PROGRAMMATIC BIOLOGICAL ASSESSMENT, CONFERENCE REPORT, AND CONSERVATION STRATEGY FOR IMPACTS FROM TRANSPORTATION IMPROVEMENT PROJECTS ON SELECT SENSITIVE SPECIES ON COLORADO'S CENTRAL SHORTGRASS PRAIRIE

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May 2003

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Acknowledgements

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) wish to thank the experts who generously donated their time and shared their research as part of the species range and impact analysis (Grunau and Lavender 2002). Their efforts helped bring this large-scale conservation effort to fruition.

For birds: Jerry Craig (CDOW), Beth Dillon (CDOW), Scott Hutchings (RMBO), Dr. Fritz Knopf (USGS-Biological Resources Division), Janet Ruth (USGS-BRD), Susan Skagen (USGS-BRD), and Tom Stanley (USGS-BRD);

For fish: Tom Nesler (CDOW);

For herpetofauna: Lauren Livo (independent researcher), Chuck Loeffler (CDOW), and Dr. Stephen Mackessy (University of Northern Colorado);

For mammals: Dr. Carron Meaney (University of Colorado) and Dr. Jerry Choate (Hays University, Kansas);

For invertebrates: Dr. Boris Kondratieff (Colorado State University), Phyllis Pineda (CSU), and Chuck Loeffler (CDOW);

For plants: Kathy Carsey and Janet Coles (Colorado Natural Areas Program), Dr. Tass Kelso (Colorado College), and Susan Spackman (CNHP).

CDOT and FHWA would also like to thank Julie Farrell, Matt Morehead, and Betsy Neeley (TNC); John Kindler (CDOW); Roland Wostl (CDOT); and Amy Lavender, Barry Baker, John Armstrong, and Mike Wunder (CNHP), for their scientific and technical expertise.

Executive Summary

The purpose of this Biological Assessment (BA), Conference Report (CR), and Conservation Strategy is to determine whether the Colorado Department of Transportation's (CDOT) routine maintenance and upgrade activities on existing transportation corridors of eastern Colorado over the next 20 years are likely to affect any of the threatened and endangered, proposed, candidate or sensitive species listed below, and to describe conservation measures that CDOT will take to mitigate those impacts.

CDOT has three goals: 1) proactive conservation of declining species in the central Shortgrass Prairie Ecoregion of Colorado; 2) compensation for potential impacts to at-risk species from transportation improvements on the existing transportation corridor network and to existing bridges in eastern Colorado; and 3) improved efficiency and effectiveness of environmental assessments associated with CDOT projects over the next 20 years. To achieve these goals, CDOT is proposing a large-scale, planned conservation effort, rather than addressing possible impacts to listed and currently non-listed species on a project-by-project basis. This will make a more effective contribution to the recovery of declining species and result in improved management of high quality priority habitats. At the same time, uncertainty in planning and implementation of CDOT projects will be minimized.

The concept for this programmatic agreement was developed in cooperation with USFWS, FWHA, CDOW, TNC, and CNHP. The project focuses on the Colorado portion of the Central Shortgrass Prairie ecoregion as modified by TNC (1998) from Bailey et al. (1994). For the purposes of this project, TNC's CSP boundary was further modified to include all segments of I-25 within Colorado. The total project area includes the entire eastern prairie in Colorado (~27,520,863 acres) and has a western boundary roughly coincident with Interstate 25 (Figure 1). It is dominated by shortgrass, mixed-grass, and sandsage prairie spread across rolling plains, tablelands, canyons, badlands, and buttes (TNC 1998).

The impact analysis was conducted using GIS and the best available scientific data in conjunction with expert review. The core project team consulted with experts in each taxonomic group (herpetofauna, birds, fish, mammals, invertebrates and plants) to select a list of species likely to be affected by CDOT activities in the CSP over the next 20 years (Grunau and Lavender 2002). Three lists of plant and animal species (terrestrial and aquatic species) were developed: species currently listed as threatened or endangered under the ESA (Table 3), proposed or candidate under the ESA (Table 4 and Table 5), and those ranked by a conservation entity as sensitive (at risk of rangewide or local imperilment) (Table 6). The experts also helped refine existing range and distribution data and define impact zones within existing transportation corridors for each species across the range of CDOT transportation improvements. The experts suggested that potential impacts from most routine CDOT maintenance activities would likely have only temporary effects (Grunau and Lavender 2002). However, because the experts identified

habitat loss as the most important potential impact, they concurred that any construction project resulting in permanent loss should be mitigated (Grunau and Lavender 2002).

CNHP calculated the maximum potential impact for each species, and then eliminated overlap among species to arrive at the total amount of habitat for targeted species within the project area that could potentially be impacted by CDOT activities: 15,160 acres (Grunau and Lavender 2002). Based on input from experts, the core project team concluded that on-site mitigation using best management practices, rather than off-site mitigation, was the most appropriate conservation strategy for aquatic species, butterflies, and some plants.

The Conservation Strategy section of this document describes actions that will be taken to offset impacts to targeted species from the Colorado Department of Transportation's (CDOT) full suite of transportation improvements and routine maintenance on the eastern plains of Colorado over the next 20 years. Details on Best Management Practices (BMPs) and some sample land protection projects that could, if implemented, meet offsite mitigation requirements, are included. The off-site mitigation strategy is based upon the acquisition of property rights (especially conservation easements) over high-quality habitat blocks that: a) contribute to the integrity of populations of targeted species, and b) allow use of an appropriate suite of management tools (e.g., prescribed fire, grazing regimes) to achieve conservation objectives, and c) are located where conservation in perpetuity is most likely to be achieved (i.e., either adjacent to other permanent conservation areas, or large enough to achieve this effect in and of themselves).

CDOT anticipates that these conservation measures for currently listed species, as well as target species that may be listed in the future, will be in effect in perpetuity. These conservation measures will satisfy CDOT's and FHWA's section 7 consultation requirements for listed species, and may satisfy future section 7 consultation requirements for target species should they become listed in the future, over the 20 years following acceptance of this Biological Assessment and Conservation Strategy, and issuance of a Biological Opinion by the U.S. Fish and Wildlife Service (USFWS).

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Part 1: Biological Assessment and Conference Report

Introduction

The purpose of this Biological Assessment (BA), Conference Report (CR), and Conservation Strategy is to determine whether the Colorado Department of Transportation's (CDOT) routine maintenance and upgrade activities on existing transportation corridors of eastern Colorado over the next 20 years are likely to affect any of the threatened and endangered, proposed, candidate, or sensitive species listed below, and to describe conservation measures that CDOT will take to avoid, minimize, and offset those impacts.

CDOT, the Federal Highway Administration (FHWA), U.S. Fish and Wildlife Service (USFWS), Colorado Department of Natural Resources (DNR), Colorado Division of Wildlife (CDOW), and The Nature Conservancy (TNC) entered a Memorandum of Agreement—Shortgrass Prairie Initiative MOA signed April 2001 " ...to effect regional conservation of declining species on Colorado's Eastern Plains by providing proactive advance conservation of priority habitats for multiple species and that will allow CDOT and FHWA to address compliance under the ESA [Endangered Species Act] for listed species, and for declining species that may become listed." The MOA addresses CDOT's 20-year plan for improvements on the existing transportation network on the eastern plains of Colorado, and associated off-system bridges.

The key to the MOA and the Conservation Strategy that accompanies this BA and CR is the purchase of real property interest(s) in selected sites from willing sellers, with the intent that Federal-aid projects will reimburse the state for mitigation credits as they are used (MOA 2001). Subsequent agreements will be executed detailing the administration, management, reporting, and monitoring for the acquired property interests, pursuant to applicable state and federal laws (MOA 2001).

In addition to federally-listed species, the BA and CR address a number of declining species not currently protected under the ESA, but considered vulnerable by the state of Colorado, the Colorado Natural Heritage Program (CNHP), RMBO or other conservation entity. Through implementation of advance conservation measures to protect habitats for selected species and best management practices to minimize impacts, CDOT intends to mitigate environmental impacts resulting from improvements on the existing transportation corridor network and existing bridges in eastern Colorado over the next 20 years. CDOT's goals are: 1) proactive conservation of declining species in the Central Shortgrass Prairie (CSP) ecoregion of Colorado; 2) compensation for potential impacts to these species from transportation improvements on the existing transportation corridor network and off-system (county) bridge improvements; and 3) improved efficiency and

effectiveness of environmental assessments associated with CDOT projects in eastern Colorado over the next 20 years.

Legal Context

Section 7 of the ESA directs all federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of threatened and endangered species (16 U.S.C. §1536(a)(1)). It also directs agencies to ensure that their actions are not likely to jeopardize the continued existence of threatened and endangered species or their habitat (16 U.S.C. §1536(a)(2)), and it requires federal agencies and departments to consult with the Secretary of Interior or of Commerce if an authorized action is likely to affect listed or proposed species or their habitat (16 U.S.C. §1536(a)(3)).

FHWA will participate in funding for transportation improvements and associated mitigation in eastern Colorado over the next 20 years. FHWA is also a signatory to the MOA. Thus, consultation with USFWS under 16 U.S.C. §1536(a)(2) is required.

A Biological Assessment (BA) is required for the "Section 7" process (16 U.S.C. §1536(c)(1)) and pursuant to the National Environmental Policy Act (NEPA) to determine whether a proposed "major construction activit(y)" under the authority of a federal action agency is likely to adversely affect listed or proposed species or designated critical habitat (42 U.S.C. 4321 et seq. and 50 CFR 402.12). The Endangered Species Consultation Handbook (Handbook) (USFWS and National Marine Fisheries Service 1998) states that " ...if both proposed and listed species are present, a biological assessment is required and must address both proposed and listed species." Further, the Handbook provides for Conferencing when a proposed action is likely to affect a "...proposed species (or candidate species if present, and voluntarily considered by the action agency...)." The outcome of a BA determines whether formal consultation or conferencing is necessary with USFWS (50 CFR §402.02, 50 CFR §402.12). The BA is used to satisfy consultation requirements with USFWS for projects requiring an Environmental Assessment or Environmental Impact Statement (id.), and displays the Determination of Effects for the proposed action. CDOT and FHWA are voluntarily considering impacts to 32 non-listed species, and for the purposes of this conference and conservation strategy for future transportation improvements, treating these species and compensating for impacts as if they were listed as threatened or endangered under the ESA (USFWS 1998).

CDOT will not be preparing a separate NEPA document for submission with this package. At this point in the process, CDOT is still in the planning stage for its improvement projects in eastern Colorado, and the mere contemplation of a project and its accompanying study do not necessarily result in a proposal for major federal action requiring a NEPA document (*Kleppe v. Sierra Club,* 427 U.S. 390, 405 (1976)-NEPA applies to proposed actions not "contemplated" actions). However site-specific impacts are to be evaluated before there is a "critical decision" to act on site development (*Save the Yaak Comm. v. Block,* 690 F.2d 714, 718 (9th Cir. 1979)) and this point is reached when the action agency proposes to make an "irreversible and irretrievable commitment

of...resources" to a project at a specific site (*Environmental Defense Fund v. Andrus,* 596 F.2d 848, 852 (9th Cir. 1985)). The courts define this as the time when the action agency still retains a maximum of options, including the "no action alternative" (*Thomas v. Peterson,* 753 F.2d 754, 760 (9th Cir. 1985); *Sierra Club v. Peterson,* 717 F.2d 1409, 1414 (D.C. Cir. 1983)). NEPA compliance will be addressed on a project-by-project basis.

Species Considered in this Document

Table 1. Populations and habitat for these species are targeted for off-site mitigation (acquisition of high quality habitat and adaptive management of that habitat in perpetuity).

Common name	Scientific Name	ESA Status/State Status
BIRDS		
Bald Eagle	*Haliaeetus leucocephalus*	Federal threatened
Burrowing Owl	*Athene cunicularia*	Colorado threatened
Cassin's Sparrow	*Aimophila cassinii*	
Ferruginous Hawk	*Buteo regalis*	Colorado special concern
Lark Bunting	*Calamospiza melanocorys*	
Lesser Prairie-chicken	*Tympanuchus pallidicinctus*	Federal candidate
Loggerhead Shrike	*Lanius ludovicianus*	Colorado special concern
Long-billed Curlew	*Numenius americanus*	Colorado special concern
McCown's Longspur	*Calcarius mccownii*	
Mountain Plover	*Charadrius montanus*	Federal proposed
MAMMALS		
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Federal candidate
REPTILES		
Massasauga Rattlesnake	*Sistrurus catenatus*	Colorado special concern
Texas Horned Lizard	*Phrynosoma cornutum*	Colorado special concern
Western Box Turtle	*Terrapene ornata*	
PLANTS		
Arkansas River Feverfew	*Bolophyta tetraneuris*	
Pueblo Goldenweed	*Oonopsis puebloensis*	
Round-leaf Four-O'clock	*Oxybaphus rotundifolius*	

Species Not Considered

Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*) listed as threatened under the ESA (63FR26517), is a riparian obligate of the Rocky Mountain Front Range. This species is not addressed in this initiative because CDOT is engaged in a separate consultation and programmatic agreement where this species occurs along Interstate 25 (I-25) in Douglas and El Paso counties.

Ute Ladies'-Tresses Orchid (*Spiranthes diluvialis*) is listed as threatened under the ESA (57 FR 2053), and is endemic, in Colorado, to wet meadows and mesic soils where the

Table 2. These species are targeted for Best Management Practices and other on-site mitigation techniques.

Common name	Scientific Name	ESA Status/State Status
AMPHIBIANS		
Northern Cricket Frog	*Acris crepitans*	Colorado special concern
Northern Leopard Frog	*Rana pipiens*	
BIRDS		
Interior Least Tern	*Sterna antillarum athalassos*	Federal endangered critical habitat identified Colorado endangered
Piping Plover	*Charadrius melodus*	Federal threatened Colorado threatened
FISH		
Arkansas Darter	*Etheostoma cragini*	Federal candidate
Brassy Minnow	*Hybognathus hankinsoni*	Colorado threatened
Common Shiner	*Notropis cornutus*	Colorado threatened
Flathead Chub	*Hybopsis gracilis*	Colorado special concern
Plains Minnow	*Hybognathus placitus*	Colorado endangered
Plains Topminnow	*Fundulus sciadicus*	Colorado special concern
Southern Redbelly Dace	*Phoxinus erythrogaster*	Colorado endangered
Suckermouth Minnow	*Phenacobius mirabilis*	Colorado endangered
MOLLUSKS		
Cylindrical Papershell	*Anodontoides ferussacianus*	
Giant Floater	*Pyganodon = [Anodonta] grandis*	
INSECTS—BUTTERFLIES		
Arogos Skipper	*Atrytone arogos*	
Hops Feeding Azure	*Celastrina humulus*	
Ottoe Skipper	*Hesperia ottoe*	
Regal Fritillary	*Speyeria idalia*	
PLANTS		
Colorado Butterfly Plant	*Gaura neomexicana* ssp. *coloradensis*	Federal threatened
Arkansas Valley Evening Primrose	*Oenothera harringtonii*	
Golden Blazing Star	*Nuttallia chrysantha*	

vegetation is relatively open (Jennings 1989; Jennings 1990). The populations in Colorado are in mesic riparian meadows in relict tallgrass prairie in the Front Range in the Ft. Collins-Denver area (Jennings 1989; Spackman et al. 1997). The orchid is not addressed in this initiative because it is not currently known from the project area. All known extant locations for this plant are in the Southern Rocky Mountain ecoregion, primarily in Boulder and Jefferson counties. The only occurrence documented in the Central Shortgrass Prairie

ecoregion is a historic record from 1856. Therefore, CDOT projects covered by this initiative would not be expected to impact this species.

Greater Prairie-chicken (*Tympanuchus cupido pinnatus*) Although this species was previously listed as threatened by CDOW, it has now been de-listed and reclassified as a game bird, open to limited harvest. As a game bird, the greater prairie-chicken is not likely to become federally-listed as a threatened or endangered species in the foreseeable future. Therefore, this species does not meet the "likelihood of federal listing under the ESA within 20 years" criterion for inclusion in this initiative.

Plains Sharp-tailed Grouse (*Tympanuchus phasianellus jamesi*) Although this species has a limited distribution in Colorado and is listed as endangered by the state, it is hunted in other parts of its range. It is, therefore, unlikely that the species will be federally-listed under the ESA in the foreseeable future. Therefore, this species does not meet the "likelihood of federal listing under the ESA within 20 years" criterion for inclusion in this initiative.

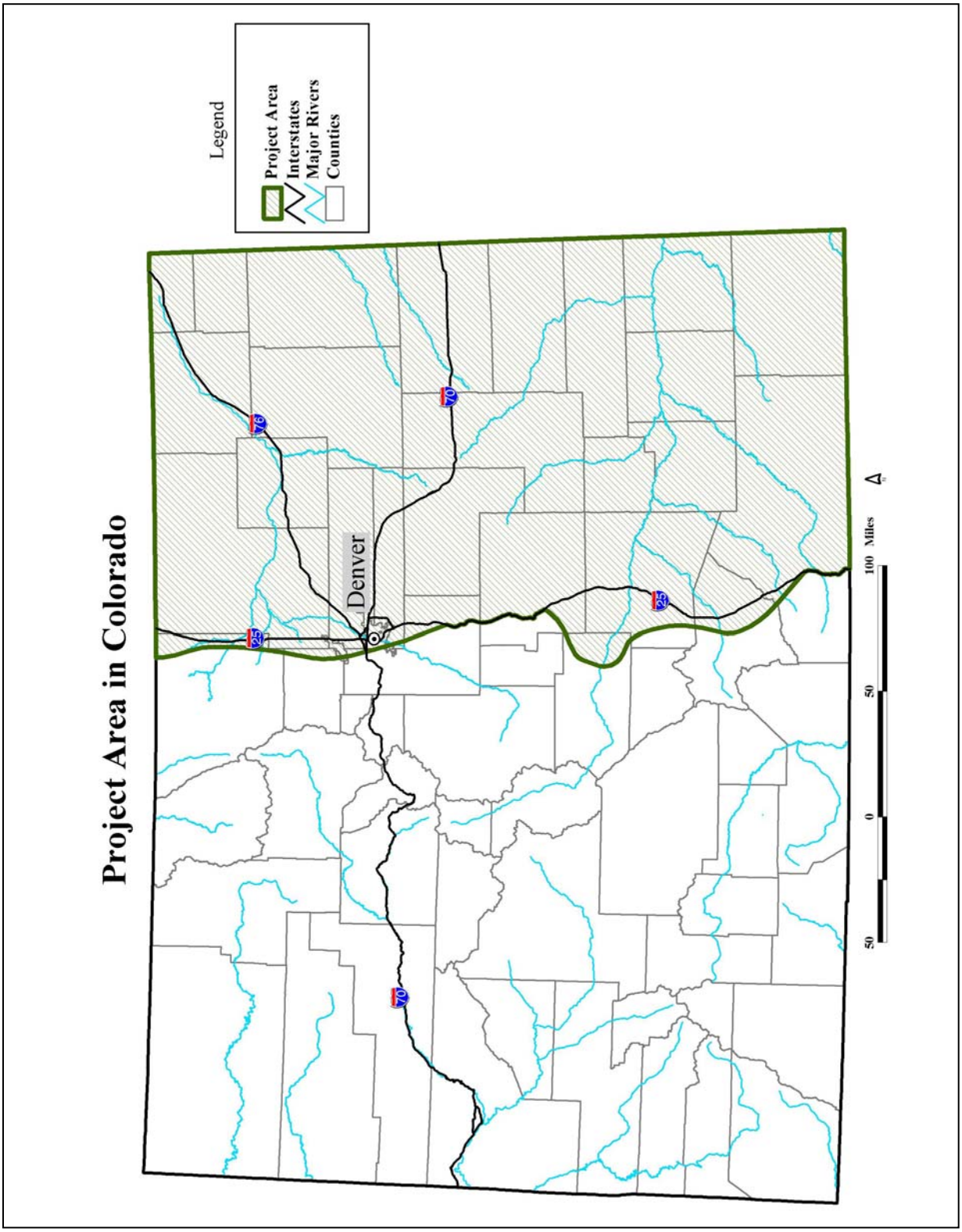
Northern Redbelly Dace (*Phoxinus erythrogaster*) This species is a species of concern in Colorado due to its extreme rarity and vulnerability to extirpation, and is found in the South Platte River basin. However, current distribution is west of I-25 in the Southern Rocky Mountain ecoregion, and is thus outside of the project area. Historically this species was found in the St. Vrain Creek near Longmont, Boulder Creek near Boulder and West Plum Creek near Castle Rock (Ellis 1914). In the most recent inventory of South Platte native fishes in Colorado, the northern redbelly dace was found only west of I-25 in West Plum Creek hydrounit 02 in Douglas County (Nesler et al. 1997). The authors found that the fish's specific habitat requirements limit the northern redbelly dace to sites in the Boulder, St. Vrain and Plum Creek drainages all west of I-25 (Nesler et al. 1997).

Roundtail Horned Lizard (*Phrynosoma modestum*) There has been a moderate inventory effort directed toward this species, yet it is only known from three locations. These are on private property along dirt roads. Experts consulted agreed that no foreseeable action of CDOT would affect these sites (Grunau and Lavender 2002).

Area Affected

The concept for this programmatic agreement was developed in cooperation with USFWS, FWHA, CDOW, TNC, and CNHP. The project focuses on the Colorado portion of the Central Shortgrass Prairie ecoregion as modified by TNC (1998) from Bailey et al. (1994). For the purposes of this project, TNC's CSP boundary was further modified to include all segments of I-25 within Colorado. The total project area includes the entire eastern prairie in Colorado (~27,520,863 acres) and has a western boundary roughly coincident with Interstate 25 (Figure 1). It is dominated by shortgrass, mixed-grass, and sandsage prairie spread across rolling plains, tablelands, canyons, badlands, and buttes (TNC 1998).

Figure 1: Location of project area and extent of CSP in Colorado



Duration of Agreement

This agreement will be in effect for 20 years from the date of signature of the BO, or until credits are exhausted as measured by acre and roadway mile.

Consultation to Date

Meetings held by the partnering agencies, conservation organizations, and consulted experts are summarized in Appendix A.

Existing Management Strategies

There are several programs at the federal and state level that influence management of several of the species included in this BA (see below). However there are no state strategies or plans that address non-listed bird, herpetofauna, or mollusk species, nor does the state address either plants or insects (pers. comm., G. Skiba, CDOW).

The ESA

The ESA applies to eight species included in this project: bald eagle (*Haliaeetus leucocephalus*), piping plover (*Charadrius melodus*), interior least tern (*Sterna antillarum athalassos*), Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*), lesser prairie-chicken (*Tympanuchus pallidicinctus*), mountain plover (*Charadrius montanus*), black-tailed prairie dog (*Cynomys ludovicianus*), and the Arkansas darter (*Etheostoma cragini*). There are federal plans in place for the first two species.

Ecosystem

Platte River Basin Program

In 1994, the Department of the Interior entered into a Memorandum of Agreement with Colorado, Nebraska, and Wyoming to establish the Platte River Basin Program. Its primary focus is to address the needs of federally-listed species along the central Platte River. One of its goals is to develop and implement a "recovery implementation program" to improve and conserve habitat for the whooping crane, piping plover, interior least tern, and pallid sturgeon, as well as to protect and improve habitats of non-listed species of concern so that future listings may be avoided (Sidle and Faanes 1997).

Partners for Fish and Wildlife

The Fish and Wildlife Service has developed a program to protect fish and wildlife habitat on private lands. "Partners for Fish and Wildlife" provides technical assistance and funding to help rehabilitate and preserve habitat. In Colorado, there is a Partners for Fish and Wildlife program in the Platte River basin and a program in the Arkansas River basin. In each, the USFWS partners with the CDOW, conservation organizations

including Ducks Unlimited, The Nature Conservancy, and Pheasants Forever, as well as individuals, while leaving land in private ownership.

Partners for Fish and Wildlife-Southeast Colorado

In Southeastern Colorado, the "Partners for Fish and Wildlife Program," its funding partners (CDOW, Natural Resources Conservation Service, North American Wetland Conservation Act, TNC, and Ducks Unlimited), its planning partners (Great Outdoors Colorado, Natural Resources Conservation Service, Ducks Unlimited, Western Governors' Association, Playa Lakes Joint Venture, local Soil Conservation Districts, local Pheasants Forever chapters), and private landowners are focusing on playa restoration and management, floodplain wetlands and riparian restorations, and native prairie restorations. These programs will benefit, among other species, the piping plover, interior least tern, lesser prairie-chicken, and northern leopard frog. Since 1996, the Partners Program in southeastern Colorado has completed 149 landowner agreements covering 1,620 wetland acres, 19,315 upland acres, and 25 riparian miles.

Partners for Fish and Wildlife-Northeast Colorado

In northeastern Colorado, the **"**Partners for Fish and Wildlife" projects are currently composed of floodplain restoration and ground water recharge projects in the South Platte River basin. The program has developed funding and planning relationships with the CDOW, Great Outdoors Colorado, Natural Resources Conservation Service, Ducks Unlimited, North American Wetland Conservation Act funding, Northern Colorado Water Conservancy District, Centennial Land Trust, South Platte Lower River Group, Lower South Platte Water Conservancy District, several smaller water providers, and private landowners. Projects in this area have accounted for improvements and restoration of 981 wetland acres, 12 miles of riparian fencing, and 3,000 acres of associated upland habitats. Species that benefit include waterfowl and bald eagles. Future plans are to target restoration projects in upland areas, specifically to benefit prairie dogs.

Bird Species

Migratory Bird Treaties and Conventions (MBTA)

The U.S. Government has signed several treaties with its neighbors for the conservation of migratory birds (16 USC 703-711). In 1916, the Secretary of State negotiated a treaty with Great Britain (acting for Canada) that provided protection of birds migrating between Canada and the United States (39 Stat. 1702). The Canadian Convention was supplemented by a treaty with Mexico in 1936 (50 Stat. 1311), a treaty with Japan in 1972 (25 U.S.T. 3329), and a treaty with the Soviet Union ratified in 1978. These treaties provide for the regulation of hunting and for conservation through the enhancement of habitat. The treaties are implemented by the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712) which makes it unlawful, *inter alia*, "to hunt, take, capture, kill...[or] possess" any bird protected by the Convention except as permitted (MBTA, 16 U.S.C. §703). The treaties provide for protecting migratory bird habitat from pollution, conversion and degradation as well as "...establish(ing) preserves, refuges, protected

areas...intended for the conservation of migratory birds and their environments, and to manage such areas so as to preserve and restore the natural ecosystems" (Convention Between the United States of America and the Union of Soviet Socialist Republics 1978). As amended in the 1972 treaty with Mexico, all of the treaties apply to raptors including bald eagles.

The Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668 et. seq.) and its associated regulations govern the taking, possession, and transportation of eagles. (§668c defines "take" to include "...or molest or disturb...")

Northern States Bald Eagle Recovery Plan

This plan, established in 1983, defines the actions the federal government will take to facilitate the recovery of the bald eagle**.**

Bald Eagle – Colorado

Each January, CDOW in cooperation with the USGS Snake River Field Station in Boise, Idaho, conducts wintering bald eagle surveys. The surveys are part of a nationwide effort to index the total wintering bald eagle population in the lower 48 states, and to identify previously unrecognized areas of winter habitat. Colorado has been conducting bald eagle mid-winter surveys since 1987, providing critical information on eagle population trends, distribution, and habitat in Colorado. In 2001, the total number of bald eagles counted was 545 (CDOW 2002b).

Monitoring Colorado's Birds

The Rocky Mountain Bird Observatory (RMBO), in cooperation with U.S. Forest Service, CDOW, the National Park Service, and the Bureau of Land Management, has implemented a bird monitoring program for Colorado (Monitoring Colorado's Birds [MCB]) designed to provide population trend or status data on all regularly-occurring breeding species in the state (Leukering et al. 2000). The goal of MCB is to be able to detect a minimum rate of population change of -3.0 percent per year over a maximum time period of 30 years. Federally-listed species are not monitored under MCB because monitoring programs are mandated for these species under ESA. Other species are either "tracked" (populations of low-abundance or localized species) or monitored (species for which a sufficient number of samples can be obtained such that they have a coefficient of variation of less than 1.00) (Leukering et al. 2000). Of the species covered in this initiative, the MCB monitors burrowing owl, Cassin's sparrow, loggerhead shrike, long-billed curlew, McCown's longspur, and mountain plover, but does not monitor bald eagle, interior least tern, lesser prairie-chicken, or piping plover.

Recovery Plan for the Interior Least Tern

The interior least tern recovery plan (USFWS 1988) calls for the maintenance of the distribution and range of the tern through protection of essential habitat and restoration of nesting habitat (suitable sandbars in the river channels of rivers with adequate stream flows).

Recovery Plan for the Piping Plover

The recovery plan (USFWS 1988) for the northern Great Plains population of the piping plover calls for the protection of essential habitat and restoration of nesting habitat (suitable sandbars in the river channels of rivers with adequate stream flows).

Strategy for Burrowing Owls

The USFWS has completed a draft status assessment and conservation plan for the burrowing owl in the United States (Anderson et al. 2001). The plan summarizes conservation efforts and strategies that have been suggested by states within the range of burrowing owls. Strategies suggested include protection and management of habitat and burrowing mammals, relocation and construction of artificial burrows, surveys and research, and education. There were no strategies suggested from Colorado.

Assessment and Conservation Strategy for the Lesser Prairie-chicken

An interstate working group, including Colorado, Kansas, New Mexico, Oklahoma, and Texas has developed a strategy for conservation and recovery of the lesser prairie-chicken (Mote et al. 1998). This conservation plan is the start of a cooperative effort among state and federal agencies and private landowners to conserve the lesser prairie-chicken and the habitat on which it depends. Conservation objectives include establishment of a regional lesser prairie-chicken working group, investigation of status and trends for populations and habitat, development and implemention of management guidelines for populations and habitat, development and distribution of education and technical assistance materials for lesser prairie-chicken conservation, and research on biology and management of the lesser prairie-chicken.

United States Shorebird Conservation Plan

The U.S. Shorebird Conservation Plan is a partnership effort being undertaken throughout the United States to ensure that stable and self-sustaining populations of all shorebird species are restored and protected. The plan was developed by a wide range of agencies, organizations, and shorebird experts who helped set conservation goals for each region of the country, identified habitat conservation needs and key research needs, and proposed education and outreach programs. http://www.manomet.org/USSCP.index.htm

North American Bird Conservation Initiative

The North American Bird Conservation Initiative is a cooperative effort of the major bird conservation organizations. It seeks to increase funding for integrated bird conservation in North America and to coordinate efforts of the existing initiatives, including the U.S. Shorebird Conservation Plan.http://www.nabci.org/

Mammal Species

Prairie Dogs—Colorado

The CDOW has initiated a private landowner incentive program to help landowners conserve habitat required by prairie dogs and other species that interact with or depend on

them, including the mountain plover (which is being considered for listing under the ESA), and the burrowing owl (which is listed by Colorado as a threatened species) (CDOW 2002a). CDOW will make $600,000 available to landowners in the Baca, West Greeley, South Pueblo and Turkey Creek soil conservation districts. Landowners in these areas will be allowed to offer a per-acre bid for the amount of compensation they think is reasonable for protecting prairie dogs on their property (CDOW 2002a). The Division and the soil conservation districts will then evaluate potential parcels based on quality of habitat, size of prairie dog colonies, acres of shortgrass, proximity to protected habitat, and distance from adjacent landowners (CDOW 2002a). Lands that provide the greatest benefit at the least cost will be accepted into the program. Landowners will be able to enter 5- or 10-year agreements. The smallest parcels acceptable will be 160 acres with prairie dogs present on at least 25 percent of the land. Compensation will be based on total acreage enrolled (CDOW 2002a).

Fish Species

CDOW is in the process of developing and preparing statewide management plans for the brassy minnow, common shiner, flathead chub, plains minnow, plains topminnow, southern redbelly dace, and the suckermouth minnow (pers. comm., Gary Skiba).

Arkansas Darter Recovery Plan

The Arkansas Darter (*Etheostoma cragini*) Recovery Plan (CDOW 2001) is a plan designed to preserve the Arkansas darter and its habitat, to restore the species to a viable condition, and to remove it from Colorado's threatened species list (CDOW 2001).

Invertebrate Species

Mussels

The USFWS has drafted a national strategy for the conservation of native mussels (Biggins et al. 1995).

Proposed Action

USFWS, FHWA, CDOW, and CDOT recognize that project-by-project ESA Section 7 consultation requires a great deal of time and resources, and can yield small and disjunct conservation benefits that contribute little to the viability of individual species and their habitats (MOA 2001). By engaging in multi-species recovery in an integrated and comprehensive fashion, CDOT, FHWA, USFWS, and CDOW hope to aid the recovery of listed and non-listed species, alleviate some of the need for additional listings under the ESA, and to improve predictability in CDOT's project development process in eastern Colorado.

The action area of the proposed project is the eastern plains of Colorado (Figure 1). Because of the programmatic nature of this project, it is not possible to specify which of the existing eastern plains transportation corridors and off-system bridges will undergo the proposed actions (described below) over the 20-year timeframe. Therefore, the extent of potential direct and indirect impacts must be considered the entire ecoregion.

Within the overall action area, the core project team (in consultation with experts) defined the project area as the ROW of existing transportation corridors, including bridges. Experts suggested that, because the "disturbance mechanism" – the road – is already present, most potential impacts from the proposed actions would be temporary. The primary source of concern was the potential for additional permanent habitat loss. The experts concurred that permanent habitat loss from any of the proposed actions would be limited to the ROW. Therefore, for the purposes of the impact analysis and conservation/mitigation strategies presented in this document, the project area is the ROW.

It should be noted that, for most of the proposed actions, the actual impacts will probably be limited to the project footprint – an area that is usually considerably smaller than the ROW. However, CDOT and FHWA are committed not only to mitigating the proposed actions, but also to offering a meaningful contribution to ultimate species recovery. Therefore, for the purposes of this project, CDOT and FHWA have defined the project area as the larger ROW, rather than the actual project footprint, and have calculated mitigation obligations accordingly.

Scope and Scale of Proposed Actions and Timeframe for Implementation

1. Bridge repairs for all bridges on the 20-year needs list.
2. Approximately 4,307 miles of resurfacing/overlays and accompanying shoulder improvements.
3. Maintenance along existing transportation corridors and bridges.
4. Safety, reconstruction, capacity, and other transportation improvements (in addition to the overlay projects) for 22 percent of the transportation corridor network in Colorado's CSP.

This project proposes to provide up-front, proactive compensation for routine maintenance on approximately 4,307 miles of existing transportation corridors in the Central Shortgrass Prairie; resurfacing of these same 4,307 miles; replacement of off-system bridges (approximately five bridges occur in the project area, and four of these are in urban areas); and safety and capacity improvements on approximately 22 percent of the existing transportation corridor network on the Central Shortgrass Prairie. The majority of permanent impacts and a large percentage of temporary impacts will occur as a result of these safety and capacity improvements.

Descriptions of Types, Purpose, and Intent of Proposed Actions

Routine maintenance involves preserving and keeping all roads, roadsides, structures and miscellaneous facilities in as close to their original or improved condition as possible.

Maintenance personnel responsibilities are to maintain roadway surfaces true to type, cross-section, alignment, and grade as originally constructed or reconstructed; to preserve the original roadway in the safest and best condition possible; and to provide the services necessary to keep traffic moving in the safest possible manner every day of the year.

Several activities are necessary to achieve these goals, including overlays, chip-sealing, patching, roadway reconstruction, bridge maintenance, rest area maintenance, noise barrier maintenance, drainage and erosion control structure maintenance, system quality enhancements, bicycle trail construction/maintenance, pedestrian facility additions or improvements, landscaping or reseeding, curb and gutter work, and wildlife crossing maintenance. Each of these activities is described in more detail below.

Best management practices and conservation measures that will be employed to avoid, minimize, and offset impacts from these actions are detailed in the Conservation Strategy section of this document.

Overlays

Overlays are placed on existing sections of highway that will not be reconstructed for a long period of time and are in need of extensive repair. When surfaces, either concrete or asphalt, of older projects show signs of distress due to deficient base course or other causes, it is often more economical or expedient to place an additional depth of bituminous surfacing over the section of road rather than reconstruct the entire base and surface courses. Asphalt overlays are generally one-half inch to two inches in thickness, but may be as thick as four inches. Overlay equipment can cover approximately one to four miles per day, and stays on the pavement. Any staging will occur within the existing ROW.

Asphalt chip seal (Seal coats)

Seal coats with cover are applied to existing asphalt surfaces that are dry, cracked, and oxidized. These coats prevent penetration of surface moisture, provide a skid-resistant wearing surface, improve the night-driving characteristics of the road, and reduce the need for patching on surfaces that show raveling or cracking.

Seal coats are applied in four stages. Bituminous material (emulsified asphalt) is first applied uniformly and continuously to a clean, dry surface. Air and surface temperature must be above 70°F at the time of application. A cover coat (crushed stone or crushed or natural gravel) material is immediately applied to the bituminous material, before it has the time to chill, set up, dry or otherwise impair retention of the cover coat. Water may be applied to the cover material to control dust. Rolling starts immediately behind the cover coat application and is continued until three complete coverages are obtained. Rolling is completed the same day that the bituminous material and cover coat are applied. The completed surface is lightly broomed the next day to remove excess material without dislodging any embedded material. A fog seal may or may not be applied. Approximately 10 – 12 lane miles, or five to six linear miles, can be chip sealed in a single day. Any staging of equipment will occur within the existing ROW.

Asphalt and concrete crack-seal

Cracks and joints in pavement surfaces are sealed by filling them with liquid asphalt and then covering them with sand, hand-raking in a rich mixture of sand and asphalt, or filling them with a specific crack-sealing material. A distributor is hauled behind a truck and the cracks are sealed by hand. The truck and distributor generally stay on the pavement or shoulder during this procedure.

Patching

Patching may be done by hand or machine, and may be temporary or permanent. For temporary hand-patching, asphalt surfaces, holes or depressions are first cleared of loose material, then liquid asphalt is applied to the sides of the hole, and the hole is filled with premix. The edges of the patch are then feathered to match the existing asphalt roadway, and the site is rolled or compacted to a smooth finish. Permanent hand patching requires exposing the road subgrade or base, determining the cause of the hole or depression, and removing and replacing any unsatisfactory material. Patch areas are made to be rectangular, cleaned, primed with a coat of light grade asphaltic material, and filled with a premixed material tamped into place in layers of no more than two inches in thickness. The patch is then rolled so that it smoothly fits the road surface. Machine patching follows the same procedure as asphalt overlays, uses similar equipment, and can generally be completed within a couple of hours.

The typical Portland Cement roadway surface in Colorado is a single course pavement of unreinforced concrete varying in thickness and width. These surfaces may fail for a variety of reasons, including cracking due to base failure, sunken or raised slabs from base failure or earth movements, raised joints resulting from faulting at a joint with an unstable base, joint spalling (chipping at joint edges), or surface scaling (separation and flaking) caused by freeze-thaw, chemical ice control, or extensive use of tire chains or studded tires on bare pavement. Patching concrete follows much the same procedure as patching asphalt. Small areas of broken-up concrete may be patched with premixed bituminous material or with a Portland Cement concrete or epoxy. Edges of the broken area are squared and a tack coat material is applied. If necessary, the subgrade is strengthened by compacting a stable material into the hole. As with asphalt patching, concrete patching can generally be completed within a couple of hours.

Concrete slab replacement

Concrete roadway slabs are removed, and the area leveled with aggregate base course. The concrete is replaced by casting-in-place a new slab or a pre-cast slab and sealing the concrete joints. When portions of concrete pavement are removed and replaced, the portion removed is at least 10 feet in length and the full width of the lane. Any remaining portion adjacent to the transverse joint that is less than 10 feet in length is also removed. The subgrade may also be replaced. Generally, one to two feet of the subgrade is dug up and compacted with moisture and density control. A crane placed on a paved surface is used to remove and replace the concrete slabs. Replacement can usually be completed in one to three days.

Asphalt reconstruction

Existing asphalt is removed or recycled. It is hauled to a central asphalt plant for hot recycling, or stockpiled for in-place cold or hot recycling, replaced, then topped with a high quality hot bituminous pavement. All work is done from the road surface, and approximately one mile of asphalt per day can be reconstructed using this procedure.

Concrete reconstruction

Concrete reconstruction involves a full depth overlay of concrete or asphalt with stabilization. Widening could also take place if warranted by traffic volume increases. Reconstructed pavements need to be placed on a hard subgrade. If concrete or asphalt is already in place, then that surface acts as the subgrade. If the old road is removed before placing the new pavement, then the subgrade needs to be re-worked to a depth of six inches to four feet to ensure that compaction requirements are met. Because of the complexity of this type of work, a week or more may be required for its completion.

Bridge maintenance/replacement/restoration/rehabilitation

All bridges and approaches on the highway system within the ROW are maintained by CDOT. Most repairs are handled by maintenance crews, but some are placed on contract. Bridges are routinely inspected for waterway, guardrail, fence, approach, and deck maintenance needs. Inspections also occur every two years by Staff Bridge, as well as during and after floods. Waterway maintenance could consist of keeping the waterway clear of fences, debris, silt, logs, or live vegetation that could reduce the carrying capacity of the structure. Additional maintenance activities include protecting the approach side slopes against erosion by using riprap, lined ditches, flumes, or pipes. Deck drains may also cause erosion and these sites may require riprap or drain extensions. Guardrail posts are kept clear of weeds and in proper repair. Bridge approaches are kept flush with the bridge deck surface, and kept drained, especially at the ends of wingwalls. Steel structures are systematically repainted to prevent deterioration by corrosion. Dirt, scale, and blisters are removed from the steel with a wire brush or a scraper, or by sand or water blasting, prior to painting. Patching bridge decks is carried out in the same manner as patching asphalt or concrete, except that patching material is kept out of expansion devices and joints.

Bridge maintenance activities are highly variable, and the associated disturbance also varies. These activities could require a few hours to a few days to complete.

Bridge replacement

Consists of the removal of the old bridge and replacing with a new structure that may be wider if traffic volumes are projected to be higher. Details of bridge construction depend upon site-specific traffic and environmental characteristics, and could require weeks or months to complete.

Bridge restoration

Deficient portions of a bridge are restored so the intended design life may be achieved. Bridge restoration usually involves removing portions of deteriorated concrete and

pouring new concrete in its place. Restoration methods are usually very specific to the type of bridge structure and are temporary.

Bridge rehabilitation

Deficient areas of the bridge are removed, which usually includes the bridge deck, bridge girders, bridge abutments and pier caps, and replacing or supporting the deficient areas with new concrete, epoxy reinforcing steel, water proof membrane and a thin layer of hot bituminous pavement. Bridge rehabilitation is more comprehensive and permanent than bridge restoration. A significant increase in service life (up to 50 years or more) and a "like new" structure can result from a rehabilitation.

Rest area construction/maintenance

Rest area maintenance includes weed control, litter control, and other activities required to keep these areas neat and orderly and their equipment functional. Weed control could occur as mowing, herbicide application, or other methods described below (Roadside Vegetation Management).

Noise barrier construction/maintenance/replacement

Activities associated with the construction and maintenance of noise barriers include clearing and grubbing, excavation and backfill. All these activities occur within the CDOT right-of-way unless a temporary easement is necessary. All disturbed areas and temporary construction easements are revegetated with native plant species or returned to original condition as soon as practical after project completion. Environmental clearances, such as wetlands and sensitive species, are obtained prior to construction or maintenance activities. Where sensitive habitats occur, plastic fencing is erected to define the work area.

Noise barriers are typically constructed of pre-cast concrete panels held together with steel posts. They may also be composed of earthen berms. Berm construction consists of excavation, hauling, disposal, placement, and compaction of all material encountered within the limits of the work. Barrier height depends upon topography as well as the location and distance of the highway from the area to be protected. Noise barriers are rarely constructed in rural areas. Virtually all noise barriers occur adjacent to major highways in urban, suburban, or industrial areas.

Drainage or erosion-control structure construction/maintenance

Drainage structures include cattle passes and cattle guards, collection ditches, shoulder drains, side ditches, under drains, outlet ditches, contour ditches, culverts, dips and overflow sections, and natural watercourses and streams. Additional drainage or erosion-control maintenance activities include sump pump maintenance, ice prevention and removal, cleaning and mowing paved and unpaved roadsides and ditches, and maintenance of slopes, streambanks, wetlands, paths and trails, fences, as well as litter control and sweeping. All drainage structures are cleaned in the fall and spring to ensure that they can accommodate spring runoff and summer rain. Excavated material is never placed in wetlands or adjacent to waterways. Equipment access is limited to one or two

points of entry. Materials used in streambank repair are free of fine-grained erodible soils, asphalt materials, and hazardous materials. Larger culverts are treated as bridges. Calcium chloride or salt is used to keep spring-fed culverts ice-free, or to open them up if they are already frozen.

System quality enhancements

Bicycle trail construction/maintenance – maintain as originally constructed or subsequently reconstructed. Keep free of all brush and debris. Maintain same as bituminous roadway surface. If gravel, fill in ruts and holes. Construction consists of clearing the construction area, drainage, building sub-grade and surfacing with aggregate base, asphalt or concrete. Width usually varies from four feet to 12 feet.

Bicycle rack installation – Purchase and install prefabricated steel bicycle rack(s). These are usually attached to asphalt or concrete surfacing.

Pedestrian facility additions or improvements – Installation of miscellaneous amenities to improve or maintain pedestrian facilities, such as overpasses, ramps, etc.

Betterments and emergency repairs

Betterments are small permanent improvements to the highway that are of urgent necessity. Emergency repairs are necessary when roadway use is impaired or substantially obstructed. Emergencies include landslides, fires, floods, and national emergencies. Maintenance actions include erecting barricades or providing flaggers, removing and repairing the obstruction, and providing a detour. There is no set procedure for these activities. They are highly variable and the rectifying actions are event-specific.

Snow and ice control

Snow removal and ice control activities involve plowing, deicer or abrasive application, emergency assistance, rockslide removal, and snow fence maintenance and construction. Snow fences are erected at a set back from the highway of 35 times the height of the snow fence. They are repaired prior to the snow season and kept free of windblown sand and weeds. Where topography permits, snow fences may be constructed by plowing windrows of snow.

Traffic services

Traffic Services include activities related to installation, repair, and maintenance of traffic control devices (signs, signals, delineators, mile markers, guardrails, pavement markings, energy attenuators [crash cushions], portable variable message signs, barricades, lighting, rumble strips). Signs are visually inspected twice every year during daylight hours and once every year during darkness for general position, visibility, legibility, damage to sign or post, breakaway devises, and reflectivity. Delineators and mile markers are also regularly inspected and cleaned and repaired as needed. Guardrails, end sections, and guardrail posts are regularly inspected and are repaired, readjusted or replaced when their proper function is compromised. If more than 25

percent of a sub-standard guardrail is damaged, the entire length of the guardrail is replaced to current design standard.

Roadside vegetation management

Roadside vegetation management includes mowing, brush control, noxious weed control, bare ground treatment, tree pruning, planting, thinning, seeding, and other actions. The area covered by these actions extends from the roadway shoulder to the right-of-way limits and includes medians. Roadside vegetation management occurs on an as-needed basis and is coordinated through the RPEM in order to obtain any necessary permits. Roadsides are maintained to be as much like their natural habitat or the condition to which they were constructed or developed as possible. Four methods of vegetation management are used by CDOT: mechanical control, chemical control, cultural control and biological control. Burning is not used by CDOT to control vegetation.

Mechanical mowers, saws, axes or other cutting implements are the tools used in mechanical control. Mechanical mowers are used only in areas that are level enough for the machinery. Mowing in rural areas (i.e., non-landscaped areas) is kept to one mower width (not to exceed 22 feet), except in areas with safety or noxious weed concerns. Mowing width is also restricted to one mower width in habitats where sensitive species are known to occur. Grasses are generally mowed to a height of eight to 10 inches, but no less than six inches. In order to protect nesting bird habitat, mowing in areas beyond the slope area that allows surface drainage (Zones 2 and 3) is avoided between April 15 and August 1. Handsaws, axes or other cutting implements are used to remove select trees, shrubs, or other vegetation. Tree and shrub pruning is generally conducted when the plants are dormant.

Chemical control is accomplished by herbicide application through either hand spraying (pulling hose or back pack) or broadcast by truck, depending upon the situation and as directed by CDOT's Weed Coordinator. Herbicides are not applied within 15 feet of a riparian area, except by personnel licensed to apply herbicide within a wetland or riparian area. In habitats where sensitive species are known to occur, herbicide application is coordinated through CDOT's Office of Environmental Programs. Best Management Practices and a weed-spraying plan are being developed by CDOT's Weed Coordinator. Plant growth regulators are used on roadsides, around delineators, and along guardrails.

Cultural control methods enhance the competitive capabilities of desirable plants by meeting their nutrient, moisture, and light requirements. Methods include reseeding, fertilizing, and irrigating.

Biological control involves releasing organisms that prey upon a specific host plant. CDOT does not frequently employ this method of weed control.

Curb and gutter

Construction of curb, gutter, or combination of curb and gutter. Three types of curbs: cast-in-place concrete, dowelled concrete, or bituminous.

Wood or metal forms are used for cast-in-place concrete. Curbs are generally constructed in 10-foot sections separated by 1/8-inch open joints, except at expansion joints, unless otherwise specified. Expansion joints are placed according to each project's plan or to match existing pavement. The curb is then cured and back-filled according to plan. Alternatively, a curb-forming machine, such as that used for a bituminous curb, may be used.

Wildlife crossings

Wildlife crossings are typically either a concrete box culvert or a large corrugated steel pipe with inlets to allow for lighting. Bridges spanning drainages may also serve as wildlife crossings. Crossings are maintained by removing debris and/or snow from existing culverts that could impede wildlife crossing.

Roadway geometrics improvements

These improvements include upgrading sub-standard roadways to meet current federal and state requirements. Examples would be improving the super-elevation of a curve, improving deficient sight distances, and changing the cross slope of the roadway for public driving safety. Construction could involve removing sub-standard road, earth work, should addition, resurfacing, adding guardrails, and jersey barriers, or blasting out rock faces.

Interchange construction/reconstruction

Interchange construction or reconstruction generally consists of adding an overpass or underpass as a means of crossing existing roadways. Newly constructed or reconstructed overpasses or underpasses usually have four ramps as well as necessary lighting, signing and signalization in order to meet increased traffic volumes on the intersecting roadways. These activities are more likely to occur in urban areas.

Intersection improvements

Intersection improvements consist of adding or improving the signalization, signing, lighting, pavement marking, and/or sight distances. They may also entail separating traffic with medians, and/or constructing through traffic or turn lanes.

Rail crossing upgrades

Rail crossing upgrades involve overpass or underpass construction, and the installation of railroad signals.

Grooved pavement, centerline, or shoulders

Placing grooves or rumble strips in either the centerline or shoulder pavement is a safety measure to alert drivers to a dangerous condition or to maintain their alertness. It involves removing parallel strips of pavement approximately five inches wide, 12 inches long, 3/8 inch deep, and seven inches apart and perpendicular to the flow of traffic, with a small asphalt planing device. Rumble strips are placed for 48 feet, and then not placed the next 12 feet, with this pattern repeated.

Lane addition (i.e., added capacity, acceleration/deceleration lanes, truck climbing lanes)

Lane addition involves earthwork, drainage work, base course addition, surfacing with either asphalt or concrete, pavement marking, signing and oftentimes guardrail placement.

Transit line addition

The addition of lines to an existing transit facility.

Transit station addition and other amenities

The addition, reconstruction, or maintenance of transit stations and amenities, such as pullouts, benches, restrooms, bicycle racks, shelters, bicycle lockers, etc.

Shoulder addition/widening

Current standards call for shoulders in each direction of travel varying from 4 – 12 feet, depending on the facility type, location, and traffic. Shoulders are 4 – 6 feet adjacent to auxiliary lanes, 8 – 10 feet along rural highways, and 10 – 12 feet along interstates. Widening consists of earthwork, drainage, base course addition, surfacing with asphalt or concrete, landscaping, pavement marking, and, if necessary, guardrail addition.

Bike trails and/or crossings

Bike trail construction includes scraping, grubbing, excavation, fill, compaction, and paving. Bike crossings are most commonly at-grade with pedestrian signalization and pavement marking, but are occasionally overpasses or underpasses.

Environmental Baseline

The CSP occupies approximately 90,700 square miles of North American grasslands. North American grasslands are dominated by grasses and grass-like plants, shrubs, and an absence of trees (Weaver 1968; Weaver et al. 1996; Licht 1997). In Colorado, the CSP is characterized by shortgrass, mixed-grass and sandsage prairie on rolling plains, tablelands, canyons, badlands, and buttes (TNC 1998). Shortgrass prairie uplands are dominated by blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*). Both are warm-season grasses that flourish with intensive grazing, retain their protein content, and remain digestible when dormant (Weaver et al. 1996). Grasslands are among the most biologically productive of all communities (Williams and Diebel 1996). Their high productivity derives from high retention of nutrients, efficient biological recycling, and a structure that provides for a wide variety of life (Estes et al. 1982).

Critical Habitat

There is no federally-designated critical habitat for target species within the action area.

Ecological Processes and Conditions

Climate, grazing, and fire are the primary ecological processes driving natural systems in the CSP (Ostlie et al. 1997). In addition, soil type is a primary determinant of the types of vegetation that can occur in an area. Historically, this combination of processes and soil type probably created a heterogeneous landscape that included a patchwork of intensively grazed lands and disturbed soils (Knopf and Sampson 1997).

Soils

Soils vary in texture, moisture, and structure. All of these attributes contribute to the potential vegetation types as well as macrobiotic soil fauna. For example, impermeable clay soils support either greasewood or four-winged saltbush communities, but not shortgrass prairie, regardless of local climate and grazing variables. Soils of this ecoregion that are loamy (clayey or sandy loams) support either mixed-grass or shortgrass, while sandy soils support sandhills grasslands or sandsage shrublands.

Climate

The total amount of precipitation is low, and evaporation generally exceeds precipitation (Bailey 1995). The central North American grasslands experience an east to west declining precipitation gradient and a north to south increasing temperature gradient that, combined, help drive a corresponding gradient in plant community type, net biomass productivity, soil carbon storage, and available nitrogen (Lauenroth et al. 1999).

Grazing

Historically (i.e., before widespread conversion to agriculture), the landscape probably consisted of a shifting mosaic of intensely and lightly grazed patches of vegetation. The patchiness of the landscape resulted from the actions of large herds of ungulates, including bison (*Bison bison*), pronghorn (*Antilocapra americana*), elk (*Cervus elaphus*), and feral horses (*Equus caballus*), as well as prairie dogs (*Cynomys ludovicianus*), grasshoppers, and wildfire (Hart 2001). Of these, the most profound grazing impacts were from bison, pronghorn, prairie dogs, and (periodically) grasshoppers. Today, domestic livestock have replaced bison and pronghorn as the primary herbivores on the CSP, and poisoning, shooting and plague have greatly reduced the extent of prairie dog colonies (Fitzgerald 1996; Knopf 1996a; EDAW 2000).

Fire

Prairie fires, either intentionally set by Native Americans or naturally ignited by lightning, occurred periodically (at undocumented frequencies). These fires returned nutrients to the soil, stimulated the growth of grasses and forbs, and retarded succession to woody vegetation. Most grasses of the CSP are adapted to survive and even flourish in the presence of fire (Wright and Bailey 1980; Brown 1989), though its value as a management tool is not well understood (Ostlie et al. 1997).

Riparian Systems

Eastern Plains Rivers

The streams and rivers of the eastern plains of Colorado are characterized by highly variable and turbid warm water flows, and support native fishes, many of which are species of special concern. Rivers are fed by intermittent tributaries, runoff and surfacing groundwater (Woodling 1985). The surfacing groundwater sometimes forms permanent stream and wetland reaches of tributary streams. Water levels become shallow (only a few inches) in summer, water temperatures become high in summer, total dissolved salt can become quite high, and in spring, flows can be high and turbulent (Woodling 1985). Fish species living in such habitats must be able to tolerate drought, flooding (both high flows from snowmelt, and flashfloods from summer thunderstorms), high turbidity, and fluctuating habitat conditions.

Floodplains

River floodplains were originally a complex of wet bottomlands in which the scouring flows of spring runoff precluded the development of permanent stands of wooded vegetation in the riparian corridor (Currier et al. 1985; Fitzgerald et al. 1994; Hart and Hart 1997). Spring flows moved large quantities of sediment, removed shallowly rooted seedlings, and created sandbars among the braided channels. Before settlement, the large river valleys were largely a mixture of poorly drained sedge meadows and marshes and relatively well-drained, slightly elevated lowland prairies (Currier et al. 1985; Hart and Hart 1997). Short- and mid-grass prairies of little bluestem (*Schizachyrium scoparium*) and buffalo grass were found on the tablelands surrounding the valleys (Currier et al. 1985; Hart and Hart 1997). Further east in the CSP, river valleys were often dominated by cottonwood and peachleaf willow woodlands, and/or tallgrass prairie communities, including big bluestem and Indian grass. (TNC 1998). With the advent of water development, the dynamic nature of the rivers has been greatly reduced. As a result, diminished hydrologic connectivity between meadows and rivers, reduced sediment supply, river bed degradation, intensive grazing, and fire restriction, have led to significant expansion of native and exotic woody vegetation onto grasslands, and into wet meadows and inactive river channels (Currier et al. 1985; Fitzgerald et al. 1994; Hart and Hart 1997; Sidle and Faanes 1997). The consequent establishment of permanent wooded vegetation has created corridors that facilitate the dispersal of fauna west of their historic ranges, including raccoons, eastern cottontails, fox squirrels, Virginia opossums, bullfrogs, and a large number of avian species (Knopf 1986; Schwalbe and Rosen 1989; Fitzgerald et al. 1994; Knopf 1994). While some of these species may have occurred sporadically in the CSP, they are now permanent and often dominant residents.

Human Context

Land Ownership

Ninety-one percent of the ecoregion is privately-owned (TNC 1998), with the remainder under federal (Department of Defense, National Grassland) or state management. The

majority of the CSP in Colorado east of I-25 is rural, with most people dependent on agriculture. Approximately 29 percent of the CSP has been converted to crop or pastureland (Knopf and Samson 1997), and approximately 40 percent remains in relatively large, intact parcels (TNC 1998).

Land Use

Agriculture has been the dominant land use in the project area for most of the last 100 years, and much of the area outside the major metropolitan areas remains in agricultural use today. While population loss on the eastern plains has been a reality for decades (Lang et al. 1995), commercial and residential development is occurring in the I-25 corridor, particularly between Colorado Springs and Fort Collins. However, Colorado is a "home rule" state, meaning that planning and decisions regarding land use are made at the local level. Metropolitan Planning Organizations and Regional Planning Organizations prioritize and funnel transportation needs, developed in response to current and locally planned development, to the Colorado Department of Transportation. In the Denver metro area, cooperating local governments have joined together in an effort to limit land consumption as a core principle of MetroVision 2020, and its update MetroVision 2025. Proposed transportation improvements will be consistent with local plans for the region of influence and will promote goals set forth in related comprehensive land use plans. The proposed transportation project and its component parts are expected to prove beneficial in the long-run, improve safety and enhance the function of surrounding transportation infrastructure features (including local and county roads) and provide greater access to surrounding developed and developing areas. Cumulative impacts from land use include continued urbanization, particularly adjacent to metro areas. This urbanization will result in the loss of some land that had formerly been used for agricultural purposes and habitat.

Soils and Associated Land Use

Loamy soils are the most likely to support agriculture, while clay soils (because they protect organic matter from decomposition, and thus, tend to be the highest in organic matter and the lowest in nutrients) are the least likely to support agriculture (Burke et al. 1989). Where soil texture tends toward the loamy, precipitation is highest and mean annual temperature most moderate, grassland is most likely to be converted to crops (Burke et al. 1994). These are the areas with the highest turnover of organic matter to soil nutrients, thus the highest carbon and nitrogen concentrations. Because the shortgrass prairie tends to be the hottest, driest portion of the North American grasslands, more of the shortgrass prairie remains in native vegetation (approximately 60 percent [Weaver et al. 1996]) than either the tallgrass or mixed-grass prairie (Lauenroth et al. 1999). Consequently there is great potential to preserve and manage large portions of the shortgrass prairie to benefit native species and communities. It is this potential that CDOT and its partners in the MOA wish to maximize.

Cumulative Effects

The cumulative impact of the loss of bison and prairie dogs, the reduction of pronghorn populations, the advent of water developments, the establishment of woodlots, shelterbelts

and tree-lined water courses, encroachment by invasive plant species, conversion of native prairie to crops or other human development, and fire suppression activities, is that grasslands are now considered one of the most imperiled ecosystem types in North America (Knopf 1986; Samson and Knopf 1996a). Grassland birds have shown steeper, more consistent, and geographically widespread declines than any other group of species (Knopf 1996a). There are 54 species across taxa resident in the CSP that are considered globally imperiled (TNC 1998).

Declining Species

Grassland Birds

Grassland bird species require a variety of grassland structures ranging from heavily grazed and even bare areas to dense, tall cover. Drought tolerance seems to be the principal ecological characteristic that determines the composition of grassland bird communities (Wiens 1974), while grazing (Hobbs and Huenneke 1992; Truett et al. 2001) and wildfire (Zimmerman 1992) also influence community composition. Grazing alters the structure, species composition, and nutritional quality of the vegetation. The primary effect of grazing on grassland birds is this influence on vegetation structure (Cody 1985; Wiens 1985). Structurally heterogeneous grassland supports a greater total abundance and diversity of birds than does a more homogeneous grassland (Patterson and Best 1996). Historically, this heterogeneity was largely the result of bison, pronghorn, and prairie dog grazing (Truett et al. 2001)

The mountain plover prefers habitat that has been heavily grazed or otherwise disturbed, and has at least 30 percent bare ground (Knopf 1996a), while the lesser prairie-chicken prefers habitat with a significant shrub component. The passerines also seem to select among patches based on plant structure (Wiens 1985). McCown's longspur prefers habitat similar to that used by mountain plovers - that is, areas of short grass subjected to heavy grazing either by large ungulates or prairie dogs (Knopf 1996a; Samson et al. 1998). Long-billed curlews and lark buntings are found in shortgrass and mixed-grass environments under a lighter grazing regime, and Cassin's sparrows and lesser prairie-chickens are found in areas with the least grazing pressure and tallest and densest vegetation (Knopf 1996a; Samson et al. 1998). For the species that remain on the Colorado prairie through the winter (lesser prairie-chicken and McCown's longspur), residual cover (cover remaining after the growing season and the effects of herbivory) is an important component of the habitat.

Using data from the BBS (1966-91), Knopf (1995) found that over the last 25 years, grassland bird species have shown steeper, more widespread and more consistent population declines than any other guild of North American birds. There are nine species of birds endemic to the North American shortgrass prairie (Knopf 1996b); these birds have declined more rapidly than have other North American birds, probably due to extensive loss of habitat through conversion of grasslands to cropland and pasture, and loss of grassland herbivore populations.

Native Plains Fish

There are some 800 species of native freshwater fish in the United States (Johnson 1995). Of these, 375 species are found in the Mississippi River drainage (Johnson 1995), which generally has a richer fish fauna than drainages west of the Rocky Mountains (Cross et al. 1985; Brooks and McLennan 1993; Echelle et al. 1995). The western Mississippi basin occupies much of the grasslands, and includes the basins of the Missouri, Arkansas, Platte, and Red Rivers. Glacial advances and retreats resulted in fragmented fish populations reflected today in small, sub-regional distributions (Cross et al. 1986).

Over the past 300-400 years, native fish communities in North America have undergone significant changes as a direct result of dramatic physical, chemical and biological changes in aquatic habitat. These changes are due to diversions, groundwater depletions, impoundments, non-point source pollution, channelization, alteration of streambed characteristics, power generation, and the introduction of non-native species (Echelle et al. 1995; Maughan 1995; Ostlie et al. 1997). The result has been modification of flows and degradation of the quality of natural waters (Echelle et al. 1995; Johnson 1995; Ostlie et al.1997).

Historically, 31 native fish species were found in the South Platte; today there are 28 native and 44 nonnative species (Nesler et al. 1997). Nine of the native species are considered species of special concern due to their rare or declining status (Nesler et al. 1997). Reduced stream flows in tributaries due to irrigation and urban water projects, increased turbidity from agricultural runoff, pollution from agricultural and urban development, and stream channelization and reservoir construction have been implicated in native fish declines (Clausen et al. 1989; Sidle and Faanes 1997).

According to Nesler et al. (1999), historic composition of native fishes in the Arkansas River has not been well documented. However, there are 22 species that are considered native to the Arkansas River basin in Colorado. Of these, one species is federally-listed, five other species are state listed or are recognized as species of special concern, and four are extirpated. A variety of human activities have contributed to alteration of native fish populations and habitat, including pollution from mining (Jordan 1891; Ellis 1914; Woodling 1985), other industries, urbanization, and agriculture (Woodling 1985); water diversions (Jordan 1891; Ellis 1914; Woodling 1985); overharvest (Ellis 1914), and introduction on non-native fishes (Ellis 1914; Woodling 1985).

Herpetofauna

Most grassland reptiles and amphibians are widely distributed. The number of species in any location is a function of the presence of water (which amphibians need to complete their life cycle) and of complex habitats (Samson et al. 1998).

There is no region-wide or continent-wide baseline information on population status and health for amphibians and reptiles, and few states monitor these species. However, researchers believe that all species of native true frogs have declined in the western United States over the past decade (Hayes and Jennings 1986). Hammerson (1999), using natural heritage rankings, provided the most comprehensive status assessment of

amphibians and reptiles in Colorado, concluding that while most species in the state are secure on a global scale, many species are of conservation concern, largely due to restricted ranges.

The following factors are believed to contribute to reptile and amphibian declines in Colorado: loss of small, temporary water bodies; presence of non-indigenous terrestrial and aquatic predators; overgrazing; and prairie dog control, which results in loss of burrows that provide winter retreats and summer nesting sites (Mackessy 1998; Samson et al. 1998; Hammerson 1999). Other threats to amphibian and reptile species include natural cycles of species attrition, loss or degradation of habitat that can be exacerbated by natural events such as drought or flood (Wake 1991), the introduction of bullfrogs (*Rana catesbeiana*), introduction of non-native predatory fish (pers. comm., C. Pague), and direct mortality due to actions of humans (pesticide application, roadkill, collection [Hammerson 1986; McDiarmid 1995]). Of these, loss of habitat may hvae the largest impact (McDiarmid 1995). However, the release and subsequent spread of bullfrogs is also known to have severe impacts on many other amphibian species (Fisher and Shaffer 1996), and probably are having a severe impact on Colorado's prairie amphibians (Hammerson 1999; pers. comm., C. Pague; L. Livo unpublished data).

Invertebrates

Ninety percent (or more) of animal species worldwide are invertebrates. There are 90,000 described insects in North America (Powell 1995). Within any quantum of terrestrial or aquatic habitat, hundreds of different invertebrates create a network consisting of primary and secondary consumers and, perhaps most importantly, detritivores.

Most invertebrates can tolerate the effects of extreme events that occur within the environment in which they exist, but are susceptible to long-term changes in that environment. Butterflies are particularly susceptible to environmental insults (Opler 1995). Because most larvae and many adults are dependent on one or a few species of plant, activities that result in vegetation changes can have population level effects on invertebrates. In aquatic environments, changes in flow regime, siltation, pollution, and the presence of non-native species have resulted in significant decreases in 72 percent of mussel species (Mason 1995).

Prairie Butterflies

There are more than 1,600 insect species known from the shortgrass prairie in Colorado (Kumar et al. 1976), and this is not a complete inventory. Some taxa are present in hot, dry years, while others favor wet years, and there is no sampling method that is adequate to detect all species. The lepidoptera comprise about 13 percent of the described and named insect species in North America (Powell 1995). There are some local inventories available, with the most comprehensive ones being in the eastern United States (Powell 1995). In addition, the Xerces Society has coordinated an annual Fourth of July Butterfly Count (modeled on the Christmas Bird Counts) since 1975.

The prairie-specialist butterflies are year-round residents on distinct prairie patches, with relatively little dispersal among patches (Opler and Krizek 1984; Moffat and McPhillips

1993; Opler 1999); thus, they require resources that are consistently available within a particular habitat patch. Because the caterpillars of most butterflies are herbivorous, lepidoptera species richness is reflective of plant species richness (Opler 1995). As the processes that define prairies are disrupted, habitat is lost and fragmented, and native plants displaced by exotics, prairie butterflies are increasingly restricted in their range (Swengel and Swengel 1995). Like other prairie inhabitants, it appears that prairie butterflies flourish in habitat mosaics, with caterpillars using one habitat type and adults another.

Mussels

The U.S. supports the greatest diversity of freshwater mussels in the world (Williams and Neves 1995). Mussels were an important food source for Native Americans, and from the late 1800s to early 1900s mussels supported a major commercial economy for button manufacture (Williams and Neves 1995). One mussel bed in the Mississippi was reported to cover an area of 2.4 kilometers by 288 meters; it failed after several years of commercial exploitation (Carlander et al. 1986). There are no federal regulations relating to the harvest of mussels except for species listed under ESA. There continues to be a limited commercial harvest, regulated at the state level, largely to produce beads that are exported to Asia for insertion into oysters and other shellfish that produce pearls (Williams and Neves 1995).

The continent-wide decline in freshwater mussels has been linked to habitat changes including dam construction, pollution, siltation, channelization, dredging, and the introduction of non-indigenous species (Williams and Neves 1995). Altered flow regimes and reservoirs that result from dams have been identified as the cause of 30-60 percent of native mussel extirpations in some rivers of the U.S. (Williams et al. 1992). Siltation resulting from poor agricultural practices and deforestation, especially of the riparian corridor, can destabilize stream bottoms; and heavy metals, pesticides and acid mine drainage have all polluted streams, resulting in mussel declines (Fuller 1974).

The American Fisheries Society has identified 213 of 297 species of mussels native to the U.S. and Canada as threatened, endangered or species of concern (Williams et al. 1993); 70 are listed as federally endangered or threatened (50 FR §17.11, §17.12, Dec. 31, 1999), and 72 are species of special concern (Williams et al. 1993). Because mussels are sessile, long-lived, bioconcentrate contaminants, and are sensitive to changes in water quality, they are important indicators of the health of aquatic ecosystems (Havlik and Marking 1987). Without increased water quality conservation, extinction of much of the North American mussel fauna in the near future is a distinct possibility (Neves 1993).

Historically, there were seven species of freshwater mussel documented from Colorado (Cordeiro 1999). Wu and Brandauer (1978) and Wu (1989) suggest that only three species remain, one of which is only known from one dead shell that likely did not originate in the place where it was found (Cordeiro 1999). Of the two remaining freshwater mussel species, one (the giant floater) occurs in the South Platte River drainage and in reservoirs in the Arkansas River drainage. The other (the cylindrical papershell) occurs only in the South Platte drainage (Cordeiro 1999). Because of the dynamic nature of the South Platte River, mussles along this river have probably always

had a limited distribution. However, the reservoirs constructed in conjunction with power and irrigation projects have resulted in a steady source of water, and mussels are now found along canals and in reservoirs along the Platte River (Lingle 1992). However, populations from numerous historic locations in the South Platte drainage are thought to be extirpated (Cordeiro 1999).

Biological Assessment and Evaluation Process

The impact analysis was conducted using GIS and the best available scientific data in conjunction with expert review. The core project team consulted with experts in each taxonomic group (herpetofauna, birds, fish, mammals, invertebrates and plants) to select a preliminary list of species likely to be affected by CDOT activities in the CSP over the next 20 years (Grunau and Lavender 2002). Three lists of plant and animal species (terrestrial and aquatic species) were developed: species currently listed as threatened or endangered under the ESA (Table 3), proposed or candidate under the ESA (Table 4 and Table 5), and those ranked by a conservation entity as sensitive (at risk of rangewide or local imperilment) (Table 6). The experts also helped refine existing range and distribution data and define impact zones within existing transportation corridors for each species across the range of CDOT transportation improvements. The experts suggested that potential impacts from most routine CDOT maintenance activities would likely have only temporary effects (Grunau and Lavender 2002). However, because the experts identified habitat loss as the most important potential impact, they concurred that any construction project resulting in permanent loss should be mitigated (Grunau and Lavender 2002).

CNHP calculated the maximum potential impact for each species, and then eliminated overlap among species to arrive at the total amount of habitat for targeted species within the project area that could potentially be impacted by CDOT activities: 15,160 acres (Grunau and Lavender 2002). Based on input from experts, the core project team concluded that on-site mitigation using best management practices, rather than off-site mitigation, was the most appropriate conservation strategy for aquatic species, butterflies, and some plants. See Conservation Strategy section of this document for additional information.

Sources of Information

Sources of information for this document include but are not limited to: USFWS, other federal agencies including U.S. Forest Service, Bureau of Land Management, U.S. Geological Survey, CDOW, TNC, CNHP, published and unpublished scientific works, and species specialists (see Grunau and Lavender 2002 for details).

Several recent, broad-scale assessments were also consulted and provided context as well as information on individual species. These included:

- Breeding bird survey: population trends 1966-92 (Peterjohn et al. 1995).
- Our Living Resources: a Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals and Ecosystems. (LaRoe et al. 1995).

- The status of biodiversity in the Great Plains (Ostlie et al. 1997).
- Status and Trends of the Nation's Biological Resources, Vol. 2. U.S. Department of the Interior, U.S. Geological Survey (Mac et al. 1998).
- Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership (Kingery 1998).
- The structure and function of ecosystems in the central North American grassland region (Lauenroth et al. 1999).
- Ecoregion-based Conservation in the Central Shortgrass Prairie (TNC 1998).

Analysis of Effects

The species accounts presented in the following section include an evaluation of direct, indirect, and cumulative effects for each species, and a biological determination of the likely effects of the project on each species (summarized in Tables 3-6). Direct effects are those that result from the agency action. Indirect effects are caused by, or result from, the agency action, are later in time, and are reasonably certain to occur, and may occur outside the area directly affected by the action. Cumulative effects are the effects of future non-federal actions (i.e., state, local, tribal, private) that are reasonably certain to occur in the action area (USFWS and National Marine Fisheries Service 1998).

Cumulative effects are described at the scale of the CSP unless specified otherwise. The primary purpose of this document is not to reiterate the life history of each species, but rather to document the most relevant information needed to make the determinations. The determinations made for species protected under ESA have been defined by USFWS and the National Marine Fisheries Service (1998), and are based on the assumption that "best management practices" are in place and the Conservation Strategy and monitoring requirements are implemented. Where a determination of "may adversely impact individuals but not likely to result in loss of viability..." is made, it does not necessarily imply mortality, but rather that there may be an indirect, temporary impact on individuals. Monitoring direction (included in the Conservation Strategy section of this document) will allow CDOT to determine the effectiveness of management actions at the off-site conservation area(s), and will facilitate the application of adaptive management principles.

Conservation Measures

The conservation measures proposed by CDOW and FHWA are detailed in Part 2, the Conservation Strategy section of this document.

Table 3. Species Listed on the Endangered Species List

Common Name	Scientific Name	Status	Effect of Project
Bald Eagle	*Haliaeetus leucocephalus*	federal threatened	may affect
Piping Plover	*Charadrius melodus*	federal threatened critical habitat identified	may affect
Interior Least Tern	*Sterna antillarum athalassos*	federal endangered critical habitat identified	may affect
Colorado Butterfly Plant	*Gaura neomexicana* ssp. *coloradensis*	federal threatened	may affect

Table 4. Species Proposed for Listing Under the Endangered Species Act

Common Name	Scientific Name	Status	Effect of Project
Mountain Plover	*Charadrius montanus*	federal proposed	may affect

Table 5. Candidate Species Under the Endangered Species Act

Common Name	Scientific Name	Status	Effect of Project
Lesser Prairie-chicken	*Tympanuchus pallidicinctus*	federal candidate	may affect
Black-tailed Prairie Dog	*Cynomys ludovicianus*	federal candidate	may affect
Arkansas Darter	*Etheostoma cragini*	federal candidate	may affect

Table 6. Species of Concern

Common name	Scientific name	Status	Effect of Project
BIRDS			
Burrowing Owl	*Athene cunicularia*	Colorado threatened CNHP G4S3S4B	may affect
Cassin's Sparrow	*Aimophila cassinii*	CNHP G5S4B	may affect
Ferruginous Hawk	*Buteo regalis*	Colorado special concern CNHP G4S3BS5N	may affect
Lark Bunting	*Calamospiza melanocorys*	Long-term declines	may affect
Loggerhead Shrike	*Lanius ludovicianus*	Colorado special concern CNHP G4G5S3BSZN	may affect

McCown's Longspur	*Calcarius mccownii*	CNHP G5S2B	may affect
HERPETOFAUNA			
Massasauga Rattlesnake	*Sistrurus catenatus*	Colorado special concern CNHP G3G4S2	may affect
Northern Cricket Frog	*Acris crepitans*	Colorado special concern	may affect
Northern Leopard Frog	*Rana pipiens*	Colorado special concern CNHP G5S3	may affect
Texas Horned Lizard	*Phrynosoma cornutum*	Colorado special concern CNHP G4G5S2	may affect
Western Box Turtle	*Terrapene ornata*	CITES listed	may affect
FISH			
Brassy Minnow	*Hybognathus hankinsoni*	Colorado threatened CNHP G5S3	may affect
Common Shiner	*Notropis cornutus*	Colorado threatened CNHP G5S2	may affect
Flathead Chub	*Hybopsis gracilis*	Colorado special concern CNHP G5S3	may affect
Plains Minnow	*Hybognathus placitus*	Colorado endangered CNHP G5SH	may affect
Plains Topminnow	*Fundulus sciadicus*	Colorado special concern CNHP G4S2	may affect
Southern Redbelly Dace	*Phoxinus erythrogaster*	Colorado endangered CNHP G5S1	no impact
Suckermouth Minnow	*Phenacobius mirabilis*	Colorado endangered CNHP G5S3	may affect
MUSSELS			
Cylindrical Papershell	*Anodontoides ferussacianus*	CNHP G5S2	no impact
Giant Floater	*Pyganodon = [Anodonta] grandis*	CNHP G5S1	no impact
BUTTERFLIES			
Arogos Skipper	*Atrytone arogos*	CNHP G3G4S2	may affect
Hops Feeding Azure	*Celastrina humulus*	CNHP G2S2	may affect
Ottoe Skipper	*Hesperia ottoe*	CNHP G3G4S2	may affect
Regal Fritillary	*Speyeria idalia*	CNHP G3S1	may affect
PLANTS			
Arkansas River Feverfew	*Bolophyta tetraneuris*	CNHP G3S3	may affect
Arkansas Valley Evening Primrose	*Oenothera harringtonii*	CNHP G2S2	may affect
Golden Blazing Star	*Nuttallia chrysantha*	CNHP G1G2S1S2	may affect
Pueblo Goldenweed	*Oonopsis puebloensis*	CNHP G1G2S1S2	may affect
Round-leaf Four-o'clock	*Oxybaphus rotundifolia*	CNHP G2S2	may affect

Part 2: Species Assessments and Analysis of Effects

Bald Eagle (*Haliaeetus leucocephalus*)

Species Description

Bald eagles are large, relatively long-lived raptors. Nests are usually built in the tops of large trees near a body of water and are reused annually. Pair bonds persist for many years. The reproductive rate is low: age of first reproduction is probably four to five years, clutches are small, and incubation and rearing periods are long (Austin 1971; Green 1985). Proximity to water, the presence of large trees with a clear flight path to one side of the tree, and excellent visibility are key features of nesting habitat (Green 1985). Eagles are opportunistic feeders, though fish are the primary diet (Green 1985). In winter, eagles congregate in areas characterized by abundant food and perches (Lingle and Krapu 1986) where they will spend four to five months. The majority of wintering areas are found near open water where the eagles feed primarily on fish and waterfowl, usually taking those which are dead, crippled, or otherwise vulnerable (USFWS 1983; Lingle and Krapu 1986). Additionally, eagles are known to feed on carrion, small mammals, and waterfowl (Green 1985; Lingle and Krapu 1986). In Colorado, wintering habitat is often coincident with black-tailed prairie dog colonies (pers. obs., C. Pague).

Distribution and Status

Bald eagles occur throughout North America. During the nesting season they tend to be sparsely distributed (Fuller et al. 1995), but congregate in large numbers at winter roosts (Kingery 1998). Little is known about historical nesting in Colorado, but today they nest throughout the state, primarily on the Western Slope (Kingery 1998). From 1987-1995, Colorado Bird Atlas researchers documented 33 nesting pairs of bald eagles in Colorado (Kingery 1998). Colorado's bald eagle population increases in winter when they are usually found along western river systems, in mountain parks, and on the eastern plains where they subsist largely on black-tailed prairie dogs (Kingery 1998).

Many local bald eagle populations experienced sharp declines from 1950 to the 1970s due to shooting, habitat conversions, and impaired reproduction due to the accumulation of pesticides ingested from prey contaminated with organochlorine pesticides (chiefly DDT) (USFWS 1983; Fuller et al. 1995). The primary causes of mortality over the last 30 years include accidental trauma, poisoning (primarily lead), gunshot, and electrocution (Green 1985; Franson et al. 1995). The factor most consistently associated with population declines is loss or degradation of nesting and wintering habitat (Green 1985). With protection under the ESA and subsequent protection of nesting habitat and reintroduction of captive eagles to the wild, the continent-wide population has rebounded (USFWS 1983).

ESA Status and Other Organizational Rankings

The eagle was listed as an endangered species on March 11, 1967 (32 *Federal Register* 4001). Since listing, populations and the number of occupied nesting territories have increased throughout much of the United States. As a result, in 1995 the bald eagle was downlisted to threatened, and in 1999 it was proposed for delisting. (To date, delisting has not occurred.) The Colorado Natural Heritage Program ranks the bald eagle G4/S1B-S3N (apparently secure rangewide; breeding birds in Colorado are very rare; Colorado's winter population is vulnerable) (CNHP 2002b). The bald eagle is listed as Threatened by CDOW.

Habitat

In Colorado, most nesting occurs on the Western Slope (Kingery 1998). The majority of the documented bald eagle occurrences on the eastern plains of Colorado are winter roost sites. Since impacts in the project area are, therefore, expected to be largely restricted to roosting bald eagles, this document only considers the effects of CDOT actions on wintering habitat.

There are two elements that are critical for bald eagle winter habitat: roosts and food. Wintering concentrations of eagles in the midcontinent region are associated primarily with river systems. Nocturnal roosts consist predominantly of large cottonwoods (*Populus spp.*) that offer protection from the elements and are apparently used year after year (Green 1985; Lingle and Krapu 1986). Roosts may be occupied for long periods of the day during inclement weather. As with nesting habitat, the structural and site characteristics are more important than species of tree. Trees used for roosting are usually the largest and oldest in a stand, and have robust horizontal limbs and open branching which facilitate landing and taking off by large birds. Activities that adversely alter historical and traditional roost sites will adversely affect wintering distributions and survival of bald eagles.

Winter diets of bald eagles track prey availability. When fish are difficult to obtain, as when rivers are covered with ice or during high winter flows, eagles are more dependent on waterfowl as a food source (Green 1985; Lingle and Krapu 1986). Wintering eagles are frequently observed feeding on carrion along roadsides and in areas where waterfowl congregate. In eastern Colorado they commonly hunt in prairie dog colonies (Kingery 1998). Thus, declines in the extent of prairie dog colonies in eastern Colorado may have an adverse impact on the continued success of bald eagle recovery.

Survival of individual eagles, particularly young of the year, probably depends on conditions encountered during the winter (USFWS 1983; Green 1985). Additionally, the physiological condition of adults at the beginning of each breeding season (an important factor influencing reproductive success) is also affected by how well energy demands are met in wintering areas (USFWS 1983; Green 1985). Thus, the survival and recovery of nesting populations of eagles depends on the presence of suitable wintering areas (USFWS 1983; Green 1985).

Conservation Planning

Bald eagles are protected at the national level by several federal laws and treaties in addition to the ESA. The Eagle Protection Act (16 USC 668 et. seq.) and its associated regulations govern the taking, possession, and transportation of eagles. The Migratory Bird Treaty Acts and associated regulations (16 USC 703-711) with Great Britain (for Canada), Russia, and Mexico provide for migratory bird conservation through the enhancement of habitat. As amended in the 1972 treaty with Mexico, all of the treaties apply to raptors including bald eagles.

Each January the Colorado Division of Wildlife, in cooperation with the USGS Snake River Field Station in Boise, Idaho, conducts wintering bald eagle surveys. The surveys are part of a nationwide effort to index the total wintering bald eagle population in the lower 48 states, and to identify previously unrecognized areas of winter habitat. Colorado has been conducting bald eagle mid-winter surveys since 1987, providing critical information on eagle population trends, distribution, and habitat in Colorado. In 2001, the total number of bald eagles counted was 545 (CDOW 2002b).

Direct and Indirect Effects of CDOT Actions on the Bald Eagle

CDOT projects would not be expected to cause direct disturbance to bald eagles. Roosting and future potential nest sites in deciduous forests along streams and rivers could be impacted if CDOT activities prevented tree regeneration and/ or accelerated tree declines already occurring. However, implementation of BMPs near streams and rivers will avoid or minimize this condition, so impacts of this nature are not expected to occur.

CDOT maintenance activities within a mile of winter roosts could disturb eagles, potentially resulting in their abandonment of the roost site. However, maintenance activities are infrequent. Expert opinion indicates that, although eagles tend not to frequent areas where traffic volume is high, birds using habitat near existing roads in Colorado have habituated to activity on the roads (pers. comm., Jerry Craig, CDOW). Therefore, CDOT activities would not be expected to cause direct disturbance to bald eagles.

However, in Colorado bald eagles rely heavily upon black-tailed prairie dogs in winter. Therefore, any loss of prairie dog colonies would translate into lost habitat (i.e., feeding areas) and resources (i.e., prey) for eagles (pers. comm., J. Craig).

The maximum potential loss of bald eagle habitat from transportation improvement projects was estimated to be 3,688 acres. This represents approximately 0.064% of the identified habitat within the project area (Grunau and Lavender 2002).

Cumulative Effects

Reduction in the threats to bald eagles across their range, especially suspension of the use of DDT, has reversed the population declines that triggered the ESA listing (Ostlie et al. 1997). This is reflected in their downlisting from endangered to threatened. In Colorado,

there were six occupied nests in 1982 (Green 1985). Between 1987 and 1995, 38 active nest sites were identified (Winternitz 1998).

Construction of new power lines across eastern Colorado, especially if they are sited near winter roosts or prairie dog colonies, can result in increased mortality risks to bald eagles due to electrocution. Construction and development activities near active bald eagle nests, or winter roosts, have lead to abandonment (pers. obs., C. Pague), suggesting that prolonged human activity near a roost may have negative consequences.

Livestock grazing practices or alteration of hydrologic flows due to irrigation and dams (Ostlie et al. 1997) can both result in reduction in the establishment of cottonwood seedlings, thus resulting in the long term degradation of riparian forests, which are important to bald eagles for nesting and winter roosting. Historically, poisoning efforts to control prairie dogs may have had the largest effect on bald eagle persistence in eastern Colorado, by reducing winter food sources. Now, plague in prairie dog colonies, accentuated by private landowners eliminating (or nearly eliminating) remaining prairie dogs in the aftermath of a plague event, have a combined impact on the availability of food for wintering bald eagles.

Biological Determination

There will be take associated with approximately 3,688 acres of affected bald eagle habitat. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect black-tailed prairie dogs, and near winter roost sites for bald eagles. In addition, CDOT will protect and manage high quality habitats for the benefit of black-tailed prairie dogs and bald eagles, in perpetuity, not less than 10,744 acres and 3,688 acres, respectively.

Piping Plover (*Charadrius melodus*)

Species Description

The piping plover is a small, migratory, beach-nesting shorebird. Adults return from wintering grounds in late April and initiate nesting in early May. Nests are scrapes placed in open sand and lined with small pebbles (Nelson 1998b). Piping plovers are often found nesting near snowy plovers (*C. alexandrinus*), killdeer (*C. vociferous*), spotted sandpipers (*Actitis macularia*), American avocets (*Recurvirostra americana*), and least terns (*Sterna antillarum*), all of which require similar nesting habitat (Nelson 1998b). Food consists of native minnows. Both adults incubate the eggs and feed the young. Piping plovers feed by gleaning invertebrates from the substrate on exposed wet sand (Corn and Armbruster 1993).

Distribution and Status

Piping plovers nest in three disjunct regions of temperate North America. One population (endangered) consists of a few breeding pairs, and only nests on the shores of northern Lake Michigan (Nelson 1998b). A second population (threatened) breeds along the Atlantic shore from the maritime provinces of Canada to South Carolina. The third population (threatened) nests on the prairies from southern Canada to Kansas and Colorado. Piping plovers winter on the coasts of the Atlantic and Gulf of Mexico from North Carolina to Mexico, and in the Bahamas, Cuba and the West Indies (Commission for Environmental Cooperation 2000).

The breeding range of the northern Great Plains population extends from southern Alberta, northern Saskatchewan and southern Manitoba, south to eastern Montana, North Dakota, South Dakota, southeastern Colorado, Iowa, Nebraska, and east to Lake of the Woods, Minnesota (USFWS 2001).

In 1991, all known piping plover breeding sites were censused (Haig and Plissner 1995) and the continent-wide population was found to be 5,486 adults at 728 sites (Haig and Plissner 1995). The northern Great Plains and prairie population consisted of 2,030 adults at 314 sites, and the Colorado population had 13 adults at four sites (Haig and Plissner 1995). The 1996 International Piping Plover Census found 5,800 breeding individuals in 20 states, nine Canadian Provinces and a few French-owned islands off the coast of Newfoundland (Commission for Environmental Cooperation 2000). The northern Great Plains plover population was found to be declining by seven percent annually (Ryan et al. 1993). The 1999 count found only 2,668 pairs of piping plover in North America (Kuzminski 1999). The continental interior population in 1999 consisted of 975 pairs (Kuzminski 1999), a decline from the 1991 count. In the United States, the interior piping plover population decreased from 682 pairs in 1988 to 296 pairs in 1999 (Kuzminski 1999).

The Colorado breeding sites are in Prowers, Bent, Kiowa, and Baca Counties in the southeast corner of the state (Nelson 1998b). During the 1991 census, nesting piping plovers were only found at the four Great Plains Reservoirs in Kiowa County (Nelson 1998b). In 1992, they were also found on the Adobe Creek and John Martin reservoirs (Nelson 1998b), where they remained in 1995 (Nelson 1998b). From 1990 to 1995, only three to eight pairs nested in Colorado annually (Nelson 1998b). In 2001, three unmated males and five nesting pairs of piping plovers were documented (Nelson 2001). Twenty-four eggs were produced and seven young fledged (Nelson 2001). Successful nests were at John Martin Reservoir and Neenoshe Reservoir (Nelson 2001). It has been hypothesized that the Colorado population developed from birds displaced by droughts elsewhere (Sidle and Kirsch 1993), or from flooded out habitat in Oklahoma (Nelson 1993).

ESA Status and Other Organizational Rankings

There are three distinct population segments of the piping plover, all listed under the ESA. The Great Lakes population (the Great Lakes watershed states of Illinois, Indiana,

Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin and Ontario) is listed as endangered, and the Atlantic coast and northern Great Plains populations are both listed as threatened (50 FR 50733). All piping plovers winter along the coasts of the southeast Atlantic and Gulf of Mexico, and are listed as threatened in their wintering habitat (50 FR 50733). Critical habitat has been proposed for the northern Great Plains population - there is none in Colorado - (66 FR 31759-31815), and for wintering habitat (65 FR 41782). The comment period for the designation of critical habitat for the northern Great Plains population was reopened and closed May 20, 2002 (67 FR 13123). The Piping Plover Recovery Team has recommended that the northern Great Plains population of the piping plover be reclassified as endangered (Sidle and Faanes 1997).

The northern Great Plains population is listed as threatened in Canada and in Mexico (Commission for Environmental Cooperation 2000). The piping plover is listed as state threatened in Colorado, and has a CNHP rank of G3/S1B-SZN (very rare or local throughout its range or found locally in a restricted range; breeding birds in Colorado are very rare; no consistent location can be discerned for migrants or non-breeding populations) (CNHP 2002b).

Habitat

Nesting habitat for the northern Great Plains and prairie populations of piping plovers includes prairie alkali wetlands and surrounding shoreline; inland and reservoir lakes, along wih their sparsely vegetated shorelines, peninsulas and islands; and river channels and their associated sandbars and islands (66 FR 31759-31815). Like the interior least tern, the piping plover seems to prefer nesting habitat that provides wide, horizontal visibility, protection from terrestrial predators, protection from rises in water level, and protection from disturbance (Sidle and Fannes 1997). Dry, mid-stream, mostly barren sandbars in wide, open channel beds of rivers historically provided these conditions (Schwalbach 1988; Ziewitz et al. 1992).

Piping plovers initiated nest building only after spring and early summer flows recede and dry areas on sandbars are exposed, usually on higher elevations away from the water's edge. Artificially created nesting sites, such as sand and gravel pits, dredge islands, and reservoir shorelines are also used.

In a comparison of sandbar area, channel width, mean elevation, and maximum elevation of nest sites versus random sites along the lower and central Platte River, plovers and terns selected for wide channels having large areas of dry, sparsely vegetated sand (Ziewitz et al. 1992).

In Colorado, piping plovers nest on broad, sandy beaches that are, ideally, located on islands (Nelson 1998b). They have successfully adapted to nesting on the shores of off-stream reservoirs and initiate nesting as the water level drops due to irrigation withdrawals (Nelson 1998b).

Conservation Planning

The piping plover recovery plan (USFWS 1988) calls for the maintenance of the distribution and range of the piping plover by protecting essential habitat and restoring nesting habitat (i.e., suitable sandbars in river channels with adequate stream flows).

CDOW has implemented a recovery plan for piping plovers that emphasizes habitat improvement and vegetation control. The plan uses agreements with ditch companies, closure of nesting beaches, manual removal of cottonwood saplings encroaching on nesting beaches, and predator exclosures (Nelson 1998b).

In 1994, the Department of the Interior entered into a Memorandum of Agreement with Colorado, Nebraska, and Wyoming to establish the Platte River Basin Program. Its primary focus is to address the needs of federally-listed species, including the piping plover, along the central Platte River by improving and conserving habitat (Sidle and Faanes 1997).

Direct and Indirect Effects of CDOT Actions on the Piping Plover

No CDOT projects will occur near the playa lakes and reservoirs of Prowers, Bent, Kiowa, or Baca counties that are used by nesting piping plovers, nor will CDOT activities affect water flows or sandbar deposition. There may be take associated with road widening that could disrupt surface flows or groundwater movement in or near piping plover feeding habitat. BMPs as described in Part 3 of this document will be implemented at any transportation improvement project site near feeding areas for piping plover.

Cumulative Effects

Piping plover populations continue to decline, primarily as a result of habitat loss due to development, water management (construction of reservoirs and altered river flows resulting in the loss of sandbars) and other human disturbance (Haig 1992; Commission for Environmental Cooperation 2000). Landscape changes that contribute to predation are also major contributors to the species' decline (Haig 1992). In the northern Great Plains, water level regulation on the major rivers results in direct chick mortality from flooding and loss of habitat from vegetation encroachment (Schwalbach 1988; Sidle et al. 1992). Concentration of piping plovers on their wintering grounds increases the likelihood of population level impacts from events such as oil spills, development, and increased dredging.

Biological Determination

CDOT activities will not occur near any piping plover nesting areas. There may be take associated with impacts to feeding habitat. CDOT will implement BMPs wherever upgrade and maintenance activities disrupt ground or surface water flow near piping plover feeding habitat.

Interior Least Tern (*Sterna antillarum*)

Species Description

The least tern is the smallest member of the tern family. It is a colony nesting shorebird found near shallow water bodies in the interior of North America during the summer. It feeds on small fish taken from rivers or sand pit ponds (Wilson 1991), and breeds on barren ground that is surrounded by water. Nest cups tend to be unlined (Ehrlich et al. 1988). Following the breeding season, least terns gather in small flocks along rivers to feed in preparation for migration. They are thought to winter on beaches along the Central American coast and along the northern coast of South America from Venezuela to northeastern Brazil (Ehrlich et al. 1988).

In Colorado, interior least terns usually arrive on their breeding grounds in mid- to late May, when water levels are receding and thus revealing bare ground (Nelson 1998c). In years with high runoff, nesting may be deferred until water levels have receded, or the colony may move (Nelson 1998c). Feeding is largely on small fish and crustaceans captured in the shallow water of rivers and lakes. Interior least terns probably do not nest on alkali playas in Colorado because such playas cannot support fish (Nelson 1998c).

Distribution and Status

The interior least tern historically nested along the Colorado (in Texas), Red, Rio Grande, Arkansas, Missouri, Ohio, and Mississippi River systems. It currently nests in the Mississippi and Rio Grande River basins from Montana south to Texas, and from eastern New Mexico and Colorado to Indiana and Louisiana (Nelson 1998c). This species is thought to overwinter in Central and South America (National Geographic Society 1999).

There are three distinct subspecies of least tern. The coastal least tern breeds along the U.S. Atlantic coast from the southern tip of Texas north to southern Maine; the California least tern breeds from southern Baja California and Mexico, north to San Francisco Bay; the interior least tern breeds locally along the major tributaries of the Mississippi River drainage basin from eastern Montana south to Texas and east to western Illinois, Missouri, Arkansas and Louisiana (National Geographic Society 1999).

Population counts of interior least terns, made at the time this bird was listed under ESA (1985), found 1,400-1,800 birds (Whitman 1988). Counts of the interior least tern made in 1988 found 4,932 individuals. Counts made in the 1990s found approximately 7,000 birds (Sidle and Faanes 1997).

In Colorado, least terns were confirmed to be nesting at Horse Creek and Adobe Creek reservoirs in 1978 (Chase 1979). In 1990, they were confirmed to be nesting at Adobe Creek and Neenoshe reservoirs (Nelson 1998c). In 1991, 23 nests were located, while in 1995 only 12 nests were located, and 1996, 19 nests were located (Nelson 1998c). In

2001, 20 pairs produced 26 nests, 67 eggs, and 31 fledglings from Tern Island at Adobe Creek Reservoir, John Martin Reservoir and Neenoshe Reservoir (Nelson 2001).

ESA Status and Other Organizational Rankings

The interior population of the least tern was federally-listed as endangered in 1985 (50 FR 21792). There are now approximately 7,000 terns widely distributed across the interior of the United States (Sidle and Faanes 1997). The interior least tern is listed as state endangered in Colorado, and has a CNHP rank of G4/T2QS1B (the species is apparently secure globally; the subspecies, as currently described, is considered imperiled across its range; there is uncertainty about taxonomic status; breeding birds are extremely rare in Colorado) (CNHP 2002b).

Habitat

Historically, interior least terns nested on river sandbars scoured by spring runoff (Nelson 1998c). In Colorado, nesting habitat included sandbars in the South Platte River (Lamb 1950). Now that such habitat along rivers is largely nonexistent, they are found on the shores and especially the islands of irrigation reservoirs (Nelson 1998c). The occurrence of breeding least terns is localized and is highly dependent on the presence of dry, exposed sandbars and favorable river flows that support small fish, and that isolate the sandbars from the riverbanks, providing protection from terrestrial predators. Characteristic riverine nesting sites are dry, flat, sparsely vegetated sand and gravel bars within a wide, unobstructed, water-filled river channel.

Nest sites are devoid of vegetation. Plant cover at nest sites is usually less than 20 percent at nest initiation (Sidle and Faanes 1997). In a comparison of sandbar area, channel width, mean elevation, and maximum elevation of nest sites versus random sites along the lower and central Platte River, piping plovers and least terns selected for wide channels having large areas of dry, sparsely vegetated sand (Ziewitz et al. 1992).

Like the piping plover, least terns seem to prefer nesting habitat that provides wide, horizontal visibility, protection from terrestrial predators, rises in water level, and disturbance (Sidle and Fannes 1997). Dry, mid-stream, mostly barren sandbars in wide, open channel beds of rivers historically provided these conditions (Schwalbach 1988; Ziewitz et al. 1992).

Conservation Planning

The Interior Least Tern Recovery Plan calls for the maintenance of the distribution and range of the tern through protection of essential habitat and restoration of nesting habitat (i.e., suitable sandbars in the river channel with adequate stream flows).

There is a Colorado recovery plan for the interior least tern that focuses on recovery and creation of nesting habitat, primarily at Tern Island on the Adobe Creek Reservoir. This includes removal of saplings around the Tern Island shore and the creation of nesting habitat on an island in John Martin Reservoir (Nelson 1998c).

Direct and Indirect Effects of CDOT Actions on the Interior Least Tern

CDOT activities will not affect sandbars and islands in rivers or on lakes. CDOT activities should have no effect on either the nesting habitat of the interior least tern or on individuals. Road widening near least tern habitat could disrupt surface flows or groundwater movement in feeding habitat. However, BMPs as described in Part 3 of this document will be implemented at any transportation improvement project site near feeding areas for interior least terns. Therefore, this impact is not expected to occur.

Cumulative Effects

Along the Platte and Arkansas River systems, reservoirs and irrigation diversions have severely reduced river flows and curtailed the scouring effects of ice and spring floods and the development of sandbars (Eschner et al. 1983; Echelle et al. 1995; Ostlie et al. 1997; Johnson 1998). These reductions have accelerated the encroachment of vegetation onto river sandbars that persist and reduce the creation of new sandbars (Sidle and Faanes 1997). Loss of these protected nesting areas increases the tern's susceptibility to predation by terrestrial predators (Sidle and Faanes 1997).

Although least terns can adapt to natural variability in river flows, the drastic changes in flow regime over the last century have severely impacted this species' distribution and abundance along the Platte River and throughout the Great Plains (Sidle and Faanes 1997).

Flooding of nesting areas by reservoirs, channelization, and unpredictable water discharge patterns below dams, and growth of brush and trees along beaches eliminate nesting habitat. These changes also affect the native fish species on which these birds depend. Additionally, the recreational use of sandbars by humans, and consequent disturbance to incubating adults and non-fledged young, threatens the reproductive success of terns (Sidle and Faanes 1997; Nelson 1998c).

Biological Determination

CDOT activities will not occur near any interior least tern nesting areas. There may be take associated with impacts to feeding habitat. CDOT will implement BMPs wherever upgrade and maintenance activities disrupt ground or surface water flow near interior least tern feeding habitat.

Colorado Butterfly Plant (*Gaura neomexicana* ssp. *coloradensis*)

Species Description

The Colorado butterfly plant is an early successional, perennial herb of the evening primrose family (Onagraceae) that lives vegetatively for several years before bearing fruit once and then dying. Flowering stems are 50-80 centimeters tall, and non-flowering plants consist simply of a stemless, basal rosette of leaves (Marriott 1987; Fertig 1994).

This species was first collected near Fort Collins, Colorado, in 1895 (Munz 1938). The butterfly plant is endemic to moist soils in wet meadows associated with floodplains (USFWS 2000a), and is adapted to use periodically disturbed stream channel sites. The vegetative rosettes seem to be fairly resistant to disturbance events, but are sensitive to low soil moisture. Generally it is a plant with a restricted geographic range and high habitat specificity (USFWS 2000a).

Distribution and Status

Little is known about the historical distribution of the butterfly plant (Fertig 1994). Intensive range-wide surveys between 1984-1986 identified more than 20 populations in Wyoming, Colorado and Nebraska with approximately 20,000 flowering individuals (Marriott 1987). Subsequent surveys have confirmed populations in Wyoming and Colorado (Fertig 1994; Floyd 1995). Today this species is confined to an area of ~17,000 acres (6880 hectares) in northcentral Colorado, extreme western Nebraska, and southeastern Wyoming (USFWS 2000a). Most are on private land (USFWS 2000a). The only known extant location in Colorado is near Fort Collins, adjacent to Interstate 25, on land owned by the City of Fort Collins (CNHP 2002a).

ESA Status and Other Organizational Rankings

The Colorado butterfly plant was listed as threatened under the ESA (50 CFR 62302) in 2000. The Colorado butterfly plant has a CNHP rank of G3T2/S1 (the species is vulnerable globally; the subspecies is imperiled globally; critically imperiled in Colorado due to extreme rarity) (Spackman et al. 1997; CNHP 2002b). It is a Forest Service sensitive species, though its presence on Forest Service land is unknown (Spackman et al. 1997).

Habitat

The butterfly plant occurs on sub-irrigated, alluvial soils on level to slightly sloping floodplains and in drainage bottoms between 5,000 to 6,400 feet (1524 and 1951 meters) (USFWS 2000a). It occurs in depressions or along bends in wide, active meandering stream channels just upslope of the channel, and requires early to mid-succession riparian habitat. Typical habitat is open, periodically disturbed (flooded), and without dense vegetation. Establishment and survival of seedlings decrease with a decrease in disturbance and the consequent increase in plant density (Floyd 1995; Fertig 1996).

Conservation Planning

There are no federal or state laws or regulations other than the ESA that provide protection for the plant or its habitat. Designation of critical habitat has been deferred (USFWS 2000a). The City of Fort Collins has land use planning regulations that provide protection for riparian habitats. The largest known site of this plant is on F. E. Warren Air force base in Wyoming, which has been designated the Colorado Butterfly Plant Research Natural Area, and a management plan has been developed for this population (Marriott and Jones 1988).

Direct and Indirect Effects of CDOT Actions on the Colorado Butterfly Plant

According to the City of Fort Collins (pers. comm., S. Comstock, City of Fort Collins Wastewater Utilities), the only known plants are at least one-half mile away from Interstate 25. Transportation improvement projects and maintenance activities would not be expected to result in direct adverse impacts to the documented occurrence. However, plants occur downstream from the interstate, so indirect impacts to the known occurrence could result if the local hydrology were altered such that downstream habitat was lost or degraded. In addition, potential habitat (currently unoccupied) exists in the ROW, and this could potentially be eliminated or degraded by transportation improvements.

Cumulative Effects

The primary threats to this species are indiscriminate use of broadleaf herbicides and disturbance of riparian areas containing native grasses. Some agricultural practices may also threaten the plant, and mowing or intensive grazing when the plant is flowering can prevent seed set (USFWS 2000a). Water development, land conversion, competition from non-natives, and the non-selective use of herbicides also pose threats to the plant.

Because this species exists as small, isolated populations with few individuals per population, it is susceptible to stochastic events that may cause extirpation of a population.

Biological Determination

There may be impacts associated with transportation improvement projects that disrupt ground or surface water at the site where the Colorado butterfly plant occurs in Colorado.

Mountain Plover (*Charadrius montanus*)

Species Description

The mountain plover is an endemic grassland species that exists on grasslands and shrub-steppe and is associated with prairie dogs and other grazers (Knowles et al. 1982; Knopf 1996a). This species evolved in a landscape shaped by the effects of large numbers of grazing mammals (Knopf 1996b), where there was a mosaic of short vegetation, bare ground and flat topography (Graul 1975; Knopf and Miller 1994; Knopf and Rupert 1995). Historically, mountain plovers nested in shallow depressions on the ground in prairie dog colonies (Knowles et al. 1982; Knowles and Knowles 1993), or on sites intensively grazed by other prairie herbivores. Recent work has identified short vegetation, at least 30 percent bare ground, the presence of a nearby conspicuous object such as a manure pile, and less than five percent slope as typical of nesting habitat (Graul 1975; Olson and Edge 1985; Knowles and Knowles 1993; Knopf and Miller 1994). Nesting also occurs on fallow and recently plowed ground where prairie habitat is fragmented (Shackford 1991). Nest site fidelity may be high, with males, females, and chicks returning to within several hundred meters of the previous years' nest (Graul 1973, 1975; Knopf 1996c). Hatchlings are led away from the nest to an area affording some

shade. In Colorado, areas with shade include those areas along roadsides (Kuenning and Kingery 1998), where plant cover may be taller and denser due to increased moisture from runoff.

Almost 99 percent of the mountain plover's diet consists of invertebrates (grasshoppers, beetles and crickets), and the rest consists of seeds (Gillihan and Hutchings 2000). Outside the breeding season, mountain plovers are gregarious and forage in loose flocks (Knopf and Rupert 1995). Generally, mountain plovers in the central and northern shortgrass prairie spend about four months on the breeding grounds, five months on the wintering grounds, and the remaining time in migration (Knopf and Rupert 1995).

Distribution and Status

Three of the eight species of plover (snowy, piping and mountain) that occur east of the 105th meridian are species of concern and are in decline (Harrington 1995). All three species are found principally in temperate latitudes and breed in specialized habitats. Mountain plover populations and distributions are declining faster than any of the other endemic shortgrass prairie birds (Gillihan and Hutchings 2000). Between 1966 and 1999, the continent-wide mountain plover population declined at a rate of 2.7 percent annually with a cumulative decline of 63 percent (USFWS 1999). Today this species exists in geographically isolated breeding and wintering populations. The current population is estimated at 10,000 birds (USFWS 1999).

Mountain plovers range from southeastern Alberta and southwestern Saskatchewan through central Montana, south to southcentral Wyoming, eastern Colorado, northeastern New Mexico, and east to northern Texas and western Kansas and into northcentral Mexico and western California (National Geographic Society 1999). They breed almost exclusively in the United States (Commission for Environmental Cooperation 2000), with most breeding occurring in Colorado (Knopf 1996a; Kuenning and Kingery 1998) and Montana (USFWS 1999). Most birds winter in the Central and Imperial Valleys of California, with others wintering in and near Mexico (Knopf 1996a).

Kuenning and Kingery (1998) estimated that Colorado has 3,600 breeding pairs, or about three quarters of the USFWS (1999) global estimate of 10,000 birds. In Colorado, mountain plovers breed on the eastern plains, and also in South Park. Wunder et al. (in prep.) estimates that approximately 15-20 percent of the global mountain plover population breed in South Park. A similar estimate is not available for the eastern plains of Colorado. However, reports in the literature that name Colorado as one of the two most important breeding sites for this species were written prior to completion of much of the South Park inventory. In other words, Colorado was already considered highly significant before researchers documented the extent of breeding in South Park. Clearly, therefore, the eastern plains of Colorado represent a significant component of the remaining habitat for this species.

ESA Status and Other Organizational Rankings

The mountain plover was proposed for listing as threatened under ESA on February 16, 1999 (64 FR 7587-7601). It is listed as threatened in Canada and in Mexico (Commission for Environmental Cooperation 2000). It has a CNHP rank of G2/S2B-SZN (imperiled globally because of extreme rarity; breeding season imperiled in Colorado) (CNHP 2002b). The Committee on Environmental Cooperation (2000), established under the North American Free Trade Act, considers the mountain plover and the black-tailed prairie dog priority grassland species for conservation action. The mountain plover is listed as threatened in Nebraska, a "species of special interest or concern" in Montana, Oklahoma and California, "a species in need of conservation" in Kansas, and a "species of management concern" under the Partners in Flight Program for Colorado, Kansas, Montana, Nebraska, New Mexico and Oklahoma. It is a species of concern in Colorado, and is a Forest Service sensitive species.

Habitat

Mountain plovers nest in shortgrass prairie or its ecological equivalent, preferring short, sparse vegetation with at least 30 percent bare ground (Graul 1973; Knowles et al. 1982; Leachman and Osmundson 1990; Parrish et al. 1993; Knopf and Miller 1994; Knowles 1996). Areas that have been disturbed by prairie dogs, intensive grazing, or fire, all provide suitable habitat for mountain plovers (Knowles and Knowles 1984; Olson 1984; Wershler and Wallis 1987; Shackford 1991). Foraging habitat is similar to nesting habitat. Wintering habitat is also characterized by low sparse vegetation and includes alkali flats, plowed or burned fields, heavily grazed grasslands, and prairie dog colonies. Mountain plovers are often associated with blue grama (*Bouteloua gracilis*) or buffalo grass (*Buchloe dactyloides*) (Graul 1973, 1975; Graul and Webster 1976; Wallis and Wershler 1981; Parrish 1988; Parrish et al. 1993), but are also known from montane grasslands, sparse shrublands, and other heavily grazed grasslands in Colorado's mountain parks (e.g., South Park, San Luis Valley, Cochetopa Park).

Conservation Planning

The BLM and Forest Service restrict oil and gas exploration during the mountain plover nesting season from April through June in Colorado, Wyoming, and Utah (Gillihan and Hutchings 2000). Both agencies also use fire to maintain shortgrass habitat, and protect prairie dog colonies. The CDOW is working on a Memorandum of Agreement to enhance conservation of mountain plovers in Colorado. The Natural Resources Conservation Service in Colorado has designated the mountain plover as a species eligible for credit in Conservation Reserve Programs (CRP). The Forest Service (1994) and the BLM (1994) have adopted an interim mountain plover management strategy for oil and gas activities on the Pawnee National grasslands because of the potential impact these activities would have on the birds.

Direct and Indirect Effects of CDOT Actions on the Mountain Plover

There was strong consensus among the experts that the primary concern over the long term for prairie birds, including the mountain plover, is loss of habitat. In some cases,

ROWs may be attracting nesting or foraging birds (i.e., creating habitat), but this was generally not considered a desirable situation by most experts (note that field data are not available to either support or reject this theory). Most commonly, nesting birds appear to avoid ROWs, and the experts considered these areas permanently lost as breeding habitat (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. There was consensus among experts that these temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects are believed to be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

The maximum potential for permanent habitat loss was estimated to be 9,936 acres. This represents approximately 0.052% of the identified habitat within the project area (Grunau and Lavender 2002).

In addition, prairie dog colonies create suitable habitat for mountain plovers, and birds are often seen in areas where prairie dogs occur on the eastern plains of Colorado. Therefore, transportation improvements that result in loss of prairie dog colonies could also adversely impact mountain plover.

Cumulative Effects

Because the mountain plover is a declining species, has a narrow range of habitat requirements, and exhibits high site fidelity, it is susceptible at the population level to cumulative or stochastic impacts on the breeding grounds. However, the species is highly vagile and can rapidly locate suitable habitat, which facilitates recolonization (pers. comm., F. Knopf).

Conversion of native shortgrass prairie to cropland, urbanization, eradication of prairie dog colonies and complexes (Knowles et al. 1982; Knopf 1994), oil and gas development, plowing and planting on nesting grounds, and insect control on nesting and wintering areas (Graul 1973; Knopf 1996c; Knopf and Rupert 1996) all represent threats to mountain plovers (USFWS 1999). Recent evidence suggests that long term grazing management of shortgrass grasslands can have a strong effect on the maintenance or degradation of mountain plover habitat (pers. comm., F. Knopf).

Biological Determination

There will be take associated with approximately 9,935 acres of affected mountain plover habitat. CDOT will protect and manage high quality habitats for the benefit of mountain plover, in perpetuity, not less than 9,935 acres.

Akansas Darter (*Etheostoma cragini*)

Species Description

The Arkansas darter is a three-inch member of the perch family (Percidae). It prefers small, shallow, usually spring-fed streams with a sandy substrate, slow current, cool water, and abundant aquatic vegetation. These characteristics provide both reproductive and non-reproductive habitat. Darters are apparently able to withstand short duration changes from the preferred conditions during droughts or heavy runoff following rainstorms (Miller 1984). Breeding occurs in spring, with eggs being deposited in open areas on organic ooze covering a sandy substrate (Woodling 1985). Juveniles remain in the open areas while adults prefer areas with aquatic vegetation (Woodling 1985). The darters feed on aquatic insects (especially mayflies) and some plant material, including seeds (Moss 1981).

Distribution and Status

The Arkansas darter is a native of the Arkansas River in Colorado. There is little historical information for this species (CDOW 2001) from which to estimate either historical range or abundance. However, it is likely that distribution was continuous prior to Euro-American settlement (Eberle and Stark 2000).

In Colorado, there are reports of darters as far north as Limon and as far west as Canon City (CDOW 2001). Scientists generally assume that the darter's distribution and abundance have declined in concert with loss of riparian habitat and decreases in groundwater aquifers supporting spring-fed environments in the Arkansas River drainage (CDOW 2001). In recent years, the Arkansas darter has been found in tributaries of the Arkansas River in southeastern Colorado, southern Kansas, northeastern and northwestern Oklahoma, southwest Missouri and northwest Arkansas (Lee et al. 1980).

From 1979-1982, CDOW surveyed intensively in southeast Colorado and found the Arkansas darter in the Fountain Creek, Rush Creek and Big Sandy Creek drainages (Loeffler et al. 1982). From 1993-1996, CDOW carried out another intensive survey and found distribution changed little from the earlier survey (Nesler et al. 1999). Currently there are 11 populations in five tributaries to the Arkansas River - Fountain Creek, Rush Creek, Big Sandy Creek, Horse Creek and Chico Creek (CDOW 2001).

Arkansas darters have been introduced to ten previously unoccupied sites within the known range of the species since 1980 (CDOW 2001).

ESA Status and Other Organizational Rankings

The Arkansas darter was listed as a federal candidate species (61 FR 40) February 28, 1996. It is listed as threatened in Colorado and Kansas, endangered in Oklahoma, rare in Arkansas, and is a Forest Service sensitive species (CDOW 2001). It has a CNHP rank of G3/S2 (vulnerable throughout its range; imperiled in Colorado) (CNHP 2002b).

Habitat

Darters prefer clear, shallow streams with a sandy substrate that is partially overgrown with rooted aquatic vegetation, slow current, and cool water (Miller and Robinson 1973; Cross and Collins 1975). It is primarily a tributary species, but needs a connection to the mainstem for colonization and dispersal.

Conservation Planning

The Arkansas Darter (*Etheostoma cragini*) Recovery Plan (CDOW 2001) is a plan designed to preserve the Arkansas darter and its habitat, to restore the species to a viable condition, and to remove it from Colorado's threatened species list (CDOW 2001).

Direct and Indirect Effects of CDOT Actions on the Arkansas Darter

The primary concern for the darter is the construction of permanent barriers to movement within the stream. The critical threshold for gradients that prohibit fish movement is not known. Other impacts associated with roadwork (e.g., siltation, turbidity) are not thought to be a concern unless they continue for more than one year. If the impacts are of short duration, they are probably little different from the impacts associated with storm and flood events to which this species is adapted. Continuance of these types of impacts for longer than a year may affect life cycles; continuance for longer than two years could extirpate local populations (pers. comm., T. Nesler).

Cumulative Effects

Several species of prairie fish that were once abundant in Great Plains riverine ecosystems have declined markedly (Rabeni 1996). These declines are likely the result of habitat degradation, particularly in the Arkansas River basin (Echelle et al. 1995), and the introduction of non-native species (Rabeni 1996). Decades of intensive agricultural development and modified flow regimes are probably responsible for declines in the fishes endemic to the small streams and turbid rivers of the Great Plains (Cross and Moss 1987). Nevertheless, the first declines noted in regional endemic fishes were in those species found in small, clear, spring-fed streams, particularly streams that were home to the Topeka shiner and Arkansas darter (CDOW 2001).

Loss and fragmentation of habitat has resulted largely from development in riparian areas leading to streambank degradation and decreased water quality, reductions in water flow and quality resulting from water diversions, and groundwater depletions (Miller 1984). The spring-fed riparian habitats required by darters are also threatened by overgrazing, which leads to bank degradation, filling of wetlands, channelization, and conversion of rangeland to croplands.

Current threats to the Arkansas darter are the limited existing habitat and the potential degradation or loss of that habitat due to land use changes, pollution, or water diversions. Natural dispersal may be impeded by increased pollution or siltation, physical obstructions, and by seasonal decreased flows resulting from storage and diversion (CDOW 2001). The primary challenge to recovery of the darter is the continuing

demand for surface and ground water for uses other than for in-stream flow (CDOW 2001).

Biological Determination

CDOT will implement BMPs, as described in Part 3 of this document, whenever transportation improvement projects occur near rivers, streams, or creeks. Therefore, CDOT activities may adversely impact individual Arkansas darters, but they are not likely to result in a loss of viability for Arkansas darters in either the immediate area of the project or in the eastern plains of Colorado.

Black-tailed Prairie Dog (*Cynomys ludovicianus*)

Species Description

Black-tailed prairie dogs are diurnal, mid-sized burrowing rodents that live in colonies composed of harem-polygynous family groups (Hoogland 1995) on short- and mixed-grass prairies of the North American grasslands. They are monestrus, with a litter size (when young first emerge) from one to six, with an average of three (Hoogland 1995). Most subadult males and some subadult females will disperse from their natal colonies before they reach sexual maturity at two years (Hoogland 1995). On average, over her lifetime (about five years) a female will produce 2.14 yearlings (Hoogland 1995).

Black-tailed prairie dogs are selectively herbivorous, with the preferred food species varying through the year and dependent on local plant community composition (Fagerstone 1981). Graminoids seem to be selected over forbs, but preferred species include wheatgrass, blue grama (*Bouteloua gracilis*), buffalo grass (*Buchloe dactyloides*), globemallow (*Sphaeralcea coccinea*) and rabbitbrush (*Chrysothamnus spp.*) (Kelso 1939; King 1955; Koford 1958; Bonham and Hannan 1978; Garret and Franklin 1988). Winter foods add prickly pear cactus (*Opuntia spp.*) and underground roots (King 1955; Summers and Linder 1978) to the diet.

Vegetation is also clipped to maintain visibility in the vicinity of the burrows. Long-term colonization of an area can result in a change in plant species composition from a grass-dominated community to a forb-dominated community with bare ground (Severe 1977; Coppock et al. 1983; Archer et al. 1987).

Black-tailed prairie dogs are active year round, but during extremely cold weather will remain underground for several consecutive days. Colonies can expand to occupy suitable adjoining habitat. Dispersal of up to ten kilometers have been documented (Knowles 1985), though most dispersal occurs within two kilometers.

Current Distribution and Status

Between 1900 and the present, the area of the western United States occupied by black-tailed prairie dog colonies has been reduced from an estimated 4 x 10^7 hectares to less than 600,000 hectares (9,880,000 to 1,480,000 acres) (Biggins and Godby 1995; Knowles 1998; Nowak 1999). Governmental and private pest control, conversion of habitat from grassland to crops, and sylvatic plague (*Yersinia pestis*), have been identified as the primary mechanisms of this decline (Cully and Williams 2001). Over the last two decades, poisoning and plague epizootics have continued to result in range wide declines of black-tailed prairie dog populations (USFWS 2000b). This represents an overall reduction in colony acreage since European settlement of North America of more than 90 percent (Biggins and Godbey 1995; Mulhern and Knowles 1997; Ostlie et al. 1997).

In the 1800s, black-tailed prairie dog colonies covered large portions of the eastern third of Colorado (Cary 1911). Historical estimates suggest that 20 percent of the shortgrass and midgrass prairies may once have been inhabited by prairie dogs (Lauenroth 1979). The largest recent concern for black-tailed prairie dog habitat in Colorado has been habitat conversion. In the Front Range corridor, urban development has resulted in highly fragmented habitat. On the eastern plains, the conversion of grassland to agriculture from the late 1800s on has resulted in the conversion of large sections of prairie. The result is a patchwork of prairie and cropland leading to mostly small remnant prairie dog colonies scattered across the eastern plains (EDAW 2000).

In a study completed for the Colorado Department of Natural Resources, EDAW (2000) developed a GIS database of known black-tailed prairie dog occurrences in eastern Colorado. EDAW (2000) documented 314,114 acres of active, inactive, no longer present and unknown status colonies. Data were assembled from federal, state, and local agencies. Some of the colony status data had been verified within the last five years (1,348 colonies), while 1087 colonies had not been verified in over ten years, and another 507 had not been verified within the last five years. EDAW field checked 38 percent of the acreage in the baseline they compiled. They concluded that of the 314,114 acres of black-tailed prairie dog habitat, 190,423 acres was active and the remainder was inactive (21,599 acres), no longer present (45,037 acres), or of unknown status (57, 056 acres). Relying on information from 1995-2000, EDAW summarized active colonies by size and found that the average current colony size is 75 acres, with a range of 0.04 acres to 4,129 acres. Of 2,578 colonies, they found that only one percent, or 17 active colonies, were greater than 1,000 acres, two percent (45 colonies) were greater than 500 acres and less than 1000 acres, and the remainder less than 500 acres.

ESA Status and Other Organizational Rankings

The black-tailed prairie dog is a candidate species for listing under the ESA. The USFWS (2000b) found that the species warrants listing but that higher priority species are in need of more immediate action, thus precluding the listing of the black-tailed prairie dog. In its 12-month finding of February 3, 2000, the USFWS again found that listing was warranted but precluded by other listing priorities. The 2001 review found no need to alter this status. It is a U.S. Forest Service sensitive species, and it is a species of

special concern in Colorado. The black-tailed prairie dog has a CNHP rank of G4/S4 (apparently secure rangewide and in Colorado) (CNHP 2002b).

The American Society of Mammalogists (1998) adopted a "Resolution on the decline of prairie dogs and the grassland ecosystem in North America," and the Society for Conservation Biology adopted a resolution on "Conservation of Prairie-dog Ecosystems (in Litt.)." Both express concern not only for prairie dog population declines, but also for loss and degradation of the system of which prairie dogs are a part.

Habitat

Black-tailed prairie dogs occur primarily on shortgrass and mixed-grass prairies on the Great Plains. Colonies are usually found on sites with slopes of less than ten percent (Koford 1958; Dalstad et al. 1981; Clippinger 1989; Reading and Matchett 1997). Prairie dogs avoid wetlands and areas with high water tables. The most suitable habitats are those with low plant cover, and thus increased visibility that likely enhances their ability to detect predators (King 1955; Hoogland 1981). The selection of new territories by dispersing individuals seems to be influenced by visibility at the new site (Cincotta 1985; Knowles 1985). In a study of black-tailed prairie dog colonies surrounded by tall grass, Osborn and Allen (1949) found that they abandoned sites or were gradually eliminated if they could not keep vegetation clipped. Total canopy cover ranged from 58 percent to 70 percent in work done in northern Colorado (Klatt and Hein 1978).

Black-tailed prairie dogs change the landscape that they colonize in several ways. They maintain the plant community in an early seral stage, maintain grasses in an early growth stage, keep vegetation height low, increase the proportion of bare ground at a site, and create a plant community pattern with forbs at the center of a colony with an increasing proportion of grasses toward the periphery (Koford 1958; Garrett and Franklin 1988).

Black-tailed prairie dogs facilitate complex species interactions by increasing landscape heterogeneity and creating conditions attractive to other species, including black-footed ferrets (endangered species), mountain plovers (proposed species), ferruginous hawk (sensitive species), swift fox (sensitive species), burrowing owls (sensitive species), rabbits, voles, mice, and a variety of insects and snakes (Knowles and Knowles 1994; Hoogland 1995). Their digging contributes to enhancing soil structure, water filtration, and forb growth (Koford 1958). Ungulates seem to prefer grazing on prairie dog colonies due to the greater nutritional value (high nitrogen and low stem content) per unit biomass of vegetation found in colonies (King 1955; Coppock et al. 1983; Holland and Detling 1990). In turn the ungulates reduce vegetation height, which is advantageous to prairie dogs (Foster and Hygnstrom 1990; Sharps and Ursek 1990). Generally, species richness appears to be significantly higher in prairie dog colonies than in surrounding areas (Reading 1993).

Conservation Planning

The conservation of prairie dogs, and thus of their large-scale functional role on short and mixed-grass prairies, is necessary to maintain viable numbers of species found in

association with them. The state of Colorado is engaged in developing a management strategy for black-tailed prairie dogs that includes prohibiting hunting east of Interstate 25 and in Adams, Arapaho, Boulder, Broomfield, Custer, Douglas, El Paso, Fremont, Huerfano, Jefferson, Las Animas, Larimer, Pueblo, and Weld counties (CDOW 2002a). However, private landowners have the authority to control prairie dogs on their land. The CDOW has initiated a private landowner incentive program to help landowners conserve habitat required by prairie dogs and other species that interact with or depend on them, including the mountain plover and the burrowing owl (CDOW 2002a). In the program, CDOW will make $600,000 available to landowners in the Baca, West Greeley, South Pueblo, and Turkey Creek soil conservation districts. Landowners will be allowed to offer a per-acre bid for the amount of compensation they think is reasonable for protecting prairie dogs on their property (CDOW 2002a). The Division and the soil conservation districts will then evaluate potential parcels based on quality of habitat, size of prairie dog colonies, acres of shortgrass, proximity to protected habitat, and distance from adjacent landowners (CDOW 2002a). Lands that provide the best benefit at the least cost will be accepted into the program. Landowners will be able to enter five or ten year agreements. The smallest parcels acceptable will be 160 acres, with prairie dogs present on at least 25 percent of the land. Compensation will be based on total acreage enrolled (CDOW 2002a).

The Colorado Department of Agriculture classifies the prairie dog as an "agricultural pest" and helps landowners reduce or eliminate prairie dog populations on their land (EDAW 2000).

In response to the proposal to list black-tailed prairie dogs as threatened under the ESA, the 13 states having black-tailed prairie dog populations have undertaken a regional planning process as the Interstate Black-tailed Prairie Dog Conservation Team. The purpose is to manage, maintain, and enhance habitat and populations of black-tailed prairie dogs across their historic range. Chief among the strategies are eliminating mandatory control, regulating seasons and possession limits, and maintaining, conserving, and establishing core populations on public lands.

The Pawnee National Grassland and Comanche National Grasslands together comprise 528,767 acres (approximately two percent) of Colorado's central shortgrass prairie. The Forest Service has selected the black-tailed prairie dog as the management indicator species for low structure grasslands and the biological community associated with prairie dog colonies on the national grasslands of the Northern Great Plains. Their management goal is to encourage the growth of large complexes, maintain small colonies, and limit control of prairie dogs to the maximum extent possible. The Comanche National Grassland contains 1,375 acres of prairie dog colonies, and the Pawnee National Grassland contains 1,008 acres of prairie dog colonies (EDAW 2000). To date, management recommendations have not resulted in increased acreage of prairie dogs on the Pawnee National Grasslands, for as yet undetermined reasons (pers. comm., S. Currey).

Direct and Indirect Effects of CDOT Actions on the Black-tailed Prairie Dog

The primary concern for impacts to black-tailed prairie dogs from CDOT actions is permanent habitat loss. CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. These temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract prairie dogs.

The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 10,744 acres. This represents approximately 0.55% of the identified habitat in the project area (Grunau and Lavender 2002).

In its discussion of factors affecting black-tailed prairie dogs in their 12-month administrative finding, USFWS made no mention of roads as a major threat to black-tailed prairie dogs (USFWS 2000b). The 12-month finding considered habitat fragmentation a moderate threat, but roads were not singled out as a source of fragmentation.

Cumulative Effects

Across most of Colorado's mid- and shortgrass prairie, most prairie dog colonies occur on private land (174,549 acres versus 39,783 acres on public lands) (EDAW 2000). It is likely that reductions in their populations, if they occur, will result from private landowners poisoning prairie dogs on their property or converting habitat from grazing to cultivated lands.

Improvement of roadways can, in the long term, result in strip development of the adjacent land, though this is more common in urban areas than in the rural areas that make up most of the planning area.

Plague is a serious threat to the persistence of prairie dogs. Plague spread east from its point of introduction into the New World in San Francisco, and today is common among various rodent species as far east as Montana, Wyoming, Colorado, New Mexico, and west Texas (Cully and Williams 2001). This disease is apparently less prevalent in eastern Colorado than in the Front Range (EDAW 2000). EDAW (2000) states that CDC maps of known plague-positive black-tailed prairie dog colonies in Colorado show little incidence of plague in eastern Colorado—though this may be due to insufficient records. However, the Comanche National Grassland in southeastern Colorado experienced a 90 percent loss of prairie dogs due to plague in the mid-90s (USFWS 2000b). Once established in an area, plague becomes persistent and periodically erupts, with the potential to extirpate local black-tailed prairie dog populations (Mulhern and Knowles 1997). Prairie dog colonies virtually eradicated by plague require approximately four to

five years to regenerate, and then again become susceptible to a plague epizootic (Cully 1989). Recovery from an epizootic may take as long as ten years (Knowles 1998).

Knowles and Knowles (1994) have suggested that prairie dogs have survived the introduction of the plague bacterium due to their dispersed populations. Cully and Williams (2001) found that on the Cimarron National Grassland, in the presence of plague, prairie dogs most likely to survive were found in complexes of small colonies that were greather than three kilometers from their nearest neighbor. Thus a diverse pattern of connected colonies in conjunction with isolated colonies of various sizes is probably the best condition to ensure that prairie dogs survive plague.

Biological Determination

There will be take associated with approximately 10,744 acres of affected black-tailed prairie dog habitat. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect black-tailed prairie dogs. In addition, CDOT will protect and manage high quality habitats for the benefit of black-tailed prairie dogs in perpetuity, not less than 10,744 acres.

Lesser Prairie-chicken (*Tympanuchus pallidicinctus*)

Species Description

The lesser prairie-chicken is a member of the subfamily Tetraoninae, a diverse group of ground dwelling birds with stocky bodies, short, thick legs with toes adapted for walking and scratching, and in which flight is brief but strong (Johnsgard 1975, 1983). This species is a non-migratory resident of arid shortgrass prairies with shinnery oak (*Quercus havardii*) or sand sagebrush (*Oligosporus filifolius*) (Jones 1963; Sutton 1967; Oberholser 1974; Andrews and Righter 1992).

Lesser prairie-chickens are primarily insectivorous during the summer months, with large grasshoppers the prey of choice (Kingery 1998; Mote et al. 1998). During the remainder of the year, birds consume plant materials including leaves, buds, catkins, seeds, and galls (Copelin 1963; Hoffman 1963). Juveniles depend almost entirely on insects (CDOW 1993).

Lesser prairie-chickens are polygynous. Males perform elaborate courting displays on leks to which the birds demonstrate a great deal of fidelity (National Geographic Society 1999). Females build ground nests, incubate the eggs, and care for the young alone (Johnsgard 1975, 1983). Nests consist of a scrape made on well-drained sites in ungrazed meadows or natural prairie within 0.8 kilometers of leks (Mote et al. 1998), and are concealed by small shrubs, or grass clumps from the previous years' growth of tall, dense, perennial grasses (Mote et al. 1998; Winn 1998).

Distribution and Status

The lesser prairie-chicken ranges from western Kansas and southeastern Colorado, south to the Texas panhandle, the Oklahoma panhandle, and eastern New Mexico (AOU 1983; Winn 1998). Prior to the 1930s, this species was common and was thought to number more than one million birds in Texas alone (USFWS 1998), but these numbers have since declined dramatically. The continent-wide population estimate today is approximately 50,000 breeding birds (CDOW 1993). It is considered to have the smallest population and most restricted distribution of all North American prairie grouse (Johnsgard 1983; Giesen 1998).

Lesser prairie-chicken distribution and population size have been significantly impacted by human activities. Excessive livestock grazing of rangelands and conversion of native rangelands to cropland or introduced pastures have significantly reduced populations and distributions. Since the 1800s, lesser prairie-chickens have experienced rangewide reductions of 92 percent, including a 78 percent reduction in occupied range since 1963 (Taylor and Guthery 1980).

The first confirmed report of lesser prairie-chickens in Colorado comes from Baca County in 1914 (Bailey and Niedrach 1965). Before the grasslands were converted to agricultural uses, lesser prairie-chickens were probably "fairly common" in southeastern Colorado (Bailey and Niedrach 1965). Today, Colorado's population is estimated at 2,000-4,000 birds found largely in the Comanche National Grasslands and on private lands south of the Cimarron River (CDOW). Colorado's population, which has increased since 1977 largely due to habitat protection on the Comanche National grassland, is the only population exhibiting consistently positive trends (Andrews and Righter 1992). Between 1986 and 1990, CDOW identified 58 active leks, 40 of them in Baca County and most on the Comanche National Grasslands (Giesen 1994a).

ESA Status and Other Organizational Rankings

The lesser prairie-chicken is a federal candidate species. It was proposed for federal listing under the ESA in 1995, but in a 12-month finding (9 June 1998) the USFWS found that listing was warranted but precluded (USFWS 1998). It is a U.S. Forest Service sensitive species on the National Grasslands, and the Bureau of Land Management considers it an emphasis species. The lesser prairie-chicken has a CNHP rank of G3/S2 (vulnerable throughout its range; imperiled in Colorado) (CNHP 2002b).

Habitat

Ideal lesser prairie-chicken habitat exhibits structural diversity, including short to mid-height grasses that provide both forage and cover. Forbs and small shrubs interspersed among the grasses provide cover for nesting as well as food and winter cover. Leks are devoid of cover and are characterized by short grasses or other low-growing vegetation (Giesen 1994b). All of these components (i.e., leks, nest and brood-rearing cover, winter cover, and food) must occur within an area of two to four square miles. In southeast Colorado, lesser prairie-chicken habitat consists of sand sagebrush communities dominated by sand dropseed (*Sporobolus cryptandrus*), sideoats grama (*Bouteloua*

curtipendula), threeawn (*Aristida* spp.), and blue grama (*Bouteloua gracilis*) (Mote et al. 1998; Winn 1998; USDA-NRCS 1999). Research from Kansas found that optimum habitat consisted of 75 percent grassland and 25 percent cropland (Horak 1984). Generally, areas composed of less than 63 percent native rangeland have been found to have little ability to support viable populations of lesser prairie-chickens (Mote et al. 1998).

Conservation Planning

An interstate working group, including Colorado, Kansas, New Mexico, Oklahoma, and Texas, has developed a strategy for conservation and recovery of the lesser prairie-chicken (Mote et al. 1998). This conservation plan is the start of a cooperative effort among state and federal agencies and private landowners to conserve the lesser prairie-chicken and the habitat on which it depends.

On the Comanche National Grassland, the U.S. Forest Service provides special management for the species. Their goal is to maintain sandy rangeland in good to excellent condition (Taylor and Guthery 1980). CDOW has undertaken transplantation of flocks into high quality non-federal habitat in southeastern Colorado, but success so far is unknown (Braun et al. 1994).

The Conservation Reserve Program may provide habitat for lesser prairie-chickens if lands remain in the program long enough to develop a shrub community and also supply all of the other habitat components within two to four square miles.

Direct and Indirect Effects of CDOT Actions on the Lesser Prairie-chicken

There was strong consensus among the experts that the primary concern over the long term for prairie birds, including the lesser prairie-chicken, is loss of habitat. In some cases, ROWs may be attracting nesting or foraging birds (i.e., creating habitat), but this was generally not considered a desirable situation by most experts (note that field data are not available to either support or reject this theory). Most commonly, nesting birds appear to avoid ROWs, and experts considered these areas permanently lost as breeding habitat (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. There was consensus among experts that these temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 78 acres. This represents approximately 0.016% of the

identified habitat in the project area (Grunau and Lavender 2002). There are currently no existing leks documented near state or federal highways in Colorado (pers. comm., Jon Kindler, CDOW).

Cumulative Effects

Habitat loss, largely through conversion from native prairies to cultivated fields, is the primary cause of lesser prairie-chicken population declines, while the removal of brush to enhance pasture continues to degrade habitat (Sutton 1967; Mote et al. 1998). Since the majority of the shortgrass prairie is privately owned (91 percent according to TNC 1998), management to prevent habitat conversions will be difficult. Use of herbicides to limit shrubs and/or forbs directly eliminates both cover and food. In southeastern Colorado, grazing, plowing, and drought (especially through the Dust Bowl of the 1930s) have been identified as causes of habitat loss (Winn 1998).

Biological Determination

There are currently no known lek sites near Colorado highways. However, there may be take associated with approximately 78 acres of affected lesser prairie-chicken habitat. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect lesser prairie-chickens. In addition, CDOT will protect and manage high quality habitats for the benefit of lesser prairie-chickens in perpetuity, not less than 78 acres.

Burrowing Owl (*Athene cunicularia*)

Species Description

The western burrowing owl is a grassland specialist that is distributed throughout North America, and is dependent on the presence of fossorial mammals. It is a largely nocturnal bird, often seen perching in the daytime on posts or on the ground, in or near prairie dog (*Cynomys* spp.) colonies (National Geographic Society 1999). They nest in underground burrows in grasslands, shrublands, deserts, and grassy urban areas (such as golf courses and airports), and forage nearby. Burrowing owls are capable of excavating their own burrows if the soils are sandy, but most often use holes excavated by other animals (especially rodents).

Burrowing owls are opportunistic feeders, subsisting largely on insects, small rodents, amphibians, reptiles, and on occasion, small birds (Haug et al. 1993). Most foraging occurs in areas with vegetation less than one meter tall (Haug and Oliphant 1990; Wellicome 1994). During the nesting season they are active throughout the day and night, hunting insects when it is light and rodents at night (Bent 1938; Plumpton and Lutz 1993a).

Fledging rates for burrowing owls are high relative to rates for other small owls, and may reflect the advantage of nesting underground as much as a need to compensate for high post-fledging mortality (Johnsgard 1988). Pezzolesi (1994) found that, of 326 birds banded at the Rocky Mountain Arsenal in Colorado in 1991 and 1992, only 28 returned to nest in 1992 or 1993.

Colonial nesting has been reported for this species (Ehrlich et al. 1988), and may reduce depredation risks as owls may alert one another to threats (Desmond 1991; Desmond et al. 1995). Jones (1998), however, suggests that this may be a recently developed behavior reflecting a scarcity of nest sites as much as a lack of territoriality. In northeastern Colorado, Hughes (1993) found that pairs breeding in large prairie dog colonies nested further apart than did pairs nesting in small colonies.

Distribution and Status

The burrowing owl is distributed discontinuously throughout the grasslands of North America. Historically it ranged from Alberta, Saskatchewan, Manitoba, and southeastern British Columbia south to Mexico and into South America as far south as northern Chile. Populations in the northern and southern portions of this range are migratory. There is a second, non-migratory population in Florida.

Surveys in the United States and Canada indicate that the burrowing owl is declining through much of its range. It is not listed under the ESA, but is listed by many states. It is listed as endangered in Minnesota and Iowa, is considered a species of special concern in Washington, Oregon, California, Montana, Wyoming, Idaho, North Dakota, South Dakota, Utah and Oklahoma, and is listed as threatened in Colorado.

BBS Survey -- The burrowing owl has been declining nationally at an average of 0.7 percent (Peterjohn et al. 1995). Breeding Bird Survey (BBS) data show a significant decline in the Central BBS Region, a stable trend in the Western BBS Region, and non-significant declines in Colorado, New Mexico, South Dakota and Texas (Sauer et al. 1997).

Colorado -- Along the Front Range of Colorado, burrowing owls have largely disappeared from much of their historic range (Jones 1998). Workers for the Colorado Breeding Bird Atlas (Jones 1998) found breeding burrowing owls almost exclusively in eastern Colorado, despite their once having been more widespread throughout the state. RMBO documented 468 burrowing owl colonies and 2,675 individuals in eastern Colorado in 1999 (Hutchings et al. 1999).

ESA Status and Other Organizational Rankings

Burrowing owls were listed as a Category 2 species to be considered for federal listing by USFWS from 1994-1996, but in 1996 Category 2 designation was discontinued. This species is a USFWS "Nongame Avian Species of Management Concern" (USFWS 1995), a sensitive species in Regions 1 and 2 of the U.S. Forest Service, and is listed as an Appendix II species by CITES (Ehrlich et al. 1992). Mexico lists the burrowing owl

as threatened, and Canada changed its rank from threatened to endangered in 1995 (Commission for Environmental Cooperation 2000). The Committee on Environmental Cooperation, established under the North American Free Trade Agreement, has identified the burrowing owl as a priority grassland species for conservation action. It is a "High Priority" Watch List species in Wyoming and Nebraska, and a Colorado threatened species. It has a CNHP rank of G4/S4B (the species is apparently secure globally and in Colorado; breeding birds may be rare in parts of range) (CNHP 2002b).

Habitat

Burrowing owls use well-drained, level to gently sloping grassland habitats characterized by sparse vegetation, usually less than four inches high, and a relatively large proportion of bare ground (Pezzolesi 1994). In eastern Colorado, they are usually found associated with prairie dog colonies (Kingery 1998). Prairie dog colonies provide burrows for nesting and perching mounds, and the low vegetation structure provides a clear view of terrestrial predators (Jones 1998). In western Nebraska, the size of prairie dog colonies was positively correlated with fledging success rates (Desmond 1991). On the Buffalo Gap National Grassland, reproductive success of burrowing owls improved with increasing prairie dog colony size (Greibel 2000). In western Nebraska, 85 percent of burrowing owl nests occurred in prairie dog colonies (Desmond 1991). In the Oklahoma panhandle, 66 percent of nests occurred in prairie dog colonies, which comprised less than 20 percent of available habitat (Butts 1973; Butts and Lewis 1982). In eastern Wyoming, nests occurred in colonies of either black-tailed or white-tailed prairie dogs (Thompson 1984; Thompson and Anderson 1988).

When a prairie dog colony is eradicated or greatly reduced, the vegetation in the colony grows taller than the owls will tolerate and the burrows begin to deteriorate. Under these circumstances, burrowing owls will abandon their nest burrows (Grant 1965; Butts 1973; MacCracken et al. 1985; Plumpton and Lutz 1993b). Black-tailed prairie dog colonies in Oklahoma became unsuitable for burrowing owls within one to three years after abandonment by prairie dogs, because of the encroachment of dense vegetation (Butts 1973). The density of burrowing owls in prairie dog colonies in northeastern Colorado was positively related to the percentage of active burrows (Hughes 1993). In Nebraska, burrowing owl density in black-tailed prairie dog colonies was negatively correlated with the density of inactive burrows (Desmond 1991) and positively correlated with density of active burrows (Desmond et al. 2000).

Burrowing owls forage in a variety of habitats, ranging from the low structure plant communities of prairie dog colonies, where they forage for insects, to areas of taller plant cover (right-of-ways and native grasslands) where small mammal prey is likely to be more abundant (Wellicome 1994). Generally they use shortgrass habitat typical of prairie dog colonies for nesting and roosting, and forage over areas of taller vegetation. Owls nesting near edges of prairie dog colonies may benefit from increased perch availability, high insect populations, and close proximity to foraging areas.

Conservation Planning

The USFWS has completed a draft status assessment and conservation plan for the burrowing owl in the United States (Anderson et al. 2001). The U.S. Government has signed several treaties with its neighbors for the conservation of migratory birds (16 USC 703-711). These treaties (with Great Britain for Canada, Mexico, Japan and the former Soviet Union) provide for the regulation of hunting and for conservation through the enhancement of habitat. MBTA calls for protecting migratory bird habitat from pollution, conversion and degradation as well as "...establish(ing) preserves, refuges, protected areas...intended for the conservation of migratory birds and their environments, and to manage such areas so as to preserve and restore the natural ecosystems." (Convention Between the United States of America and the Union of Soviet Socialist Republics 1978).

Direct and Indirect Effects of CDOT Actions on the Burrowing Owl

There was strong consensus among the experts that the primary concern over the long term for prairie birds, including the burrowing owl, is loss of habitat. In some cases, ROWs may be attracting nesting or foraging birds (i.e., creating habitat), but this was generally not considered a desirable situation by most experts (note that field data are not available to either support or reject this theory). Most commonly, nesting birds appear to avoid ROWs, and experts considered these areas permanently lost as breeding habitat (Grunau and Lavender 2002). The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 11,246 acres. This represents approximately 0.051% of the identified habitat in the project area (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. There was consensus among experts that these temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

Also, because burrowing owls are so dependent on active prairie dog colonies for nesting habitat, any actions CDOT takes that negatively impact prairie dogs are likely to impact burrowing owls. Further, because large insects, particularly grasshoppers, comprise more than 80 percent of burrowing owl summer diet (Gillihan and Hutchings 2000), insecticide use on ROWs near burrowing owl nests may limit food availability, and thus impact reproductive success.

Cumulative Effects

Conversion of rangeland to taller non-native grassland or cropland, urban growth, and the eradication of prairie dog colonies, have contributed to the decline of burrowing owls (Commission for Environmental Cooperation 2000; Anderson et al. 2001). This intensification of land use has resulted in both loss and fragmentation of nesting habitat. In many areas, the fate of burrowing owls is tied to that of active prairie dog colonies. Poisoning of prairie dog colonies and plague outbreaks have eliminated nest sites. Dechant et al. (2001b) identified the elimination of burrowing rodents (prairie dogs and ground squirrels) by rodenticides as a primary factor in burrowing owl declines.

Burrowing owls prefer grasslands of low structure that are typical of grazed grasslands (MacCracken et al.1985). Cessation of grazing, either through loss of prairie dogs or removal of ungulates, can negatively impact burrowing owls. Owls in Saskatchewan and Alberta nested in pastures with shorter vegetation than occurred in randomly chosen pastures (Clayton 1997). Owls in North Dakota nested in moderately or heavily grazed mixed-grass pastures, but not in hayed or lightly grazed mixed-grass pastures (Kantrud 1981). In Colorado, Montana, Nebraska, North Dakota, South Dakota, and Wyoming, optimal habitat occurred in heavily grazed areas (Kantrud and Kologiski 1982).

Pesticide poisoning of insects and vehicle collisions (as the birds hunt along right-of-ways) have also contributed to their decline (Haug et al. 1993). Burrowing owls ingest poisoned rodents and forage in areas where insects have been poisoned (James et al. 1990). Pesticide use targeting the large insects on which burrowing owls depend during the nesting season (grasshoppers, crickets and beetles) depletes the prey base, and may impact reproduction. Owls in pastures treated with strychnine-coated grain weighed less than owls in control pastures, suggesting either a sub-lethal effect on the owls themselves, or reduction in prey availability (James et al. 1990). The use of insecticides and rodenticides in burrowing owl habitat can have several effects: pesticides not only reduce the owl's food supply and the number of burrowing mammals, but these chemicals may also be toxic to the owl (James and Fox 1987, James et al. 1990).

Almost 80 percent of eastern Colorado's prairie dog colonies occur on private land (EDAW 2000). Continued use of insecticides, conversion of rangeland to cropland or to urbanization, and reductions of prairie dog colonies can be expected to occur (Ostlie et al. 1997). It is also likely that prairie dog colonies on private land will tend to be small, and therefore will not provide the higher quality nesting habitat of large colonies and complexes.

Biological Determination

There will be take associated with approximately 11,248 acres of affected burrowing owl habitat. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect burrowing owls and prairie dogs. Furthermore, CDOT will protect and manage high quality habitats for the benefit of burrowing owls in perpetuity, not less than 11,248 acres.

Cassin's Sparrow (*Aimophila cassinii*)

Species Description

The Cassin's sparrow is a shrub-grasslands specialist, endemic to the southwestern U.S and northern Mexico. They have been reported to exhibit an opportunistic nesting strategy that takes advantage of rainfall because it stimulates insects and seeds (Phillips 1944; Maurer et al. 1989). Cassin's sparrows forage primarily on the ground in relatively open areas (Schnase 1984) for a diet composed largely of insects (beetles, grasshoppers, crickets and caterpillars) and seeds (Gillihan and Hutchings 2000). Young are fed almost exclusively on insects (Bock and Scharf 1994).

Nests are cups placed on the ground in bunchgrass, near the base of a shrub or cactus, or a few inches off the ground in a shrub or cactus (Ehrlich et al. 1988; Gillihan and Hutchings 2000).

Most birds leave for wintering grounds by late September (Gillihan and Hutchings 2000). Nesting in Colorado occurs from mid-May through July. Human disturbance at the nest often results in nest abandonment (Johnsgard 1979).

Distribution and Status

There is little information available on historical population densities or distributions of Cassin's sparrow (Ruth 2000). Populations exhibit great variability in distribution and numbers from year to year at any site (Hubbard 1977; Melcher 1998; Ruth 2000), making evaluation of BBS data difficult. They likely move across the landscape in response to changes in habitat quality (Hubbard 1977).

Cassin's sparrows breed from southwestern Nebraska, western Kansas, southeastern Colorado (and irregularly into northeastern Colorado [Melcher 1998]), southern and eastern New Mexico, western Oklahoma, west Texas and into northern Mexico (Howell and Webb 1995; AOU 1998). Possibly 20 percent (Melcher 1998), and perhaps up to 40 percent, of the breeding distribution of Cassin's sparrow is contained within Colorado (CBO 1995; Yanishevsky and Petring-Rupp 1998). Cassin's sparrows are migratory in the northern part of their range, and probably migrate to the southern part of their range in winter (Ruth 2000). In Colorado, they are common summer residents in the southeast, and are irregular nesters to the northeast (Andrews and Righter 1992; Melcher 1998). Their core population is centered in the Comanche National Grasslands in Baca County (Ruth 2000). In general, however, their numbers vary both annually and geographically within Colorado (Gillihan 1999).

ESA Status and Other Organizational Rankings

The Cassin's sparrow is not protected under the ESA, but is included on the USFWS' "Migratory Nongame Birds of Management Concern in the United States: the 1995 List," where it is listed as a species of concern in Regions 2 and 6 (USFWS 1995). It is also

listed on the National Audubon Society-Partners In Flight "WatchList." Cassin's sparrow has been assigned a CNHP rank of G5/S4B (demonstrably secure globally; breeding birds in Colorado apparently secure, but may be rare in parts of range) (CNHP 2002b).

Habitat

Cassin's sparrows inhabit shortgrass prairie with scattered shrubs or other tall vegetation (bunchgrasses, sagebrush, yucca, rabbitbrush, mesquite, oaks, cactus). Taller plants are used as song perches and nest cover. Territories typically contain 20-35 percent bare ground, 40-80 percent total cover of short and mixed grass, and at least five percent shrub cover. In Colorado, nearly 50 percent of all nesting birds were found on shortgrass prairie, while sandsage grasslands accounted for another 25 percent of nesting habitat (Melcher 1998). They appear to avoid grasslands without shrubs (or other suitable perches such as fences) and shrublands without grass (Hubbard 1977; Faanes et al. 1979). The shrubs are used as song perches (Schnase and Maxwell 1989) and for nesting. Nests are placed on the ground under shrubs or in shrubs a few inches off the ground (Johnsgard 1979).

Conservation Planning

The Cassin's sparrow is protected under the Migratory Bird Treaty Act (MBTA). The U.S. Government has signed several treaties with its neighbors for the conservation of migratory birds (16 USC 703-711). These treaties (with Great Britain for Canada, Mexico, Japan and the former Soviet Union) provide for the regulation of hunting and for conservation through the enhancement of habitat. MBTA calls for protecting migratory bird habitat from pollution, conversion, and degradation, as well as "...establish(ing) preserves, refuges, protected areas...intended for the conservation of migratory birds and their environments, and to manage such areas so as to preserve and restore the natural ecosystems" (Convention Between the United States of America and the Union of Soviet Socialist Republics 1978).

In 2001, RMBO and CDOW began a program of habitat-based bird monitoring throughout the state. Because Cassin's sparrows are one of the species for which BBS data in Colorado are inadequate, they are a priority species for this program (Ruth 2000).

Direct and Indirect Effects of CDOT Actions on the Cassin's Sparrow

There was strong consensus among the experts that the primary concern over the long term for prairie birds, including Cassin's sparrow, is loss of habitat. In some cases, ROWs may be attracting nesting or foraging birds (i.e., creating habitat), but this was generally not considered a desirable situation by most experts (note that field data are not available to either support or reject this theory). Most commonly, nesting birds appear to avoid ROWs, and these areas are considered permanently lost as breeding habitat. The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 2,284 acres. This represents approximately 0.055% of the identified habitat in the project area (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. There was consensus among experts that these temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

Cumulative Effects

Cassin's sparrows are at risk from habitat conversion and degradation resulting from conversion of native prairie to cropland, urbanization, planting non-native grasses, and fire exclusion (Gillihan and Hutchings 2000; Ruth 2000). Grazing in areas with sparse vegetation devalues habitat, probably because of the need for some tall vegetation for nest protection and song perches (Bock et al. 1984; Bock and Bock 1988). Management practices that result in complete removal of the shrub component, or the loss of grass cover with an increase of shrub density beyond some threshold negatively affect Cassin's sparrow (Ruth 2000).

Biological Determination

There will be take associated with approximately 2,284 acres of affected Cassin's sparrow habitat. CDOT will protect and manage high quality habitats for the benefit of the Cassin's sparrow in perpetuity, not less than 2,284 acres.

Ferruginous Hawk (*Buteo regalis*)

Species Description

The ferruginous hawk is an uncommon, locally distributed buteo of grasslands, sagebrush, and desert scrub habitats in the Great Plains and Great Basin (Gilmer and Stewart 1983; Ehrlich et al. 1988). It is an opportunistic nester that will use trees, ledges, rock or dirt outcrops, the ground, haystacks, nest platforms, power poles, or other man-made structures (Olendorff 1973; Gilmer and Stewart 1983; Ehrlich et al. 1988; MacLaren et al. 1988; Finch 1991; Faanes and Lingle 1995). Fidelity to nest locations from year to year is high, and typically several nests may be built in an area (Davy 1930; Weston 1968; Olendorff 1973; Palmer 1988; Schmutz 1991; Houston 1995). In Colorado, ferruginous hawks begin to nest from mid-March to early April (Preston 1998; Gillihan and Hutchings 2000). Fledging occurs 38-50 days after hatching (Preston 1998) and, in Colorado, fledglings have been recorded from late June to late July (Preston 1998).

The ferruginous hawk feeds primarily on prairie dogs, ground squirrels, jackrabbits, and less frequently on locusts, crickets, birds, amphibians, and reptiles (Weston 1968; Gilmer and Stewart 1983; Ehrlich et al. 1988; Finch 1991; Gillihan and Hutchings 2000; Dechant et al. 2001c). In Colorado, ferruginous hawks feed most often on prairie dogs (Preston and Beane 1996; Preston 1998). Density and productivity of ferruginous hawks are closely associated with cycles of prey abundance (Woffinden 1975; Smith et al. 1981; White and Thurow 1985; Schmutz 1989; Schmutz and Hungle 1989; Bechard and Schmutz 1995), and local influxes of the birds have been documented in response to prey availability (Gilmer and Stewart 1983).

Like other raptors, ferruginous hawks are widely dispersed and are found at low densities, especially during the nesting season (Fuller et al. 1995; Preston 1998). In the Pawnee National Grassland, they have been found at an estimated breeding density of one pair per 108 square kilometers (Olendorff 1972). Wintering populations in Colorado seem to be associated with prairie dog colonies, though the relationship between prairie dogs and hawk survivorship is unknown.

Distribution and Status

Ferruginous hawks breed from northeastern Washington, southern Alberta and southern Saskatchewan, south to eastern Oregon, western Nevada, southern California, and northern Arizona, and east through northern Texas, western Oklahoma, and eastern North Dakota (National Geographic Society 1999). Two subpopulations are recognized - one residing east of the Rocky Mountains and one found west of the Rocky Mountains (Bechard and Schmutz 1995). Year-round range is in the southern Rockies and southwestern Great Plains, while wintering range includes the southern Great Plains west to California and south to Central Mexico from October-April (Commission For Environmental Cooperation 2000).

The breeding distribution of ferruginous hawks in Canada has declined to about 50 percent of its former range (Houston and Bechard 1984; Schmutz et al. 1992). However, during the past ten years, population declines have only been documented in eastern Nevada and northern Utah (Olendorff 1993), while populations have been stable or rebounding throughout the rest of its range. BBS data for the U. S. and Canada indicate an average annual increase of 0.5 percent for 1966-1989 (Droege and Sauer 1990), and CBC counts also indicate an increase in ferruginous hawk numbers from 1952-1984 (USFWS 1992). Olendorff (1993) has estimated the continent-wide population at 5,842-11,330 birds, while Schmutz et al. (1992) estimate there are 14,000 birds on the Great Plains. Because between-year movement of these birds is common (and is probably a result of local prey availability), estimation of abundance is difficult.

In Colorado, ferruginous hawks have been stable from 1979-1992 (Olendorff 1993). Ferruginous hawks are found in Colorado year round (Preston 1998; Gillihan and Hutchings 2000), though they are most common in winter in eastern Colorado. Johnsgard (1990) estimated that about 1,200 birds winter in Colorado, which comprises about 20 percent of the total winter population in the United States. Preston (1998) estimated about 150 nest sites in Colorado, primarily on the eastern plains.

ESA Status and Other Organizational Rankings

The ferruginous hawk is listed as vulnerable in Canada (Commission for Environmental Cooperation 2000), as a species of conservation concern in Mexico (Commission for Environmental Cooperation 2000), as a USFWS Species of Concern (USFWS 1996), a USFS Region 2 sensitive species, a BLM sensitive species, and is listed on CITES Appendix II. It is a species of special concern in Arizona, Colorado, and Oklahoma, and is a threatened species in Utah. The Partners in Flight Watchlist identifies the ferruginous hawk as a "High Priority" species for Wyoming, North Dakota, South Dakota, and Nebraska. The Commission For Environmental Cooperation (2000) established under North American Free Trade Agreement, has identified the hawk as a priority grassland species for conservation action. It has a CNHP rank of G4/S3B-S5N (apparently secure globally; breeding birds vulnerable in Colorado) (CNHP 2002b).

Habitat

The ferruginous hawk is a bird of open grasslands and shrub steppe communities (Stewart 1975; Wakeley 1978; Gilmer and Stewart 1983; Green and Morrison 1983; MacLaren et al. 1988; Palmer 1988; Leslie 1992; Bechard and Schmutz 1995; Faanes and Lingle 1995; Houston 1995; Leary et al. 1998; Gillihan and Hutchings 2000). In eastern Colorado they favor habitats associated with black-tailed prairie dogs.

Selection for nest sites appears to depend on a combination of available substrates and the surrounding land use. Ground nests are typically located far from human activities and on elevated landforms within grassland areas (Blair 1978; Gilmer and Stewart 1983; Preston 1998). When trees are the nesting substrate, lone or peripheral trees are preferred to densely wooded areas (Weston 1968; Lokemoen and Duebbert 1976; Gilmer and Stewart 1983; Woffinden and Murphy 1983; Palmer 1988; Bechard et al. 1990; Leslie 1992; Hansen 1994; Dechant et al. 2001c). Generally areas of intensive agriculture or high human disturbance are avoided (Gilmer and Stewart 1983; Schmutz 1984, 1987; Bechard et al. 1990; Schmutz 1991). Ferruginous hawks nested more frequently in grassland areas than in cultivated areas in eastern Colorado (Olendorff 1973; Leslie 1992; Preston 1998; Dechant et al. 2001c).

Prey availability also influences habitat selection. Small and mid-sized mammals comprise most of the diet of ferruginous hawks. Grazing by large herbivores or prairie dogs benefits ferruginous hawks by reducing plant cover and making prey more visible (Wakeley 1978; Gilmer and Stewart 1983). The hawks appear to avoid dense vegetation where visibility of prey is limited (Howard and Wolfe 1976; Wakeley 1978). Fire may also be beneficial to ferruginous hawks as it maintains grasslands in an early seral stage.

Population size and distribution may fluctuate with respect to the availability of small and mid-sized mammal prey (Grossman and Hamlet 1964; Lokemoen and Duebbert 1976; Ehrlich et al. 1988). Winter residents in eastern Colorado concentrate around prairie dog towns (Bechard and Schmutz 1995; Preston and Beane 1996).

Conservation Planning

The ferruginous hawk is protected under the Migratory Bird Treaty Act. The U.S. Government has signed several treaties with its neighbors for the conservation of migratory birds (16 USC 703-711). These treaties (with Great Britain for Canada, Mexico, Japan and the former Soviet Union) provide for the regulation of hunting and for conservation through the enhancement of habitat. MBTA calls for protecting migratory bird habitat from pollution, conversion and degradation as well as "...establish(ing) preserves, refuges, protected areas...intended for the conservation of migratory birds and their environments, and to manage such areas so as to preserve and restore the natural ecosystems" (Convention Between the United States of America and the Union of Soviet Socialist Republics 1978).

Because of their winter preference for habitats modified by prairie dogs, conservation plans benefiting prairie dogs will also benefit ferruginous hawks. The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would protect large areas of ferruginous hawk habitat.

In 2001, RMBO and CDOW began a program of habitat-based bird monitoring throughout the state. Because ferruginous hawks are one of the species for which BBS data in Colorado are inadequate, they are a priority species for this program (Leukering et al. 2000).

Direct and Indirect Effects of CDOT Actions on the Ferruginous Hawk

Ferruginous hawks are sensitive to disturbance during the breeding season (Gilmer and Stewart 1983; Schmutz 1984; White and Thurow 1985; Bechard et al. 1990; Preston 1998; Gillihan and Hutchings 2000). In eastern Colorado, nests in remote locations exhibited higher productivity than did nests in more accessible locations (Olendorff 1973). Sensitivity to disturbance has also been found to increase during years of low prey abundance (White and Thurow 1985). Because ferruginous hawks in eastern Colorado preferentially hunt on prairie dog colonies, any CDOT actions that negatively impact prairie dogs are likely to impact ferruginous hawks.

The maximum potential for permanent loss of ferruginous hawk habitat from transportation improvement projects was estimated to be 10,773 acres. This represents approximately 0.055% of the identified habitat in the project area (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. There was consensus among experts that these temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to

offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

Cumulative Effects

Conversion of grasslands to row crops has been recognized as a major threat to ferruginous hawks (Lokemoen and Duebbert 1976; Gilmer and Stewart 1983; Finch 1991; Ostlie et al. 1997; Preston 1998; Commission for Environmental Cooperation 2000; Gillihan and Hutchings 2000). Invasive plant species and overgrazing have also contributed to habitat loss in some locations (Dobkin 1994; Commission for Environmental Cooperation 2000). Loss of nesting sites (Dobkin 1994; Commission for Environmental Cooperation 2000) and lack of prey (e.g., eradication of prairie dogs, other mid-sized rodents, and rabbits) have also negatively affected ferruginous hawk populations (Commission for Environmental Cooperation 2000; Gillihan and Hutchings 2000). Almost 80 percent of eastern Colorado's prairie dog colonies occur on private land (EDAW 2000). Continued use of insecticides, conversion of rangeland to cropland or to urbanization, and reductions of prairie dog colonies can be expected to occur (Ostlie et al. 1997). It is also likely that prairie dog colonies on most private land will tend to be small, and thus not provide the higher quality foraging habitat of large colonies and complexes.

Biological Determination

There will be take associated with approximately 10,773 acres of affected ferruginous hawk habitat. CDOT will protect and manage high quality habitats for the benefit of ferruginous hawks in perpetuity, not less than 10,773 acres.

Lark Bunting (*Calamospiza melanocorys*)

Species Description

The lark bunting is a breeding season resident of the shortgrass prairie, and is the state bird of Colorado. It shares breeding habitat within appropriate ranges with chestnut-collared longspurs, McCown's longspurs, horned larks, western meadowlarks, Cassin's sparrows, and Brewer's sparrows, among other species. However, compared to other grassland species, lark buntings begin nesting later, occupy habitat with taller vegetation, and feed larger insect prey to their young (Kingery 1998). They arrive on the breeding grounds in late April and early May, and leave for the southern U.S. and Mexico by mid-September. Lark buntings are gregarious, arriving on the breeding grounds in small flocks. Territory is not strongly developed, and nests may be found in close proximity (Ehrlich et al. 1988; Gillihan and Hutchings 2000). The nest is a small cup placed on the ground and partially concealed by tall grasses or shrubs. The diet consists of insects, mainly grasshoppers (75 percent), and seeds (25 percent) (Ehrlich et al. 1988; Gillihan and Hutchings 2000). The lark bunting is an irruptive species, making monitoring of populations difficult (Hibbard 1965; Baumgarten 1968; Wilson 1976).

Distribution and Status

Using data from the BBS (1966-91), Knopf (1995) found that over the last 25 years, grassland bird species have shown steeper, more widespread, and more consistent population declines than any other guild of North American birds. The population declines of mountain plover, Franklin's gulls, Cassin's sparrows and lark bunting are all significant (Knopf 1995; Peterjohn et al. 1995). Decline of lark bunting populations appear to be localized, though the cumulative effect is a continent-wide decline (Knopf 1995).

Lark buntings breed from southern Alberta through southern Manitoba, south to west Texas, and east to western Minnesota and northeastern Kansas. The Rocky Mountain Bird Observatory reports that lark bunting numbers have decreased by 50 percent over the last three decades. In Colorado, lark bunting numbers are highest in the shortgrass prairies of extreme eastern Colorado near the Kansas border (Kingery 1998).

Along BBS routes, lark buntings are normally most numerous on the central and western Great Plains from eastern Colorado and western Kansas north to Montana and North Dakota, with their numbers rapidly diminishing towards the peripheries of their range.

Lark buntings winter in the southwestern deserts, from south Texas to southern Arizona, and in Mexico. They occupy weedy, barren habitats within these desert communities (Phillips et al. 1964). They are also nomadic during the winter, apparently in response to food availability.

ESA Status and Other Organizational Rankings

The lark bunting is on the Partners in Flight national watchlist. It has experienced long-term continent-wide population declines of two percent (Peterjohn et al. 1995). The lark bunting has a CNHP rank of G5/S4 (demonstrably secure across its range; apparently secure in Colorado) (CNHP 2002b).

Habitat

In Colorado, lark buntings are most numerous in shortgrass prairies, but they also occupy sagebrush habitats in mountain parks (Andrews and Righter 1992), shrubsteppe habitat and Conservation Reserve Program fields (Cameron 1908; Wiens 1973; Creighton 1974; Maher 1974; Pleszczynska and Hansell 1980; Kantrud 1981; Kantrud and Kologiski 1983; Johnson and Schwartz 1993). They prefer grasslands of low to moderate height, with bare ground of about 10-15 percent and 10-30 percent shrub cover (Baldwin et al. 1969; Wiens 1970; Creighton 1974). Rotenberry and Wiens (1980) found that abundance of lark buntings in parts of Colorado, Kansas, Montana, Nebraska, Oklahoma, South Dakota, Texas, and Wyoming was correlated positively with litter depth. Breeding Bird Survey data indicated that lark buntings preferred areas dominated by wheatgrass (*Agropyron* spp.), blue grama (*Bouteloua gracilis*), needle-and-thread (*Stipa comata*), and big sagebrush (*Artemisia tridentata*). Gillihan and Hutchings (2000) reported that lark buntings will not nest in areas with less than 30 percent grass cover or with greather

than 60 percent bare ground. Ryder (1980) found that they did not use heavily grazed areas in summer in Colorado, though they would use them in winter.

Lark buntings often locate nests under protective vegetation, including forbs, tall grasses, low shrubs, cacti, and yucca (Woolfolk 1945; Baumgarten 1968; Baldwin et al. 1969; Creighton 1971; Wilson 1976; Pleszczynska 1977; Gillihan and Hutchings 2000). This cover may provide protection from inclement weather, predation, shade from the hot sun for nestlings (Woolfolk 1945; Baumgarten 1968; Baldwin et al. 1969; Shane 1972; Creighton 1974; Pleszczynka 1977; Gillihan and Hutchings 2000), as well as open views in one or more directions (Baldwin et al. 1969; Wilson 1976). Protective cover may be a major factor in reproductive success (Strong 1971; Pleszczynska 1977).

Conservation Planning

There are no formalized conservation plans that specifically address lark buntings. However the Migratory Bird Treaty Act does apply. The U.S. Government has signed several treaties with its neighbors for the conservation of migratory birds (16 USC 703-711). These treaties (with Great Britain for Canada, Mexico, Japan and the former Soviet Union) provide for the regulation of hunting and for conservation through the enhancement of habitat. MBTA calls for protecting migratory bird habitat from pollution, conversion and degradation as well as "...establish(ing) preserves, refuges, protected areas...intended for the conservation of migratory birds and their environments, and to manage such areas so as to preserve and restore the natural ecosystems" (Convention Between the United States of America and the Union of Soviet Socialist Republics 1978). The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would protect large areas of lark bunting habitat.

Direct and Indirect Effects of CDOT Actions on the Lark Bunting

There was strong consensus among the experts that the primary concern over the long term for prairie birds, including the lark bunting, is loss of habitat. In some cases, ROWs may be attracting nesting or foraging birds (i.e., creating habitat), but this was generally not considered a desirable situation by most experts (note that field data are not available to either support or reject this theory). Mowing during the breeding season could destroy nests on the ground if lark buntings were to use ROWs for nesting. Most commonly, however, nesting birds appear to avoid ROWs, and experts considered these areas permanently lost as breeding habitat. The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 12,124 acres. This represents approximately 0.054% of the identified habitat in the project area (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. There was consensus among experts that these temporary impacts would be localized and

unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

Cumulative Effects

The pattern of local population declines and local increases within a context of a continent-wide decline implies loss of breeding habitat (Knopf 1995). In shortgrass prairie, heavy grazing has been found to be detrimental to lark buntings because of the increase in bare ground, reduction of vegetation height, and loss of tall cover (Rand 1948; Finzel 1964; Wiens 1973; Ryder 1980; Finch et al. 1987; Bock et al. 1993).

Like many other grassland birds, habitat destruction has been responsible for declines in lark bunting populations since the nineteenth century (Andrews and Righter 1992; Kingery 1998).

Biological Determination

There will be take associated with approximately 12,124 acres of affected lark bunting habitat. CDOT will protect and manage high quality habitats for the benefit of the lark bunting in perpetuity, not less than 12,124 acres.

Loggerhead Shrike (*Lanius ludovicianus*)

Species Description

The loggerhead shrike is a robin-sized passerine of pasture, grassland, and open brushland, but it is ecologically analogous to a small raptor. It preys primarily on large insects (especially crickets, beetles, and grasshoppers), but will also take small birds, mammals, and herpetofauna (Fraser and Kuukkonen 1986; Ehrlich et al. 1988). Breeding shrikes prefer habitat of high horizontal and vertical structural diversity. They nest in trees (below the crown), shrubs, or (occasionally) in a vine tangle (Ehrlich et al. 1988). Ehrlich et al. (1988) indicated that males show strong year-to-year fidelity to breeding territories. However, Haas and Sloane (1989) suggested that low site fidelity to breeding territories, rather than winter mortality, accounts for low return rates of migratory loggerhead shrikes. They hunt from elevated perches, and sometimes impale their prey on barbed wire or thorns (Fraser and Luukkonen 1986; Ehrlich et al. 1988; Dobkin 1994) to store for later use (Applegate 1977). Shrikes are present in southeast Colorado from early April through October (Andrews and Righter 1992). They winter in the southern U. S. and Mexico (National Geographic Society 1999).

Distribution and Status

Loggerhead shrikes breed from Washington, northern Alberta, central Saskatchewan and southern Manitoba south to California and Florida, east to southwestern Minnesota, southern Wisconsin, southern Michigan and Maryland (Yosef 1996; National Geographic Society 1999). They winter in the southern half of their breeding range south to the Gulf Coast, southern Florida and into Mexico.

The loggerhead shrike has experienced continent-wide population declines of about 3.6 percent per year (Commission for Environmental Cooperation 2000). Breeding Bird Survey (BBS) data for the period 1966-1979 indicate a 55 percent population decline nationally, 47 percent in the central states and 59 percent in the western states (Robbins et al. 1986). The decline is most severe in the northeast and north-central regions. Shrikes are now extirpated from most of the northeast, and are nearly extirpated from Minnesota, Michigan, and Wisconsin. Causes of the decline in shrike populations are not well understood, but are believed to be related to conditions on the breeding grounds (including habitat loss due to conversion of grasslands to agricultural uses, and loss of nesting substrate), accidental poisoning, loss of insect food due to pesticide use (Dobkin 1994), and collision with cars while hunting (Ehrlich et al. 1992; Gillihan 1999). Work in the upper midwest and southeast also implicated problems on the wintering grounds (Brooks and Temple 1990; Gawlick and Bildstein 1990).

In Colorado, the loggerhead shrike is found primarily in rural areas (scattered farm buildings and shelterbelts) and shortgrass prairie, preferring open country with scattered trees and shrubs (Carter 1998). Colorado Breeding Bird Atlas workers found breeding shrikes to be conspicuous and, like raptors, sparsely distributed. Most nesting in Colorado occurs in eastern Colorado (Carter 1998).

ESA Status and Other Organizational Rankings

The loggerhead shrike is a U.S. Forest Service sensitive species. The Committee on Environmental Cooperation, established under the North American Free Trade Act, has identified the loggerhead shrike as a priority grassland species for conservation action. In Canada, the eastern population was listed as endangered in 1991, and the prairie population was listed as threatened in 1986, under the Provincial Wildlife Act of Ontario and Manitoba (Commission for Environmental Cooperation 2000). It is a species of concern in Colorado and has a CNHP rank of G4/S3S4B-SZN (apparently secure rangewide; breeding birds watchlisted in Colorado) (CNHP 2002b).

Habitat

Loggerhead shrikes occupy a variety of habitats in plains grasslands, deciduous riparian woodlands, foothill and mountain grassland, piñon-juniper woodland, cold desert shrublands, deciduous shrublands, and ponderosa pine, in each case using open country with scattered trees and shrubs (Dobkin 1994; Dechant et al. 2001a). Scattered shrubs or trees, especially in thick patches, provide nesting sites and hunting perches (Porter et al. 1975; Woods 1995; Yosef 1996). On the plains, suitable nest sites include fencerows,

shelterbelts and stream bottoms. Plant structure appears to be more important than species in nesting habitat selection.

Shrikes use perches of varying heights (ranging from tall grasses to utility poles). They forage over areas of shorter grass where insects may be abundant, including mowed ROWs (Dechant et al. 2001a). However large expanses of very short grass (as in heavily grazed pastures) are avoided (Prescott and Collister 1993).

Conservation Planning

A conservation strategy has not been prepared for loggerhead shrikes in the United States, but there is one in Canada (Commission Environmental Cooperation 2000). The Migratory Bird Treaty Acts and associated regulations (16 USC 703-711) with Great Britain (for Canada), Russia, and Mexico provide for migratory bird conservation through the enhancement of habitat. The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would protect large areas of loggerhead shrike habitat.

Direct and Indirect Effects of CDOT Actions on the Loggerhead Shrike

There was strong consensus among the experts that the primary concern for prairie birds over the long term is loss of habitat. In some cases, ROWs may be attracting nesting or foraging birds (i.e., creating habitat), but this was generally not considered a desirable situation by most experts (note that field data are not available to either support or reject this theory). Most commonly, nesting birds appear to avoid ROWs, and experts considered these areas permanently lost as breeding habitat. The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 8,780 acres. This represents approximately 0.061% of the identified habitat in the project area (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. There was consensus among experts that these temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

In addition, the Commission for Environmental Cooperation (2000), Ehrlich et al. (1992), and Gillihan (1999) identify vehicle collision while the birds are hunting as another factor contributing to continent-wide declines in shrike populations. In a non-road context, grazing has been found to have a beneficial effect on loggerhead shrike habitat by providing conditions amenable to the large insects preferred by shrikes. Mowing of ROWs may mimic these conditions, and therefore provide areas adjacent to highways that are attractive to shrikes. This is most likely to be true if there are also fences or

utility lines (perch sites) running along the road. However, as noted above, experts consulted during this project suggested that habitat along ROWs could be population sinks, and that birds should be discouraged from using these areas.

Cumulative Effects

The primary long-term concern for this species is loss of habitat, especially on private lands, because of conversion of grasslands to row crops, development, or succession of areas to later seral stages dominated by woody species (Yosef 1996; Ostlie et al. 1997). Pesticide use, especially for grasshoppers, may also affect the species by decreasing or contaminating insect populations (Yosef 1996; Commission for Environmental Cooperation 2000; Gillihan and Hutchings 2000).

Biological Determination

There will be take associated with approximately 8,780 acres of affected loggerhead shrike habitat. CDOT will protect and manage high quality habitats for the benefit of the loggerhead shrike in perpetuity, not less than 8,780 acres.

Long-billed Curlew (*Numenius americanus*)

Species Description

The long-billed curlew is a fairly long-lived member of the sandpiper family, and is the largest of the shorebirds. It is a migratory species, breeding in the northern regions of the American west and wintering in parts of California, Mexico and Guatemala. The long-billed curlew uses shortgrass prairies in addition to the wetlands typically used by wading birds. It is an opportunistic feeder, using its long, curved bill to probe for grasshoppers, beetles, caterpillars (Nelson 1998a; Gillihan and Hutchings 2000), marine and freshwater invertebrates, mollusks, amphibians, fruits, and even eggs and nestlings of other bird species (Ehrlich et al. 1988; Dobkin 1994). Curlew nests are shallow depressions on the ground, often near standing water. Following the breeding season, they form flocks and migrate to coastal habitats.

Long-billed curlews arrive on the breeding grounds from mid-March through May, and leave for the wintering grounds from August to October (Silloway 1900; Sugden 1933; Salt and Wilk 1958; Bent 1962; Maher 1973; Stewart 1975; Allen 1980; Pampush 1980; Renaud 1980; Redmond et al. 1981; Bicak et al. 1982; Paton and Dalton 1994). In Colorado, adults arrive on the breeding grounds in April, and chicks are fledged by early July (Nelson 1998a). Nesting sites are reused from year to year, and some individuals demonstrate specific nest site fidelity (McCallum et al. 1977; Allen 1980; Redmond and Jenni 1982, 1986).

Distribution and Status

Long-billed curlews were once common nesters of the prairies throughout the west and mid-west. Their historical range extended from British Columbia east to Manitoba, southeast to Wisconsin, Illinois and Kansas, and west to northern California and north Texas (Nelson 1998a). Their populations have shown significant declines and range contractions (Sugden 1933; Harrington 1995) since the nineteenth century. Historically, populations of many North American shorebirds were dramatically reduced during the 19th century due to market hunting (Forbush 1912), conversion of native grasslands to agriculture, and loss of wetlands (Gill and Handel 1995). They have experienced a continent-wide annual decrease in population of three percent over the last ten years (Gill and Handel 1995).

Today, long-billed curlews breed from interior British Columbia and southern Alberta through southern Manitoba, south to central California, and east to western North Dakota, central South Dakota, central Nebraska, western Kansas, northeastern New Mexico, and northern Texas (National Geographic Society 1999). Winter range is discontinuously distributed across the southern United States south to Baja California and to Guatemala (National Geographic Society 1999).

A survey of birders and professionals in Colorado in 1974-1975 revealed a distribution in Colorado largely limited to Baca and Kiowa counties (McCallum et al. 1977). Today in Colorado, there are three clusters of breeding curlews: Baca and Las Animas counties, eastern El Paso County east to Kansas, and northeastern Colorado in prairies bordering the South Platte River and on the Pawnee National Grassland (Nelson 1998a). Habitat conversion from prairie to intensive agriculture or urbanization is the primary threat to their persistence in Colorado (Gillihan and Hutchings 2000).

ESA Status and Other Organizational Rankings

The long-billed curlew is classified as a sensitive species by the U.S. Forest Service, and is a species of special concern in Colorado, Kansas, Nebraska, Oklahoma, and Wyoming. The Colorado Partners in Flight Land Bird Conservation Plan notes that it "is arguably the highest conservation priority in this physiographic area" (Colorado Partners in Flight 2000). It has a CNHP rank of G5/S2B-SZN (demonstrably secure globally; breeding season imperiled in Colorado) (CNHP 2002b).

Habitat

During the breeding season, long-billed curlews use open, level to gently sloping grasslands that are characterized by short vegetation (either shortgrass prairie or recently grazed mixed-grass prairie) (Graul 1971; Stewart 1975; Johnsgard 1979; Bicak et al. 1982; Cochran and Anderson 1987; Oakleaf et al. 1996; Gillihan and Hutchings 2000; Dechant et al. 2001d).

Nesting occurs where vegetation is less than 12 inches tall, and often less than four inches tall (Gillihan 1999; Gillihan and Hutchings 2000). After hatching, adults move the precocial chicks to areas of taller, but not dense, vegetation where they are protected from

predators and weather. Nests often occur on hummocks, possibly to improve visibility for predators and to prevent flooding in otherwise level fields (Cochran and Anderson 1987), or near an object (e.g., big sagebrush [*Artemisia tridentata*] branches, rocks, dirt mounds, manure, metal cans, and bunchgrasses [Bent 1962; Johnsgard 1979; Allen 1980; Cochran and Anderson 1987]). King (1978) found that long-billed curlews in Colorado used shortgrass, mixed-grass, and weedy areas more often than expected based on the availability of those habitats; they used agricultural areas (cropland, stubble fields, and bare ground) or bare ground less often than expected based on availability; and they did not use areas dominated by sand sagebrush (*Artemisia filifolia*).

Curlews forage in grasslands, cultivated fields, stubble fields, wet meadows, prairie dog colonies, and occasionally along wetland margins (Silloway 1900; Salt and Wilk 1958; Johnsgard 1979; Shackford 1994). Throughout their range, they forage in areas of low, sparse vegetation (Gillihan 1999), avoiding dense forbs and shrubs (Pampush and Anthony 1993). In a study completed on the Comanche National Grassland, foraging was spread across habitat types, with selection favoring short and mixed-grass areas and avoiding bare ground and agricultural fields (King 1978). Long-billed curlews in Colorado and Mexico have been observed feeding among scattered junipers adjacent to grasslands (pers. obs., C. Pague).

Proximity to water may be an important factor in habitat selection (McCallum et al. 1977; Cochran and Anderson 1987; Shackford 1994). Curlews are frequently found within one quarter mile of standing water (Gillihan and Hutchings 2000), where they forage in wet meadows and wet soils. In a survey in Baca County, Colorado, in 1974-75, 42 percent of long-billed curlews were found within 100 yards of standing water, and 68 percent were found within one quarter of a mile of standing water (McCallum et al. 1977). In Colorado during May and June, at the height of nesting season, adults fly to the shorelines of reservoirs to feed and drink, and as soon as young can fly, family groups move to reservoirs to feed (Nelson 1998a). During migration, especially following breeding, long-billed curlews feed along shorelines of prairie reservoirs.

Habitat interspersion is an important component of high quality curlew habitat. Nesting habitat is close to foraging and brood-rearing habitat and roosting cover. More diverse habitat has been found to support smaller curlew territories than less diverse habitat (Allen 1980). Although long-billed curlews select nest sites in areas with short vegetation, vegetation within three to six meters of the nest may be taller than vegetation in the surrounding habitat patch (Maher 1973; King 1978; Allen 1980; Pampush 1980; Cochran and Anderson 1987; Pampush and Anthony 1993; Paton and Dalton 1994).

Conservation Planning

There are no state, regional, or national conservation plans for the long-billed curlew.

Through their work with the Canadian-U.S. Shorebird Monitoring and Assessment Committee, USGS scientists Jon Bart, Susan Skagen, Marshall Howe, and Robert Gill are helping to establish the Program for Regional and International Shorebird Monitoring, or PRISM. This project will link shorebird monitoring efforts of government agencies and

private groups across North America, and will address specific goals of the Canadian and U.S. Shorebird Conservation Plans. The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would protect large areas of long-billed curlew habitat.

Direct and Indirect Effects of CDOT Actions on the Long-billed Curlew

There was strong consensus among the experts that the primary concern over the long term for prairie birds, including the long-billed curlew, is loss of habitat. In some cases, ROWs may be attracting nesting or foraging birds (i.e., creating habitat), but this was generally not considered a desirable situation by most experts (note that field data are not available to either support or reject this theory). Most commonly, nesting birds appear to avoid ROWs, and experts considered these areas permanently lost as breeding habitat. The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 5,058 acres. This represents approximately 0.049% of the identified habitat in the project area (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are mowing, re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), and weed management. There was consensus among experts that these temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

Cumulative Effects

The conversion of rangeland to cropland can be expected to continue on some private lands in short and mixed-grass prairie (Chuluun et al. 1997; Ostlie et al. 1997). Although curlews may use cropland for foraging, cropland does not provide sufficiently high quality habitat to support viable curlew populations. In the Platte River Valley of Nebraska, conversion of upland prairie to cropland had a negative impact on curlews through the destruction of nesting habitat (Faanes and Lingle 1995). Habitat conversion to cropland in Colorado occurs more frequently in the northern (northeastern Colorado) and middle populations (north of the Arkansas River from eastern El Paso County to Kansas) of long-billed curlews (as defined by Nelson 1998a). Fire suppression is likely to continue on private lands, thereby reducing the open habitat preferred by curlews (Redmond and Jenni 1986; Dechant et al. 2001d).

Biological Determination

There will be take associated with approximately 5,058 acres of affected long-billed curlew habitat. CDOT will protect and manage high quality habitats for the benefit of the long-billed curlew in perpetuity, not less than 5,058 acres.

McCown's Longspur (*Calcarius mccownii*)

Species Description

The McCown's longspur is a ground-foraging passerine of the central shortgrass prairie. The longspur genus consists of four stocky, ground-dwelling finches. McCown's longspur is distinguished by its preference for relatively barren habitat. It is found in habitats similar to those used by mountain plovers, long-billed curlews, burrowing owls, and horned larks (Gillihan 2000). McCown's nest cycle lags two weeks behind that of horned larks, thus decreasing competition for nest sites and food between these two species (Kuenning 1998).

The McCown's longspur breeding season extends from mid-March with the arrival of males, followed two weeks later by the arrival of females, through mid-October (Mickey 1943; Giezentanner and Ryder 1969; Felske 1971; Creighton 1974; Greer 1988; With 1994). Second broods have been reported in northcentral Colorado (Strong 1971), but are likely limited by the female's energy reserves (Felske 1971; With 1994).

The diet consists largely of grass and forb seeds, but young are fed almost exclusively on insects, and adults also include insects (especially grasshoppers) in their summer diet (Ehrlich et al. 1988; Dobkin 1994; Gilllihan and Hutchings 2000). On the Pawnee National Grassland, nestling diets consisted of grasshoppers, beetles, butterflies and moths (Kuenning 1998). The proportion of grasshoppers in both adult and juvenile diets increases as grasshoppers become more abundant through the summer (Mickey 1943; With 1994). Pairs often nest near each other (Mickey 1943; Felske 1971).

Distribution and Status

The historic range of McCown's longspurs once extended from Alberta, Manitoba and Saskatchewan in Canada south to Oklahoma (Bent 1968), but has contracted significantly. Today they breed from southern Alberta and Saskatchewan, south through Montana, eastern and central Wyoming, and northcentral Colorado, and east to western Nebraska, and southwestern North Dakota (With 1994; Kuenning 1998; National Geographic Society 1999). The Pawnee National Grasslands in northern Weld County is the center of breeding in Colorado, with a few sites also confirmed on private ranches in Washington, Elbert, Lincoln, and Kit Carson counties (Kuenning 1998). Winter range includes western Oklahoma, west Texas, southern New Mexico and Arizona, southeast California, extreme northcentral Mexico (National Geographic Society 1999; Gillihan and Hutchings 2000), and extreme southeastern Colorado.

McCown's longspur has not been reported as a breeding bird in Oklahoma, South Dakota, Minnesota or Manitoba since 1915 (With 1994). Declines in abundance and range contractions since 1900 are attributable to several factors. Habitat loss due to conversion of native prairie to row crops, control of wildfires, and urbanization, have all been implicated as factors, as has use of pesticides, especially insecticides (Stewart 1975; With 1994; Kuenning 1998; Gillihan and Hutchings 2000; Dechant et al. 2001e).

ESA Status and Other Organizational Rankings

The McCown's longspur is not protected under the ESA. It is listed on the National Audubon Society-Partners In Flight "Watch List" (not adequately sampled by the BBS). It has a CNHP rank of G5/S2B-SZN (demonstrably secure globally; breeding season imperiled in Colorado) (CNHP 2002b).

Habitat

McCown's longspur breeding habitat is characterized by shortgrass prairie where vegetation cover is sparse (due to either low soil moisture or grazing), with little litter (Kuenning 1998), and interspersed with shrubs or tall grasses (Kuenning 1998). Areas of bare soil are required, and nest sites are often found on barren hillsides, including south-facing slopes (Giezentanner 1970; Felske 1971; Creighton 1974; Gillihan and Hutchings 2000). Nesting territories include 45 to 80 percent grass cover - largely blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*) (Creighton 1974), and 15 to 25 percent bare ground (Gillihan and Hutchings 2000). In northcentral Colorado, nests were exposed completely to solar radiation at midday, and experienced 45 percent total exposure per day. This may ameliorate cold stress associated with early breeding, as nests constructed later were more likely to be near vegetative cover, which probably served to shade the nest during hotter weather (With and Webb 1993). This suite of habitat requirements implies evolution in association with grazers, particularly bison (Kuenning 1998).

Conservation Planning

There are no formal conservation plans that address McCown's longspur, but the Migratory Bird Treaty Act does apply. The U.S. Government has signed several treaties with its neighbors for the conservation of migratory birds (16 USC 703-711). These treaties (with Great Britain for Canada, Mexico, Japan and the former Soviet Union) provide for the regulation of hunting and for conservation through the enhancement of habitat. MBTA calls for protecting migratory bird habitat from pollution, conversion and degradation as well as "...establish(ing) preserves, refuges, protected areas...intended for the conservation of migratory birds and their environments, and to manage such areas so as to preserve and restore the natural ecosystems." (Convention Between the United States of America and the Union of Soviet Socialist Republics 1978). In addition, The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would protect a large area of McCown's longspur habitat.

Direct and Indirect Effects of CDOT Actions on the McCown's Longpur

There was strong consensus among the experts that the primary concern over the long term for prairie birds, including McCown's longspur, is loss of habitat. In some cases, ROWs may be attracting nesting or foraging birds (i.e., creating habitat), but this was generally not considered a desirable situation by most experts (note that field data are not available to either support or reject this theory). Mowing could potentially destroy any nests on the ground if McCown's longspurs were to use the ROW. Most commonly,

however, nesting birds appear to avoid ROWs, and experts considered these areas permanently lost as breeding habitat. The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 1,888 acres. This represents approximately 0.054% of the identified habitat in the project area (Grunau and Lavender 2002).

CDOT activities that are most likely to result in permanent habitat loss are road widening, maintenance yards and stockpiling, and bridgework. Other CDOT activities with potential for temporary impacts are re-surfacing and shoulder improvements, winter maintenance (e.g., sanding, de-icing), weed management, and mowing. There was consensus among experts that these temporary impacts would be localized and unlikely to result in long-term adverse impacts to populations. Use of best management practices and seasonal restrictions during construction projects should be sufficient to offset temporary impacts. Otherwise, ROWs should be managed such that they do not attract birds (Grunau and Lavender 2002).

Cumulative Effects

Declines in abundance and range contractions since 1900 are attributable to several factors. Habitat loss due to conversion of native prairie to row crops, control of wildfires, and urbanization, have all been implicated as factors, as has use of pesticides, especially insecticides (With 1994; Kuenning 1998; Gillihan and Hutchings 2000; Dechant et al. 2001e).

Biological Determination

There will be take associated with approximately 1,888 acres of affected McCown's longspur habitat. CDOT will protect and manage high quality habitats for the benefit of the McCown's longspur in perpetuity, not less than 1,888 acres.

Brassy Minnow (Hybognathus hanksinsoni)

Species Description

Brassy minnows are members of the minnow family (Cyprinidae). The minnow family is large and highly variable. Sexual dimorphism is usually conspicuous; breeding, brightly colored males have nuptial tubercles on the head, body and along fin rays (Blair et al. 1968). Minnows construct a variety of nests, including piles of stones (carried by mouth to the nest), cup-shaped depressions in or above riffles, and excavations under a stone where the eggs are attached to the underside of the stone.

The abundance of minnows may be attributed to their tolerance, as a group, of diverse habitats (from fresh to brackish water, warm to cool waters, and moving to standing water), small size (thus a large number of minnows can occupy a small space and find sufficient food and shelter), and rapid attainment of sexual maturity. The smaller

minnows usually live three or four years; larger species may live seven to ten years, and the carp even longer.

The brassy minnow is a fish of tributaries, and is generally found in clear, cool pools of sluggish water over sand or gravel (Scott and Crossman 1973; Woodling 1985). Food consists primarily of algae and phytoplankton, though zooplankton and aquatic insect larvae are also taken (Scott and Crossman 1973; Woodling 1985). The brassy minnow is preyed upon by larger fish, kingfishers, and mergansers (Scott and Crossman 1973). Spawning occurs in May or June, and adults grow to three to four inches in length (Scott and Crossman 1973). The brassy minnow can tolerate high water temperatures and low dissolved oxygen concentrations, and therefore can persist in small fluctuating streams and the pools that remain during intermittent flow (CDOW 2002c).

Distribution and Status

The brassy minnow is a native of North America, and is found from the upper St. Lawrence River and Lake Champlain drainages in Quebec and New York west to the Great Lakes and, Hudson Bay to the Peace and Fraser River systems of Alberta to British Columbia (Scott and Crossman 1973). It was introduced into British Columbia (Blair et al. 1968). It ranges south into the Missouri-upper Mississippi River basin into Kansas (Scott and Crossman 1973).

The species is native to Colorado, though Colorado is at the southern and western periphery of its distribution (Nesler et al. 1997; CDOW 2002c). It is found in low numbers in the South Platte and Republican River basins (CDOW 2002c). Propst (1982) found the brassy minnow in the South Platte, but restricted to portions of the mainstem and most abundant in the eastern portion of the plains. It was collected from only five sites in the South Platte River drainage during 1993-1994 (Nesler et al. 1997), whereas in similar surveys made from 1978-1980, it was found at 22 sites (Propst 1982). The frequency of occurrence decreased from 11 to two percent between the two surveys. Sampling locations in the 1993-1994 survey (Nesler et al. 1997) included those of Propst in 1982, and sampling frequency was more intense. While occurrence in natural streams has apparently decreased, the brassy minnow has been reported in significant numbers in irrigation ditches (Platania 1990). Today it is found in the South Platte River basin (St. Vrain River, Cache la Poudre River, Pawnee Creek, Lonetree Creek, the lower South Platte River [east of Sterling]), and in the Republican River basin (Arikaree River and the South Fork of the Republican River) (CDOW 2002c).

ESA Status and Other Organizational Rankings

The brassy minnow is listed as a species of special concern in Illinois, Kansas, Vermont, and British Columbia. It is classified as rare in Missouri, is a candidate species in Quebec (Schmidt 1996), and is state threatened in Colorado. It has a CNHP rank of G5/S3 (demonstrably secure globally; vulnerable in Colorado) (CNHP 2002b).

Habitat

The brassy minnow uses cooler, clear, flowing water or pools that have a sand to gravel substrate and rooted aquatic vegetation (Nesler et al. 1997). It has been reported in significant numbers in irrigation ditches in the Fort Collins area (Platania 1990). It tolerates conditions typical of seasonally fluctuating plains streams (Woodling 1985), and is a species of tributaries, though it uses connection to the mainstem for colonization and dispersal (pers. comm., T. Nesler, CDOW). It is usually found in close association with the fathead minnow (*Pimephales promelas*) (Woodling 1985), and will establish populations in ponds and lakes, although brassy minnows are seldom abundant in this type of habitat.

Conservation Planning

CDOW is identifying suitable habitats and the limiting conditions for the brassy minnow. Once habitats are identified, habitat improvements and restoration stocking will be initiated (CDOW 2002c). The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would protect large areas of brassy minnow habitat.

Direct and Indirect Effects of CDOT Actions on the Brassy Minnow

According to expert opinion, the primary concern for prairie fish, including the brassy minnow, is the construction of permanent barriers to upstream/downstream movement (e.g., conduit pipes). The critical threshold for gradients that prohibit fish movement is unknown. Other impacts commonly associated with roadwork, such as siltation and turbidity, are not thought to negatively affect these species unless such impacts continue for longer than one year. If these impacts are of short duration, they are not substantially different from the types of storm and flood events that these species are adapted to. Continuance of these types of impacts for longer than a year may affect life cycles; continuance for longer than two years could extirpate local populations (pers. comm., T. Nesler, CDOW).

Cumulative Effects

Woodling (1985) suggested that further decreases in distribution and abundance would likely result from continued elimination of the preferred habitat through dewatering, increased siltation, and higher temperatures due to impoundments (Woodling 1985). Current threats also include nonpoint source pollution, and mainstem impoundments that alter natural flow regimes (Echelle et al. 1995).

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by brassy minnows. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect brassy minnows.

Common Shiner (*Notropis cornutus*)

Species Description

The minnow family (Cyprinidae) is large and highly variable. Sexual dimorphism is usually conspicuous; breeding, brightly colored males have nuptial tubercles on the head, body and along fin rays (Blair et al. 1968). Minnows construct a variety of nests, including piles of stones (carried by mouth to the nest), cup-shaped depressions in or above riffles, and excavations under a stone where the eggs are attached to the underside of the stone.

The abundance of minnows may be attributed to their tolerance, as a group, of diverse habitats (from fresh to brackish water, warm to cool waters, and moving to standing water), small size (thus a large number of minnows can occupy a small space and find sufficient food and shelter), and rapid attainment of sexual maturity. The smaller minnows usually live three or four years; larger species may live seven to ten years, and the carp even longer.

The genus *Notropis* contains more species than any other genus of American minnow (Blair et al. 1968). Breeding common shiner males develop a deep blue head with rose-pink fins and body, and extensive breeding tubercules (Woodling 1985). Colorado specimens reach six inches in length. The diet varies with season - in summer and winter, aquatic insects predominate; vegetation forms the bulk of the diet in spring; vegetation and small fish are eaten in the fall (Starrett 1950). Feeding occurs on the bottom, in the water column, or at the surface (Scott and Crossman 1973).

Common shiners spawn in spring on gravel beds in flowing water, often at the head of a riffle (Raney 1940). Males defend a small territory, and may move a few stones to provide some clearing of the spawning site, excavate a depression, or even spawn over the nest of another species (Raney 1940; Scott and Crossman 1973; Woodling 1985).

Distribution and Status

The common shiner is found from New England and Nova Scotia, south to Virginia and west to Saskatchewan and Colorado (Lee et al. 1980). In Canada it is found in the Saskatchewan, Qu'Appelle, Assiniboine, Red, English, Winnipeg, and Nelson Rivers (Crossman and McAllister 1986).

Historic distribution data for the common shiner in Colorado indicate a clear declining trend in the South Platte River basin, though it was once well-distributed in the Front Range (Nesler et al. 1997). Propst (1982) found common shiners in four streams tributary to the South Platte River. Nesler et al. (1997) found common shiners at only six sites in the St. Vrain and West Plum Creek systems of the South Platte River basin. The common shiner is uncommon both in relative abundance and frequency of occurrence in the South Platte River Basin (Nesler et al. 1997). Today it is found in upper South Platte

River tributaries and the St. Vrain drainage (CDOW 2002c). It is considered native to the Arkansas River Basin, though this has been questioned by Fausch and Bestgen (1996).

ESA Status and Other Organizational Rankings

The common shiner is state threatened in Colorado and is recommended for special concern status in Wyoming (Patton 1997). It has a CNHP rank of G5/S2 (demonstrably secure globally; imperiled in Colorado) (CNHP 2002b).

Habitat

The common shiner requires streams of moderate gradient with cool, clear water, gravel bottoms, and shade from brush or trees (Trautman 1981). It will not spawn in silted streams (Miller 1964), and is intolerant of silt-dominated waters (Propst 1982; Woodling 1985).

Conservation Planning

There are no specific conservation plans in place for the common shiner. However, The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would protect key areas of common shiner habitat.

Direct and Indirect Effects of CDOT Actions on the Common Shiner

According to expert opinion, the primary concern for prairie fish, including the common shiner, is the construction of permanent barriers to upstream/downstream movement (e.g., conduit pipes). The critical threshold for gradients that prohibit fish movement is unknown. Other impacts commonly associated with roadwork, such as siltation and turbidity, are not thought to negatively affect these species unless such impacts continue for longer than one year. If these impacts are of short duration, they are not substantially different from the types of storm and flood events that these species are adapted to. Continuance of these types of impacts for longer than a year may affect life cycles; continuance for longer than two years could extirpate local populations (pers. comm., T. Nesler, CDOW). However, the common shiner is intolerant of silt-dominated habitats (Propst 1982; Woodling 1985). Therefore, the common shiner could be adversely affected by any changes that substantially increased siltation (Nesler et al. 1997).

Cumulative Effects

Species such as the common shiner, that require clean gravel for spawning, are becoming increasingly rare in Colorado because of increased siltation (CDOW 1994). The limited range of the common shiner in Colorado puts the species at threat of extirpation due to stochastic events (Nesler et al. 1997).

Current threats also include nonpoint source pollution and mainstem impoundments that alter natural flow regimes. Other threats across its range include dewatering of rivers from irrigation and degradation of riparian areas (Echelle et al. 1995).

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by common shiners. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect common shiners.

Flathead Chub (*Platygobio* [= *Hybopsis*] *gracilis*)

Species Description

The minnow family (Cyprinidae) is large and highly variable. Sexual dimorphism is usually conspicuous; breeding, brightly colored males have nuptial tubercles on the head, body and along fin rays (Blair et al. 1968). Minnows construct a variety of nests, including piles of stones (carried by mouth to the nest), cup-shaped depressions in or above riffles, and excavations under a stone where the eggs are attached to the underside of the stone.

The abundance of minnows may be attributed to their tolerance, as a group, of diverse habitats (from fresh to brackish water, warm to cool waters, and moving to standing water), small size (thus a large number of minnows can occupy a small space and find sufficient food and shelter), and rapid attainment of sexual maturity. The smaller minnows usually live three or four years; larger species may live seven to ten years, and the carp even longer.

The flathead chub is a minnow that forms large schools and prefers shallow water to sand bars. It has a morphology that adapts it well to life in strong currents - a wedge-shaped head, large sickle-shaped pectoral fins, and, for a minnow, large size (to ten inches) (Eddy and Surber 1943; Woodling 1985). The flathead chub relies on external tastebuds for locating food in turbid water (Eddy and Surber 1943), and is an opportunistic feeder, taking aquatic and terrestrial insects, other invertebrates, algae, and plants (Lee et al. 1980; Woodling 1985). Spawning occurs when water levels recede to seasonal lows. In Missouri, the flathead chub is believed to spawn in July or August (Pflieger 1975) when water temperatures are maximal, turbidity is reduced, and the sandy bottoms have stabilized (Sublette et al. 1990).

Note: The flathead chub was returned to the genus *Platygobio* in 1989 and is sometimes referenced in the literature as *Hybopsis gracilis* (American Fisheries Society 1991).

Distribution and Status

The historic range of the flathead chub extended from the lower Mississippi River and its tributaries, including the southern Canadian River in Oklahoma and New Mexico, north and west through the Missouri River drainage of the Great Plains in the United States and Canada, to the McKenzie Delta and the Saskatchewan Basin east to Lake Winnipeg

(Eddy and Surber 1943; Blair et al. 1968; Scott and Crossman 1973; Sublette, et al. 1990).

The flathead chub is scarce in Colorado, and detailed abundance is unknown (Woodling 1985). Early researchers found the flathead chub common in the Arkansas River mainstem up to Salida, where the river is a coldwater trout fishery (Ellis 1914). More recent work has failed to find the flathead chub on the mainstem of the Arkansas River downstream of the John Martin Reservoir (Woodling 1985).

ESA Status and Other Organizational Rankings

The flathead chub was a candidate species for listing under the ESA, but was removed from that category February 28, 1996 (USFWS 1996). It is a Forest Service sensitive species in Region 2, and is a species of concern in Colorado. It has a global rank of G5/S5 (demonstrably secure globally and in Colorado) (CNHP 2002b).

Habitat

The flathead chub is tolerant of, and found in, a variety of aquatic habitats, but is most abundant in the main channels of turbid, moderate to strong current rivers that have mud, rock, or sand substrates (Lee et al. 1980). It is also found in pools in small clear streams (Woodling 1985). The typical occurrence in Colorado is over sandy bottoms on the mainstem of the Arkansas River (Woodling 1985). It also appears to be tolerant of organic enrichment. Specimens collected from Fountain Creek, downstream from the Fountain, Colorado, wastewater treatment effluent outfall, appeared to be in excellent condition, despite water chemistry showing extensive organic enrichment with high ammonia concentrations (Woodling 1985).

Conservation Planning

There are no conservation plans in place for the flathead chub. However, a rangewide status assessment for it has been prepared by Region 3 (Midwest Region) of the U.S. Fish and Wildlife Service (Tibbs 1998). The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would act as refuges for flathead chub populations.

Direct and Indirect Effects of CDOT Actions on the Flathead Chub

According to expert opinion, the primary concern for prairie fish, including the flathead chub, is the construction of permanent barriers to upstream/downstream movement (e.g., conduit pipes). The critical threshold for gradients that prohibit fish movement is unknown. Other impacts commonly associated with roadwork, such as siltation and turbidity, are not thought to negatively affect these species unless such impacts continue for longer than one year. If these impacts are of short duration, they are not substantially different from the types of storm and flood events that these species are adapted to. Continuance of these types of impacts for longer than a year may affect life cycles; continuance for longer than two years could extirpate local populations (pers. comm., T. Nesler, CDOW).

Cumulative Effects

The greatest threats to the flathead chub are nonpoint source pollution, dewatering of stream channels, and mainstem impoundments that alter natural flow regimes (Woodling 1985; Echelle et al. 1995; Ostlie et al. 1997).

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by flathead chub. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the flathead chub.

Plains Minnow (*Hybognathus placitus*)

Species Description

The minnow family (Cyprinidae) is large and highly variable. Sexual dimorphism is usually conspicuous; breeding, brightly colored males have nuptial tubercles on the head, body and along fin rays (Blair et al. 1968). Minnows construct a variety of nests, including piles of stones (carried by mouth to the nest), cup-shaped depressions in or above riffles, and excavations under a stone where the eggs are attached to the underside of the stone.

The abundance of minnows may be attributed to their tolerance, as a group, of diverse habitats (from fresh to brackish water, warm to cool waters, and moving to standing water), small size (thus a large number of minnows can occupy a small space and find sufficient food and shelter), and rapid attainment of sexual maturity. The smaller minnows usually live three or four years; larger species may live seven to ten years, and the carp even longer.

The plains minnow is a mainstem species adapted to the habitat provided by highly unstable plains rivers (Cross et al. 1985). It is a schooling, bottom dweller of turbid river channels with a sandy bottom and some current (Cross et al. 1985). These fish feed by scraping algae, diatoms, and other microflora from the rocks, aquatic snags, and plant roots found on stream bottoms or margins. Spawning is sporadic and associated with high and receding, turbid flows in spring (Taylor and Miller 1990). This is a species adapted to highly unstable plains rivers. Changes in distribution result from rare highflow events.

Distribution and Status

The plains minnow is a resident of the Great Plains states, from Texas north through North Dakota, and from Iowa west through Wyoming.

In Colorado, it was characterized as an "occasional resident" of the South Platte River in 1982 (Propst). Woodling found their distribution in 1985 to include the South Platte

River in Logan County, a few individuals from the Republican River in Yuma County, and the Arkansas River basin in Kiowa County. Today it is found in the Arkansas River basin (Nesler et al. 1997), and is an uncommon fish of the South Platte River basin (Nesler et al. 1997). The only known recent occurrences are a few individuals from the South Platte River between Ft. Morgan and Sterling (Tate and Martin 1995; CDOW 2002c).

ESA Status and Other Organizational Rankings

The plains minnow was listed in the Federal Register, November 15, 1994, as a Category 2 Candidate for listing as threatened or endangered under the ESA. In 1996 it was removed from the list of candidate species (61FR40), though it remains a species of management concern. It is a Forest Service sensitive species, and in New Mexico, the Canadian River population of the plains minnow is "at risk." The plains minnow is listed as a species of concern in Arkansas and Kansas (Schmidt 1996), and is recommended for special concern status in Wyoming (Patton 1997). It is listed as endangered by the state of Colorado (CDOW 2002c), and has a CNHP rank of G4/SH (apparently secure globally; historically known from Colorado but not verified for an extended period) (CNHP 2002b).

Habitat

The plains minnow is a fish of main channels with sandy bottoms, abundant vegetation, and turbid water (Cross et al. 1985; Woodling 1985). It is adapted to the habitat provided by highly unstable plains rivers (Cross et al. 1985), including highly variable water levels, unstable streambeds, and fluctuating water temperature.

Conservation Planning

The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that could act as refuges for plains minnow populations.

Direct and Indirect Effects of CDOT Actions on the Plains Minnow

The elimination of highly variable water levels, unstable streambeds, and fluctuating water temperature can contribute to the decline of short-lived fish species, like the plains minnow, that are adapted to highly unstable plains rivers (CDOW 2002c). However, according to expert opinion, the primary concern for prairie fish, including the plains minnow, is the construction of permanent barriers to upstream/downstream movement (e.g., conduit pipes). The critical threshold for gradients that prohibit fish movement is unknown. Other impacts commonly associated with roadwork, such as siltation and turbidity, are not thought to negatively affect these species unless such impacts continue for longer than one year. If these impacts are of short duration, they are not substantially different from the types of storm and flood events that these species are adapted to. Continuance of these types of impacts for longer than a year may affect life cycles; continuance for longer than two years could extirpate local populations (pers. comm., T. Nesler, CDOW).

Cumulative Effects

The elimination of highly variable water levels, unstable streambeds, and fluctuating water temperatures have contributed to the decline of this species (Cross et al. 1985). Current threats are nonpoint source pollution, and mainstem impoundments impacting natural flow regimes. Other threats include dewatering of rivers from irrigation and degradation of riparian areas (Echelle et al. 1995).

Biological Determination

CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the plains minnow. Therefore, CDOT activities may adversely impact individual plains minnows, but are not likely to result in a loss of viability in Colorado or loss of species viability rangewide.

Plains Topminnow (*Fundulus sciadicus*)

Species Description

The plains topminnow is a small, stout fish (approximately 2.5 inches long) adapted to surface feeding. Food consists of small crustaceans, aquatic insects (especially aquatic stages of mosquitoes), and filamentous algae (Williams 1995). Topminnows are found either singly or in small, isolated aggregations near the water surface. Spawning occurs in early summer (Woodling 1985; Williams 1995). Eggs are deposited on submerged vegetation and algae (Lee et al. 1980; Woodling 1985; Williams 1995).

Distribution and Status

There are two disjunct populations of the plains topminnow. One population is centered in Nebraska, with small populations found in northeastern Colorado, eastern Wyoming, and southern South Dakota (Woodling 1985). The second population is largely in south-central Missouri to southeast Kansas and northeast Oklahoma (USGS 2000).

The plains topminnow is a native of Colorado (Jordon 1891), and has been introduced into several drainages in Colorado, including the White River in Rio Blanco County and the Rio Grande in the San Luis Valley (Wick et al. 1981). It persists in the White River drainage, but has been extirpated from the Rio Grande (Fuller 2000). Historically it was widely distributed in Colorado in tributaries of the South Platte River basin (Propst 1982). Today it is found in isolated colonies in foothills streams, intermittent prairie streams, and the lower mainstem of the South Platte River (Woodling 1985; Nesler et al. 1997). The Pawnee National Grasslands has found it in Coal Creek, Willow Creek, and tributaries of Pawnee Creek (Roosevelt National Forest, Arapaho National Forest and Pawnee National Grassland FEIS).

ESA Status and Other Organizational Rankings

The plains topminnow was formerly a candidate for listing as a Category 2 species. It is classified as a sensitive species by Region 2 of the U.S. Forest Service, and is listed as threatened in Minnesota, Oklahoma, and South Dakota (Schmidt 1996). It is a species of concern in Colorado (CDOW 2002c) and has a CNHP rank of G4/S4 (apparently secure globally and in Colorado) (CNHP 2002b).

Habitat

The plains topminnow has specialized habitat needs that include still, clear water with sand or gravel substrates, and abundant macrophytes including filamentous algal growths (Propst 1982; Woodling 1985). It can also exist in sloughs and ponds (Nesler et al. 1997).

Conservation Planning

The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified high priority conservation areas that would protect areas of plains topminnow habitat.

Direct and Indirect Effects of CDOT Actions on the Plains Topminnow

CDOT actions that result in silting or toxic spills into water courses, or that change the flow regime could adversely affect the plains topminnow. However, according to expert opinion, the primary concern for prairie fish, including the plains topminnow, is the construction of permanent barriers to upstream/downstream movement (e.g., conduit pipes). The critical threshold for gradients that prohibit fish movement is unknown. Siltation and turbidity are not thought to negatively affect these species unless such impacts continue for longer than one year. If these impacts are of short duration, they are not substantially different from the types of storm and flood events that these species are adapted to. Continuance of these types of impacts for longer than a year may affect life cycles; continuance for longer than two years could extirpate local populations (pers. comm., T. Nesler, CDOW).

Cumulative Effects

Habitat loss and competition with introduced mosquitofish have been identified as the primary causes of rangewide population declines (Lynch 1988). In Colorado, habitat loss has resulted from dewatering, channelization, siltation (which covers spawning substrates), and urbanization in the Front Range corridor (Nesler et al. 1997).

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by plains topminnow. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the plains topminnow.

Southern Redbelly Dace (*Phoxinus erythrogaster*)

Species Description

The southern redbelly dace is an herbivorous fish, feeding primarily on vegetation, diatoms, and blue-green algae gleaned from the stream bottom (Phillips 1969). It spawns in late spring in swift, shallow riffles over a gravel substrate, or in the nests of other minnow species (Cross and Collins 1975). Spawning usually occurs in schools with two males accompanying a female (Woodling 1985). Eggs require a high oxygen environment to hatch (BISON 2000a).

Distribution and Status

The southern redbelly dace is found throughout the Mississippi-Ohio River system, with disjunct populations in Kansas, Oklahoma, Colorado, and New Mexico (Miller and Robison 1973; Cross and Collins 1975; Pflieger 1975; Starnes and Starnes 1980).

In Colorado, northern redbelly dace are found in the South Platte River basin, whereas southern redbelly dace are found in the Arkansas River basin (Miller 1982; Woodling 1985). Native populations are apparently extirpated, and today, the southern redbelly dace only occurs in relatively isolated populations at two pond sites on Fort Carson and at the Pueblo Army Depot (CDOW 2002c).

ESA Status and Other Organizational Rankings

The southern redbelly dace is listed as a sensitive species in U.S. Forest Service Regions 2 (Colorado) and 3 (New Mexico and Arizona), and is designated as state endangered in Colorado (CDOW 2002c). It has a CNHP rank of G5/S1 (demonstrably secure globally; critically imperiled in Colorado) (CNHP 2002b).

Habitat

The southern redbelly dace prefers clean, cool headwaters of small, shallow streams with permanent flows, but can apparently tolerate periodic turbidity (Woodling 1985). The preferred bottom substrate is gravel, though they have been found over mud, detritus, or weed beds (Woodling 1985). In New Mexico, it is found in clear, cool, shaded streams and spring runs (BISON 2000a). In Wisconsin, Becker (1983) found that it used undercut stream banks for escape cover.

In Colorado, the southern redbelly dace is found where water flow is permanent, the water is cool, and the bottom consists of gravel, mud, or organic debris (Cross 1967; Miller and Robinson 1973; Pflieger 1975; Trautman 1981). In 1984, the single Colorado population was found in a small, slow flowing, clear creek with abundant algal growths covering a stream substrate of deep silt deposits. In addition, there was abundant riparian vegetation providing shade (Woodling 1985).

Conservation Planning

There are no formal conservation plans in place for the southern redbelly dace, but the City of Pueblo protects the riparian habitat of the stretch of stream within its jurisdiction. The Nature Conservancy (1998) developed a Central Shortgrass Prairie ecoregional conservation plan that identified reaches of the Arkansas River in and near Pueblo as high priority conservation areas for the southern redbelly dace.

Direct and Indirect Effects of CDOT Actions on the Southern Redbelly Dace

The primary concern for this species is the construction of permanent barriers to movement. Siltation may pose a threat, though this species is adapted to survival in turbid water resulting from storm and flood events. If siltation should persist for more than one year, there may be an impact on population viability (pers. comm., T. Nesler). An accidental spill of any toxicant into the stream could easily eliminate these populations of southern redbelly dace.

Cumulative Effects

Throughout much of its range, the southern redbelly dace is common in suitable habitat. However, small, disjunct populations, such as those in New Mexico and Colorado, are subject to extirpation through habitat degradation such as siltation, pollution, bank destabilization, introduction of exotics, and dewatering (BISON 2000a).

In Colorado, habitat loss has resulted from dewatering, channelization, and siltation (which covers spawning and feeding substrates). Current threats also include nonpoint source pollution and mainstem impoundments that impact natural flow regimes. Other threats across its range include dewatering of rivers from irrigation and degradation of riparian areas (Echelle et al. 1995).

Biological Determination

CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the southern redbelly dace. CDOT activities are not likely to impact the two remaining known populations of this fish, and CDOT activities are not likely to impact stream habitat known to have supported southern redbelly dace populations in the 1980s.

Suckermouth Minnow (*Phenacobius mirabilis*)

Species Description

The minnow family (Cyprinidae) is large and highly variable. Sexual dimorphism is usually conspicuous; breeding, brightly colored males have nuptial tubercles on the head, body and along fin rays (Blair et al. 1968). Minnows construct a variety of nests, including piles of stones (carried by mouth to the nest), cup-shaped depressions in or

above riffles, and excavations under a stone where the eggs are attached to the underside of the stone.

The abundance of minnows may be attributed to their tolerance, as a group, of diverse habitats (from fresh to brackish water, warm to cool waters, and moving to standing water), small size (thus a large number of minnows can occupy a small space and find sufficient food and shelter), and rapid attainment of sexual maturity. The smaller minnows usually live three or four years; larger species may live seven to ten years, and the carp even longer.

The suckermouth minnow has a snout and lips that are adapted to rooting in the streambed for insect larvae and invertebrates, as well as detritus and plant material (Ellis 1914; Starret 1950; Pflieger 1975; Woodling 1985). Spawning extends from April through August, which may be an adaptation to extreme fluctuations in the flow of plains streams (Cross and Collins 1975). It is more tolerant of silty waters than many other fish (Miller and Robison 1973), but does appear to require permanent flows (Woodling 1985).

Distribution and Status

The suckermouth minnow is found across a large part of North America, from the Great Lakes states through the midwest to scattered locations in the Great Plains. It occurs throughout most of the Mississippi River basin, from Ohio west to Wyoming and south to Louisiana and Texas, where it is found in a few Gulf Coast drainages. Overall, the suckermouth minnow appears to be common over much of its range, and has extended its distribution in Ohio (Trautman 1981) and in Wisconsin (Becker 1983).

In Colorado, the suckermouth minnow had a distribution that was limited to the eastern plains and included the St. Vrain and Boulder Creek drainages (Ellis 1914), the main stem of the South Platte River (Propst 1982), Republican River (Cancalosi 1980), and the lower mainstem and some tributaries of the Arkansas River downstream of the John Martin Reservoir (Woodling 1985; Nesler et al. 1997). Today it is found in the Lodgepole Creek drainage of the mainstem South Platte, and there is a small population in the mainstem Arkansas River between John Martin Reservoir and the Kansas state line (CDOW 2002c).

ESA Status and Other Organizational Rankings

The suckermouth minnow is a species of special concern in Arkansas (Schmidt 1996), threatened in New Mexico (BISON 2000b), and endangered in Colorado. It has a CNHP rank of G5/S2? (demonstrably secure globally; imperiled in Colorado) (CNHP 2002b).

Habitat

The suckermouth minnow prefers clear shallow water with riffles, a sand, gravel, or bedrock substrate, and year-round flows (Ellis 1914; Pflieger 1975; Propst 1982; Woodling 1985). In some areas it seems to tolerate high levels of turbidity and organic

enrichment (Miller and Robinson 1973; Becker 1983), but it does require permanent flows (Propst 1982; Woodling 1985).

Conservation Planning

CDOW is establishing broodstocks of the suckermouth minnow to use in restoration stocking (CDOW 2002c). The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of suckermouth minnows in Wyoming and Colorado.

Direct and Indirect Effects of CDOT Actions on the Suckermouth Minnow

The primary concern for this species is the construction of permanent barriers to movement. Siltation may also pose a threat, though these fish are adapted to survival in turbid water resulting from storm and flood events. If siltation should persist for more than one year, there may be an impact on population viability (pers. comm., T. Nesler).

Cumulative Effects

In Colorado, habitat loss has resulted from dewatering, channelization, and siltation (which covers spawning and feeding substrates). Current threats also include nonpoint source pollution and mainstem impoundments that impact natural flow regimes. Threats across its range include dewatering of rivers from irrigation and degradation of riparian areas (Echelle et al. 1995). The suckermouth minnow remains at risk because of its narrow food niche as a bottom feeder, and because of habitat deterioration as a result of loss of permanent flows and riffle habitat, increased siltation, water diversion, and nutrient enrichment (Propst et al. 1985; Nesler et al. 1997).

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by suckermouth minnows. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the suckermouth minnow.

Northern Cricket Frog (*Acris crepitans blanchardi*)

Species Description

The northern cricket frog is a small, non-climbing tree frog in the family Hylidae. It is the most completely aquatic North America Hylid, and remains near permanent water year-round (Kellar et al. 1997). Its active season extends from May to October, but it may emerge from hibernation in April (Hammerson 1982, 1999). Eggs float or stick to submerged plants and hatch after a few days. Newly metamorphosed cricket frogs have been observed in Colorado in early July (Hammerson 1982). Food for juveniles and adults probably consists of small invertebrates captured at the water's edge (Stebbins

1951; Labanick 1976; Hammerson 1986; Kellar et al. 1997). Tadpoles are probably herbivorous (Stebbins 1951).

Small frogs like the northern cricket frog are preyed upon by many birds, snakes, raccoons (*Procyon lotor*), and diving beetles, as well as non-native bullfrogs (*Rana catesbeiana*).

Distribution and Status

The northern cricket frog has the most northerly range of the two species in the genus *Acris* (Kellar et al. 1997). The genus is endemic to eastern and central North America, and is largely restricted to the United States. The range of the subspecies *blanchardi* occurred from Michigan, Ohio, Kentucky, and Tennessee westward to northeastern Colorado, southeastern New Mexico, western Texas, northeastern Mexico, and two locations in Canada (Hubbard et al. 1979; Kellar et al. 1997).

In Colorado, the northern cricket frog was documented in the Republican River and South Platte River drainages, and was most abundant along the North Fork of the Republican River in Yuma County (Hammerson 1986), and perhaps in the South Platte River in Weld and Morgan counties (Hammerson 1999). Recent evaluation of northern cricket frog records indicates that it was present in the Republican River drainage and Platte River drainage in Colorado at least through the 1970s, but subsequent surveys indicate that its distribution has declined, and it may be extirpated from Colorado (Hammerson and Livo 1999.)

ESA Status and Other Organizational Rankings

The northern cricket frog is a species of special concern in Michigan, and is listed as endangered in Wisconsin and Canada (Kellar et al. 1997). It is a species of special concern in Colorado, and has a CNHP rank of G5/SH (demonstrably secure globally; historically known from Colorado, but not verified for an extended period of time) (CNHP 2002b).

Habitat

The northern cricket frog prefers the gently sloping banks of ponds, ditches, and marshes (Hubbard et al. 1975; Kellar et al. 1997). It breeds in ponds and slow-moving pools, and is likely to be found within 0.25-0.5 miles of water in rainy weather and directly adjacent to water during dry weather (pers. comm., L. Livo). In Colorado, it is found on sunny, muddy, or marshy edges of ponds, reservoirs, streams, and irrigation ditches (Hammerson and Langlois 1981; Hammerson 1982; Hammerson 1986). Although cricket frogs usually are found near water in Colorado, Burnett (1926) found one in the opening of a prairie dog burrow in Weld County (Hammerson 1986). The northern cricket frog hibernates in soil cracks on land (Regan 1972; Gray 1983).

Conservation Planning

There are no conservation plans in place in the United States for the northern cricket frog. There is a recovery plan for this frog in Canada, where it is at the northern periphery of its distribution (Kellar et al. 1997). The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the northern cricket frog in Colorado.

Direct and Indirect Effects of CDOT Actions on the Northern Cricket Frog

Potential impacts to the northern cricket frog derive from changes in local hydrology, and include habitat loss due to de-watering, pollution (salts, de-icing compounds, hydrocarbons), siltation, and changes in the aquatic regime that favor the non-native bullfrog (pers. comm., C. Loeffler, CDOW; pers. comm., L. Livo; pers. comm., S. Mackessy, UNC).

Cumulative Effects

The bullfrog is widely established in western North America, and is implicated in restricting the range of many native North American frogs (Jennings and Hayes 1994; McCoid 1995; Corn and Peterson 1996; Hammerson 1999). Hammerson (1982b, 1986) and Finch (1991) identified predation and competition from introduced bullfrogs as factors in declines of small frogs in Colorado. Habitat degradation and loss due to conversion of wetlands have also been identified as factors in the decline of North American frogs (Jennings and Hayes 1994). The application of pesticides, especially during metamorphosis, has been shown to cause mortality (Ferguson 1963; Porter 1972).

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by northern cricket frogs. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect northern cricket frogs.

Northern Leopard Frog (*Rana pipiens*)

Species Description

The northern leopard frog is a small frog in the Ranidae (the true frogs). In eastern Colorado, it inhabits bodies of permanent water, is active from March though October or November, and breeds in the non-flowing portions of permanent water bodies (Hammerson 1986). These frogs hibernate underwater (Livo 1981; Hammerson 1982, 1986), forage on land or in shallow water (Post 1972; Hammerson 1982), and bask on shore or in shallow water. Egg masses are attached to vegetation just below the water surface in shallow, relatively warm water (Hammerson 1999). Individuals gather during

breeding and at over-wintering sites (Post 1972; Gillis 1975; Livo 1981). Food habits in Colorado are not well studied (Hammerson 1986), but anuran larvae often filter-feed on algae (Tanner 1931) and feed in still water (Hammerson 1982).

Distribution and Status

The northern leopard frog ranges across much of the northern continental United States and southern Canada. In Colorado, it occurs throughout the state except in the Republican River drainage and south of the Arkansas River in southeastern Colorado (Hammerson 1986, 1999).

Livo (1995) updated known county distributions of Colorado amphibians and reptiles based on published reports of occurrences. The northern leopard is sympatric with the plains leopard frog in Cheyenne, El Paso, Lincoln, and Pueblo counties in Colorado, and these species are known to hybridize (Post 1972; Gillis 1975; Hammerson 1982, 1999). In some areas, reduced or extirpated leopard frog populations are associated with the presence of bullfrogs (Hammerson 1982). For example, northern leopard frogs were abundant in East Plum Creek (Douglas County) in the early 1990s, but recent observations showed hundreds of bullfrogs and only five leopard frogs in a 1,000 meter reach of stream (C. Pague, unpublished data). Bullfrogs now outnumber northern leopard frogs in areas of eastern Colorado (Hammerson 1999). The northern leopard frog has undergone documented declines in Colorado (Corn 1994).

ESA Status and Other Organizational Rankings

The northern leopard frog has been designated a Forest Service sensitive species in Region 3 (New Mexico and Arizona) and in Region 2 (Colorado). It is a species of special concern in Arizona and Colorado, and has been assigned a CNHP rank of G5/S3 (demonstrably secure globally; vulnerable in Colorado) (CNHP 2002b).

Habitat

The northern leopard frog is a wetland obligate that typically uses the banks and shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds, streams, and other bodies of permanent water, including irrigation ditches and wet meadows (Hammerson 1986, 1999). Permanent water bodies having rooted vegetation are particularly attractive (Hammerson and Langlois 1981; Hammerson 1982, 1986), though the frogs are rarely found near ephemeral ponds (Finch 1991).

Conservation Planning

There are no government conservation plans in place for the northern leopard frog. However, The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of northern leopard frogs in Colorado.

Direct and Indirect Effects of CDOT Actions on the Northern Leopard Frog

Potential impacts to the northern leopard frog are largely related to changes in local hydrology. Primary concerns would be habitat loss through temporary or permanent de-watering, and indirect effects from aquatic alteration, pollution (e.g., salts, de-icing compounds) and siltation. If aquatic alteration results in habitat that favors the exotic bullfrog, additional impacts may include increased predation on adult leopard frogs, loss of tadpoles due to increased competition, and an increase in pathogens (pers. comm., L. Livo).

The experts consulted for this project identified local roadkill as among the most significant threats to some amphibian populations (Grunau and Lavender 2002).

Cumulative Effects

The bullfrog is widely established in western North America, and is implicated in restricting the range of native North American ranids (Corn 1982; Livo 1984; Jennings and Hayes 1994; McCoid 1995; Corn and Peterson 1996; Hammerson 1999). Bullfrogs are not native to Colorado, but have been intentionally introduced in numerous locations. They are large, aggressive, and highly competitive predators that are increasing in number and abundance. It is expected that concomitant with bullfrog increases there will be a decrease in leopard frog (*Rana pipiens* and *R. blairi*) numbers and populations (Hammerson 1986; Mackessy 1998). Hammerson (1999) and Finch (1991) identified predation and competition from introduced bullfrogs as factors in northern leopard frog declines in Colorado. Habitat degradation and loss due to conversion of wetlands have also been identified as factors in the decline of North American ranids (Jennings and Hayes 1994).

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by norther leopard frogs. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect northern leopard frogs.

Massasauga (*Sistrurus catenatus*)

Species Description

The massasauga is a small rattlesnake of the dry grasslands of eastern Colorado (Mackessy 1998; Hammerson 1999). Its annual period of activity extends from April to October. It is generally a crepuscular species (Hammerson 1986). Courtship has been documented in June and possibly in September, and births occur in August and September (Hammerson 1999). In Colorado, the massasauga is an opportunistic feeder of small rodents, lizards, frogs, large insects, and occasionally carrion (Mackessy 1998; Hammerson 1999). Smith et al. (1965) reported that a massasauga from Crowley County

had eaten two white-footed mice (*Peromyscus leucopus*). The massasauga hibernates individually through the winter. In Colorado they use rodent burrows in hard packed soils for hibernacula (Mackessy 1998). Telemetry work completed on the Comanche National Grassland by Mackessy (1998) recorded movements as late as 21 November, and concluded that it is likely that snakes are active throughout the year as local temperature permits. In Colorado, the massasauga moves from shortgrass prairie with hard, loamy soils to sandsage habitat with softer, sandier soils in the spring (Mackessy 1998).

Distribution and Status

The massasauga ranges from the Great Lakes to northern Mexico. Data suggest that massasaugas in Colorado are intergrades between *Sistrurus c. edwardsii* (desert massasauga) and *Sistrurus c. tergemimus* (western massasauga) (Mackessy 1998; Hammerson 1999). Mackessy (1998) suggested that massasaugas in Colorado are most similar to *Sistrurus c. edwardsii* and should be assigned to *edwardsii*. In any case, the massasauga in Colorado appears to be geographically disjunct from both neighboring races, lying west of an area in Kansas that is possibly inhabited by the intergrading forms (Mackessy 1998).

The Colorado population is centered in southeastern Lincoln County and western Kiowa County, and is uncommon south of the Arkansas River (Hammerson 1986; Hobert et al. 1997; Mackessy 1998). Mackessy reported a small population of massasaugas in Baca County, and noted that, prior to his find, the most recent massasauga record for Baca County was in 1882 by A. E. Beardsley (no specific locality given). Mackessy (1998) also collected a road-killed massasauga in El Paso County. The Colorado Herpetological Society (2000a) shows recent records for massasaugas in Lincoln, El Paso, Pueblo, Crowley, Otero, Bent, Kiowa, Cheyenne, Prowers, Baca, and Las Animas Counties.

ESA Status and Other Organizational Rankings

The massasauga is a species of concern in Colorado and has a CNHP rank of G3G4/S2 (watchlisted globally; imperiled in Colorado) (CNHP2002b).

Habitat

The massasauga inhabits dry plains grassland and sandhill regions in Colorado (Hammerson 1986, 1999). Sandy soils probably provide good habitat for potential prey. Rodent burrows in hard packed soils provide habitat for hibernacula (Mackessy 1998).

Conservation Planning

There are no government conservation plans in effect for this subspecies. The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of key native populations of the massasauga in Colorado.

Direct and Indirect Effects of CDOT Actions on the Massasauga

According to experts consulted, roads are among the most significant threats to local reptile populations (Grunau and Lavender 2002). The primary highway impacts are those that cause direct mortality such as mowing and roadkill (pers. comm., S. Mackessy). CDOT activities that result in increased speed and traffic volume may lead to an increase in roadkill.

Roads may attract reptiles for basking or hunting prey (pers. comm., L. Livo; Mackessy 1998). In addition, massasaugas cross roads when moving between hibernation and foraging areas in Lincoln County, and likely elsewhere (pers. comm., S. Mackessy). Also, they frequently cross roads during the active season (April to October) in places where roads bisect habitat, and are therefore subject to significant risk. From 1995-1998, over 200 road-killed massasaugas were collected in southeastern Colorado, virtually all killed by vehicles (pers. comm., S. Mackessy).

The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 1,891 acres. This represents approximately 0.036% of the identified habitat in the project area (Grunau and Lavender 2002).

Cumulative Effects

In addition to road mortality, the massasauga has suffered loss of habitat and has been collected indiscriminately for the pet trade; and, like most snakes, particularly venomous species, it is often killed on sight (Mackessy 1998).

Biological Determination

There will be take associated with approximately 1,891 acres of affected massasauga habitat. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the massasauga. In addition, CDOT will protect and manage high quality habitat for the benefit of the massasauga, in perpetuity, not less than 1,891 acres.

Texas Horned Lizard (*Phrynosoma cornutum*)

Species Description

The Texas horned lizard is a ground-dwelling inhabitant of unplowed shortgrass prairie. It is a diurnal ant specialist, whose daily activities tend to be a response to temperature changes in the environment and the related activity of its primary prey, ants (Pianka and Parker 1975; Bockstanz 1998; Mackessy 1998). Texas horned lizards are most active on warm to hot days in late June through early September. Burrowing into the ground is an important behavior in thermoregulation, as it protects the lizard from heat or cold depending on the temperature of the soil in which the animal is buried (Potter and Glass

1931). They emerge from hibernation in early May and go into hibernation in September (Hammerson 1986).

The Texas horned lizard is oviparous and lays its eggs in moist, sandy soil (Pianka and Parker 1975; Bartlett and Bartlett 1999). Mating probably occurs in May or June, with egg-laying in June or July (Hammerson 1986, 1999), and eggs hatching at the end of August or early September (Mackessy 1998).

Distribution and Status

The Texas horned lizard occurs from central Kansas, extreme southwestern Missouri, and the southeastern corner of Colorado, south and westward throughout most of Oklahoma, Texas (including the coastal barrier islands), the southeastern half of New Mexico, and the southeastern corner of Arizona to the Mexican states of Sonora, Chihuahua, Durango, Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi, and Zacatecas (Reeve 1952; Hammerson 1986).

In Colorado, the Texas horned lizard occurs in the southeast corner of the state south of the Arkansas River (Hammerson 1986; Mackessy 1998). It was documented in extreme eastern Pueblo County and has been found in Kiowa County (Mackessy 1998). It has also been documented in Pueblo, Otero, Bent, Cheyenne, Baca, and Las Animas Counties (Livo 1995; Colorado Herpetological Society 2000b).

The Texas horned lizard and short-horned lizard (*P. hernandesi*) have virtually complementary ranges in Colorado; their ranges meet but show very little overlap (Hammerson 1982, 1999).

The Texas horned lizard has largely disappeared from east Texas. Population declines have also occurred in parts of Oklahoma and other areas in Texas (Hammerson 1999). Recent work in Colorado by Hammerson, the Colorado Natural Heritage Program, and the University of Northern Colorado, indicates that the Texas horned lizard in Colorado remains widespread and fairly common within its historic range (Hammerson 1999).

ESA Status and Other Organizational Rankings

The Texas horned lizard is considered threatened in all parts of its current range, including Colorado, where it is a species of special concern (Donaldson et al. 1994). It has a CNHP rank of G4G5/S3 (apparently secure globally; vulnerable in Colorado) (CNHP 2002b).

Habitat

The Texas horned lizard inhabits plains grasslands, especially where there are large patches of bare soil. It requires feeding habitat (generally where ants are abundant), basking habitat, habitat where digging is easy (for thermoregulation), and hibernation habitat. Bare ground typical of what occurs in association with grazing is a characteristic feature of Texas horned lizard habitat throughout its range (Whiting et al. 1993; Fair and

Henke 1997), but the lizard seems to be absent from areas with the large bare areas typical of plowing (Hammerson 1999). The lower limit of juniper growth seems to delimit the upper limit of its habitat in canyons and at the foot of mesas (Hammerson 1986; Bartlett and Bartlett 1999). Texas horned lizards select sandy areas where they inhabit abandoned animal burrows (Bockstanz 1998), usually in close proximity to the nests of harvester ants (Seymour 1996). They will use berms along dirt roads as basking sites (Mackessy 1998). In Colorado, they have been found to be most abundant on sandy soils with sage (*Artemisia* spp.) and large areas of bare ground (Mackessy 1998).

Conservation Planning

There are no formal conservation plans in effect for this subspecies. The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the Texas horned lizard in Colorado.

Direct and Indirect Effects of CDOT Actions on the Texas Horned Lizard

Roads are among the most significant local threats to reptile populations. Roads tend to attract reptiles such as horned lizards for basking or hunting prey (Mackessy 1998). The primary impacts from highways are those that cause direct mortality such as mowing and roadkill (pers. comm., S. Mackessy). CDOT activities that result in increased speed and traffic volume may lead to increased roadkill.

The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 1,568 acres. This represents approximately 0.033% of the identified habitat in the project area (Grunau and Lavender 2002).

Cumulative Effects

The Texas horned lizard is threatened primarily by habitat loss and conversion. Much of the appropriate habitat in Baca County has been lost to agriculture, and if this trend continues, populations in this area will become threatened (Mackessy 1998). The Texas horned lizard has declined for several reasons, including collection for the pet trade, the invasion of the imported fire ant (*Solenopsis invicta*), and loss of habitat (Donaldson et al. 1994).

Biological Determination

There will be take associated with approximately 1,568 acres of affected Texas horned lizard habitat. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the Texas horned lizard. In addition, CDOT will protect and manage high quality habitat for the benefit of Texas horned lizards, in perpetuity, not less than 1,568 acres.

Western Box Turtle (*Terrapene ornata*)

Species Description

The western box turtle is a terrestrial species (though it has been observed using quiet water) (Rodeck 1949; Hammerson and Langlois 1981; Hammerson 1986) that can completely enclose itself in its shell. The front of the plastron is hinged, and can be drawn up tightly against the carapace (Hammerson 1986). The western box turtle is a diurnal turtle that spends the night in burrows dug by itself or by other animals (Legler 1960; Ernst and Barbour 1972). They move an average of 200-300 feet/day (60-90 meters) over a home range of about five acres (two hectares with mean maximum diameter of ~170 meters) in Kansas (Legler 1960). Another Kansas study reported a mean maximum home range diameter of 152 meters for males and 267 meters for females (Metcalf and Metcalf 1978). Blair (1976) calculated Texas home range diameters as ~100 meters. In central New Mexico, mean home range size is 1.6 hectares, or a mean maximum diameter of 276 meters (Nieuwolt 1996). There are large spurts of activity following summer rains (Rodeck 1949; Hammerson 1999).

Food of adults consists largely of beetles, lepidoptera larvae, and grasshoppers, but many other foods including carrion are taken (Legler 1960; Metcalf and Metcalf 1970; Ernst and Barbour 1972; Hammerson 1986). Cow dung is sometimes ingested during predation on insects (Legler 1960). Juveniles eat a greater variety of foods than individual adults (Legler 1960). Western box turtles may have evolved in conjunction with the large herds of grazing animals on the North American prairies, as their powerful front legs and strong claws are well adapted for tearing apart manure piles which they search for dung beetles and grubs (Legler 1960). Research has shown that turtle numbers decline when cattle are removed from their home ranges (Legler 1960).

Western box turtles enter hibernation in October and November as day length decreases, temperatures drop, and autumn rains moisten and soften the soil. If suitable places to dig are not found, the burrows of other animals may be used for hibernating (Legler 1960; Ernst and Barbour 1972). They emerge from hibernation in April (Hammerson 1986).

Male western box turtles become sexually mature at eight to nine years of age, and females are sexually mature at ten or 11 years (Legler 1960; Ernst and Barbour 1972). Courtship and mating occur immediately after emerging from hibernation, but may extend into the summer and fall (Legler 1960; Ernst and Barbour 1972; Nieuwolt-Decanay 1997). Nesting occurs from May through July, reaching a peak in mid-June. An open area of soft, well-drained soil is selected for the nest, a clutch of one to four eggs is laid, and incubation duration is variable depending on temperature and moisture (Legler 1960; Ernst and Barbour 1972; Nieuwolt-Decanay 1997). Average incubation is 65-70 days (Legler 1960; Ernst and Barbour 1972). Sex is determined by incubation temperature (Voght and Bull 1982; Packard et al. 1985). Hatchlings usually leave the nest from early September through October, but may overwinter in the nest, leaving the following spring (Legler 1960; Ernst and Barbour 1972). Natural longevity can be at least 28-32 years (Blair 1976; Metcalf and Metcalf 1985).

Distribution and Status

Western box turtles are found from southwestern South Dakota, southern Michigan, and Indiana south to the Gulf Coast and extreme northern Mexico, eastern Texas across southern New Mexico to southeastern Arizona and into Sonora (Ernst and Barbour 1972; Garrett and Barker 1987). This species occurs throughout most of eastern Colorado below 5500 feet (1676 m) (Hammerson 1986; Colorado Herpetological Society 2000c). The western box turtle is scarce or absent on the western crest of the Platte-Arkansas divide and west of Baca County south of the Arkansas River, but it is locally common within its range in Colorado, especially in the sandhill regions south of the South Platte River (Hammerson 1999) and just north of the Arkansas River (pers. obs., C. Pague). The most robust populations in Colorado coincide with the remaining areas of unplowed prairie (Hammerson 1999).

ESA Status and Other Organizational Rankings

The western box turtle is listed in the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) Appendix II (species not now threatened with extinction, but could become so unless trade is strictly controlled). Export permits are needed from the country of origin (CITES 1994). The western box turtle has a CNHP rank of G5/S5 (demonstrably secure globally and in Colorado) (CNHP 2002b).

Habitat

The western box turtle inhabits open grasslands and sandhills (Garrett and Barker 1987; Hammerson 1999). It prefers soft, sandy soils that are easily penetrated for nesting, temperature regulation, and hibernation (Legler 1960; Ward 1978; Hammerson 1999). It is found in prairie dog colonies, where it uses prairie dog burrows for hibernation and temperature regulation (Clark et al. 1982; Hoogland 1995), finds soils suitable for digging nests, and forages for food.

Conservation Planning

There are no conservation plans in effect for this subspecies. The Colorado Wildlife Commission allows individuals to collect up to four western box turtles from the wild each year with a total of no more than 12 held in captivity (Article I – General Provisions #1000 – Protected Species). Doroff and Keith (1990) recommend establishing roadless preserves of at least 100 hectares. The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified large areas important for the conservation of native populations of western box turtles in Colorado.

Direct and Indirect Effects of CDOT Actions on the Western Box Turtle

Roads are among the most significant local threats to reptile populations, and are often cited as a primary source of mortality for the western box turtle (Legler 1960; Hammerson 1999). Box turtles are very slow when crossing roads, often enclosing within their shells for extended periods upon sensing an automobile, thereby exposing themselves to the vehicles for prolonged periods of time. Roads attract western box

turtles for basking (Mackessy 1998), and they are known to feed on roadkilled animals, further exposing themselves to the hazards of traffic (Mackessy 1998; Hammerson 1999; pers. obs., C. Pague). Also, turtles use road banks for breeding sites (egg deposition), and are potentially susceptible to impacts from ground disturbance. The locations of such breeding sites are not available, so scope or severity of this impact cannot be estimated (pers. comm., L. Livo).

Hammerson (1986, 1999) reports hundreds of box turtles killed on roads each year. The primary highway impacts are those that cause direct mortality, such as mowing and roadkill. Box turtles are common victims of roadkill on some roads (e.g., Dr. Mackessy's crew once counted 75 roadkilled box turtles on a single pass of US287 – approximately 21 miles - between Kit Carson and Eads). Because box turtles are long-lived, populations may not be able to sustain current levels of highway mortality (pers. comm., L. Livo), and population effects are not readily observable in a short time frame (pers. comm., C. Pague). CDOT activities that result in increased speed or traffic volume could lead to increased roadkill.

The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 1,910 acres. This represents approximately 0.061% of the identified habitat in the project area (Grunau and Lavender 2002).

Cumulative Effects

The greatest source of mortality for adult western box turtles is vehicle collisions (Rodeck 1949; Legler 1960; Blair 1976; Knight and Collins 1977; Doroff and Keith 1990; Mackessy 1998; Hammerson 1999). Because of high local mortality due to vehicle collisions, late age of sexual maturity, and low fecundity, there are localities that may function as population sinks (Hammerson 1999). Western box turtles are also vulnerable to collection for the pet trade (they are particularly visible when crossing roads), to habitat fragmentation and to pesticide poisoning (because of the large number of insects in their diet).

Biological Determination

There will be take associated with approximately 1,910 acres of affected western box turtle habitat. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the western box turtle. In addition, CDOT will protect and manage high quality habitat for the benefit of western box turtles, in perpetuity, not less than 1,910 acres.

Cylindrical Papershell (*Anodontoides ferussacianus*)

Species Description

The cylindrical papershell is a member of the class Bivalvia and family Unionidae that includes the clams, oysters, and mussels. These are filter-feeding burrowers of the benthos (Barnes 1974) that are parasitic for part of their life and require a vertebrate, usually a fish, as host (O'Dee and Watters 1998). The larval stage, the glochidium, is parasitic on the surface of fish whose body forms a cyst around the glochidium (Barnes 1974). After 10-30 days, the immature animal breaks out of the cyst, falls to the bottom, and burrows into the mud where it completes development (Barnes 1974). The adult mussel is a filter-feeding, sessile organism.

Mussels are long-lived species; many live more than ten years, and some are reported to live more than 100 years. Thin-shelled species - the floaters and papershells - grow much faster than thicker-shelled species (Cummings and Mayer 1992). The cylindrical papershell has an elongated-oval shell that is yellowish white to olive or dark brown, and is to 114 millimeters in length (Wu 1989).

Distribution and Status

In Colorado, the cylindrical papershell is found only in the Platte River drainage, primarily in Boulder County, but was also recorded from Denver, Morgan, Sedgwick, and Weld counties (Wu 1989). It is most common in spring-fed lakes and ponds in Boulder County (Wu 1989). Cordeiro (1999) reported that this species' distribution has shrunk from 15 formerly documented locations to only two – Valmont Lake and Little Thompson River, both in Boulder County.

ESA Status and Other Organizational Rankings

As a group, native mussels are the most rapidly declining animal group in the United States, and constitute the largest group of federally-listed endangered or threatened invertebrates (TNC 1996). The cylindrical papershell is state endangered in Missouri and state threatened in Iowa. It has a CNHP rank of G5/S2 (demonstrably secure globally; imperiled in Colorado).

Habitat

Mussels are found in waters where velocity allows for stable substrates for burrowing, but in which siltation does not occur (Ellis 1931; McMahon 1991). Being sessile filter feeders, mussels require good water quality and quantity for feeding, breathing, and reproducing, and thus typically inhabit unpolluted waters that are rich in oxygen, calcium, and suspended food particles. Because they are filter feeders, they are organic-nutrient sinks and are probably significant aquatic decomposers (McMahon 1991). The cylindrical papershell inhabits the mud and sand benthos of small creeks and the headwaters of larger streams (Cummings and Mayer 1992).

Conservation Planning

There are no conservation plans for cylindrical papershell, but USFWS has drafted a national strategy for the conservation of native mussels (Biggins et al. 1995). The U. S. Environmental Protection Agency and The Nature Conservancy have also developed partnerships for water quality protection and habitat restoration that will benefit mussels (Jennings 2000).

Direct and Indirect Effects of CDOT Actions on the Cylindrical Papershell

CDOT projects could negatively impact the cylindrical papershell if they resulted in increased runoff or siltation, or disruption of surface or groundwater flow. Bridge repair that resulted in removal of riparian vegetation could destabilize stream bottoms and eliminate mussels and other benthic organisms (Jennings 2000). However, according to experts consulted for this project, the only potential impacts anticipated would be altered quantity or quality of permanent water sources if BMPs were not employed (Grunau and Lavender 2002). Other impacts from future CDOT activities were considered temporary since the disturbance mechanism (the road) is already present (pers. comm., C. Loeffler, CDOW).

Cumulative Effects

The decline, extirpation, or extinction of many mussel species likely results from ecological and biological traits that make them particularly vulnerable to anthropogenic effects (Neves 1993). Their life cycle includes a larval stage that is an obligate parasite of fishes. Therefore, they are susceptible to reproductive failure because of a lack of fish host availability. The fish faunas of many rivers have changed in response to changes in hydrologic regimes stemming from water development projects, flood control, power generation, and some agricultural practices. Species composition changes that disfavor host species for mussel larvae adversely affect mussels, and because mussels can disperse only during the larval stage, barriers to fish dispersal are also barriers to mussel dispersal.

Habitat loss is the main problem facing cylindrical papershells. Among the factors thought to be responsible for their decline are changes in the hydrologic regime stemming from dam construction, water development, pollution, siltation, commercial navigation, and over harvest (Fuller 1974; Wu 1989; Williams et al. 1992; Williams and Neves 1995; Jennings 2000). Decline of host fish and encroachment by non-native mollusks also pose threats (Cummings and Mayer 1992; Williams et al. 1993; Williams and Neves 1995).

Biological Determination

The cylindrical papershell has a very limited distribution within the project area (restricted to Boulder County), and will not be affected by the vast majority of projects covered by this programmatic agreement. In addition, for any project that does occur within the range of this mollusk, CDOT will employ BMPs (as described in Part 3 of this document) to avoid, minimize, and offset any alteration to water quantity/quality and streamside vegetation. Therefore, CDOT activities are not expected to affect this species.

Giant floater (*Pyganodon* = [*Anodonta*] *grandis*)

Species Description

The giant floater is a member of the class Bivalvia and family Unionidae that includes the clams, oysters, and mussels. These are filter-feeding burrowers of the benthos (Barnes 1974) that are parasitic for part of their life and require a vertebrate, usually a fish, as the host (O'Dee and Watters 1998). The larval stage, the glochidium, is parasitic on the surface of fish whose body forms a cyst around the glochidium (Barnes 1974). Thirty-seven hosts have been reported for the giant floater (Watters 1995). After 10-30 days, the immature animal breaks out of the cyst, falls to the bottom, and burrows into the mud where it completes development (Barnes 1974). The adult giant floater is a filter-feeding, sessile organism that has a fragile, elongate, oval shell 106-191 millimeters in length (Wu 1989).

Mussels are long-lived species; many live more than ten years, and some are reported to live more than 100 years. Thin-shelled species - the floaters and papershells - grow much faster than thicker-shelled species (Cummings and Mayer 1992).

Based on allozyme and morphological data, *Anodonta grandis* has been reclassified as *Pyganodon grandis* (Hoeh 1990).

Distribution and Status

The giant floater is found from the east coast to the Rocky Mountains in permanent bodies of water having a muddy or silty substrate (Wu and Brandauer 1978). In Colorado, Wu (1989) found the giant floater in the Platte and Republican River drainages in Boulder, Larimer, Morgan, and Yuma counties. Herrman and Fajt (1985) have recorded it in the Arkansas River drainage, and in reservoirs in Kit Carson, Adams and Pueblo counties. Wu (1989) found that the species is most abundant in spring-fed lakes and ponds in Boulder and Larimer counties. Cordeiro (1999) reported this species in Cherry Creek Reservoir and Boyd Lake (Platte River drainage), Flagler Reservoir (Republican River drainage), and Pueblo Reservoir and Colorado Fuel and Iron Reservoirs 1-3 (Arkansas River drainage).

ESA Status and Other Organizational Rankings

As a group, native mussels are the most rapidly declining animal group in the United States, and constitute the largest group of federally-listed endangered or threatened invertebrates (TNC 1996). The giant floater has a CNHP rank of G5/S1 (demonstrably secure globally; critically imperiled in Colorado) (CNHP 2002b).

Habitat

Mussels are found in waters where velocity allows for stable substrates for burrowing, but in which siltation does not occur (Ellis 1931; McMahon 1991). Being sessile filter

feeders, mussels require good water quality and quantity for feeding, breathing, and reproducing, and thus typically inhabit unpolluted waters that are rich in oxygen, calcium, and suspended food particles. Because they are filter feeders, they are organic-nutrient sinks and are probably significant aquatic decomposers (McMahon 1991). The giant floater is found in ponds, lakes, and sluggish mud-bottomed pools of creeks and rivers, though it can be found in a variety of other habitats as well (Cummings and Mayer 1992).

Conservation Planning

There are no conservation plans for the giant floater, but USFWS has drafted a national strategy for the conservation of native mussels (Biggins et al. 1995). The U. S. Environmental Protection Agency and The Nature Conservancy have also developed partnerships for water quality protection and habitat restoration that will benefit mussels (Jennings 2000).

Direct and Indirect Effects of CDOT Actions on the Giant Floater

CDOT projects could negatively impact the cylindrical papershell if they resulted in increased runoff or siltation, or disruption of surface or groundwater flow. Bridge repair that resulted in removal of riparian vegetation could destabilize stream bottoms and eliminate mussels and other benthic organisms (Jennings 2000). However, according to experts consulted for this project, the only potential impacts anticipated would be altered quantity or quality of permanent water sources if BMPs were not employed (Grunau and Lavender 2002). Other impacts from future CDOT activities were considered temporary since the disturbance mechanism (the road) is already present (pers. comm., C. Loeffler, CDOW).

Cumulative Effects

The decline, extirpation, or extinction of many mussel species likely results from ecological and biological traits that make them particularly vulnerable to anthropogenic effects (Neves 1993). Their life cycle includes a larval stage that is an obligate parasite of fishes. Therefore, they are susceptible to reproductive failure because of a lack of fish host availability. The fish faunas of many rivers have changed in response to changes in hydrologic regimes stemming from water development projects, flood control, power generation, and some agricultural practices. Species composition changes that disfavor host species for mussel larvae adversely affect mussels, and because mussels can disperse only during the larval stage, barriers to fish dispersal are also barriers to mussel dispersal.

As with most wildlife, habitat loss is the main problem facing giant floaters. Among the factors thought to be responsible for their decline are changes in the hydrologic regime stemming from dam construction, water development, pollution, siltation, commercial navigation, and over harvest (Fuller 1974; Wu 1989; Williams et al. 1992; Williams and Neves 1995; Jennings 2000). Decline of host fish and encroachment by non-native mollusks also pose threats (Cummings and Mayer 1992; Williams et al. 1993; Williams and Neves 1995).

Biological Determination

The giant floater has a limited distribution within the project area, and will not be affected by the vast majority of projects covered by this programmatic agreement. In addition, for any project that does occur within the range of this mollusk, CDOT will employ BMPs (as described in Part 3 of this document) to avoid, minimize, and mitigate any alteration to water quantity/quality and streamside vegetation. Therefore, CDOT activities are not likely to affect this species.

Arogos Skipper (*Atrytone arogos*)

Species Description

The arogos skipper is a member of the Hesperiidae. It has a short flight, with emergence occurring in late June through mid July in the Front Range, and one to two weeks earlier on the plains (Pineda and Ellingson 1997). Activity periods are in late afternoon when thunderstorms are forming, rather than clear sunny times of the day (Ferris and Brown 1981). Males perch on tall flowers or grasses to wait for females, who oviposit single eggs under host plant leaves (Pineda and Ellingson 1997).

Larvae are obligate feeders on grasses, including big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), side oats grama (*Bouteloua curtipendula*), and possibly switch grass (*Panicum* spp.). Caterpillars construct tents of two leaves silked together; fourth instar caterpillars enter diapause, complete feeding the next spring, and pupate in a leaf cocoon in vegetation about three feet above the ground (Opler et al. 1995).

Distribution and Status

Two subspecies of arogos skipper are recognized: *arogos* of the Atlantic and Gulf coastal plains and *iowa*, found in the Great Plains including Colorado (Ferris and Brown 1981).

The arogos skipper occurs in isolated colonies from Long Island south to Florida, and west along the coast to east Texas (Opler et al. 1995). The interior populations occur on the prairies from southeastern North Dakota and central Minnesota south to South Texas (Opler and Krizek 1984; Opler et al. 1995).

In Colorado, the arogos skipper is documented from the northern Front Range and extreme northeastern Colorado in Arapahoe, Boulder, Jefferson, Larimer, and Yuma Counties (Stanford and Opler 1993; Pineda and Ellingson 1997).

There is no long-term monitoring program comparable to the Breeding Bird Survey for butterflies, nor are the population dynamics as well documented for prairie butterflies as for birds. Fourth of July butterfly counts are not supported or distributed in a way that adequately monitors rare species of butterflies and skippers.

ESA Status and Other Organizational Rankings

The arogos skipper has a CNHP rank of G3G4/S2 (watchlisted globally; imperiled in Colorado), and is a sensitive species in Region 1 of the Forest Service.

Habitat

The arogos skipper is found in relatively undisturbed mixed and tallgrass prairies, meadows, sand prairies, and serpentine barrens (Ferris and Brown 1981; Opler et al. 1995; Royer 2001). Larval host plants include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and switchgrass (*Panicum* spp.) (Scott 1986; Opler 1995).

Adult nectar plants include purple vetch (*Vicia* spp.), Canada thistle (*Cirsium arvense*), dogbane (*Apocynum* spp.), stiff coreopsis (*Coreopsis* spp.), purple coneflower (*Echinacea angustifolia*), green milkweed (*Asclepias* spp.), and ox-eye daisy (*Leucanthemum vulgare*) (Opler 1995).

Conservation Planning

There are no conservation plans specifically for the arogos skipper. The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of arogos skippers in Colorado.

In addition, there are several sources of general management guidelines for butterflies in the plains (Dana 1991; Royer and Marrone 1992; Moffat and McPhillips 1993). The goal for managers is to strive for diversity and patchiness within and among sites when managing for prairie butterflies. Mechanical cutting or light grazing seem to be most effective at maintaining prairie habitat preferred by prairie butterflies—implying an ecosystem adaptation to herbivory (Swengel and Swengel 1995). Invasive exotics such as crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), and yellow sweet clover (*Melilotus officinalis*), many purposely introduced to increase forage for cattle, out-compete the native forbs that prairie butterflies need for adult nectar sources and larval host plants. Grazing, mowing, and small controlled burns (following surveys for concentrations of host and nectar plants) have been successfully used to manage prairie habitat for butterflies.

Direct and Indirect Effects of CDOT Actions on the Arogos Skipper

The greatest concern for potential impacts to butterflies, including the arogos skipper, is any adverse effect on host plants and nectar sources from mowing, spraying, and construction activities (pers. comm., B. Kondratieff; pers. comm., P. Pineda). Many invertebrates are host-plant specific species. ROWs on the prairie may contain more host plant and nectar source plants than surrounding landscapes that are heavily grazed. However, mowing, herbicide application, or re-seeding after construction with non-native plants may result in reduced availability of host plant and nectar sources, thereby reducing reproductive success of the butterflies. Also, grasshopper spraying in ROWs

when larvae are feeding or adults are flying, or mowing while larvae are actively feeding, could lead to direct mortality of individuals.

Ground disturbance that accompanies highway construction, presence of heavy equipment, and maintenance activities are usually vectors for introduction and spread of noxious weeds. Seasonal mowing (mid-spring) may be beneficial because reduction in the growth of weedy cool season grasses will benefit the native, warm-season grasses that are used as host plants by butterflies. However, the arogos skipper is sensitive to management, and will avoid recently grazed or mowed areas (Moffat and McPhillips 1993). Prescribed fires, depending on timing, generally result in fewer butterflies for the next several years, though as vegetation recovers the butterfly benefits (Dana 1991; Swengel and Swengel 1995).

Cumulative Effects

Conversion of tallgrass prairie to agricultural use has greatly reduced the habitat and numbers of the arogos skipper (Ostlie et al. 1997). Livestock grazing, if heavy, and non-native grasses and forbs can reduce the suitability of grassland habitat (Royer and Marrone 1992). Broad-scale insecticide applications pose a threat to the persistence of the butterfly in grasslands (Ostlie et al. 1997), as do use of herbicides, which can diminish larval food (Pineda and Ellingson 1997). While possibly a concern in small roadside populations, the impact of long term mortality due to vehicular collisions is not known.

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by the arogos skipper. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the arogos skipper.

Hops feeding Azure (*Celastrina humulus*)

Species Description

The hops feeding azure is a recently described colonial species of butterfly found in the Front Range of Colorado (Pineda and Ellingson 1997; Scott and Wright 1998; Pineda 2002). Adult hops feeding azures emerge in late May and early June (Wright 1995; Royer 2001). The sole caterpillar host is hops (*Humulus lupulus*), and adult food is flower nectar (Royer 2001).

Distribution and Status

The hops feeding azure was formally described in 1998 (Scott and Wright 1998). The authors make a strong case for it as a valid taxon, although they note that it could be

classified as a subspecies of an eastern azure (Scott and Wright 1998). It is probably endemic to the Front Range of Colorado, and has been documented in Adams, Arapahoe, Boulder, Douglas, El Paso, Elbert, Jefferson, and Larimer Counties (Stanford and Opler 1993, 1996; Pineda and Ellingson 1997) above 5300 feet (Pineda 2002).

There is no long-term monitoring program comparable to the Breeding Bird Survey for butterflies, nor are the population dynamics as well documented for prairie butterflies as for birds. Fourth of July butterfly counts are not supported or distributed in a way that adequately monitors rare species of butterflies and skippers.

ESA Status and Other Organizational Rankings

The hops feeding azure has a CNHP rank of G2G3/S2 (imperiled to vulnerable globally; imperiled in Colorado) (CNHP 2002b).

Habitat

The hops feeding azure has been found in mountain foothill canyons, valleys, and gulches from about 5300-6500 feet, and is always associated with permanent water and patches of hops (Opler 1999; Pineda and Ellingson 1997). Hops (a disturbance tolerant species that requires open, sunny areas in canyon habitats) are the larval food. Adults sip nectar sources from waxflower (*Jamesia americana*) or coyote willow (*Salix exigua*) catkins (Pineda 2002).

Conservation Planning

There are no conservation plans specifically for the hops feeding azure. However, The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion (and subsequently in the Southern Rocky Mountain ecoregion) that identified areas important for the conservation of native populations of the hops feeding azure in Colorado.

In addition, there are several sources of general management guidelines for butterflies in the plains (Moffat and McPhillips 1993; Dana 1991; Royer and Marrone 1992). The goal for managers is to strive for diversity and patchiness within and among sites when managing for prairie butterflies. Mechanical cutting or light grazing seem to be most effective at maintaining prairie habitat preferred by prairie butterflies—implying an ecosystem adaptation to herbivory (Swengel and Swengel 1995). Invasive exotics such as crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), and yellow sweet clover (*Melilotus officinalis*), many purposely introduced to increase forage for cattle, out-compete the native forbs that prairie butterflies need for adult nectar sources and larval host plants. Grazing, mowing, and small controlled burns (following surveys for concentrations of host and nectar plants) have been successfully used to manage prairie habitat for butterflies.

Direct and Indirect Effects of CDOT Actions on the Hops Feeding Azure

There are no documented extant occurrences of this species within the project area, but there is potential habitat within the species'overall range. If this species occurs in the project area, the greatest concern for potential impacts would be any adverse effect on host plants and nectar sources from mowing, spraying, and construction activities. Many invertebrates are host-plant specific species. ROWs on the prairie may contain more host plant and nectar source plants than surrounding landscapes that are heavily grazed. However, mowing, spraying, or re-seeding after construction with non-native plants may result in reduced availability of host plant and nectar sources, thereby reducing reproductive success of the butterflies. Ground disturbance that accompanies highway construction, presence of heavy equipment, and maintenance activities are usually vectors for introduction and spread of noxious weeds. Seasonal mowing (mid-spring) may be beneficial because reduction in the growth of weedy cool season grasses will benefit the native, warm-season grasses that are used as host plants by butterflies.

Cumulative Effects

Loss of habitat due to urbanization and the spread of non-native plants both threaten the persistence of the hops feeding azure (Pineda and Ellingson 1997). Fire suppression may also pose a threat because the larval host plant is an early-successional plant requiring sunny, open areas in canyons of the foothills.

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by the hops feeding azure. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect habitat for the hops feeding azure.

Ottoe Skipper (*Hesperia ottoe*)

Species Description

The Ottoe skipper is a moderately sized butterfly that has the characteristic skipping flight of the skippers (Hesperiidae)**.** After hatching, the nocturnally active larvae move to a host plant, where they build a shelter of leaves and silk in which they spend the day. Larval host plants include *Andropogon gerardii*, *Schizachyrium scoparium*, *Bouteloua curtipendula, Stipa* spp., and *Poa* spp. (Scott 1986; Royer 2001). Larvae enter diapause and overwinter as fourth instar caterpillars, then continue feeding in the spring. Adults emerge in early summer (males preceding females by about one week) and feed on nectar from flowers of *Asclepias* spp., *Echinacea purpurea, Helianthus* spp.*, Lactuca* spp.*, Medicago sativa*, *Opuntia* spp., and *Vicia* spp. There is one flight of adults that usually lasts from June through August, peaking in July (Sedman and Hess 1985). Males perch near host plants waiting for receptive females. Females oviposit at the base of forb or grass stems (Dana 1991).

Distribution and Status

There is no long-term monitoring program comparable to the Breeding Bird Survey for butterflies, nor are the population dynamics as well documented for prairie butterflies as for birds. Fourth of July butterfly counts are not supported or distributed in a way that adequately monitors rare species of butterflies and skippers. However, butterflies requiring prairie habitat have clearly experienced long-term declines (Swengel 1990). The Ottoe skipper occurs widely in the prairie, but has restricted habitat requirements that result in a localized distribution (Swengel and Swengel 1995). The Ottoe skipper is found from southern Manitoba and eastern Montana, south along the high plains to north Texas, east through Nebraska and Kansas to central Illinois and southwest Michigan (Ferris and Brown 1981; Scott 1986; Stanford and Opler 1993).

In Colorado the Ottoe skipper is restricted to mixed and tallgrass prairies, and has been documented in Front Range counties from El Paso County north to the Wyoming border. There are a few records from eastern Colorado (Pineda and Ellingson 1997). The populations in the Front Range are disjunct from the plains population. The Ottoe skipper has been documented in Arapahoe, Boulder, Douglas, Elbert, El Paso, Jefferson, Larimer, Phillips, and Yuma Counties (Stanford and Opler 1993).

ESA Status and Other Organizational Rankings

The Ottoe skipper is listed as a sensitive species in Region 1 of the U. S. Forest Service. It has a CNHP rank of G3G4/S2 (watchlisted globally; imperiled in Colorado) (CNHP 2002b).

Habitat

The Ottoe skipper is a butterfly of unplowed, open mid-grass to tallgrass prairie, or high quality grazed prairie (Ellingson and Pineda 1997). They avoid weedy conditions (Ferris and Brown 1981; Scott 1986). Larval host plants include *Andropogon gerardii, Schizachyrium scoparium, Bouteloua curtipendula, Stipa* spp., and *Poa* spp. (Scott 1986; Royer 2001). Adult nectar plants include flowers of *Asclepias* spp., *Echinacea purpurea, Helianthus* spp., *Lactuca* spp., *Medicago sativa, Opuntia* spp., and *Vicia* spp. (Royer 2001).

Conservation Planning

There are no conservation plans specifically for the Ottoe skipper. However, The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the Ottoe skipper in Colorado.

In addition, there are several sources of general management guidelines for butterflies in the plains (Moffat and McPhillips 1993; Dana 1991; Royer and Marrone 1992). The goal for managers is to strive for diversity and patchiness within and among sites when managing for prairie butterflies. Mechanical cutting or light grazing seem to be most effective at maintaining prairie habitat preferred by prairie butterflies—implying an

ecosystem adaptation to herbivory (Swengel and Swengel 1995). Invasive exotics such as crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), and yellow sweet clover (*Melilotus officinalis*), many purposely introduced to increase forage for cattle, out-compete the native forbs that prairie butterflies need for adult nectar sources and larval host plants. Grazing, mowing, and small controlled burns (following surveys for concentrations of host and nectar plants) have been successfully used to manage prairie habitat for butterflies.

Direct and Indirect Effects of CDOT Actions on the Ottoe Skipper

The greatest concern for potential impacts to butterflies, including the Ottoe skipper, is any adverse effect on host plants and nectar sources from mowing, herbicide application, and construction activities. Many invertebrates are host-plant specific species. ROWs on the prairie may contain more host plant and nectar source plants than surrounding landscapes that are heavily grazed. However, mowing, spraying, or re-seeding after construction with non-native plants may result in reduced availability of host plant and nectar sources, thereby reducing reproductive success of the butterflies. Also, grasshopper spraying in the ROW when larvae are feeding or adults are flying, and mowing while larvae are actively feeding, could lead to direct mortality of individuals.

Ground disturbance that accompanies highway construction, presence of heavy equipment, and maintenance activities are usually vectors for introduction and spread of noxious weeds. Seasonal mowing (mid-spring) may be beneficial because reduction in the growth of weedy cool season grasses will benefit the native, warm-season grasses that are used as host plants by butterflies. However, the Ottoe skipper is sensitive to management, and will avoid recently grazed or mowed areas. Prescribed fires, depending on timing, generally results in fewer butterflies for the next several years, though as vegetation recovers the butterfly benefits (Dana 1991; Swengel and Swengel 1995).

Cumulative Effects

Conversion of tallgrass prairie to agricultural use has greatly reduced the habitat and numbers of the Ottoe skipper (Ostlie et al. 1997). Livestock grazing, if heavy, and presence of non-native grasses and forbs, can reduce the suitability of grasslands habitat for the butterfly. Broad-scale insecticide applications pose a threat to the persistence of the butterfly in grasslands (Ostlie et al. 1997), as do use of herbicides, which can diminish larval food (Pineda and Ellingson 1997). While possibly a concern in small roadside populations, the impact of long term mortality due to vehicular collisions is not known.

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by the Ottoe skipper. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the Ottoe skipper.

Regal Fritillary (*Speyeria idalia*)

Species Description

The regal fritillary is a large member of the brush-footed butterflies (Nymphalidae). Eggs hatch in late summer, and the caterpillar overwinters in diapause as a first instar under leaf litter (Opler et al. 1995). Caterpillars begin to feed in the spring on violets, including bird's foot violet (*Viola pedata*) and prairie violet (*V. pedatifida*) (Scott 1986; Royer and Marrone 1992). Adults emerge in early to mid-June through early July (Opler et al. 1995). Females emerge two weeks later through August (Opler et al. 1995). Adults are nectar feeders using *Asclepias* spp., *Campanula* spp., *Cirsium* spp., *Echinacea* spp., *Erigeron* spp., *Gaillardia* spp., *Monarda* spp., *Liatris* spp., and *Rudbeckia* spp. (Opler et al. 1995; Arnett 1997; Fritz 1997). Adult males patrol continuously when not feeding or basking, while adult females range widely and delay egg laying until late August (Royer 2001). Eggs are laid singly on or near violets (Opler et al. 1995).

This is a colonial species, but adults are highly mobile and probably require corridor or "stepping stone" habitats throughout the prairie to maintain genetic viability (Swengel and Swengel 1995; Pineda 2002).

Distribution and Status

There is no long-term monitoring program comparable to the Breeding Bird Survey for butterflies, nor are the population dynamics as well documented for prairie butterflies as for birds. However, butterflies requiring prairie habitat have clearly experienced long-term declines. The extinction wave of the regal fritillary from east to west, and the species' increasingly localized occurrence within the prairie region, are well documented (Swengel 1990). The regal fritillary was once widespread throughout the northeastern and mid-western United States, but today is largely limited to prairie remnants in the north-central plains from Montana and North Dakota south to Colorado, Nebraska, and Oklahoma.

Individuals have been confirmed in eastern Colorado north of the Arkansas River (Opler et al. 1995), but there is only one confirmed colony in Kit Carson County (Pineda and Ellingson 1997). Worn individuals have been sighted outside of the breeding season in Boulder, Douglas, El Paso, Gilpin, Jefferson, Kit Carson, Logan, Morgan, Park, Sedgwick, and Yuma Counties (Stanford and Opler 1993). The regal fritillary is the most widespread prairie butterfly, but it requires larger habitat patches or connected patches to maintain populations (Swengel and Swengel 1995).

ESA Status and Other Organizational Rankings

The regal fritillary is a U.S. Forest Service sensitive species and was formerly a C2 candidate for listing under the ESA (insufficient biological information available to support listing). It is included on the Watch List by the Missouri Department of

Conservation, and is state endangered in Wisconsin. It has a CNHP rank of G3/S1 (very rare or local throughout its range; critically imperiled in Colorado) (CNHP 2002b).

Habitat

The regal fritillary is a species of tallgrass and mixed-grass prairie, where it is found in moist meadows, marshes and wet fields (Ferris and Brown 1981; Opler et al. 1995). Adults feed on the nectar of a variety of flowers, and caterpillars require habitat that supports violets. Since violets have a short growth form, they are displaced by tallgrass species. Therefore, regal fritillary habitat must include some form of disturbance so that violets remain in sufficient density to support caterpillars.

Conservation Planning

There are no conservation plans for the regal fritillary. However, The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the regal frittilary in Colorado.

In addition, there are several sources of general management guidelines for butterflies in the plains (Moffat and McPhillips 1993; Dana 1991; Royer and Marrone 1992). The goal for managers is to strive for diversity and patchiness within and among sites when managing for prairie butterflies. Mechanical cutting or light grazing seem to be most effective at maintaining prairie habitat preferred by prairie butterflies—implying an ecosystem adaptation to herbivory (Swengel and Swengel 1995). Invasive exotics such as crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), and yellow sweet clover (*Melilotus officinalis*), many purposely introduced to increase forage for cattle, out-compete the native forbs that prairie butterflies need for adult nectar sources and larval host plants. Grazing, mowing, and small controlled burns (following surveys for concentrations of host and nectar plants) have been successfully used to manage prairie habitat for butterflies.

Direct and Indirect Effects of CDOT Actions on the Regal Fritillary

The greatest concern for potential impacts to butterflies, including the regal fritillary, is any adverse effect on host plants and nectar sources from mowing, spraying, and construction activities. Many invertebrates are host-plant specific species. ROWs on the prairie may contain more host plant and nectar source plants than surrounding landscapes that are heavily grazed. However, mowing, herbicide application, or re-seeding after construction with non-native plants may result in reduced availability of host plant and nectar sources, thereby reducing reproductive success of the butterflies. Also, grasshopper spraying in the ROW when larvae are feeding or adults are flying, or mowing while larvae are actively feeding, could lead to direct mortality of individuals.

In addition, ground disturbance that accompanies highway construction, presence of heavy equipment, and maintenance activities are usually vectors for introduction and spread of noxious weeds. Seasonal mowing (mid-spring) may be beneficial because

reduction in the growth of weedy cool season grasses will benefit the native, warm-season grasses that are used as host plants by butterflies.

CDOT activities that lower groundwater levels could negatively impact the regal fritillary by decreasing the ability of the land to support its larval and adult food plants (Nagel 1992).

Cumulative Effects

Loss and fragmentation of grasslands have a direct impact on this species, as does loss of disturbance, such as fire (Royer and Marrone 1992). Livestock grazing, if heavy, can reduce the suitability of grasslands habitat for the regal fritillary. Broad-scale insecticide applications pose a threat to the persistence of the regal fritillary in grasslands (Ostlie et al. 1997), and use of herbicides can diminish larval food (Pineda and Ellingson 1997).

Biological Determination

There may be take associated with CDOT transportation improvement projects in areas inhabited by the regal fritillary. CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the regal fritillary.

Arkansas River Feverfew (*Bolophyta tetraneuris*)

[synonym = *Parthenium tetraneuris*]
family = Asteraceae

Species Description

The Arkansas River feverfew is a low, mat-forming herb with white to pale cream-colored flowers that bloom in April and May, and produce fruit from late May through June. It is a long-lived, slow-growing plant (Spackman et al. 1997).

Distribution and Status

The Arkansas River feverfew is found in Harding County, New Mexico and in Colorado (Spackman et al. 1997). In Colorado, it is found in Chaffee, Fremont, Las Animas, and Pueblo Counties (Spackman et al. 1997). In 1983, intense surveys found the Arkansas River feverfew in 19 very small populations (Colorado Native Plant Society 1997), many along roadsides (CNHP 2000d).

ESA Status and Other Organizational Rankings

The Arkansas River feverfew has a CNHP rank of G3/S3 (vulnerable throughout its range and in Colorado) (CNHP 2002b), and it is a BLM Sensitive species in the Cañon District (Spackman et al. 1997). It was formerly a Category 2 species under the ESA.

Habitat

The Arkansas feverfew is endemic to gypsum ridges (Weber and Wittmann 1999) and barren shale or limestone cliffs and bluffs derived from the Niobrara Formation (Colorado Native Plant Society 1997; CNHP 2000d), in the Pueblo-Cañon City area of the Arkansas River Valley. It is often found in association with *Tetraneuris acaulis* (Weber and Wittmann 1999) and in communities composed of Colorado piñon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), mountain mahogany (*Cercocarpus* spp.), and frankenia (*Frankenia* spp.) (CNHP 2000d). Two other rare limestone barrens species, the round-leaf four-o'clock (*Oxybaphus rotundifolius*), and golden blazing star (*Nuttallia chrysantha*) occur in the same habitat and are often found with the Arkansas River feverfew (Spackman et al. 1997).

Conservation Planning

There are no conservation plans specifically for the Arkansas River feverfew. However, The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the Arkansas River feverfew in Colorado.

Direct and Indirect Effects of CDOT Actions on the Arkansas River Feverfew

The Arkansas River feverfew is a long-lived, slow-growing plant. Disturbance to a population may result in loss of individuals, reduced reproductivity, and potential loss of the entire population, depending on the scope and severity of the disturbance. This plant does not re-colonize easily after being disturbed (pers. comm., J. Coles; pers. comm., R. Rondeau). Road clearing, road widening, and herbicide application could extirpate local populations (pers. comm., J. Coles; pers. comm., S. Spackman).

The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 141 acres (Grunau and Lavender 2002).

Cumulative Effects

Habitat loss, primarily from limestone quarrying and urbanization, is the major threat to this species (Colorado Native Plant Society 1997).

Biological Determination

CDOT will employ BMPs, as described in Part 3 of this document, wherever transportation improvement may affect the Arkansas River feverfew. In addition, CDOT will protect and manage high-quality, occupied habitat for the benefit of the Arkansas River feverfew, in perpetuity, not less than 141 acres. However, CDOT activities may adversely affect the Arkansas River feverfew by eliminating local populations.

Arkansas Valley Evening Primrose (*Oenothera harringtonii*)

family = Onagraceae

Species Description

The Arkansas Valley evening primrose is an annual herb with an erect, well-developed, leafy stem (Spackman et al. 1997). It flowers from mid-May through June (Spackman et al. 1997). Though typically an annual, in the southern part of its range some individuals may overwinter, flowering for a second season (Wagner et al. 1985). Weber describes the species, based on garden trials, as at least a biennial or perhaps perennial (Weber and Wittmann 1999).

Distribution and Status

The Arkansas Valley evening primrose is endemic to the Arkansas River drainage in Colorado (Weber and Wittmann 1999). It has been found in El Paso, Fremont, Huerfano, Las Animas, Pueblo and Otero Counties (Spackman et al. 1997). Ten occurrences (two historical) have been documented (Spackman 1996).

ESA Status and Other Organizational Rankings

The Arkansas Valley evening primrose has a CNHP rank of G2/S2 (globally imperiled; imperiled in Colorado) (CNHP 2002b).

Habitat

The Arkansas Valley evening primrose grows on compacted silty clays, looser rocky soils, and sandy soils in open grasslands (Wagner et al. 1985), especially shortgrass prairie, within an elevational range of 1,433-1,859 meters (Spackman et al. 1997).

Conservation Planning

There are no conservation plans specifically for the Arkansas Valley evening primrose. However, The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the Arkansas Valley evening primrose in Colorado.

Direct and Indirect Effects of CDOT Actions on the Arkansas Valley Evening Primrose

Almost all known occurrences of the Arkansas Valley evening primrose are along roads (pers. comm., S. Spackman). Herbicide spraying, road widening, and growing-season mowing would be particularly harmful to this species (pers. comm., S. Spackman).

Cumulative Effects

Very little is understood about why this plant is rare. Although loss of habitat may be an important issue, there are probably numerous other factors to consider, including change in grazing regime, change in pollinators, and change in disturbance regime. The Arkansas Valley evening primrose is not known from high quality natural habitats, and is found primarily along roadways (pers. comm., S. Spackman).

Biological Determination

CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the Arkansas Valley evening primrose. However, CDOT activities may adversely affect the Arkansas Valley evening primrose by eliminating local populations.

Golden Blazing Star (*Nuttallia chrysantha*)

[synonym = *Mentzelia chrysantha*]
family = Loasaceae

Species Description

The golden blazing star is an upright, branched herb that flowers in the early evening, from mid-July through early September, and fruits from late August through early September (Spackman et al. 1997; Weber and Wittmann 1999). Flowers are 10-petaled and golden yellow.

Distribution and Status

The golden blazing star is a Colorado endemic. Its global range comprises approximately 50 miles of the Arkansas River Valley in Fremont and Pueblo Counties between Cañon City and Pueblo (Spackman et al. 1997).

There have been 14 reported occurrences of the golden blazing star in the two counties: two from 1874 and 1921, and the rest since 1990 (CNHP 2000a). Of the 12 recent occurrences, one is on private land, two in the Garden Park Registered Natural Area, one in the Pueblo Reservoir Recreational Area, and three in highway ROWs (CNHP 2000a).

ESA Status and Other Organizational Rankings

The golden blazing star has a CNHP rank of G1G2/S1S2 (Critically imperiled globally because of extreme rarity; critically imperiled in Colorado) (CNHP 2002b). It is a BLM sensitive species, and was formerly a Category 2 species for listing.

Habitat

The golden blazing star is narrowly endemic and is known only from chalk, gypsum, and limestone outcrops along the Arkansas River in Pueblo and Freemont Counties (Spackman et al. 1997; Weber and Wittmann 1999). These sites, on barren, eroding slopes of the Niobrara shale in the Arkansas River Valley, are rich in calcite or gypsum; are unusually hot and dry; and are stressful but low competition sites for species that can tolerate the conditions (Kelso 1999). These conditions often occur on highway ROWs in Pueblo and Freemont Counties.

Two other rare limestone barrens species, the Arkansas River Feverfew (*Bolophyta tetraneuris*), and the round-leaf four-o'clock (*Oxybaphus rotundifolius*), occur in the same habitat, and are often found with the golden blazing star (Spackman et al. 1997).

Conservation Planning

There are no conservation plans specifically for the golden blazing star. There are only two protected populations of the plant, both in the Garden Park Registered Natural Area. The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the golden blazing star in Colorado.

Direct and Indirect Effects of CDOT Actions on the Golden Blazing Star

Road widening, mowing (especially in late August through September when the plant is blooming), and pesticide use can all have negative impacts on the golden blazing star. This species does not transplant well. Re-seeding disturbed areas may be a viable mitigation alternative, but it is very important not to decimate the original seed source population. This species is not abundant, and seed availability is limited. Seed harvest would need to be restrained so as not to deplete the soil seed bank in remaining populations (pers. comm., T. Kelso; pers. comm., J. Coles).

Cumulative Effects

Because this plant has a narrow distribution and occurs along roads, activities in the ROWs where it occurs, including widening, growing-season mowing, and herbicide application, will have adverse effects on the golden blazing star.

Biological Determination

CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the golden blazing star. However, CDOT activities may adversely affect the golden blazing star by eliminating local populations.

Pueblo Goldenweed (*Oönopsis puebloensis*)

family = Asteraceae

Species Description

The Pueblo goldenweed is a recently described perennial subshrub with yellow ray and disk flowers that bloom in July (CNHP 1996; Spackman et al. 1997).

Distribution and Status

The Pueblo goldenweed is a Colorado endemic, occurring only in Fremont and Pueblo counties (Spackman et al. 1997; CNHP 2000c).

ESA Status and Other Organizational Rankings

The Pueblo goldenweed has a CNHP rank of G1G2/S1S2 (critically imperiled globally; critically imperiled in Colorado) (CNHP 2002b).

Habitat

The Pueblo goldenweed is found on barren outcrops of shale of the Niobrara Formation in sparse shrublands or piñon-juniper woodlands at an elevations range of 4800-5500 feet (Spackman et al. 1997), as well as on shortgrass prairie swales where soils are silty and often hold water longer than in surrounding areas of shortgrass prairie (pers. comm., R. Rondeau). These conditions are found along roadsides in Fremont and Pueblo Counties, and also in non-roadside settings.

Conservation Planning

There are no conservation plans specifically for the Pueblo goldenweed. The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the Pueblo goldenweed in Colorado.

Direct and Indirect Effects of CDOT Actions on the Pueblo Goldenweed

The population of Pueblo goldenweed that occurs at the intersection of State Highways 50 and 115 is currently being affected by CDOT and utility maintenance activities (pers. comm., J. Coles). Road widening, mowing, or pesticide use could all have negative impacts on the Pueblo goldenweed. The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 82 acres (Grunau and Lavender 2002).

Cumulative Effects

The Pueblo goldenweed is threatened by mining for cement products, residential expansion, and increased recreation use from off road vehicles (CNHP 2000c).

Biological Determination

CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the Pueblo goldenweed. In addition, CDOT will protect and manage high-quality, occupied habitat for the benefit of the Pueblo goldenweed, in perpetuity, not less than 82 acres. However, CDOT activities may adversely affect the Pueblo goldenweed by eliminating local populations.

Round-leaf Four O'clock (*Oxybaphus rotundifolius*)

[synonym = *Mirabilis rotundifolia*]
family = Nyctaginaceae

Species Description

The round-leaf four-o'clock is a bushy, branching herb. It has round, thick, leathery basal leaves that are shed early in the growing season, and are usually not present when the plant blooms (Colorado Native Plant Society 1997; Spackman et al. 1997). It blooms from early to mid-June and has magenta, trumpet-like, tubular flowers that open before dawn and remain open until mid morning (Colorado Native Plant Society 1997; Spackman et al. 1997). Pollination may be by bees and moths, or it may self- pollinate; seeds might be dispersed by wind (CNHP 2000b).

Distribution and Status

The round-leaf four-o'clock is a Colorado endemic restricted to limestone outcrops of the Niobrara Formation in Fremont and Pueblo Counties, in the Arkansas River Valley, between Pueblo and Cañon City (Spackman et al. 1997). It has also been found on the U.S. Army's Piñon Canyon maneuver site in the Purgatoire River drainage (Colorado Native Plant Society 1997).

ESA Status and Other Organizational Rankings

The round-leaf four-o'clock has a CNHP rank of G2/S2 (imperiled globally; imperiled in Colorado) (CNHP 2002b). It was formerly a Category 2 species under the ESA.

Habitat

The round-leaf four-o'clock is found only on sedimentary soils of the Arkansas and Purgatoire River drainages, barren shale outcrops of the Niobrara Formation (Spackman et al. 1997), gypsum soils (Weber and Wittmann 1999), or limestone outcrops of the Niobrara Formation (Colorado Native Plant Society 1997). It is commonly found in association with Frankenia (*Frankenia* ssp.), Juniper (*Juniperus* spp.), pinyon pine (*Pinus edulis*), and saltbush (*Atriplex* spp.) (O'Kane 1988). It is also found associated with Arkansas River feverfew, Indian millet (*Oryzopsis hymenoides*), buckwheat (*Eriogonum fendlerianum*), paperflower (*Zinnia grandiflora*), broom snakeweed (*Gutierrezia sarothrae*), and golden blazing star (Spackman et al. 1997; CNHP 2000b).

Conservation Planning

There are no conservation plans specifically for the round-leaf four-o'clock. The Nature Conservancy (1998) developed a conservation plan for the Central Shortgrass Prairie ecoregion that identified areas important for the conservation of native populations of the round-leaf four-o'clock in Colorado.

Direct and Indirect Effects of CDOT Actions on the Round-leaf Four-o'clock

Road widening, mowing, or pesticide use could all have negative impacts on the round-leaf four-o'clock (pers. comm., T. Kelso; pers. comm., S. Spackman). The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 117 acres (Grunau and Lavender 2002).

Cumulative Effects

The primary threats to persistence of the round-leaf four-o'clock are limestone mining for use in cement and the expansion of suburbs west of Pueblo (O'Kane 1988; Colorado Native Plant Society 1997).

Biological Determination

CDOT will implement BMPs, as described in Part 3 of this document, wherever transportation improvement projects may affect the round-leaf four-o'clock. In addition, CDOT will protect and manage high-quality, occupied habitat for the benefit of the round-leaf four-o'clock, in perpetuity, not less than 117 acres. However, CDOT activities may adversely affect the round-leaf four-o'clock by eliminating local populations.

PART 3: Conservation Strategy

The purpose of this Conservation Strategy (Strategy) is to describe actions that will be taken to offset impacts to federally-listed threatened and endangered prairie species, as well as sensitive declining prairie species, from the Colorado Department of Transportation's (CDOT) full suite of transportation improvements and routine maintenance on existing transportation corridors of eastern Colorado and off-system bridge improvements over the next 20 years. This section details on-site Best Management Practices (BMPs), and presents some sample land protection projects that could, if implemented, meet offsite mitigation requirements.

CDOT anticipates that these conservation measures for currently listed species, as well as those previously described target species that may be listed in the future, will be in effect in perpetuity. These conservation measures will satisfy CDOT's and FHWA's section 7 consultation requirements for listed species, and may satisfy future section 7 consultation requirements for target species should they become listed in the future, over the 20 years following acceptance of this Biological Assessment and Conservation Strategy, and issuance of a Biological Opinion by the U.S. Fish and Wildlife Service (USFWS).

CDOT, FHWA, USFWS, Colorado Department of Natural Resources (DNR), Colorado Division of Wildlife (CDOW), and The Nature Conservancy (TNC) entered into a Memorandum of Agreement (Shortgrass Prairie Initiative MOA 2001) "to effect regional conservation of declining species on Colorado's Eastern Plains by providing proactive advance conservation of priority habitats for multiple species and … [to] allow CDOT and FHWA to address compliance under the ESA for listed species, and for declining species that may become listed." CDOT and FHWA's goals are: 1) proactive conservation of declining species in the Central Shortgrass Prairie (CSP) ecoregion of Colorado; 2) compensation for potential impacts to these species from transportation improvements on the existing transportation corridor network; and 3) improved efficiency and effectiveness of environmental assessments associated with CDOT projects in eastern Colorado over the next 20 years.

Discussions with recognized experts in each taxonomic group of species led to an approach focused on off-site mitigation of impacts for most of the terrestrial species subject to the agreement. For aquatic species (fish, amphibians, and mollusks) and some of the more range-restricted species (the butterflies and some plants), programmatic Best Management Practices (BMPs) were designed to compensate for impacts on-site. Experts acknowledged that the CDOT ROW currently functions as degraded and less than desirable habitat for most species due to current management practices and the proximity to fast-moving vehicles. However, the site-specific quality of the habitat along state and federal ROWs was not assessed. CDOT agreed to consider land within the specific species' range and the impact zones determined by species experts as potential habitat, and to compensate for loss of this habitat with the permanent protection of high quality, off-site habitat, which could contribute to the conservation of viable communities, and species recovery and trend reversal in perpetuity. CDOT was willing

to invest in conservation based on "presumed presence" in suitable habitat types within species' ranges. High quality conservation areas that currently provide (or that could be managed to provide in the future) habitat to viable communities of target species were identified according to the process set out in the MOA.

The partners only inquired about potential projects with willing participants in identified high priority conservation areas as determined by the CDOW, TNC, the Rocky Mountain Bird Observatory, and the Natural Resources Conservation Service and USFWS Partners for Wildlife Program. This advance mitigation approach was developed with the intent that Federal-aid projects will reimburse the state for mitigation credits as they are used (MOA 2001). CDOT intends to issue an RFP seeking acquisition and management in perpetuity of real property interests in habitat that meets the goals and criteria outlined in the conservation strategy. As of this writing, USFWS has been working internally on guidance for conservation banking for some time, and though drafts were shared with the team, ultimately USFWS only issued guidance for programmatic consultation for transportation projects. This BA and the associated Conservation Strategy follow those guidelines.

CDOT and FHWA's Approach to Ecosystem Wide Needs and Species Recovery

This project focuses on the Colorado portion of the Central Shortgrass Prairie ecoregion as modified by TNC (1998) from Bailey et al. (1994). For the purposes of this project, TNC's CSP boundary was further modified to include all segments of Interstate 25 within Colorado. The total project area includes the entire eastern prairie in Colorado (~27,520,863 acres), and has a western boundary roughly coincident with Interstate 25 (Figure 1). It is dominated by shortgrass, mixed-grass, and sandsage prairie spread across rolling plains, tablelands, canyons, badlands, and buttes (TNC 1998).

Because the prairie ecosystem is considered one of the most imperiled ecosystem types in North America (Samson and Knopf 1996a), CDOT and FHWA seek to proactively conserve declining prairie species and habitats in a holistic manner. Current practices are typically project-by-project evaluations, and species-by-species reports and consultation. This approach often results in inefficient use of resources and a piecemeal approach to mitigation. CDOT, FHWA, and the resource agencies and organizations consulted throughout the process agreed that a large-scale approach to impact assessments and a comprehensive conservation strategy would result in improved management of high quality priority habitats, and would make a more effective contribution to the recovery of declining species.

Development of Conservation Measures

Analysis of Potential Impacts

There were three components to the analysis of potential impacts: 1) selection of target species, 2) expert review of species range/distribution, discussion of possible impacts from CDOT activities, and definition of potential impact zones and generally appropriate mitigation (i.e., off-site or on-site habitat mitigation and whether connectivity considerations were a factor), and 3) GIS calculations of acres of potential impact based on defined impact zones. The impact analysis was conducted using a geographic information system and the best available scientific data, in conjunction with expert review, so that the widest set of existing knowledge could be incorporated. The core project team consulted with experts in each taxonomic group (amphibians and reptiles, birds, fish, mammals, invertebrates, and plants) to help select target species, to refine existing range/distribution data, and to guide development of impact zones and generally appropriate mitigation types. Impact zones were used to calculate acreage of potential impact for each species (i.e., impact area was conservatively defined as anything in the zone that could be potentially impacted by CDOT projects, regardless of the quality of the habitat, or whether or not the target species are actually present in the area). Results were edited to represent only suitable habitat within the range of each species, and then combined to eliminate redundancy in reporting.

The experts agreed that the primary impact of concern across most taxonomic groups was permanent habitat loss, and that the impact zone for all of the terrestrial species was likely to be limited to an area approximating the right-of-way. There was general consensus among the experts consulted that potential impacts from routine maintenance activities are probably temporary, and can be minimized through the use of BMPs[1]. However, construction projects that result in permanent habitat loss should be mitigated. Therefore, the most appropriate conservation strategy to mitigate potential impacts to terrestrial species (i.e., birds, mammals, reptiles, and plants) is permanent habitat protection through the purchase of real property interests, and management of acquired property interests for the benefit of the targeted species, native ecosystems, and native ecosystem processes.

Based on available data and consultation with experts, the core project team concluded that, for some species, on-site conservation measures would be more effective in offsetting potential impacts from transportation improvement projects than off-site habitat protection. By nature, hydrologic settings are fundamentally different than terrestrial settings. Because water moves through a landscape in several different ways,

[1] State-funded maintenance is not subject to the ESA Section 7 consultation process, as no federal action occurs. However, CDOT is committed to increased training for maintenance staff and better management of the ROW for wildlife, such as reducing mowing of the ROW to one mower width (maximum of 22 feet) from the edge of pavement in rural areas. It should be noted, however, that some species experts thought it was not desirable to maintain the ROW for wildlife, as it could unnecessarily increase species mortality. Management that attracts wildlife to a "hazard zone" from traffic may result in no net population gain, and possibly net losses.

impacts are potentially distributed over a larger area, indirect impacts may be more difficult to detect, and it is more difficult to determine an accurate spatial measure of the distribution of impacts. Also, in some cases, targeted species (especially fish) are restricted to certain drainages, and may not benefit from protected habitat elsewhere. According to information provided by CDOW, most of the targeted fish species are restricted to stretches of the mainstems of the Arkansas River or the South Platte River, and/or to relatively isolated and disjunct reaches of tributaries. The core project team decided that it would not be feasible to develop a large-scale habitat protection project that would adequately offset impacts to all these species, and that land protection per se would not be an adequate tool to conserve many lotic habitats of fish species. Because of the complexities inherent in Colorado water rights laws and practices, control over the management of surrounding lands would not necessarily include control over water in a stream. Furthermore, the primary concern regarding potential impacts to fish species from transportation improvements was creation of permanent barriers in the streams and reduction in water quality, not habitat loss. Similarly, the primary concerns expressed by the experts regarding potential impacts to amphibian species from transportation improvement projects were alteration to local hydrology and increased direct mortality (e.g., from mowing, roadkill, etc.). The primary concern regarding potential impacts to mollusk species was possible reduction in water quality (especially related to bridgework) and loss of permanent water sources. Therefore, the core project team concluded that the most appropriate conservation strategy for fish, amphibian, and mollusk species would be use of BMPs and other on-site conservation measures to avoid, minimize and offset impacts to aquatic habitats.

According to the best available data, the interior least tern and piping plover are restricted in occurrence within Colorado to a few specific reservoirs in the southeastern corner of the state. Additional consultation with experts and field refinement of presumed presence for these species revealed little likelihood that transportation improvements would directly impact existing nesting habitat for these species. The only potential for impact to these species was identified as the potential for disruption of surface flows or groundwater movement in feeding habitat if any roads were to be widened in the vicinity of nesting habitat. The extremely limited distribution of these species within the project area, the lack of available habitat for off-site mitigation, and the fact that experts considered likelihood of impact to be very low suggest that on-site conservation measures would be more appropriate than off-site habitat protection for these birds.

The greatest concern expressed by experts for potential impacts to butterflies from transportation improvements was any adverse effect on host plants and nectar sources in the ROW from mowing, spraying, and construction activities. Comments from experts suggested that these potential impacts could be readily avoided or minimized through seasonal restrictions on mowing and spraying and using native plants during post-construction re-seeding.

The only feasible approach for three of the targeted plant species is use of on-site conservation measures. There is only one documented extant occurrence of the Colorado butterfly plant in Colorado. This occurrence is located in a wetland area downstream

from I-25. There is potential for transportation improvement projects to adversely affect this site, and there are no other known sites that could be protected to offset potential impacts. The Arkansas Valley evening primrose is no longer known from high quality natural habitats. Almost all of the known occurrences are along roadways. Similarly, the majority of known occurrences of the golden blazing star are found within existing ROWs. Therefore, the most appropriate conservation strategy for these plants is avoidance to the maximum extent practicable, and the application of BMPs and other *in situ* conservation measures where necessary.

Habitat-based approach

The ultimate goal of the Shortgrass Prairie Initiative project is to contribute to strategic, long-term conservation of declining prairie species. The project area is regional in scale, and is characterized by vegetation patterns that shift across the landscape over time in response to climatic conditions and management/land use. In addition, many of the targeted species are quite vagile within ranges that encompass the entire project area, and may move in response to local conditions such as weather and grazing intensity. Therefore, the conservation strategy must address both temporal and spatial scales, and the propensity of species to move and utilize different places over time. Large-scale conservation of viable habitats that have a reasonable expectation of being occupied was chosen as the best way to achieve this objective.

In contrast to the above-described habitat approach, and given the dynamic nature of the vegetation mosaic and occupied/unoccupied habitat, an occurrence-based approach alone may fail to achieve conservation goals regardless of effort, due to incompatible management objectives within the landscape context. A habitat-based approach offers a better chance for long-term conservation success because large-scale protection of habitats can be achieved within a landscape context that is managed for the target species. Furthermore, as loss of habitat is thought to be an important (in some cases, *the* most important) reason for decline of some shortgrass prairie species, a habitat-based approach to conservation will make a measurable contribution to abatement of this significant threat. Thus, a large-scale, habitat-based approach is the foundation of the conservation strategy presented in this document.

This conservation strategy is based upon the acquisition of property rights (especially conservation easements) over high-quality habitat blocks that: a) contribute to the integrity of populations of targeted species, and b) allow use of an appropriate suite of management tools (e.g., prescribed fire, grazing regimes) to achieve conservation objectives, and c) are located where conservation in perpetuity is most likely to be achieved (i.e., either adjacent to other permanent conservation areas, or large enough to achieve this effect in and of themselves). Identification, protection, and management of high-quality habitat for targeted species will achieve the following:

- Predictability of species conservation – protection of habitats addresses both spatial and temporal scale issues in a predictable way.

- Conservative approach – estimating the acreage of potential impact (and therefore, the acreage of mitigation) using a habitat-based approach yields a more conservative result than an analysis based on species occupancy alone (i.e., occupied habitat only).

A conservation effort that focuses on occurrences and project-scale habitat may be considered successful under a project-by-project consultation process, but may be less successful in terms of contributing to long-term persistence of viable populations – the goal of this conservation strategy. High quality habitat within an appropriate landscape context is a widely accepted indicator of species occurrence and viability. In addition, the potential conservation areas featured in this document incorporate commonly accepted reserve design principles, which also increase the integrity of populations. Finally, the likelihood of long-term persistence of species/populations is increased by virtue of the fact that all the potential conservation areas were identified as high priority conservation areas (based on known species occupancy) by the interagency Conservation Site Identification Panel and cooperating non-profit conservation entities, and are in areas identified as global priorities by The Nature Conservancy. These criteria increase the probability that the chosen sites will have tangible, lasting conservation impact.

Mitigation focuses on two key issues related to viability. The team aimed to identify conservation areas where habitat would be protected and maintained to support one or more viable populations of targeted species. However, the number of acres potentially impacted by CDOT (and therefore, the acres of mitigation required) may not, in many cases, be adequate to protect viable populations of target species (i.e., some species such as bald eagles range over a wider area). In such cases, the strategy is to mitigate habitat loss through land protection such that the conservation area maximizes the contribution to the viability of the targeted species, and does not simply meet the mitigation needs. Similarly, properties that are available for conservation action are of variable size and were selected for greatest contribution to the size, condition, and landscape context of the target habitat types and species.

It should be noted that the rare plants that are targeted for conservation in this strategy represent an exception to the habitat-based approach that is employed for the animal species. These plants are very edaphic (i.e., tightly correlated with a specific rare geological substrate), and are narrow endemics. The majority of known occurrences for some of these species are along roadsides. Because there are few high-quality occurrences documented from natural habitats, opportunities for protection of habitat for these plants are extremely limited. Therefore, for plant species, the conservation strategy is occurrence-based.

Species Considered in this Strategy

Habitat for these species is targeted for **off-site mitigation** (land protection):

<u>Birds</u>		
Bald Eagle	*Haliaeetus leucocephalus*	Federal threatened
Burrowing Owl	*Athene cunicularia*	Colorado threatened
Cassin's Sparrow	*Aimophila cassinii*	

Ferruginous Hawk	*Buteo regalis*	Colorado special concern
Lark Bunting	*Calamospiza melanocorys*	
Lesser Prairie Chicken	*Tympanuchus pallidicinctus*	Federal candidate
Loggerhead Shrike	*Lanius ludovicianus*	Colorado special concern
Long-billed Curlew	*Numenius americanus*	Colorado special concern
McCown's Longspur	*Calcarius mccownii*	
Mountain Plover	*Charadrius montanus*	Federal proposed

Mammals

Black-tailed Prairie Dog	*Cynomys ludovicianus*	Federal candidate

Reptiles

Massasauga Rattlesnake	*Sistrurus catenatus*	Colorado special concern
Texas Horned Lizard	*Phrynosoma cornutum*	Colorado special concern
Western Box Turtle	*Terrapene ornata*	

Plants

Arkansas River Feverfew	*Bolophyta tetraneuris*	
Pueblo Goldenweed	*Oonopsis puebloensis*	
Round-leaf Four-o'clock	*Oxybaphus rotundifolia*	

These species are targeted for **Best Management Practices** and other on-site mitigation techniques:

Amphibians

Northern Cricket Frog	*Acris crepitans*	Colorado special concern
Northern Leopard Frog	*Rana pipiens*	Colorado special concern

Birds

Interior Least Tern	*Sterna antillarum athalassos*	Federal endangered Critical habitat identified Colorado endangered
Piping Plover	*Charadrius melodus*	Federal threatened Colorado threatened

Fish

Arkansas Darter	*Etheostoma cragini*	Federal candidate
Brassy Minnow	*Hybognathus hankinsoni*	Colorado threatened
Common Shiner	*Notropis cornutus*	Colorado threatened
Flathead Chub	*Hybopsis gracilis*	Colorado special concern
Plains Minnow	*Hybognathus placitus*	Colorado endangered
Plains Topminnow	*Fundulus sciadicus*	Colorado special concern
Southern Redbelly Dace	*Phoxinus erythrogaster*	Colorado endangered
Suckermouth Minnow	*Phenacobius mirabilis*	Colorado endangered

Insects—Butterflies		
Arogos Skipper	*Atrytone arogos*	
Hops Feeding Azure	*Celastrina humulus*	
Ottoe Skipper	*Hesperia ottoe*	
Regal Fritillary	*Speyeria idalia*	
Mollusks		
Cylindrical Papershell	*Anodontoides ferussacianus*	
Giant Floater	*Anodonta grandis*	
Plants		
Arkansas Valley Evening Primrose	*Oenothera harringtonii*	
Colorado Butterfly Plant	*Gaura neomexicana* ssp. *coloradensis*	Federal threatened
Golden Blazing Star	*Nutallia chrysantha*	

Habitat Types[2]

There are five major habitat types that comprise the CSP ecoregion, and that are the focus of the off-site habitat protection component of this conservation strategy: shortgrass prairie, mixed-grass prairie, shrublands, riparian, and juniper communities (including juniper woodlands and juniper breaks).

Shortgrass

Shortgrass prairie occurs primarily in the western Great Plains from southern Canada to northern Mexico on a flat to rolling upland landscape. The dominant species are *Bouteloua gracilis* (blue grama) and *Buchloe dactyloides* (buffalograss), but midgrasses may co-dominate in some areas. Blue grama grass is extremely tolerant of grazing and drought, and may increase in abundance with increased grazing. Midgrass and shortgrass alternate on the landscape in response to climatic and management conditions (Weaver 1968). Numerous other graminoids and forbs may be present, as well as scattered shrubs in some areas.

Species targeted for off-site mitigation that rely upon this habitat type are: bald eagle, burrowing owl, ferruginous hawk, lark bunting, long-billed curlew, McCown's longspur, mountain plover, black-tailed prairie dog, massasauga rattlesnake, Texas horned lizard, western box turtle, and Pueblo goldenweed.

Mixed-grass

Mixed-grass prairie occurs in a north-south band from South Dakota to Texas, between the shortgrass prairie that occurs to the west and the tallgrass prairie found to the east.

[2] Unless cited otherwise, habitat descriptions for shortgrass, mixed-grass, shrub, and juniper woodlands are summarized from NatureServe 2002. The habitat description for riparian is summarized from Menard and Kindscher 2002.

The mixed-grass prairie ecological system contains elements of both shortgrass and tallgrass systems. Plant species present are determined primarily by soil moisture and topography, but grazing and fire are important ecological processes as well. Grasses present in mixed-grass prairie include western wheatgrass (*Pascopyrum smithii*), little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), needle-and-thread grass (*Stipa comata*), prairie dropseed (*Sporobolus heterolepis*), big bluestem (*Andropogon gerardii*), and blue grama (*Bouteloua gracilis*) (Menard and Kindscher 2002). Forbs are common, but typically represent less than 10 percent cover. Scattered shrubs may be present, including fringed sage (*Artemesia frigida*), *Gutierrezia* spp., chokecherry (*Prunus virginiana*), smooth sumac (*Rhus trilobata*), snowberry (*Symphoricarpos occidentalis*), and *Rosa* ssp. Midgrass and shortgrass alternate on the landscape in response to climatic and management conditions (Weaver 1968).

Species targeted for off-site mitigation that rely upon this habitat type are loggerhead shrike and McCown's longspur.

Shrub

Prairie shrublands occur across the prairie in various patch sizes, ranging from several acres up to 100,000 acres. Shrublands include numerous vegetation types, including sandsage shrublands, four-winged saltbush shrublands, rabbitbrush shrublands, greasewood shrublands, and yucca shrublands. The driving factors for the different vegation types are typically soils and climatic conditions. In general, sandy soils are dominated by sandsage (*Artemisia filifolia*), while silty soils often support four-winged saltbush, and clays or loams are typically dominated by greasewood. The most important climatic condition is precipitation. This is important for greasewood shrublands, where water availability is related to local precipitation. Greasewood shrublands are the only type of shrubland that requires groundwater within one to 1.5 meters below the surface. Groundwater is not a dominant factor in the distribution of other shrubland types. Yucca shrublands can occur on nearly any type of soil, and may be, in some cases, a reflection of grazing history in combination with climate. Although grazing may impact shrub composition, it has more of an impact on the forb understory. Rabbitbrush may occur in any soil type, and is often associated with other shrub types such as sandsage or greasewood.

Species targeted for off-site mitigation that rely upon this habitat type are: Cassin's sparrow, lesser prairie-chicken, and loggerhead shrike. Target species that use this habitat type are: massasauga rattlesnake, Texas horned lizard, and western box turtle.

Riparian

Great Plains riverine systems are found in the floodplains of medium and large rivers. Alluvial soils and periodic, intermediate flooding (every 5-25 years) are typical. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats, and are linked by underlying soils and the flooding regime. Tamarisk can invade degraded areas within the floodplains, especially in the western Great Plains. Riparian areas are often subjected to heavy grazing and/or agriculture use, and can be heavily degraded in some areas. In some cases, the majority of the wet

meadow and prairie communities may be extremely degraded or extirpated from the system. Wooded draws and ravines are typically found associated with permanent or ephemeral streams and small rivers. These communities may occur on steep northern slopes or within canyon bottoms that do not experience periodic flooding, but where soil moisture and topography allow greater than normal moisture conditions compared to the surrounding areas.

Species targeted for off-site mitigation that rely upon this habitat type are: bald eagle. With the exception of the reptiles, all of the target species may use riparian habitat at certain times in their life cycle.

Juniper Woodlands

This habitat type occurs in the southwestern United States on dry sites on mesas, mountains, foothills, canyons, plateaus and plains. Stands tend to occur on north-facing slopes at low elevations, and on south-facing slopes at higher elevations. Soils range from sandy loam to clay, and are usually shallow, rocky, calcareous and alkaline. Stands range from moderately sparse to moderately dense. The understory is usually sparse and patchy. Succulents and perennial graminoids are usually present. Shrubs and annual forbs/grasses may be present as well. This habitat type is extremely drought-tolerant. Response to fire varies according to tree height and density, fine fuel load, weather, and season. The quality of juniper woodland sites is affected by altered fire regimes, wood cutting, and incompatible grazing.

Species targeted for off-site mitigation that use this habitat type are: Cassin's sparrow, loggerhead shrike, Arkansas River feverfew, and round-leaf four-o'clock.

Conservation Measures to Address Permanent Habitat Loss

Grasslands have been identified as the most imperiled ecosystem type in North America (Samson and Knopf 1996a), as they have been converted to agriculture, pastureland, and development. Following directly from habitat conversion and degradation is the decline of many species that co-evolved with the grasslands. In the CSP, 58 species are endemic, declining or disjunct in their distribution, another 54 species are considered globally imperiled and, of these, 10 are listed under the ESA, one is proposed for listing, and six are candidates for listing (TNC 1998).

Habitat loss, fragmentation, and degradation are recognized as the primary threats to the persistence of most species dependent on the shortgrass prairie (Lauenroth 1979; Hammerson 1986; Clausen et al. 1989; Wake 1991; Dobkin 1994; Opler 1995; Nesler et al. 1997; Sidle and Faanes 1997). Extensive loss of habitat resulting from grasslands converted to crops, planted to pasture, and loss of native herbivore populations has been identified as the primary cause for the decline of neotropical migrant landbird species endemic to the North American shortgrass prairie (Dobkin 1994; Knopf 1996b). In general, loss of habitat and degradation of habitat have been identified as having the largest impact on amphibian species (Jennings and Hayes 1994; McDiarmid 1995).

Habitat degradation and loss in the form of reduced stream flows due to irrigation and urban water projects, increased turbidity from agricultural runoff, pollution from agricultural and urban development, and stream channelization and reservoir construction have been implicated in native fish and mussel declines (Clausen et al. 1989; Williams and Neves 1995; Nesler et al. 1997; Sidle and Faanes 1997).

CDOT has taken the importance of loss of habitat into consideration in planning its maintenance and upgrade activities in Colorado's shortgrass prairie over the next 20 years. In addition to mitigating the temporary effects of maintenance through use of BMPs, CDOT is proposing to conserve several large tracts of high quality habitat in Colorado's CSP, meeting or exceeding mitigation requirements of 15,160 acres, for select rare, sensitive and declining species that may be impacted by CDOT's projects.

This strategy will directly benefit the black-tailed prairie dog and species dependent on prairie dogs, their burrows, or prairie dog modified habitat. Black-tailed prairie dogs are of particular concern in this strategy because this species, more than any other target species, faces limited opportunities for conservation in Colorado due to persistent and sustained eradication efforts. This Conservation Strategy will also benefit bald eagles, burrowing owls, ferruginous hawks, lark buntings, loggerhead shrikes, long-billed curlews, McCown's longspurs, mountain plovers, massasauga rattlesnakes, Texas horned lizards, and western box turtles. Other targeted species benefiting from this strategy are Cassin's sparrow, lark bunting, lesser prairie-chicken, Arkansas River feverfew, Pueblo goldenweed and the round-leaf four-o'clock. Some species that were not target species (i.e., were not deciding factors in locating conservation areas) will also benefit from this conservation strategy, including: Swainson's hawk (*Buteo swainsoni*), prairie falcon (*Falco mexicanus*), grasshopper sparrow (*Ammodramus savannarum*), chestnut-collared longspur (*Calcarius ornatus*), swift fox (*Vulpes velox*), eastern spotted skunk (S*pilogale putorius*), longnose snake (*Rhinocheilus lecontei*), ground snake (*Sonora semiannulata*), triploid Colorado checkered whiptail (*Cnemidophorus neotesselatus*), mottled dusky wing butterfly (*Erynnis martialis*), simius roadside skipper butterfly (*Amblyscirtes simius*), two-spotted skipper butterfly (*Euphyes bimacula*), Colorado blue butterfly (*Euphilotes rita coloradensis*), and the Colorado green gentian (*Frasera coloradensis*).

The proposed conservation strategy is to offset permanent habitat loss through large-scale habitat protection. During a 20-year time period (i.e., the amount of time covered by this project), the maximum percent of existing transportation corridors within Colorado's Central Shortgrass Prairie anticipated to undergo construction of safety, re-construction, or capacity improvements (and thus potentially lead to permanent habitat loss) is estimated by CDOT at 22 percent. This estimate is based on estimated funding levels as of 2000 and 2001, and the amount of time required to complete construction projects. Therefore, "maximum potential impact" was determined to be 22 percent of the number of acres of presumed presence within the impact zone for each species. (If larger than expected future budgets allow CDOT to undertake reconstruction and capacity improvements on more than 22 percent of the existing network, extension or renewal of this agreement would be required.) Once the maximum potential impact was calculated for each species, impact zones for each species were overlaid to subtract overlap among

species (i.e., to account for areas providing potential habitat for multiple species). When redundancy in reporting is eliminated, the maximum amount of CSP habitat for targeted species that is subject to potential habitat loss is 15,160 acres.

The plant species targeted for off-site habitat protection are extremely rare, and are limited in range and distribution to a very discrete area that has been fairly well surveyed. Therefore, potential impacts were calculated based on known locations, and mitigation lands were identified using the same criterion.

For the terrestrial animal species targeted for off-site habitat protection, acres of potential impact were calculated using CDOW's GAP[3] vegetation types to represent suitable habitat and potential presence. Estimates of impact and the approach to mitigation were as conservative as possible. No distinction was made between occupied habitat and unoccupied habitat. The impact analysis was based on "presumed presence" – in other words, the analysis assumed that all suitable habitat was occupied. The same weight of importance was given to unoccupied habitat as to occupied habitat, and therefore, has likely overestimated the real potential impact to species by a substantial degree.

Likewise, the quality of habitat within the CDOT ROW was not evaluated, though experts agreed that, in general, such habitats are relatively degraded by current CDOT maintenance practices. Most experts agreed that the ROW should be not be maintained in ways that attract or support wildlife, due to the danger of increased mortality from fast-moving vehicles. The impact analysis and the conservation strategy are conservative in approach, in that potential impacts to presumably degraded habitat are being compensated by protection in perpetuity of high quality habitat, that is within a good landscape context, and that is currently being used (or can be used) by target species. Therefore, the conservation strategy is overestimating impacts and conserving higher quality habitats than those potentially being impacted, and adaptively managing for species protection in perpetuity.

Once the maximum acres of potential impact were calculated, all vegetation types representing suitable habitat for targeted species were grouped into habitat types for mitigation. Each GAP vegetation type within the impact zone and its corresponding mitigation habitat type are presented in Table 7. The potential impacts for each vegetation type are presented in Table 8.

Site Selection Process

The Memorandum of Agreement (MOA Shortgrass Prairie Initiative 2001) established a Conservation Site Identification Panel to assist CDOT in identifying potential

[3] Gap Analysis Project. Vegetation types were developed by the Colorado Division of Wildlife for the GAP project to map habitat types across Colorado and to help model animal distributions. Vegetation types were photointerpreted from Landsat imagery with a 100-hectare minimum mapping unit. Contact Colorado Division of Wildlife for full metadata on GAP vegetation types. Refer to Grunau and Lavender 2001 for additional information on how these data were used in the Shortgrass Prairie Initiative Project.

Table 7: Mitigation Habitat Types

Mitigation Habitat Type	Impact Vegetation Type
Shortgrass	Dryland agriculture Shortgrass prairie Barren land Bare soil
Shrub	Sand dune shrub complex Desert shrub Sandy areas
Mixed-grass	Irrigated agriculture Midgrass prairie Tallgrass prairie Foothills/mountain grassland Sand dune grassland complex
Riparian	Forest dominated wetland/riparian Graminoid/forb dominated wetland/riparian Shrub dominated wetland/riparian Open water
Dryland forest	Pinyon-juniper Juniper woodland

conservation areas. This Panel, including experts from CDOW, CNHP, TNC, and RMBO was charged with:

- Identification of priority conservation areas for target species and habitats, and recommendations from among those;
- Identification of target species that could be conserved at different sites, and to what degree;
- Development of site-specific management plans and agreements for the preferred habitat and real property interests, on behalf of CDOT;
- Recommendations on which entity (e.g., TNC, CDOW, other) could successfully manage the site(s).

A preliminary list of potential high-quality conservation areas in high priority areas was identified based upon previous planning efforts by TNC (via their Central Shortgrass Prairie Ecoregional Plan) and CDOW (via their real estate plan). CDOW reported overlap with the results of their real estate plan, and ultimately endorsed use of The

Nature Conservancy's ecoregional conservation plan for the CSP (TNC 1998)[4] as a framework for selection of conservation areas, which were reviewed and discussed extensively by the Conservation Site Identification Panel.

TNC's plan was developed over a one and a half-year period by a multi-disciplinary team of biologists and conservation practitioners. The stated goal of the plan is "the long-term survival of all viable native species and natural plant community types occurring within the ecoregion." It included extensive consultation with experts, as well as thorough evaluations of the status of all native species within the ecoregion, threats, and landscapes where conservation success might be achieved. The result was a "portfolio of conservation sites" that identified the highest priority conservation sites within the CSP. In this case, "highest priority" includes areas with the greatest likelihood of conservation success due to size, quality, and landscape context. Each of the proposed conservation areas presented in this document is represented as a high priority for conservation in this scientifically based and collaboratively developed plan.

The conservation strategy is based on impacts to presumed habitat within a species' range, whether or not habitat is occupied at any given time. Therefore, it was not necessary to observe each targeted species during the site evaluation process, or to document status of populations (although sites were originally identified based on documented occurrences of targeted species). However, each conservation parcel needed to offer a reasonable expectation that the species would be present. Criteria for demonstrating likelihood of occurrence included presence of high quality suitable habitat of appropriate size, occurrence within the range of the targeted species, and previously documented occurrence on the site, or observations of targeted species on nearby parcels.

FHWA, CDOT, and USFWS based the strategy on a 1:1 ratio of acres of potential impact to acres of mitigation lands. Therefore, the minimum total acreage of mitigation lands must equal no less than 15,160 acres, if all mitigation could be found in the appropriate amount and where it would occur in the most efficiently overlapping situation for target species.

The total acreage of lands presented in this document as sample projects is 55,811 acres, of which 46,640 acres would count towards mitigation credit. The acreage of mitigation credit was calculated by buffering all state and county roads within the proposed parcels by one-quarter mile for all species except the McCown's longspur and the lesser prairie-chicken. The road buffer used in calculating mitigation acres on the proposed McCown's longspur site was defined as 287 feet – the radius of this species' average home range. Home range estimates for lesser prairie-chicken are quite large – enough to suggest that no reasonable distance from roads will prevent mortality. However, for females with broods, home range size has a radius of ½ mile, which suggests that, optimally, the protected 78 acres would be at least ½ mile from active roads.

[4] Approximately 80 scientists from agencies, universities, and non-governmental organizations assisted in the identification of the priority conservation areas that were ultimately set forth in TNC's ecoregional plan for the CSP.

Table 8: Estimated Acres of Potential Impact by Vegetation Type[5]

Acres of Maximum Potential Impact: 15,160 Total acres in the Presumed Presence: 25,188,497 Highway Miles within Presumed Presence: 3,217 Total Highway Miles in the Project Area: 4,307			
Vegetation Types within Presumed Presence	Acres of Vegetation Type within Presumed Presence	Acres of Maximum Potential Impact	Percent of Presumed Presence Subject to Potential Impact
Dryland Agriculture	8,479,627	5,221	0.06%
Shortgrass Prairie	9,912,523	4,901	0.04%
Sand Dune Shrub Complex	2,634,015	1,888	0.07%
Irrigated Agriculture	804,586	1,396	0.17%
Midgrass Prairie	953,633	468	0.04%
Forest Dominated Wetland/Riparian	170,044	263	0.15%
Tallgrass Prairie	492,327	257	0.05%
Pinyon-Juniper	427,610	252	0.05%
Foothills/Mountain Grassland	205,710	223	0.10%
Desert Shrub	165,823	128	0.07%
Graminoid/Forb Dominated Wetland/Riparian	77,256	68	0.08%
Juniper Woodland	576,739	34	0.01%
Barren Land	37,502	29	0.07%
Shrub Dominated Wetland/Riparian	27,235	17	0.06%
Open Water	68,290	13	0.01%
Bare Soil	3,386	2	0.05%
Sand Dune Grassland Complex	132,762	0	0
Exposed Rock	11,133	0	0
Sandy Areas	5,250	0	0
Greasewood Fans/Flats	2,191	0	0
Big Sagebrush	855	0	0

[5] In Table 8, column 2 "Acres of Vegetation Type within Presumed Presence" equals the total acreage of each vegetation type within presumed presence (i.e., suitable habitat) for all target species combined (with overlap subtracted). Column 3 "Acres of Maximum Potential Impact" equals 22 percent of the total acreage of each vegetation type within the "impact zone" (i.e., presumed presence within the ROW). This number is based on CDOT's estimate of the maximum extent of existing roadways that could feasibly undergo construction during the 20-year timeframe covered by this project (22%).

Sample Conservation Scenarios

The following section contains descriptions of four sample properties that demonstrate how successful mitigation could occur. These properties are presented only as potential projects, but could be replaced by different projects (one or more) that also comply with mitigation requirements.[6] The sample conservation areas are: 1) Potential Rare Plant Site, southern Front Range; 2) Potential Multi-Species Site, southeastern Colorado south of the Arkansas River; 3) Potential McCown's Longspur Site, northeastern Colorado near Pawnee National Grasslands; 4) Potential Lesser Prairie-chicken Site, southeastern Colorado. Tables 9 and 10 summarize the contributions that each of these sample sites would offer toward mitigation requirements for habitats and for species, respectively.[7] Full profiles of each sample site are presented in the following section of this document.

Table 9: Estimated acres of potential mitigation by habitat type.

Habitat Type	Estimated Impact (in acres)	Potential Rare Plant Site	Potential Multi-Species Site	Potential McCown's Longspur Site	Potential Lesser Prairie-chicken Site	Percent of Mitigation Needed
Shortgrass	10,153	1,230	32,978	2,133		>100%
Mixed-grass	2,344		At least 2,344			>100%
Shrub	2,106		2,363		163	>100%
Riparian	361		581			>100%
Dryland forest	286	1,463	4,124			>100%
Mitigation credit		**2,693**	**41,651**	**2,133**	**163**	**>100%**
Total acres in easement		2,693	50,137	2,341	640	>100%

[6] These sample conservation scenarios were identified by the Conservation Site Identification Panel. The Conservation Site Identification Panel will evaluate any proposed properties, and nominate substitutions as necessary.

[7] Calculations for proposed conservation areas are based on unofficial boundary lines provided by landowners. These numbers should be considered draft until legal property boundaries are obtained.

Table 10: Estimated acres of potential mitigation by species.

Species name	Estimated Total Impact (in acres)	Potential Rare Plant Site (in acres)	Potential Multi-Species Site (in acres)	Potential McCown's Longspur Site (in acres)	Potential Lesser Prairie-chicken Site (in acres)	Percent of Mitigation Needed
BIRDS						
Bald Eagle	3,688		33,559			>100%
Burrowing Owl	11,246		32,978			>100%
Cassin's Sparrow	2,284		4,055			>100%
Ferruginous Hawk	10,773		32,978			>100%
Lark Bunting	12,124		37,016			>100%
Lesser Prairie-chicken	78				163	>100%
Loggerhead Shrike	8,780	1,463	7,964			>100%
Long-billed Curlew	5,058		32,978			>100%
McCown's Longspur	1,888			2,133		>100%
Mountain Plover	9,936		32,978			>100%
MAMMALS						
Black-tailed Prairie Dog	10,744		32,978			>100%
REPTILES						
Massasauga rattlesnake	1,891		18,925			>100%
Texas Horned Lizard	1,568		18,925			>100%
Western Box Turtle	1,910		14,147			>100%
PLANTS						
Arkansas River Feverfew	141	205				>100%
Pueblo Goldenweed	82	88				>100%
Round-leaf Four-o'clock	117	205				>100%

Potential Rare Plant Site

General Location

Southern Front Range of Colorado.

Site Visits

This parcel has been visited at least seven times since 1998.

General Description

This site is a large parcel situated on the western edge of the Central Shortgrass Prairie ecoregion. It is best characterized as a shortgrass prairie that has linear patches of juniper savanna breaks and desert shrublands scattered throughout.

For CDOT and FHWA's purposes, the most notable aspect of this parcel is the presence of good to excellent occurrences of four narrow endemic species of plants. These include Arkansas River feverfew, (*Bolophyta tetraneuris*), Pueblo goldenweed (*Oonopsis puebloensis*), round-leaf four o'clock, (*Oxybaphus rotundifolius*), and Arkansas Valley evening primrose (*Oenothera harringtonii*). This parcel is considered to hold a significant part of the world's population for these four species. The round-leaf four o'clock and the Arkansas River feverfew are tightly associated with the chalk bluffs or shale barrens that are often vegetated with juniper savanna. The Arkansas Valley evening primrose is a shortgrass prairie species, and the Pueblo goldenweed is found in both shortgrass prairie and desert shrublands.

In addition to the rare plants, the juniper savanna and desert shrublands are habitat for loggerhead shrike, and the shortgrass prairie is habitat for burrowing owl, ferruginous hawk, lark bunting, mountain plover, and black-tailed prairie dog - all declining species of the shortgrass prairie.

Contribution to Conservation Strategy

This sample project is a 2,693-acre conservation easement. Of the 2,693 total acres in the sample easement, there are 1,230 acres of shortgrass prairie and 1,463 acres of dryland forest (juniper savanna breaks). This potential easement represents the only available opportunity to protect three of the targeted species: Arkansas River feverfew (*Bolophyta tetraneuris*), Pueblo goldenweed (*Oonopsis puebloensis*), and round-leaf four-o'clock (*Oxybaphus rotundifolius*). This parcel is within the center of global distribution for these rare, endemic plants, and represents the best chance of conservation success for these species. Such an easement would meet in full all mitigation requirements for these three plants. In addition, the property contains 17 percent of the mitigation requirements

for loggerhead shrike habitat, as well as a small occurrence of the Arkansas Valley evening primrose (*Oenothera harringtonii*).

Target species observed

Arkansas River feverfew, Pueblo goldenweed, round-leaf four o'clock, Arkansas Valley evening primrose, black-tailed prairie dog, burrowing owl, ferruginous hawk, lark bunting, loggerhead shrike, and mountain plover.

Target species potential

Bald eagle, Cassin's sparrow. Although these species were not directly observed during site visits, the parcel contains high quality suitable habitat within these species' ranges, and there are documented occurrences nearby.

Other species that will benefit

Swainson's hawk, prairie falcon, triploid Colorado checkered whiptail, mottled dusky wing, simius roadside skipper.

Boundary justification

An easement boundary could include the full extent of the highest quality occurrences of the rare plants on the property. Although two of these plants also occur in the western portion of the parcel, the populations in the suggested easement are considered of greater conservation value due to a better landscape context, as well as size and condition of the occurrences. In addition, the possible easement area contains occurrences of the Pueblo goldenweed and the Arkansas Valley evening primrose, whereas the western portion of the property does not. This suggested boundary also contains loggerhead shrike habitat.

Landscape Context

The landscape context of the parcel is good to excellent for most of the property, and easily meets all of CDOT's criteria for conservation areas. The southeast boundary of the property is adjacent to an extensive residential development, and is, therefore, subject to issues associated with fragmented landscapes and introduced species. The sample easement boundary has excellent landscape context as it is enclosed withing the property and is surrounded by a native landscape. Land use within the sample easement is primarily livestock grazing and wildlife habitat. Little land "improvement" has occurred; only cattle fencing, cattle tanks, two-track dirt roads to maintain water tanks, and pipelines to move water to tanks are present. The condition, size, and landscape context for the targeted CDOT species are good to excellent.

Current Management

The potential project area is used to graze cattle. The landowner is interested in managing this property as a sanctuary for rare plants and wildlife, and is very interested in working with conservation biologists to manage his land for biodiversity values.

Although the relationship between cattle grazing and the targeted plant species is not well understood, current management practices appear to favor the target species.

Protection Urgency

The sample project area faces residential development on two sides, and is highly desired for additional future development. Given that this parcel holds a significant portion of the known populations of four globally rare, narrow endemic species, protection is considered an essential component of any conservation strategy targeting these plants.

Habitat Mitigation Target

Shortgrass prairie/steppe and shale barrens that are habitat for the rare Arkansas Valley plants. The shale barrens are often associated with old-growth juniper savanna.

Species Targeted for Conservation in This Habitat Example

Arkansas River feverfew (*Bolophyta tetraneuris*)
Pueblo goldenweed (*Oonopsis puebloensis*)
Round-leaf four o'clock (*Oxybaphus rotundifolius*)
Arkansas Valley evening primrose (*Oenothera harringtonii*)

The Arkansas Valley evening primrose depends on shortgrass prairie/steppe; the Pueblo goldenweed depends on shortgrass prairie and desert shrublands; both the round-leaf four-o'clock and the Arkansas River feverfew depend on shale barrens, usually associated with the juniper savanna. The shale barren plants favor areas with low competition from other plants, often with greater than 50 percent bare ground. The Pueblo goldenweed appears to favor slightly wetter swales within the prairie and shrublands. The Arkansas Valley evening primrose's habitat criteria are less well known, but this plant is tightly associated with shortgrass prairie.

Grazing is the dominant ecological process of the shortgrass/steppe system. Other important processes include the activities of burrowing animals, fire, wind, and precipitation. Wind and precipitation occur naturally and are not under management control. Fire occurs naturally, but is probably occurring now at lower frequencies than during some historical periods due to suppression in an around the property. On-the-ground monitoring will be necessary to determine if and when fire is desirable. Grazing and/or fire may be important to achieve conservation goals for the primrose. Fire is a useful tool within the shortgrass where adequate controls and expertise can be ensured. The frequency of natural fires in the juniper savanna-shale barrens is unknown, but is expected to be low given the naturally low ground cover and old age of the junipers. Therefore, fire is not considered a management tool for the shale barren plants.

The effects of grazing on these plants is unknown, but the general hypothesis is that the shale barren plants can withstand a low to moderate grazing regime, while the primrose and goldenweed may be able to withstand moderate to high grazing pressures. The primrose and the goldenweed inhabit the shortgrass prairie ecosystem, which evolved

with grazing animals. It is possible that the timing of grazing activity could influence any potential impact to these plants (either positive or negative), but research would be required to answer this question.

Continued goal-oriented grazing on the property would result in a mosaic of plant cover and height, with the dominant form being low structure, low cover shortgrass (except in wet years). Remaining areas would include pockets of varying plant cover and height, but with patches of greater height and structural complexity being easily visible. The patches may move over time depending on water availability, grazing patterns, and adaptive management. If fire were to be used in this system, it would be expected to enhance the patchiness of the vegetation.

Management Goal(s)

Maintain/manage ~2000 acres of juniper savanna-shale barren habitat, where management and natural disturbance maintain a mosaic of plant structure, such that much of the area is greater than 50 percent bare ground. Manage the existing Pueblo goldenweed occurrences such that the quality of the populations is maintained or improved over time. Goals for the primrose and goldenweed are explicitly vague because the natural history of these plants is not well understood at this time. A conservation easement or other protective tool could increase the ability to study these plants.

Clockwise from top right: Arkansas Valley evening primrose (*Oenothera harringtonii*), Pueblo goldenweed (*Oonopsis puebloensis*), Arkansas River feverfew (*Bolophyta tetraneuris*), round-leaf four-o'clock (*Oxybaphus rotundifolius*).

Potential Multi-Species Site

General Location

South of the Arkansas River.

Site Visits

This property was visited five times during 2001 and 2002.

General Description

The sample easement is part of a large parcel with nearly all deeded land. Approximately four percent of the property is owned by the State Land Board. The dominant vegetation varies across the landscape, and includes shortgrass prairie with a blue grama – buffalo grass plant association as the matrix community, as well as juniper woodlands and savannas. The eastern portion of the property is primarily shortgrass prairie on loam soils that support small black-tailed prairie dog towns with associated burrowing owls. Ferruginous hawks were also noted on the prairie dog towns. Shale and limestone outcrops are scattered throughout the shortgrass prairie and support the rare and Colorado endemic prairie gentian (*Frasera coloradensis*). The condition of this shortgrass prairie is considered fair to good, with restoration potential to raise that good to excellent. This is a large, intact landscape with most of the associated native species present, but weeds and "increasers" (e.g., cheatgrass, snakeweed) are also found throughout. There is evidence of past heavy grazing, but current stocking rates appear to be appropriate for the maintenance of the conservation targets on the property.

The juniper woodlands and savanna occupy large areas of the property, especially in the western portion. The juniper age class ranges from seedlings to 100+ years. The western portion of the property has many very scenic dissecting sandstone canyons with small streams. The roundtail horned lizard (*Phrynosoma modestum*) was observed in this area. This species is quite rare in Colorado; it was previously only known from two other Colorado locations. Landscape context is excellent, primarily due to the large size of this property and adjacent parcels.

Contribution to Conservation Strategy

This sample project is a >40,000-acre conservation easement. Mitigation habitat types present on this property include large areas of shortgrass prairie and dryland forest. The proposed easement would meet in full all mitigation requirements for habitat for these target species: bald eagle, burrowing owl, Cassin's sparrow, ferruginous hawk, lark bunting, long-billed curlew, mountain plover, black-tailed prairie dog, massasauga rattlesnake, Texas horned lizard, and western box turtle. In addition, the easement would contribute approximately 91 percent of the mitigation requirements for loggerhead shrike habitat.

Target species observed

Bald eagle, burrowing owl, Cassin's sparrow, ferruginous hawk, lark bunting, long-billed curlew, black-tailed prairie dog, and Texas horned lizard were observed within the shortgrass prairie.

Target species potential

The landowner reported that swift fox and horned lizards are common. There are also box turtles throughout the property, and although they can be found in all habitat types, the landowner reports seeing more of them on the shortgrass prairie than in the juniper savannas. He also noted that he has seen loggerhead shrikes killing lizards and grasshoppers on fences. Four long-billed curlews were observed on a recently plowed crop field that is adjacent to the parcel. The landowner reports seeing these birds on his property as well. The property is expected to support massasauga rattlesnakes (pers. comm., S. Mackessy) and mountain plovers.

Other species that will benefit

Swainson's hawk, prairie falcon, grasshopper sparrow, swift fox, eastern spotted skunk, longnose snake, ground snake, simius roadside skipper, Colorado blue butterfly, Colorado green gentian.

Boundary justification

This sample parcel is by far the largest of the potential mitigation parcels. This property could contribute all mitigation requirements for eleven target species, as well as the majority of the mitigation requirements for one additional species. The twelve species targeted for protection on this site require three different habitat types. For instance, the burrowing owl, ferruginous hawk, long-billed curlew, and mountain plover all require very short, sparse vegetation, while the Cassin's sparrow, lark bunting, and loggerhead shrike require more vegetative structure. The western box turtle requires sandy soils, whereas prairie dogs require clay soils. These habitats occur in a mosaic across the potential easement. Acquiring needed mitigation acres of high-quality habitat for each species requires a boundary larger than the impact assessment suggests. In addition, for prairie dogs in particular, a mosaic of suitable and unsuitable habitat is desireable.[8] Finally, this potential easement does not occur in close proximity to any other lands that are currently managed for biodiversity protection. Therefore, if conservation is intended to be in perpetuity, the need for appropriate landscape context in which to manage mitigation habitats would need to be met within the easement itself.

Management

Future management on the prairie should include monitoring the targets in order to ensure a viable population. Under a potential conservation easement, plague may be the

[8] Cully and Williams (2001) found that…in the presence of plague, prairie dogs most likely to survive were found in complexes of small colonies that were greater than three kilometers from their nearest neighbor.

most serious remaining threat. The condition of all habitats could be improved, and fire management may be a useful tool. Development of a fire management plan would be warranted.

Protection Urgency

Residential or commercial development is not anticipated in the near future given the relatively remote location of this potential project relative to existing urban/exurban centers. However, species and habitat conservation in this area of the state is difficult in most places due to the high skepticism of local governments and active opposition of some organizations and individuals toward conservation easements in perpetuity and management for unpopular species.

Habitat Mitigation Target

Shortgrass prairie/steppe in a mosaic of variants: early successional stages, mixed-grass areas (especially on hillsides, and in depressions such as swales), juniper savannas, sandy shortgrass, and low prairie shrublands (e.g., snakeweed and saltbush). In addition, there are several riparian zones and prairie wetlands/seeps that support unique species groups.

Specis Targeted for Conservation in This Habitat Example

Bald eagle, burrowing owl, Cassin's sparrow, ferruginous hawk, lark bunting, loggerhead shrike, long-billed curlew, mountain plover, black-tailed prairie dog, massasauga rattlesnake, Texas horned lizard, and western box turtle.

All the species listed above occur in the shortgrass prairie complex. Burrowing owls, ferruginous hawks, long-billed curlews, mountain plovers, and Texas horned lizards, as well as many burrowing mammals, favor earlier successional stages with greater than 30 percent bare ground and vegetation height of less than four inches. This is the dominant condition on the parcel. Lark buntings occur in all variants of shortgrass, but favor a higher structure in the grass. Cassin's sparrows favor grasslands with additional complexity, generally in the form of shrubs or low trees, but may also be fences (e.g., in the Pawnee National Grasslands). Loggerhead shrikes occur in areas where shrubs occur, as in the juniper savannas of the property. Western box turtles are common on shortgrass prairie with sandier soils - a type that is abundant in the southern portion of the potential easement. Massasaugas frequent many forms of shortgrass prairie, including all of the types that occur on the property. Finally, it is likely that the plains leopard frog occurs in the wetlands on the parcel, given the presence of suitable habitat within appropriate range for this species (pers. obs., C. Pague). Burrowing mammals of several species, most notably pocket gophers, are common throughout the site.

Grazing and fires are the dominant ecological processes in this system. Other important processes include the activities of burrowing animals, wind, and precipitation. Pocket gophers, smaller ground squirrels, and other burrowing small mammals are common at the site, and are expected to persist and continue to provide ecological services under existing conditions. Wind and precipitation occur naturally, and are not under

management control. Fire occurs naturally, and may have a higher frequency than is generally recognized. In this large landscape, modern fire suppression may not have a large impact on changing the fire return intervals. The landowner does not actively suppress fires on the property; however, fire initiated near public roads and railroads are acted upon. On-the-ground monitoring would be needed to determine if and when fire is necessary. Fire has been observed to have large restorative impacts, especially in reducing the cover of snakeweed (pers. obs., C. Pague). Grazing would be necessary to achieve conservation goals, and fire would be a useful tool where adequate controls and expertise can be ensured.

Grazing would be expected to maintain a core area of ~13,000 acres in not more than two segments, that are managed for early successional stages, including dominance by plant cover less than 70 percent, over at least 60 percent of the area. An additional 20,000 acres would be managed to achieve a mosaic of plant cover and height, dominated by areas of increased plant structure, as favored by species such as lark buntings. At least 3,000 acres of the sandy soils favored by western box turtles could be included. An additional 1,500 acres could be managed to sustain or slightly expand (restore) the juniper savanna/shrubland areas. Finally, the remainder of the prairie could be managed for some higher structure, including low form shrublands, favoring species such as the Cassin's sparrows. Within this matrix, some areas could be managed to maintain roosts and perches for bald eagles, which are known to feed in the area. In addition, prairie wetlands could be considered for restoration so long as necessary water is available to livestock.

The patches of many habitat types may occur in different locales over time, depending on water availability, grazing patterns, and the results of adaptive management. However, the core area that would be maintained in the earliest successional stages would remain fixed. If fire were to be used in this system, it would be expected to enhance the patchiness of the vegetation, specifically by reducing the area dominated by snakeweed.

The complex mosaic of existing vegetation forms means that some habitat types would be provided in larger quantities than others, and larger than required by CDOT's mitigation needs for any one community or habitat type. Given natural stages of succession, individual patches are difficult to manage in a single vegetative form such that conservation goals are met. The sample habitat complex presented in this assessment is identified as the most likely and desirable arrangement (of existing possibilities) that would achieve the conservation goals of shortgrass prairie, and that would support such a diverse assemblage of declining prairie species.

Management Goal

Manage at least 40,000 acres of shortgrass prairie, juniper savanna, and prairie wetlands/seeps in a manner that keeps a core area of shortgrass prairie, with surrounding areas of various successional stages. Of the total, ~13,000 acres would be managed for shortgrass prairie with adequate bare ground for nesting mountain plovers (early successional attributes), ~20,000 acres would be managed as a mosaic of shortgrass-mixed-grass prairie (with less than 40 percent bare ground), and ~1,500 acres would be

managed as juniper savanna. In any given year (on average), the results would yield approximately 50 percent of the core area with more than or equal to approximately 40 percent bare ground.

Potential McCown's Longspur Site

General Location

Vicinity of Pawnee National Grasslands, northeastern Colorado.

Site Visits

This property was visited on at least five occasions from 1999 – 2001.

General Description

This sample parcel is a large property, of which ~2,300 acres are potentially available for conservation easement. Most of the property is classified as shortgrass prairie. In addition, there are patches of mixed-grass prairie and a few very small playas. The mixed grass occurs on steeper slopes, gravelly soils, and in moister areas. This is a natural variant of the local vegetation that is present because of edaphic conditions, precipitation patterns, and (most importantly) the grazing pattern. Areas with taller grasses support chestnut-collared longpsurs. In a few areas, there are adequate taller grasses such that Cassin's sparrows probably occur in small numbers. In most areas where the grasses are taller and are not in CRP[9], a modest change in grazing pattern would result in a more typical shortgrass structure. In general, the condition of most patches of shortgrass is good to excellent. Several flocks of longspurs (probably mixed species) were observed along the adjacent roads in October 2001, and in a few cases, elsewhere on the parcel and adjacent properties.

Most of the surrounding lands are used as pasture for livestock. The vegetation of most of the area is shortgrass prairie. There are also many areas nearby in CRP, now in mixed or tall grasses – a vegetation structure and composition that is not within the range of natural variability for shortgrass prairie. There is a small amount of farmland on the northeast and east sides of the parcel, but not adjacent to the proposed easement. County dirt roads may result in a moderate level of fragmentation. There are a few homesites, some of which are planted with living fences. In a few areas, there are soil conservation contours (terracing). At the southern end of the property, the land is adjacent to U.S. Forest Service lands for approximately 5.5 miles of the boundary.

Contribution to Conservation Strategy

The potential project is a 2,341-acre conservation easement, of which 2,133 acres would be proposed for mitigation credit, and 208 acres would provide buffer zones around

[9] Conservation Reserve Program. The CRP program was authorized in 1985 via the Food Security Act, and is administered by the Commodity Credit Corporation through the Farm Service Agency (part of the U.S. Department of Agriculture). The program offers annual rental payments to farmers for establishing approved cover on eligible cropland for the purpose of improving soil, water, and wildlife resources. CRP lands are usually planted in non-native grasses that are taller than native species, and have a higher percent cover. As such, CRP lands are not considered high quality habitat for the species targeted for conservation in the Shortgrass Prairie Initiative project.

existing roads. The mitigation habitat type present on this property is shortgrass prairie. The potential easement would meet in full all mitigation requirements for habitat for the McCown's longspur. The potential easement is adjacent to a 25,000 acre section of the Pawnee National Grassland, which is managed in part for biodiversity values and provides a supportive landscape context.

Target species observed

McCown's longspur, ferruginous hawk, lark bunting, and mountain plover.

Target species potential

Burrowing owl, loggerhead shrike

Other species that will benefit

Chestnut-collared longspur, Swainson's hawk, prairie falcon, swift fox, two-spotted skipper.

Boundary Justification

The sample easement boundary includes suitable habitat within the property where McCown's longspurs have been observed.

Management

Small amounts of the sample property have some planted grasses (e.g., crested wheatgrass) that are not desirable in shortgrass prairie. Some restoration is desirable, and this presents a restoration opportunity for the mitigation project. The landowners are amenable to grassland restoration and grazing that supports the conservation of the McCown's longspur, mountain plover, and other associated species.

Protection Urgency

Key threats to the example property are exurban residential development, conversion to non-native vegetation structure (e.g., CRP tallgrasses), and invasive species of grasses. Some CRP lands in the parcel are planted with crested wheatgrass or smooth brome. The smooth brome and crested wheatgrass do not appear to be spreading into the adjacent grasslands.

Habitat Mitigation Target

Shortgrass prairie/steppe dominated by early successional stages, but with some areas in plant cover that more closely resembles later succession/more mesic shortgrass or midgrass prairie

Species Targeted for Conservation in This Habitat Example

McCown's longspur
Lark bunting
Mountain plover

These three species depend on shortgrass prairie/steppe. McCown's longspur and the mountain plover favor earlier successional stage habitats with greater than 30 percent bare ground and less than four inches in vegetation height. The lark bunting occurs in all variants of shortgrass, but favor grass with a higher structure. The lark bunting also tolerates areas with a greater amount of plant cover.

Grazing is the dominant ecological process of the system. Other important processes include the activities of burrowing animals, fire, wind, and precipitation. Pocket gophers, smaller ground squirrels, and other burrowing small mammals are common at the site, and are expected to persist and provide adequate ecological services (under existing conditions). Wind and precipitation occur naturally, and are not under management control. Fire occurs naturally, but are probably currently occurring at a lower frequency than during some historical periods due to fragmentation and fire suppression. On-the-ground monitoring would be needed to determine if and when fire is necessary. Grazing would be necessary to achieve conservation goals, and fire can be a useful management tool where adequate controls and expertise can be ensured.

Grazing would be expected to achieve a mosaic of plant cover and height, with the dominant form being low height, low cover shortgrass (except in wet years). Other areas would include pockets of varying plant cover and height, with patches of greater height and structural complexity being easily visible. The patches may occur in different locales over time, depending on water availability, grazing patterns, and the results of adaptive management. If fire were to be used in this system, it would be expected to enhance the patchiness of the vegetation.

Management Goal

Manage ~2500 acres of shortgrass prairie in an early successional stage, where all habitat is currently in, or would become through management, shortgrass prairie. In any given year (on average), the results would yield approximately 50 percent of the area with less than or equal to 30 percent bare ground.

Potential Lesser Prairie-chicken Site

General Location

Southeastern Colorado.

Site Visits

This property was visited once during 2001.

General Description

This parcel, which is adjacent to Commanche National Grasslands, is part of a larger sandsage shrubland/grassland complex dominated by sandsage (*Artemisia filifolia*).

For CDOT and FHWA's purposes, the most notable aspect of this parcel is the occurrence of lesser prairie-chickens (LPC) nesting in this area. The CDOW believe that there may be approximately two to three nests on this parcel (pers. comm., K. Giesen). There are several LPC leks within three miles of this parcel. The parcel also contains good habitat for loggerhead shrike and Cassin's sparrow.

The sandsage shrubland vegetation on this parcel is in fair to poor condition, primarily due to low cover of native grasses and forbs. Most of the expected native grasses are present, but cover is low. Grasses of particular interest are sand bluestem (*Andropogon hallii*), blue grama (*Bouteloua gracilis*), and needle-and-thread grass (*Stipa comata*).

The landowners graze this parcel during the winter season, beginning in November. Although winter is a good time for grazing this vegetation type, it appears that overstocking has occurred in the past. The last three years have been drought years, and therefore the vegetation is probably in worse condition than would be expected in years with normal levels of precipitation. Most of the parcel is in sub-par condition, but minimum restoration efforts could vastly improve the condition of the vegetation, and hence improve LPC habitat.

Contribution to Conservation Strategy

This potential project is a conservation easement on part of a large area of LPC habitat adjacent to the Commanche National Grasslands. This potential easement would meet, in full, all mitigation requirements for the lesser prairie-chicken. In addition, the parcel contains approximately two percent of the mitigation requirements for loggerhead shrike habitat, and seven percent of the mitigation requirements for Cassin's sparrow habitat.

Target species observed

Lesser prairie-chicken. The landowners report regularly seeing LPC using this parcel in the spring, which would indicate nesting and brood rearing. Cassin's sparrows were heard.

Target species potential

Loggerhead shrike.

Other species that will benefit

Swainson's hawk.

Boundary justification

The easement boundary would include the full extent of the sandsage shrubland available within the parcel. The potential easement would also contain loggerhead shrike and Cassin's sparrow habitat. Since this sample easement is adjacent to Commanche National Grasslands, the easement would be considered large enough to allow for LPC populations to survive, as it is part of a larger complex of leks and nesting habitat.

Landscape Context

The parcel itself is too small to consider as a landscape, but it is imbedded in a landscape that is functioning and viable. The parcel itself would improve with some restoration attention. The parcel is bounded on two sides by the Commanche National Grasslands. The other boundaries are adjacent to private land that is used for grazing cattle. Current land use within the potential easement is primarily winter livestock grazing. The condition of habitat for the targeted species is currently fair to poor, but with good restoration potential.

Current Management

The landowner is interested in managing this parcel for rangelands. Current management appears to have reduced the native grass and forb cover, although all of the expected species are still present. Based on information currently available, current livestock grazing rates may be too heavy at times. Future restoration work should consider increasing the abundance and cover of native forbs and grasses (i.e., this pasture may need to be rested for a short time). The grass and forb component is a very important attribute for LPC nesting requirements.

Protection Urgency

This area appears to be experiencing little development pressure at this time. However, it is extremely important for the survivorship of LPC that the condition of the shrublands remains undeveloped and in good condition.

Habitat Mitigation Target

Sandsage shrublands

Species Targeted for Conservation in This Habitat Example

Lesser prairie-chicken
Cassin's sparrow
Loggerhead shrike

The LPC depends on sandsage shrublands or sandy grasslands for nesting and brood rearing.

Grazing is the dominant ecological process of the shortgrass/steppe system. Other important processes include the activities of burrowing animals, fire, wind, and precipitation. Wind and precipitation occur naturally and are not under management control. Fire occurs naturally, but is probably occurring now at lower frequencies than during some historical periods due to fragmentation and fire suppression. On-the-ground monitoring would be necessary to determine if and when fire is desirable. Grazing and or fire may be important to achieve conservation goals for the LPC. Fire may be a useful tool within the sandsage prairie where adequate controls and expertise can be ensured. The frequency of natural fires in the sandsage shrubland/praire is unknown.

Grazing on sandsage shrublands impacts the grasses and forbs more than the shrubs. Excessive grazing will reduce cover of grasses and forbs, which will not only reduce cover for LPC, but will also adversely impact their food source. The LPC evolved with large grazing animals, and grazing may be important to their survival. Grazing should provide for adequate cover and height of grasses and forbs, especially during the spring when LPC are using the area.

Management Goal(s)

Maintain/manage ~640 acres of sandsage shrublands, such that appropriate grass and forb cover is maintained in good to excellent condition. Restore degraded vegetation through grazing management and seeding with native grasses and forbs.

Monitoring of Conservation Areas

Monitoring of the final conservation areas will be necessary to ensure that management actions are having the desired effect, and that conservation goals are being met. The core project team developed a set of baseline reporting requirements that will be included in the easement documentation, and will be updated annually by qualified personnel. These annual baseline reporting requirements were designed to document the general state of the habitat and presence (or absence) of target species, without being unduly labor and cost intensive, thereby preserving the majority of the stewardship budget for management needs. Results of the annual baseline reports will be analyzed to determine whether or not a change in management is necessary to achieve conservation goals.

Annual Baseline Reporting

1. Best available information on type of plant communities/habitats present
   - Estimated size of each
   - General condition of each (address any weed infestations, relative abundance)
   - Description of plant communities present and geographical relationship of commuities
   - Estimated percent cover of each community

2. Brief description of land use on-site and in surrounding areas documented in initial baseline. Annual report briefly describing changes.

3. Success of Recommendations from previous year and suggested modifications to management plan. (These will be coarse measures to start. A management plan will be developed in the first year after acquisition of the real estate interest and updated at least every five years.).

4. General observations on wildlife diversity, activity, and general trends, noting presence or absence of targeted species (i.e., field notes. Surveys and quantitative data are not required).

5. Photo points at established permanent locations according to protocols to be developed in the management plan.

6. Acquire new or existing aerial photos as they become available, as applicable and appropriate. Label habitat on existing aerial photos. If photos are unavailable, a map may be developed on USGS topographical quadrangles.

Conservation Measures to Minimize and Offset On-site Impacts

Definitions:

Stream: Surface state waters, not including lakes and wetlands.

Action Area: Segment of the Right-of-way within which construction or maintenance operations are being conducted.

Disturbed Site: Areas within the action area where soil disturbance has occurred.

CDOT will integrate the following "Best Management Practices" (BMPs) techniques into its transportation improvement projects. These BMPs are designed to offset potential impacts identified by agency and core project team biologists, and by species experts. **Minor changes to these BMPs may be made in the final documentation to ensure consistency with the existing MOU between CDOT and CDOW, which is being updated to include USFWS and FHWA, on management of sensitive areas within ROWs. These BMPs are designed to ensure that actions avoid and minimize impacts to the extent possible.**

These BMPs will be employed within presumed presence for relevant target species. Maps depicting presumed presence for species on the primary species list are included in the accompanying report "Estimating Impacts of Highway Projects on Select Rare, Sensitive, or Declining Species on Colorado's Central Shortgrass Prairie" (Grunau and Lavender 2002). Maps depicting presumed presence for species for which BMPs are the primary conservation strategy are included at the end of this section. Maps for fish species represent current known distribution and planned recovery areas, as identified by CDOW (pers. comm., T. Nesler). These maps are for graphical display purposes only. CDOT will use digital data layers to map presumed presence at more appropriate scales for specific projects.

Erosion Control and Storm Water Quality

(1) Best Management Practices (BMPs) as described in the latest edition of CDOT's Erosion Control and Stormwater Quality Guide and the Erosion Control Pocket Book shall be used by CDOT during all projects to protect aquatic resources and riparian areas including wetlands. These BMPs include, but are not limited to, standard soil/sediment erosion control practices that are correctly located, installed, and maintained to prevent sedimentation of Colorado's waterways. Most streams on the eastern plains where small native fish species are found flow at less than five cubic feet per second. Thus, it is important to control sedimentation that may occur without precluding fish passage. CDOT will ensure continuity of the natural flow regime of any stream documented in a CDOT action area. Programmatic BMPs and performance standards include the following:

- Where practicable, habitat in and around disturbed sites will be restored to its original condition or better at the end of the project.
- Habitat enhancement may include the creation of riffle habitat using boulders or other bio-engineering techniques, as well as replacing or enhancing the riparian and wetland vegetation, and restoring or improving habitat connectivity at the disturbed site.

(2) All specifications set forth in the CDOT's Standard Specifications for Road and Bridge Construction, section 107.25 Water Quality Control, shall be included in all projects. This section outlines practices that minimize water pollution during construction to any state waters, including wetlands. Additionally, section 208 Erosion Control, shall be included on all projects. Section 208 directs contractors on the construction, installation, maintenance, and removal of erosion control measures during the life of the contract to prevent or minimize erosion, sedimentation, and pollution of any state waters, including wetlands. Erosion Control devices will be installed according to CDOT M&S Standards.

Examples of methods used for erosion control are:
- Seeding/Mulching
- Blankets
- Check Dams
- Earthen berms

Examples of methods used for sediment control are:
- Inlet protection
- Erosion bales/logs
- Silt fence
- Sediment trap/basin

Inspections of all erosion control features shall occur every 14 days and after each storm event that causes surface run-off. Corrective action measures must occur within 7 days of inspection. Once earthwork has begun on a section it shall be pursued to completion. Within seven days, completed areas should be stabilized. Stabilization may include permanent stabilization such as seed/mulch, or temporary stabilization such as mulch with mulch tackifier, as appropriate.

Black-tailed Prairie Dogs

(3) CDOT will avoid and minimize impacts from projects to known black-tailed prairie dog colonies within the project footprint.

Burrowing Owls

(4) Although burrowing owls may occur throughout a prairie dog colony, they are most often found near the colony's margins (Craig 2001). Causing abandonment of a nest is a violation of the Migratory Bird Treaty Act and is not covered by this agreement. As

such, CDOT will limit work on projects that impact prairie dog colonies within the ROW to the non-nesting season, from August 15 to April 1 (Craig 2001).
(5) Burrowing owls may be present at a burrow up to one month prior to egg-laying and several months after young have fledged. Thus, in areas where burrowing owls are known by the CDOT staff biologist to occur, earthwork should be avoided where possible between March 1 through March 31 and August 15 through October 31 (Craig 2001).
(6) If CDOT engages in spraying for insects on any of its ROWs, this should be reevaluated and eliminated in areas within 225 feet of known nesting locations (Dechant et al. 2001b).
(7) If a project that will impact prairie dog colonies within the ROW cannot be scheduled for construction during any other time except the nesting season (from April 1 to August 15), the project area will be surveyed by the CDOT staff biologist for the presence of burrowing owls. If burrowing owls are found at the site, CDOT will coordinate with USFWS under the Migratory Bird Treaty Act to ensure compliance.

Bald Eagles

(8) Bald Eagles are protected under the ESA, MBTA and the Bald and Golden Eagle Protection Act. For projects occurring near documented nesting/roosting areas, CDOT will check with CDOW to determine whether or not active nests/roosts are known to be present, and what actions, if any, are desirable to protect these features. If there are active nesting or roosting bald eagles within one mile of an active project area, CDOT activities will be curtailed from February 1 through July 31 during the nesting period, and from November 1 through March 31 during the roosting period, as determined by the CDOT staff biologist based on input from CDOW.

Ground-nesting Birds

(9) Mowing in CDOT Maintenance Zone 1 shall not exceed one mower width (22 feet maximum) and can be done at any time of the year. Mowing in Zones 2 and 3 in rural areas (those areas with native plants or those areas that are not in cities) shall not occur unless mowing restrictions compromise highway safety or noxious weeds are present. Prior to mowing or other actions necessary for the removal/control of noxious weeds or mowing for highway safety, the Regional Planning and Environmental Manager must be contacted for approval.
(10) Harvesting in the Right-of-Way is only permitted outside the nesting period for migratory birds. Harvesting in the right-of-way rules limit harvesting to a 6-inch height.

Lesser Prairie-chicken

(11) There are currently no known lesser prairie-chicken leks near any CDOT roadways (pers. comm., J. Kindler, CDOW). If any CDOT projects are undertaken in known lesser prairie-chicken habitat, CDOT will consult with CDOW to determine whether or not any new lek sites have been identified in the project area, and if so, what measures should be taken to avoid or minimize potential impacts.

Interior Least Tern and Piping Plover

(12) If CDOT widens any roads in the vicinity of feeding habitat, roads will be designed so existing surface waters or ground water movement shall be maintained. Where practicable, historic flows will be restored.

Native Fish and Mussels

(13) Temporary and permanent erosion and sediment control measures shall be installed at the earliest practicable time consistent with good construction practices to prevent siltation into state waters.
(14) CDOT activities will be planned to avoid alteration of the natural flow regime of any stream and to implement natural flow restoration improvements, where such can be incorporated into the larger transportation improvement project.
(15) All disturbed areas above the ordinary high water mark shall be revegetated with appropriate native plant species to provide bank stabilization, erosion control, and habitat replacement. This may include the creation of riffle habitat using boulders or other bio-engineering techniques, as well as replacing or enhancing the riparian vegetation, wetland and aquatic vegetation. Restoration will be planned and carried out in consultation with CDOW and CDOT's wetlands and/or threatened and endangered species coordinator(s) and CDOT's landscape architect.
(16) Each project requiring an NPDES permit will have a Stormwater Management Plan (SWMP), which will include site-specific BMPs for each project developed or reviewed by CDOT landscape architects in consultation with CDOT's biologists.
(17) To limit possible siltation and other pollution problems of streams, stormwater will be directed away from streams and associated wetlands. Such run-off shall be treated with the most appropriate temporary and permanent best management practices.
(18) No vegetation clearing, grubbing or grading will be done until just before other soil disturbance work is to begin in a specific area. The exposed areas will be stabilized as soon as work in the area is completed.
(19) Actions that result in disturbance of water or sediment underlying state waters will be avoided. Debris from bridge repair will not be allowed to enter the stream or surrounding habitat.
(20) Where possible, deck drains over streams will be eliminated and run-downs will be located on the bridge approach. Energy dissipaters will be placed at the outlet of the rundown as directed by the hydraulic engineer; a vegetated swale shall be installed where practicable for erosion control and as a means of filtering contaminants.
(21) During a project, motor fuels, lubricants, and other toxic substances will be kept at least 50 feet from the stream. The most current edition of CDOT's Standard Specifications for Road and Bridge Construction will govern the use, storage, and stockpiling of chemicals in the vicinity of state waters.

Prairie Butterflies

(22) CDOT will complete a sensitive habitat delineation using GPS and GIS technology that will include sensitive habitat for Prairie Butterflies and other species. This information will be provided to maintenance patrols so that inadvertent spraying of habitat does not occur. Where sensitive habitat has been delineated, the following

conservation measures will be used where determined to be necessary by CDOT's staff biologist.

(23) Within presumed presence for the regal fritillary as demonstrated by the sensitive habitat delineation, mowing in all Maintenance Zones or herbicide application will be avoided until late in the season (mid September). The timing of these efforts is important because 1) adults are generally present and feeding during most of the summer; and 2) the larvae feed upon their host plants when the plants themselves are most visible during the spring. If mowing must occur while larvae are feeding, the blade will be adjusted to a height of at least six inches, and mowing will be preceded by surveys by the CDOT staff biologist for violets (Wisconsin DNR 2000).

(24) Reseeding of disturbed areas will use a mix of native graminoids and forbs. When adequate moisture is available and seed is available, species that may be included in the mix are big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), switchgrass (*Panicum virgatum*), milkweeds (*Asclepias speciosa* and *A. incarnata*), dogbane (*Apocynum cannabinum*), coneflower (*Ratibida columnifera* and *Rudbeckia hirta*), wavy-leaf thistle (*Cirsium undulatum*), and horsemint (*Monarda fistulosa*). Mixes shall be as specified and/or approved by the CDOT landscape architect.

(25) Herbicide applications, if necessary, will occur in early spring or after mid-July, in order to correlate with the timing of the butterflies in their adult stages.

(26) Should mowing be necessary for safety requirements, CDOT will seek to maintain at least one-half the width of the roadside in an unmowed state. Mowing will occur in the spring to reduce the incidence of and competition from exotic cool season graminoids with warm season native grasses.

(27) If wild hops (*Humulus lupulus*), the larval host for hops feeding azures, is present in riparian or gulch areas, CDOT will avoid removing the hops to the maximum extent practicable, and will attempt to maintain a rocky and sunny exposure if that is the original condition of the habitat.

(28) CDOT is following a plan to reduce the spread, and eliminate where possible, noxious weeds in the ROW, through a program of mapping and treatment of larger patches of noxious weeds. Noxious weeds and Russian olive trees in areas of mitigation will be removed, to the extent practicable, to maintain a non-competitive, open, and sunny habitat for the butterflies, the hostplant(s), and the nectar sources.

(29) If road widening has potential to alter hydrologic regimes (and thus adjacent grasslands), culverts will be installed to ensure that water flow is not disrupted.

Northern Cricket Frog and Northern Leopard Frog

(30) If construction activities are to occur between March 1 and July 31 at sites that contain habitat for the northern cricket frog or the northern leopard frog, the CDOT staff biologist will be consulted prior to construction to determine actions necessary to avoid and minimize impacts.

(31) Pesticide application near permanent bodies of water will be restricted during the period of frog metamorphosis (June – August).

Texas Horned Lizard, Massasauga Rattlesnake, and Western Box Turtle

(32) In areas with high population densities of the target species, underpasses and drift fences will be installed where practicable, as part of reconstruction projects. Since Hammerson (1999) counsels caution in placing such devices, and additionally recommends education of the public via roadside signs placed at known turtle crossings, the CDOT staff biologist will be consulted before construction activities begin in known Texas horned lizard, Massasauga or Western Box Turtle habitat to determine that turtle crossings are properly placed and determine if road signs should be used.

Rare Plants

(33) If target plant(s) are present, mowing will be avoided until late in the season (mid-September) if possible. The timing of these efforts is important because flowering does not occur until mid-summer, and therefore, seeds are not fully developed until fall. If mowing cannot wait until autumn (e.g., for safety reasons), spring mowing (prior to June 15) will still allow plants to complete their reproductive life cycle.

(34) Re-seeding of disturbed areas will be with a mix of native graminoids and forbs wherever possible. Native mixes shall be specified and/or approved by the CDOT landscape architect.

(35) Herbicide applications will be used only if the herbicide targets monocots but not dicots. If monocot targeted herbicides are used, timing of application is not an issue.

(36) Where road widening results in alteration of the hydrologic regime, efforts will be made to ensure that water flow is not interrupted.

(37) While the majority of known occurrences for golden blazing star (*Nuttallia chrysantha*) are in the ROW of existing roads, road widening is not expected to occur within 165 feet of existing populations of this plant. This species does not transplant well. Re-seeding disturbed areas may be a viable alternative, but it is very important not to decimate the original seed source population. This species is not abundant, and seed availability is limited. Seed harvest is restrained so as not to deplete the soil seed bank in remaining populations. Therefore, habitat destruction for this species will be avoided to the maximum extent practicable.

Figure 2: Area of BMP Application for Interior Least Tern and Piping Plover

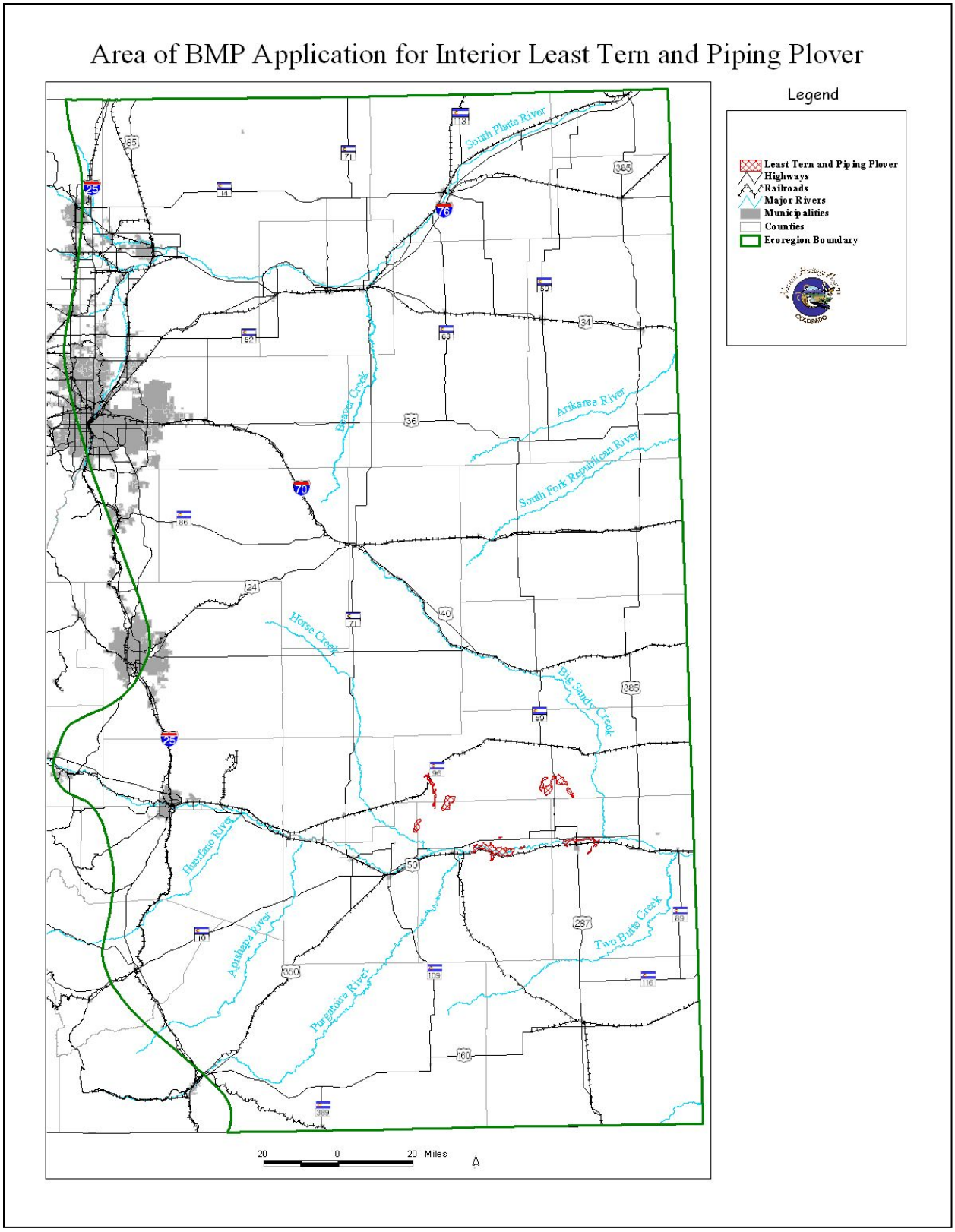


Figure 3. Area of BMP Application for Fish and Mussels

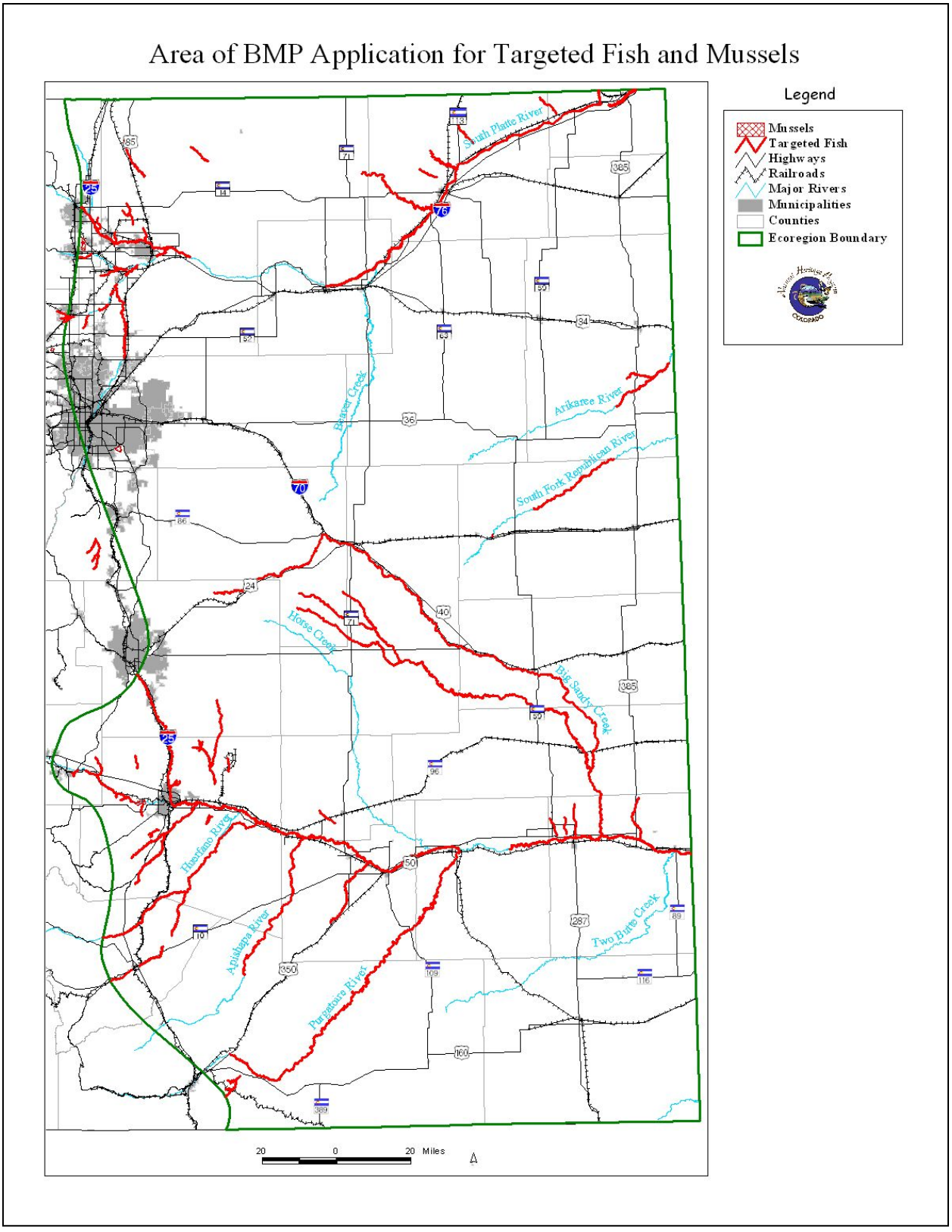


Figure 4. Area of BMP Application for Arogos skipper

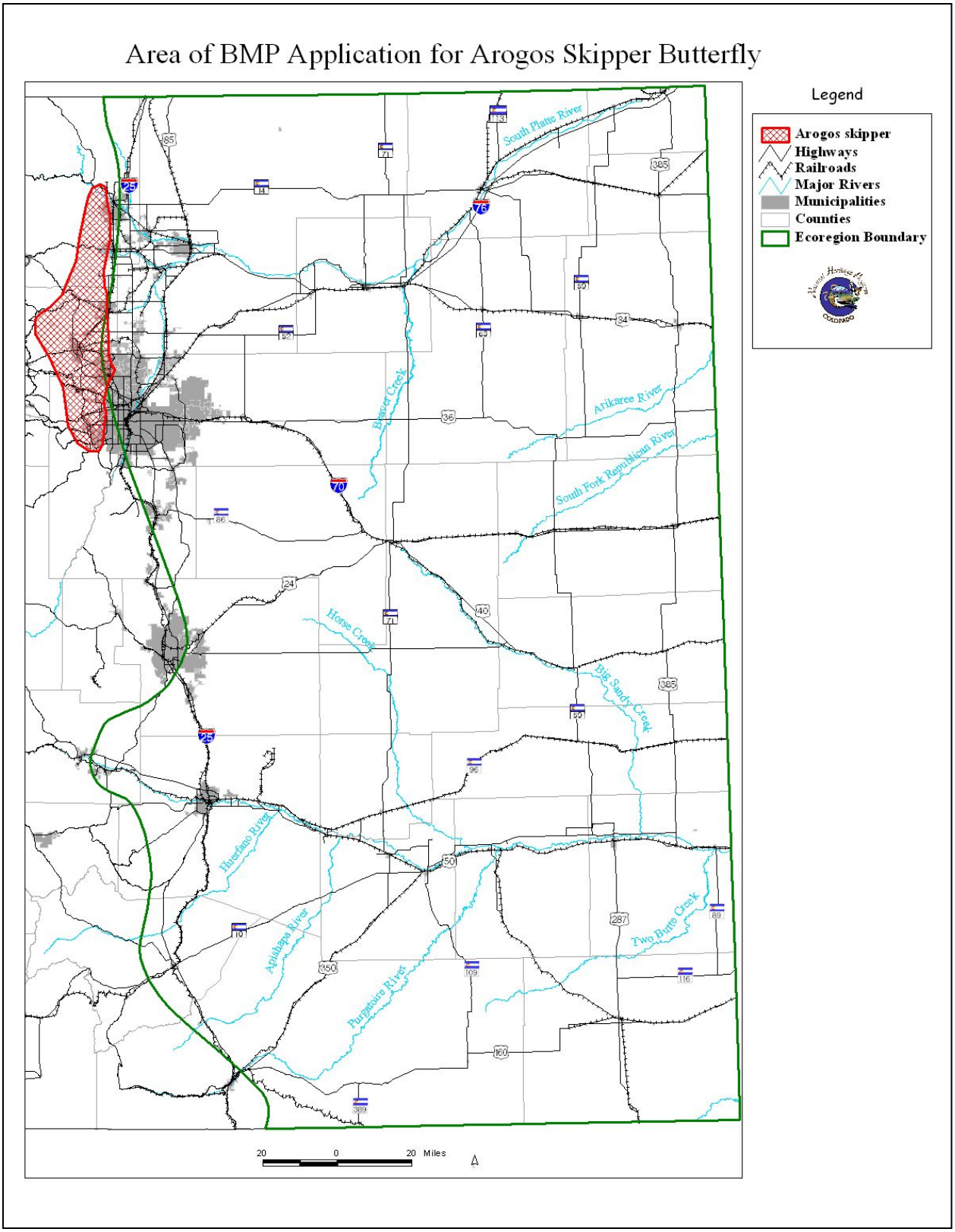


Figure 5. Area of BMP Application for Regal fritillary

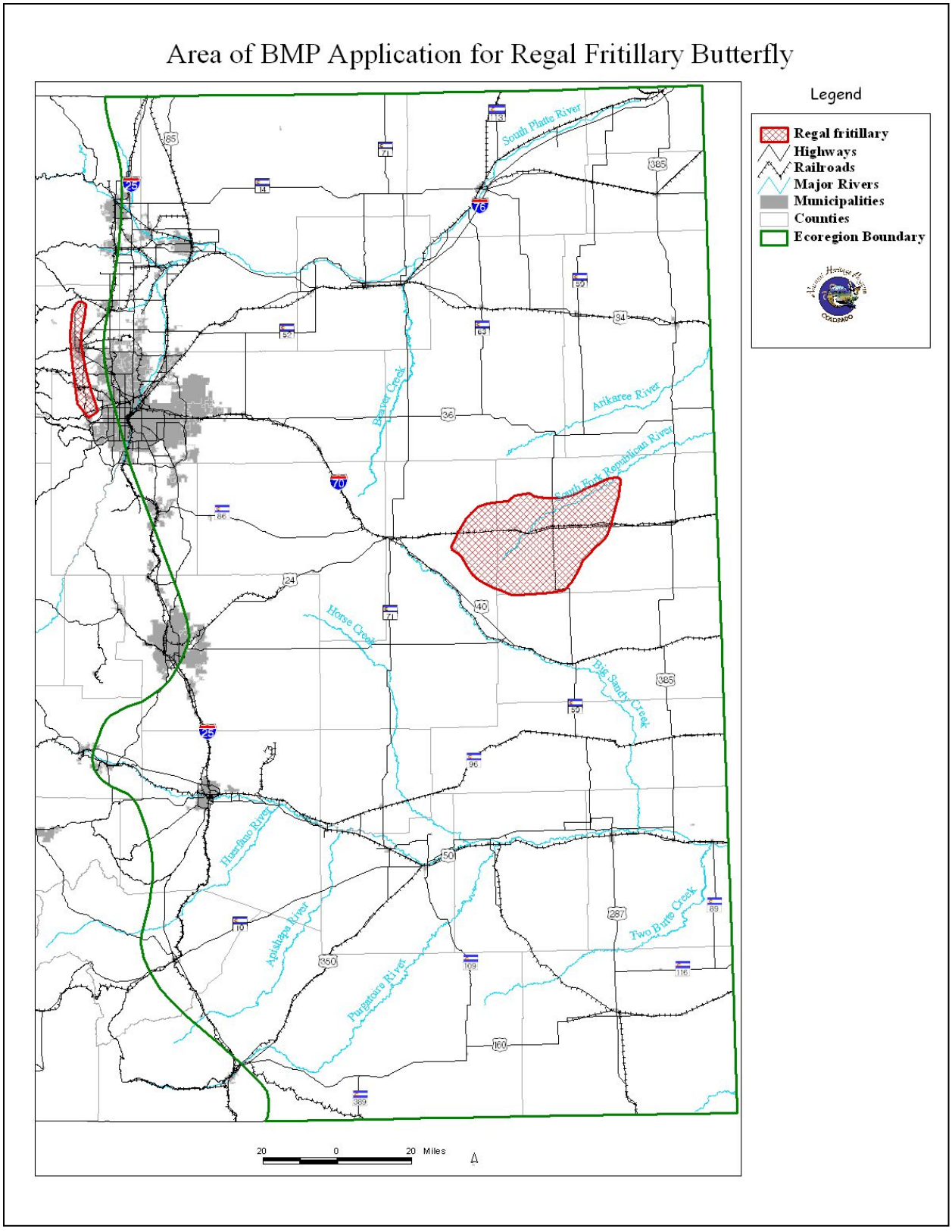


Figure 6. Area of BMP Application forHops feeding azure.

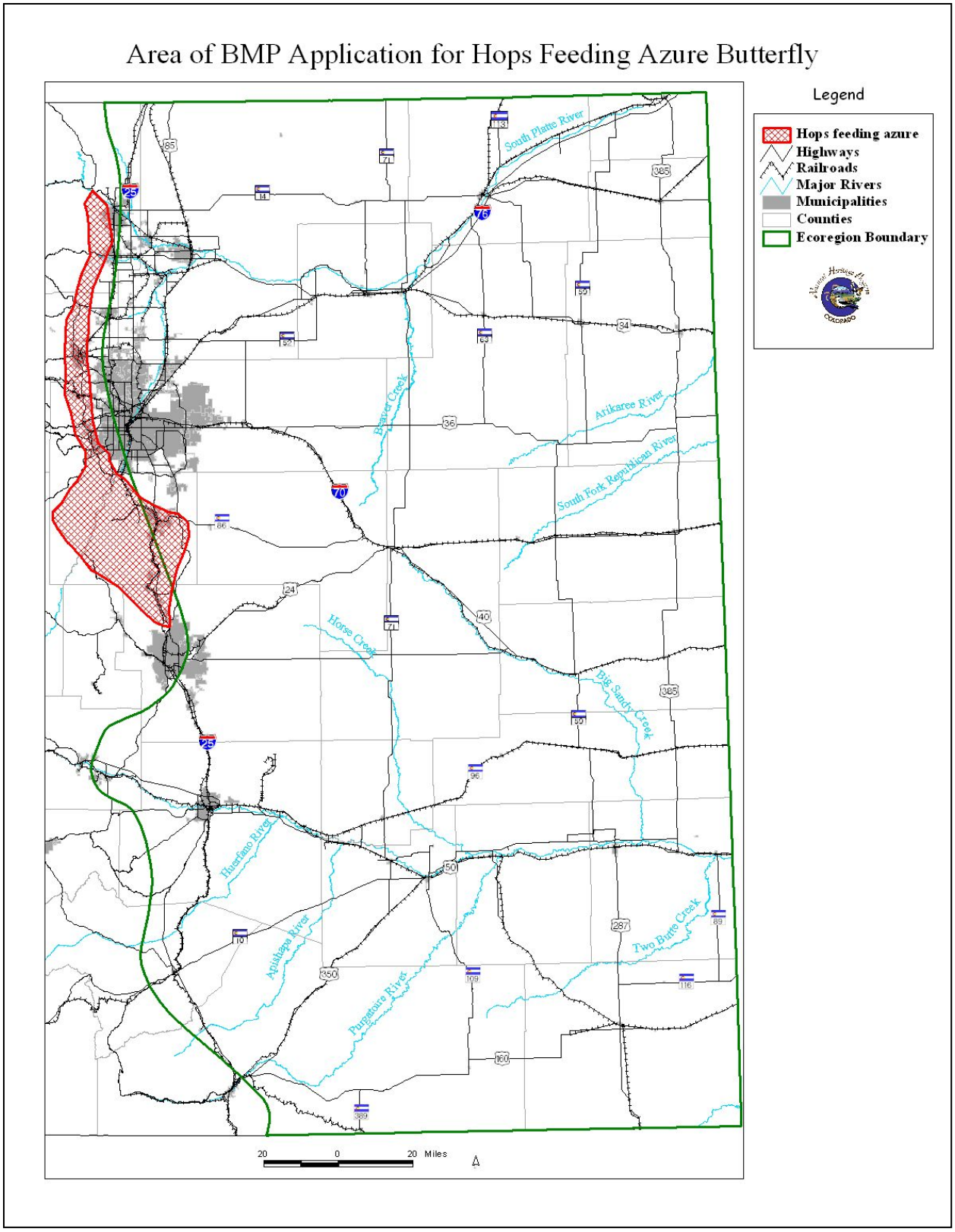


Figure 7. Area of BMP Application for the Ottoe Skipper.

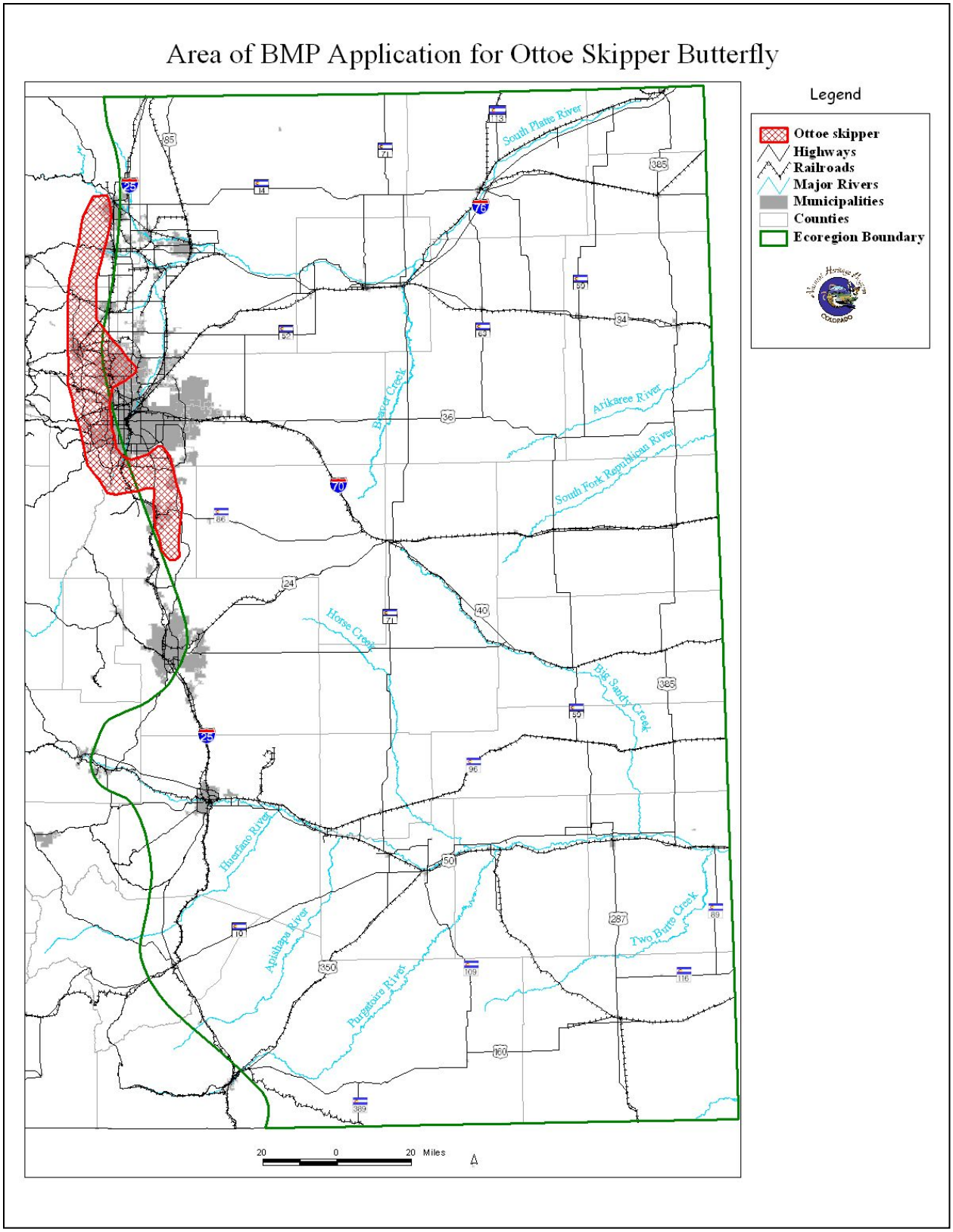


Figure 8. Area of BMP Application for Amphibians.

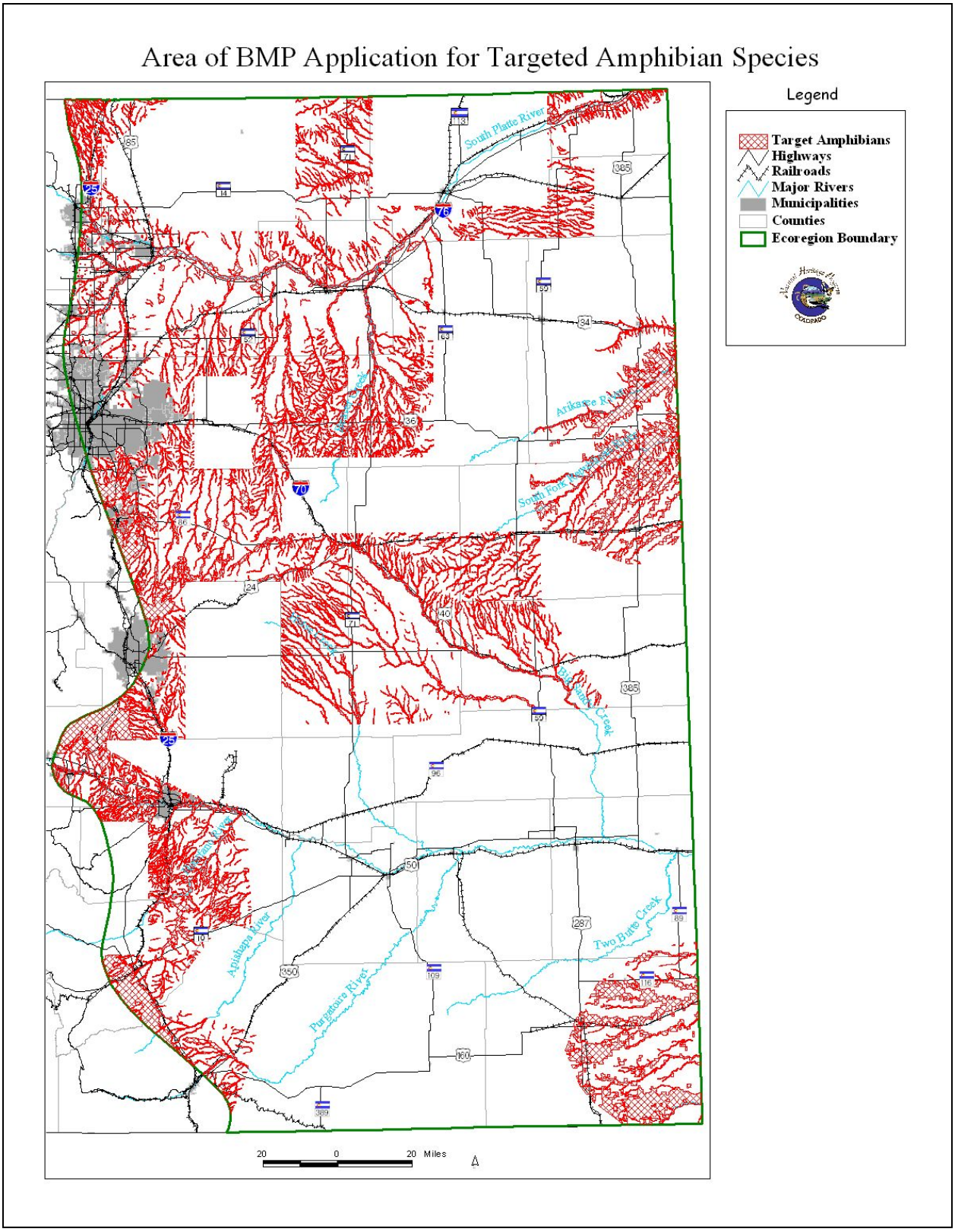


Figure 9. Area of BMP Application for Arkansas Valley evening primrose.

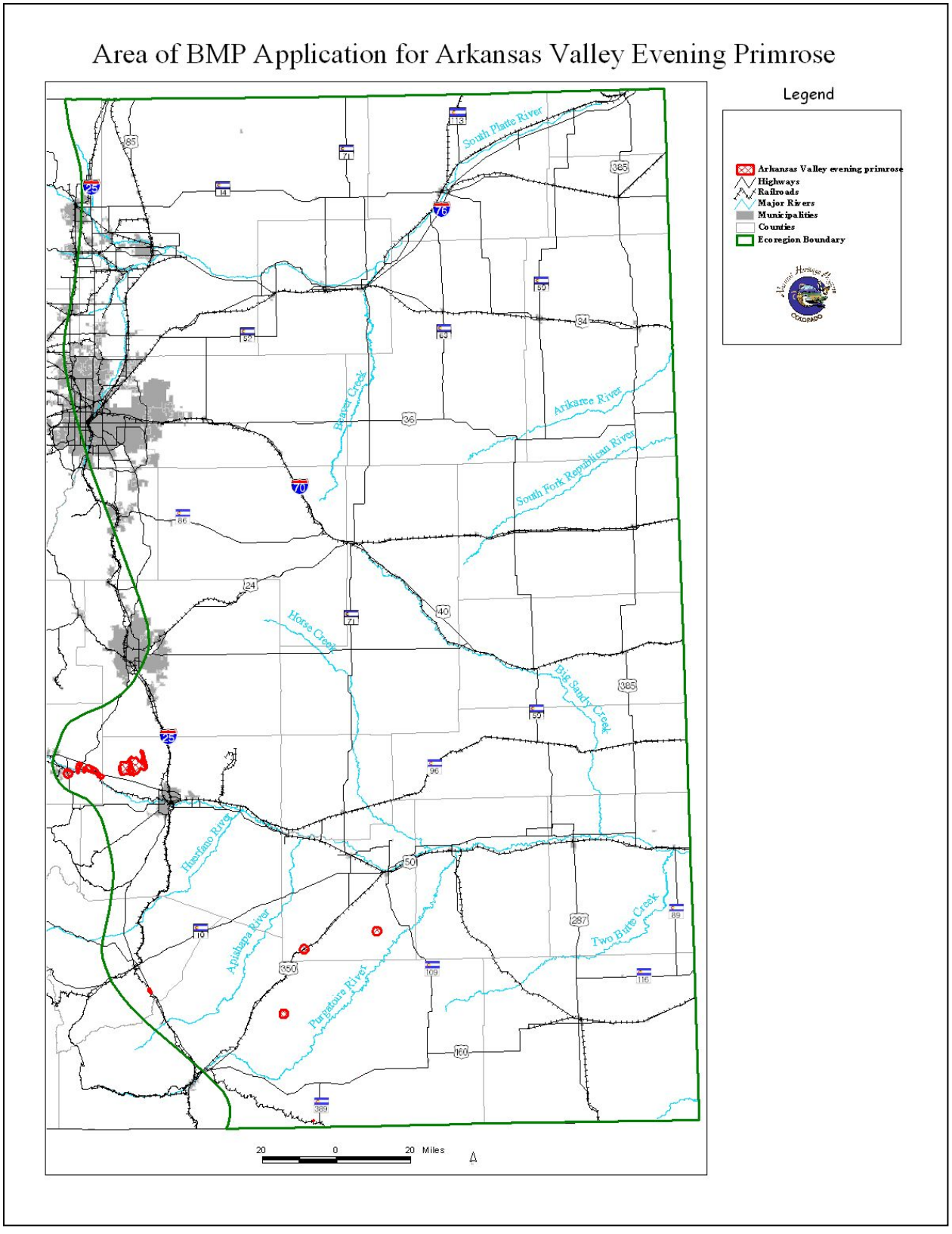


Figure 10. Area of BMP Application for Colorado butterfly plant.

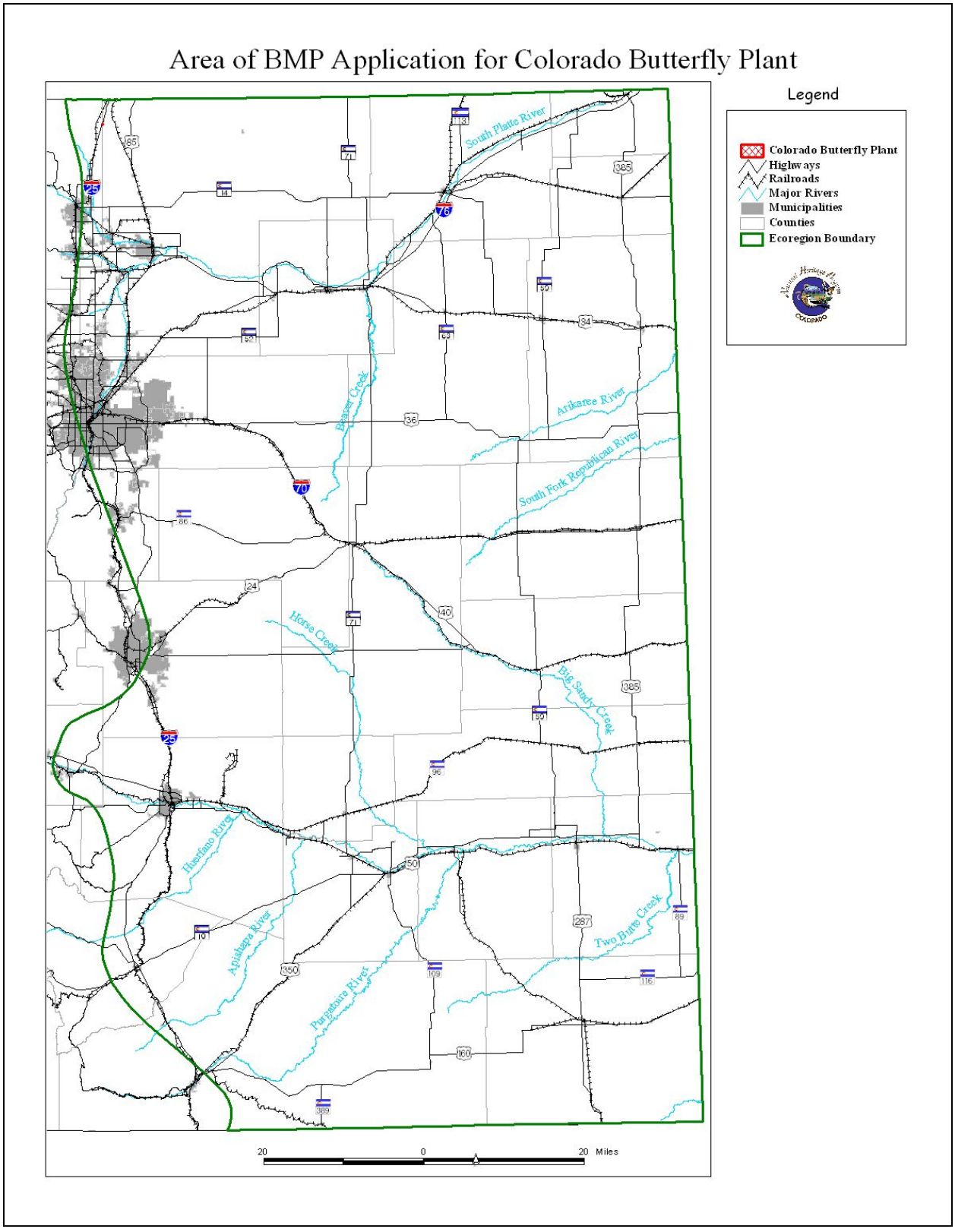
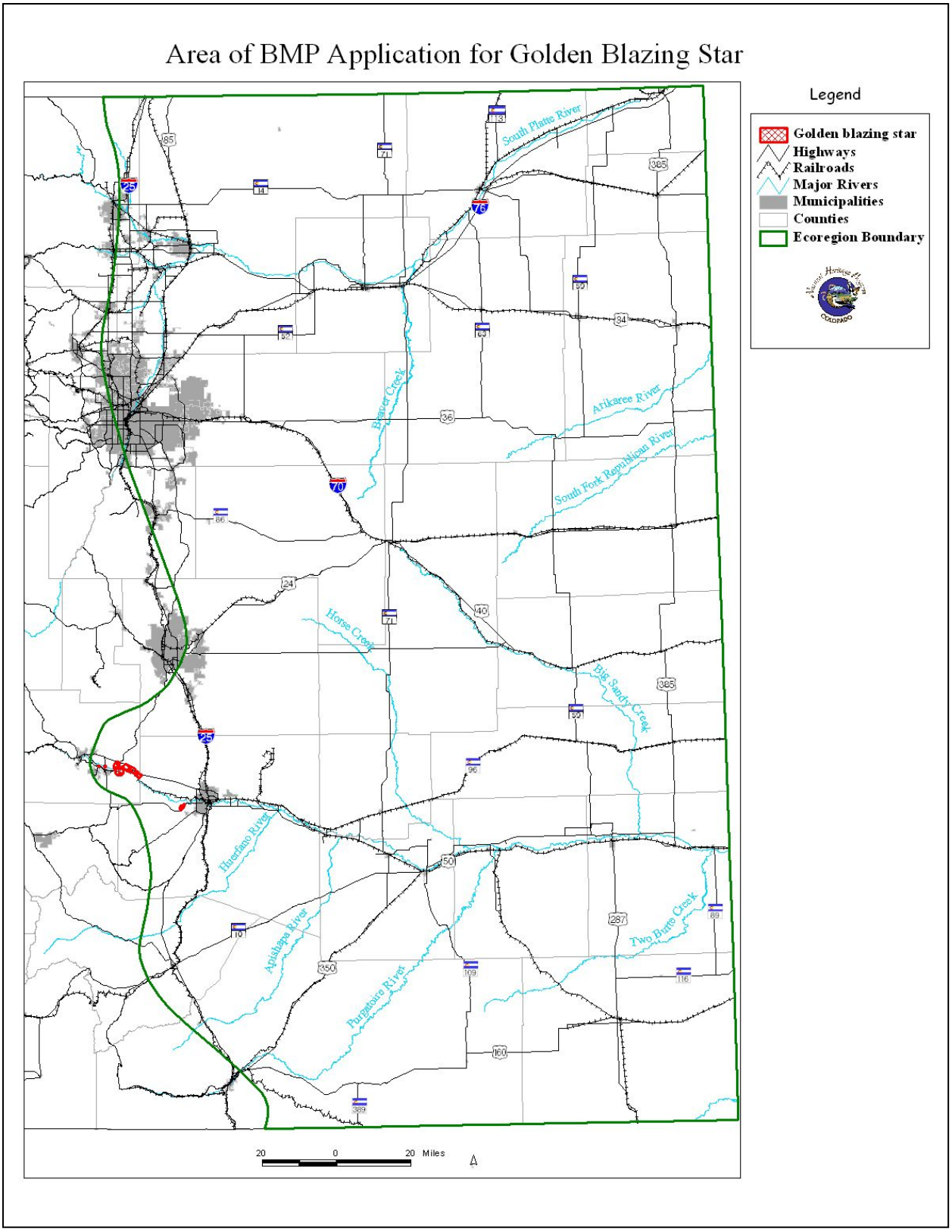


Figure 11. Area of BMP Application for Golden blazing star.



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Appendix A Chronology of Consultation

2 Feb 2000 Attendees: Tim Harris (CDOT Project Development Branch Manager), Marie Venner (Venner Consulting), George Gerstle (CDOT Planning Branch Manager), Roland Wostl (Environmental Planning Unit Manager), Ron Speral (FHWA Colo. Div. Program Delivery Team Leader), Edrie Vinson (FHWA Colo. Div. Environment/ROW Program Manager), Paul Garrett (FHWA HQ Ecologist), Lee Carlson (USFWS Field Office Director, Colo. Div.), Terry Ireland (USFWS biologist), and Alison Michael (USFWS/CDOT Liaison).

Discussion of various options for the legal documents, including programmatic Section 7 agreement, CCAA, Safe Harbor agreement, and multi-species programmatic agreements. Overall end goal is habitat conservation contributing toward species stabilization/recovery and assurances for CDOT. It may be necessary to take different approaches for different species, depending on listing status. Section 7 would be a more likely approach for listed species. Typically a Section 7 approach would: describe conditions necessary for reaching a non-jeopardy decision; require direct/indirect impacts from fragmentation to be treated separately under a programmatic agreement; would not be legally binding for non-listed species (therefore, CDOT would not get assurances); would require a BA for each project. A CCAA may be most appropriate for prairie dog and other shortgrass prairie species, but there were remaining questions on whether or not use of CCAA would be prohibited if federal FHWA funds were involved. [Later update from USFWS: a CCA would not be prohibited, but there would be no assurances.] Questions on interpretation included whether the regulation applies to "federal property owners" or to any federal involvement. Safe Harbor would require property management that ensured a baseline number of T/E species were maintained or increased. All these options were left on the table for further investigation, and there was agreement to pursue a programmatic approach that might draw on various aspects of these existing mechanisms. Edrie Vinson and Marie Venner reported on a meeting with TNC and CNHP regarding opportunities for cooperation, TNC's Central Shortgrass Prairie (CSP) ecoregional plan that identified priority areas for conservation.

14 Mar 2000 Attendees: Tim Harris; Becky Vickers (Project Development, CDOT Environmental Programs Mgr.), Marie Venner; Jerry Powell (CDOT Threatened & Endangered Species Specialist), George Gerstle, Roland Wostl, Ron Speral, Edrie Vinson, Robin Smith, Lee Carlson, Alison Michael, Mary Klein (CNHP Director), Lee Grunau (CNHP Conservation Planner), Chris Pague (TNC Director of Conservation Science), Betsy

Neely (TNC Conservation Planner), Tom Nesler (CDOW Aquatic Section biologist), Jennie Slater (CDOW Grassland Species Coordinator).

General issues for the prairie initiative:
CNHP and TNC presented data from the CSP ecoregion, along with rough budget for impact analysis based on existing data and brief site visits. Also discussion of possibility of TNC owning/managing property for CDOT, requirements under NEPA, options for conservation banking. There was agreement that top priorities for conservation would be species that were likely to become federally-listed and were potentially impacted by transportation projects. These priority species were to be identified using the State's threatened and endangered species list and CNHP's tracking list.

Regulatory Vehicles:
Further discussion of the use of CCAA as a possible vehicle to achieve CDOT's goal of habitat and species conservation. It was noted that the purpose of a CCAA is to lead to recovery, and a presumption that implementation of the CCAA would result in a noticeable contribution to recovery, sufficient to avoid listing when combined with the conservation efforts of others.

Impact Analysis:
The accuracy of analysis of impacts from transportation projects was discussed, along with the drivers including USFWS requirements and CDOT approval of funding for the conservation effort. Lee Carlson suggested that the analysis level is driven by NEPA, and that NEPA likely wouldn't be triggered by this action. The ESA requires only that the best scientific information available be used. It was noted that more conservative estimates need to be made when fewer data are available.

Conservation/mitigation banking:
There was discussion on the purchase of a large property for the purpose of conservation/mitigation banking (and what its service area would be), and of alternatives to a single large purchase. The benefits of a large land area were discussed; lack of current large protected parcels and beneficial interactions between species on large parcels were noted. An alternative discussed was in-lieu fee arrangement where funds would go into a trust fund for gradual, more opportunistic land purchases. There were questions of whether this was possible for state or federal agencies to do.

Next steps:
Explore trust fund/interagency expert advisory committee; advisory committee paper; CDOT options/benefits paper; meet with CDOT Regions 2 and 4; prioritize species to be included in agreement; level of impact analysis and cost; I-70 corridor programmatic approach.

22 Mar 2000 **Core Project Team Meeting.** Attendees: Lee Carlson, Becky Vickers, Alison Michael, Jennie Slater, Mary Klein, Jeff Manuel (CDOT Region 4), Rick Willard (CDOT Region 6), Lee Grunau.

Target Species List:
Discussion of species list composition. The target species lists in TNC's CSP ecoregional plan were used as a starting point for discussion. Decision was made to include all "candidate" species. Other possible inclusions discussed: whiptail, Texas horned lizard, box turtle, Cassin's sparrow, snowy plover, lesser prairie chicken, ferruginous hawk, burrowing owl, long-billed curlew, Arkansas speckled chub, Iowa darter, plains topminnow, redbelly dace, endemic invertebrates, possibly hops blue and moss's elfin, Botta's pocket gopher *rubidus*, plains pocket gopher *macrotis*, black-tailed prairie dog, any plants that grow in roadcuts. The group agreed to consult with other biologists on the core project team (Chris Pague and Jerry Powell), query CNHP databases, and develop a list of potential species to be compiled into a table and reviewed by full core project team and species experts.

4 Apr 2000 **Core Project Team Meeting.** Attendees: Edrie Vinson, Marie Venner, Alison Michael, Lee Carlson, Lee Grunau.

Regulatory Vehicles:
Discussion of potential use of the following agreements: Candidate Conservation Agreement, Habitat Conservation Plan, Safe Harbor, Section 7 Biological Opinion and programmatic. Unresolved question whether CCAAs can be used if federal funding were involved, even though this is a state project. Agreed to continue evaluating the potential use of each vehicle.

13 Apr 2000 **Core Project Team Meeting.** Attendees: Marie Venner, George Gerstle, Roland Wostl, Becky Vickers, Chris Pague, Edrie Vinson, Lee Grunau.

Project Goals:
Consensus on project goals: spend funds on direct conservation rather than section 7 consultation process, favor bulk impact assessment/habitat conservation over project-by-project BAs, fulfill ESA compliance and add predictability to project timelines, maximize assurances and minimize risk of legal challenges. Consensus objectives: fulfill section 7 requirements through early/programmatic BA/BO or avoid through CCAA; avoid re-initiation of consultation by making conservative estimates of impact. Decision was made to add globally rare Arkansas Valley plants to the species list, as these all occur in CDOT ROWs, and likelihood of federal listing is at least moderate.

Impact Analysis:
Potential approaches for impact analysis discussed were: habitat-specific analysis, range-restricted approach, predictability of impact (i.e., assessing potential impact based on a rating system of how predictable it is that target species would actually occur in the impact zone). Suggestion was made to identify species of concern, critical habitat/ecosystem for each species using existing GIS vegetation data, miles of road through habitat and width of impact zone, percent of impact and acres of impact by ecosystem/habitat. The team thought that this would provide the most reliable and conservative measure of potential impact because it would be based on measurable distribution and habitat data, and assumed species presence rather than species absence. (In other words, the approach would be conservative because the amount of potential impact would be over-estimated by assuming that target species were present throughout the impact zone. Therefore, the amount of mitigation accomplished would be greater than the actual impact.) Suggested use of "experts workshop" approach to define impact zones and estimate impacts.

19 Apr 2000 **Core Project Team Meeting.** Attendees: Marie Venner, Chris Pague, Lee Grunau.

Target Species List and Impact Analysis:
Discussion of criteria that a species should meet to be included in the project. Decision in favor of the following criteria: 1) potential for impact from transportation projects, 2) potential for federal listing within the timeframe of the project (~20 years), 3) availability of a mechanism for programmatic mitigation. Experts to be consulted for each taxonomic group (i.e., amphibians and reptiles, birds, fish, mammals, invertebrates, and plants) were identified. Some potential questions that could be posed to the experts were suggested: predictability of impact and within what area, sensitivity/severity of impact, reversibility of impact, on-site vs. off-site mitigation and which is best for long-term success, what percent of potential habitat is occupied and would this percentage be expected to remain constant over time.

1 Jun 2000 **Core Project Team Meeting.** Attendees: Marie Venner, Lee Carlson, Amy Lavender (CNHP GIS Manager), Alison Michael, Dr. Barry Baker (CNHP Information Manager), Lee Grunau.

Impact Analysis:
Lee Carlson approved habitat model approach for impact analysis. Habitat model approach would include development of distribution maps based on known occurrence/location data, identification of critical habitat types based on existing vegetation data, and calculation of acres of potentially impacted habitat within impact zones (to be defined in conjunction with experts).

Target Species List:
Agreement to get further review and narrow targeted species list by the following week, and to begin consultation with experts.

21 Jun 2000 **Expert Meeting - Lauren Livo (independent researcher)** – expert on amphibians and reptiles. Other attendees: Lee Grunau, Alison Michael.

Species list:
Rana blairi may be experiencing some declines, and may be "medium" in potential for federal listing.

Presumed Presence:
Acris crepitans – there is low probability of occurrence outside presumed presence map. Researchers have been looking for this species for a long time, and have not seen it. This is a distinctive frog. *Rana pipiens* – There are populations at Doudy Draw in Boulder County and Plum Creek in Douglas County. Most other historic populations are no longer there. This species occurs mainly in the foothills areas, and has been replaced by *R. blairi* on the plains. They are found near Wray, south of La Junta, along U.S. 160, along the Arkansas and Purgatoire Rivers. Survey efforts during highway projects would be desirable. Texas horned lizards have a more spotty distribution. You don't necessarily find 10 where you've found one. It is unclear whether this is due to difficulty in detecting, or low population density. Box turtles used to have "really good populations" in the sand hills areas. They are still present, but not as prevalent. "Good populations" occur in Yuma County. Any unplowed place with sandy soils would be good potential habitat.

Impacts:
Amphibians tend to stay pretty close to water, breeding in ponds and slow moving pools. Northern cricket frog and northern leopard frog would be expected to remain in the immediate vicinity of water in dry weather. They may wander up to ¼ mile to ½ mile away from water in rainy weather. Changes in hydrologic setting (including temporary de-watering or reduction of permanent water sources), siltation, salt in water, increased fragmentation, and pollution would impact these species. Also, hydrologic alteration may benefit exotic bullfrogs, which would be bad for the native species (i.e., predation on adults, tadpoles out-competed for resources, reservoirs of pathogens). De-icing compounds are supposedly not toxic at concentrations used, but may slow down development of *Bufo* tadpoles. Salts could also impact aquatic species. Many impacts could be minimized by timing - should avoid breeding season when animals are searching for mates and when young-of-year are dispersing. Fragmentation could be a problem for species that use wetlands where roads are barriers. Invasive weeds along roadsides could be a problem, as

well as any increase in predators such as raccoons. Roadkill is a primary concern for reptiles. The box turtle is a long-lived species, and may not be able to sustain current levels of "highway harvest." Turtles use road banks for breeding sites (egg deposition), so ground disturbance could be a problem. But researchers don't know where these sites are, and can't estimate scope/severity of potential impacts. Turtles "move around a lot" after rain episodes. Texas horned lizard often basks on highways, so roadkill is problematic. Massasauga are attracted by roads.

Impact zones:
Recommends 1/3 mile off road and up drainages.

Other comments:
Ms. Livo would like CDOT to fund studies on herpetofauna movement as roads are among the most significant impacts on populations, at least locally. Recommends minimizing road use in more valuable habitats, avoiding increase in traffic/speed, and directing roads away from riparian areas (including small drainages).

21 Jun 2000 **Expert Meeting - Dr. Carron Meaney (Univ. of Colorado)** – expert on mammals. Other attendees: Lee Grunau, Marie Venner, Jerry Powell, Alison Michael.

Species list:
Concerned about possible declines in white-tailed jackrabbit, but this is a broadly distributed species and declines are not well documented.

Impacts:
For pocket gophers, barriers between underground burrows are really the only impact of concern (i.e., from soil compaction, maybe road widening). This could lead to genetic barriers as well. Soil compaction under roads would probably be a limiting factor in burrowing underground. Pocket gophers are very subterranean, and do not come out of burrows very much. There is not a lot known about dispersal. When pocket gophers come above ground, it is usually at night. Roadkill not considered a problem. Regular maintenance not problematic either (e.g., vibration of mowers would cause them to go underground). Swift fox and prairie dogs - not much concern. Roadkill and connectivity are probably not a big issue. Foxes do cross roads and get hit, but roads probably function more as a filter than a barrier. Roads may be a more substantial filter for prairie dogs because this species is diurnal, but they may tunnel under roads.

Impact zones:
Agreed with 75 meter zone for pocket gophers based on movement data presented in Fitzgerald et al. (1999), suggesting that 90 percent of movement activity for Botta's pocket gopher (the more vagile of the two

subspecies) occurred within 50 meters of the nest. For swift fox, suggests 50-100 meter zone, based on potential impacts to prey base.

22 Jun 2000 **Expert Meeting - Susan Spackman (CNHP botanist)** – expert on plants. Other attendees: Lee Grunau, Jerry Powell.

Species list:
Recommend taking *Asclepias uncialis* off project list. State/federal highways not an issue for only known occurrences. Can't really define habitat well enough to predict occurrence. Other plants to consider: *Ambrosia linearis, Oonopsis foliosa*. *A. linearis* is commonly found along roads. Natural habitat is playas, but plant does well in drainage areas along roads. If playas are lost, roads may become an important refuge. *O. foliosa* occurs along roads, but in large areas. This plant is tolerant of disturbance, and is probably doing ok.

Presumed Presence:
There is only one extant location for *Gaura neomexicana* ssp. *coloradensis* in Colorado (at I-25 north of Fort Collins).

Impacts:
Less concerned about *Bolophyta tetraneuris* than the rest of the Arkansas Valley plants. Primrose is of particular concern – almost all existing occurrences are along roads. Not known to occur in high quality natural habitat anymore. All known occurrences are small. Mowing, spraying, ground disturbance (especially highway widening), any other impacts to pollinators and adjacent habitat would be problems for all these plants. Especially important NOT to spray near primrose populations. Alteration of hydrology additional impact to *G. n.* ssp. *coloradensis*. However, it is unclear whether impacts are positive or negative.

Impact zone:
Recommend 50 meters off road. Treat *G. n.* ssp. *coloradensis* like fish/mollusks.

22 Jun 2000 **Expert Meeting - Dr. Boris Kondratieff (CSU)** – expert on invertebrates. Other attendees: Lee Grunau, Alison Michael.

Species list:
Recommend eight species from Mydidae, Asihdae, and Cicadas, but very little is known about any of these, and the likelihood of federal listing is very low.

Impacts:
For mollusks, biggest impact from bridgework and siltation. For insects, host plant interactions very important. Impacts include mow/spray impacts

to host plants and nectar sources. Seasonal mowing may be helpful. Important to maintain integrity of streams. ROWs contain many nectar source plants.

27 Jun 2000 **Expert Meeting - Dr. Stephen Mackessy (UNC)** – expert on amphibians and reptiles. Other attendees: Alison Michael.

Species list:
Acris crepitans may have been extirpated from Colorado, but they are very difficult to survey for.

Impacts:
Problems for massasauga from roads are barriers to movement, roadkill, and increased visibility to predators. These snakes move in nearly straight lines from their hibernation areas to feeding grounds and back again. If a road is in the way, they cross it. High densities occur in the Hugo area. Worst impacts to herpetofauna in general are those that cause direct mortality (e.g., mowing, roadkill). Roads may actually attract many herps. Horned lizards in general tend to bask on roads. On a single pass of Highway 287 between Kit Carson and Eads, Dr. Mackessy's crew counted 75 road-killed box turtles. Emphasized that roadkill is biggest problem. In ~60,000 miles of road surveys over three seasons, Dr. Mackessy's crews found approximately 1,200 *useable* roadkilled specimens. Recommends use of underpasses accompanied by barriers in areas of high density. Underpasses would only need to be about one foot deep and "a couple of turtle widths" to be effective. Barriers paralleling the highway would serve to keep animals off the road and funnel them toward the underpasses. This would greatly improve the effectiveness of underpasses, but would not be essential. Underpasses should ideally be placed at intervals of approximately 100 meters.

28 Jun 2000 **Expert Meeting - Chuck Loeffler (CDOW)** – expert on amphibians, reptiles, and mollusks. Other attendees: Jerry Powell.

Species list:
Roundtail horned lizard could be dropped from list. This species is not likely to be impacted by any action of CDOT.

Impacts and impact zone:
For mollusks, the only concern would be impacts to permanent water sources or water quality. Impacts would be temporary since disturbance mechanism (i.e., the road) is already present. These amphibians are dependent on permanent water for long-term survival. Reduction of permanent wetlands or temporary de-watering of suitable habitat could destroy a local population. Permanent loss of wetlands would call for mitigation. For reptiles, construction leading to increased roadkill would

impact the species. Maintenance impacts would be temporary. Mitigation should only be for habitat that is permanently destroyed.

28 Jun 2000 **Expert Meeting - Janet Coles and Kathy Carsey (CNAP)** – experts on plants. Other attendees: Jerry Powell.

Species list:
Asclepias uncialis not known to occur close to roads; not expected to be found in ROW; lower probability of being impacted.

Impacts:
For *G. n.* ssp. *neomexicana*, do not alter hydrology. Could salvage the plant for mitigation. *Bolophyta tetraneuris* is the most common of the Arkansas Valley plants, but is slow-growing and long lived. This is the hardest plant to mitigate for. It does not tolerate disturbance, and will not recolonize. Road clearing and herbicides could effectively wipe it out. If other Arkansas Valley plants are protected, this one will be also. For *Nuttallia chrysantha*, moratorium on mowing in late August-September would help reproduction. This species colonizes roadcuts and would be easy to mitigate by salvaging seeds. For *Oxybaphus rotundifolius*, mow after July. This plant is likely to be listed by USFWS. *Oonopsis puebloensis* grows in roadsides. Utilities in ROW at Highway 50 and 115 are impacting – this plant is at significant risk.

29 Jun 2000 **Expert Meeting - Tass Kelso (Colorado College)** – expert on plants. Other attendees: Jerry Powell.

Species list:
There are no road issues with *Asclepias uncialis.* Could drop *Bolophyta tetraneuris* from the list – most common of the feverfews.

Impacts:
For *Oenothera harringtonii*, likes disturbed sites such as roadsides; seeds could be collected and hand seeded as a mitigation technique. For *Bolophyta*, does not like roadcuts, and not easy to re-establish. Protect existing populations. For *Nuttallia chrysantha*, found on roadcuts – road-widening could have major impact. Potentially could salvage seeds and reseed newly disturbed areas; moratorium on late-season mowing could help reproduction. For *Oxybaphus rotundifolius*, found on roadsides – widening would have negative impact. Work on Highway 50 and Highway 115 would have major impact. Buy land to protect. This is the best species for growth on small parcels of land. For *Oonopsis puebloensis*, does not do well on roadcuts. Protect habitat, and all other plants will be protected as well.

12 Jul 2000 **Expert Meeting - Scott Hutchings, Dr. Fritz Knopf, Susan Skagen, Janet Ruth, Beth Dillon, Tom Stanley** – experts on birds. Other attendees: Jennie Slater, Chris Pague, Marie Venner, Amy Lavender, Lee Grunau.

Species list:
Add lark bunting (PIF watchlist) and loggerhead shrike (NAFTA species of concern) to the list per request by Jennie Slater. Remove greater prairie-chicken (soon to become a game bird in CO) and plains sharp-tailed Grouse (hunted in other parts of range and unlikely to become federally-listed).

Impacts:
Activities with potential to impact: mowing (some spraying); sanding/de-icing; widening, re-surfacing and shoulder improvements; bridgework; maintenance yards/stockpiling; weed management. Birds may be attracted to roadsides, but ROWs should be written off as habitat, since populations will not be viable there. Question of primary concern is "how much habitat is permanently lost?" (rather than "what are the chances of a CDOT project hitting a bird?"). Biggest threat is habitat loss. Strong consensus that this is what should be mitigated. Use seasonal restrictions and BMPs to address temporary impacts. (None of the experts were willing to make projections about percent of habitat occupied or likelihood of a species being present.) Activities expected to result in permanent habitat loss are widening (part under pavement), maintenance yards and stockpiling areas, and bridge widening. Mitigating by habitat type would effectively mitigate for all birds as follows: Shortgrass = burrowing owl, mountain plover, long-billed curlew, McCown's longspur; Playa = western snowy plover; Desert shrub = loggerhead shrike; Mixed-grass = lesser prairie-chicken, Cassin's sparrow, greater prairie-chicken, sharp-tailed grouse.

Impact zone:
Recommended analysis area is ROW. Loss is greater than number of acres permanently lost. There is no science to say how much, but need something greater than 1:1 mitigation. Acreage of potential permanent habitat loss should be calculated, and then some additional percentage should be added to offset temporary impacts.

19 Jul 2000 **Core Project Team Meeting.** Attendees: Marie Venner, Alison Michael, Jerry Powell, Amy Lavender, Lee Grunau.

Expert Meetings Debrief:
Based on discussion with bird experts (12 July 2000), decision to define impact zone for birds as the ROW, and to calculate potential impacts by estimating average width of ROW and number of road miles that would be

worked on, intersected with presumed presence polygons. The bird experts suggested adding some undefined percentage (of acreage) on to the mitigation requirements (in addition to the acreage of potential permanent habitat loss) to offset temporary impacts; the very conservative assessment approach we are outlining should cover this. Decision to add lark bunting and loggerhead shrike to list based on request by Jennie Slater. The lark bunting was on the Partners In Flight national watchlist, and the loggerhead shrike was listed as a species of conservation concern under the North American Free Trade Agreement. The team agreed that the presence of these species on other "radar screens" may indicate a higher potential for future federal listing. Decision to drop greater prairie-chicken and plains sharp-tailed grouse off the project list. The greater prairie chicken was moved off the state "Threatened" list by CDOW, and was scheduled to become a game bird open for limited harvest. The plains sharp-tailed grouse, though listed as endangered in Colorado by CDOW, is hunted in other parts of its range. Therefore, likelihood of future federal listing was considered to be low. Agreement to include the ferruginous hawk on a secondary "also protected" list. The likelihood of federal listing was considered to be low because populations have been increasing. However, the ferruginous hawk was mentioned as a species of potential conservation concern at the bird expert meeting, so the group agreed to keep this species on the radar screen for the time being by adding it to the secondary species list. Agreement to delete the roundtail horned lizard from the project list (only known occurrences are not near roads, and therefore unlikely to be impacted by CDOT projects), and to add *Rana blairi* (plains leopard frog) to the secondary list based on the suggestion by Lauren Livo (amphibian expert) that populations may be declining. Agreement to measure impact for herpetofauna within the ROW, except at drainage crossings, where an additional 1/3 mile would be added to the ROW impact zone for amphibians. (According to Dr. Mackessy, acute impacts (loss of habitat & roadkill) are more important than secondary impacts.) Suggestion also to identify some percentage of acreage above permanent habitat loss to offset temporary impacts (as suggested for birds). Decision to delete *Asclepias uncialis* (dwarf milkweed) from the species list based on input from plant experts that state and federal highways are not impacting known occurrences of this plant. Furthermore, habitat requirements for this plant are hard to identify, and plants are not predictably found in habitat that appears to be suitable.

20 Jul 2000 **Expert Meeting - Dr. Jerry Choate (Ft. Hays State Univ.)** – expert on swift fox. Telephone interview with Lee Grunau.

Impacts:
Swift foxes are affected hardly at all by presence of humans. Doubt there is much impact once the road is there. This is a generalist species that does well in altered habitats, and exists everywhere between Kansas and

the Colorado Front Range. May lose some denning habitat if vegetation grows up taller along roadside (interstate highway) ditches; area between highway and fence would be lost to foxes. Does not think that habitat has been fragmented by roads. Roadkill may be an issue, but greatest concern for swift fox is coyotes.

Impact zone:
Did not think that there was significant potential for impact from CDOT projects. Attempting spatial measure of impact does not make sense for this species.

07 Aug 2000 **Expert Meeting - Tom Nesler (CDOW)** – expert on fish. Other attendees: Lee Grunau, Amy Lavender.

Species list:
Include all state-listed fish.

Presumed Presence:
Redbelly dace, plains topminnow, and common shiner occur in relatively isolated populations. Arkansas darter and brassy minnow are tributary species, but need connection to mainstems for colonization and dispersal. Plains and suckermouth minnows are mainstem species. The suckermouth occurs from John Martin Reservoir downstream in the Arkansas and near Lake Meredith. The plains minnow only occurs in one population, but CDOW will likely reintroduce additional populations. The southern redbelly dace is a pond/pool species. It has a very disjunct distribution. CDOW is only looking at the area around Canon City/Pueblo for recovery. Flathead chub is everywhere within the Arkansas basin above John Martin Reservoir. Plains minnow – This is a mainstem species. There is no real population to impact right now. Recovery will be Arkansas from Pueblo to state line except John Martin Reservoir. This species is virtually extirpated now. Brassy minnow is a tributary species. There may be potential restoration sites in tributaries around north of South Platte. Suckermouth minnow – this is a mainstem species in the Arkansas. There is also one location in the South Platte.

Impacts:
Issues would be permanent barriers (e.g., conduit pipes, cement fall structures). There is some critical threshold for gradient, but does not know what it is. Not concerned with turbidity, siltation, etc., as this type of impact isn't any different from results of summer storms, to which fish are adapted. Any impact that lasts longer than one year could affect life cycle. Impacts longer than two-year duration could extirpate populations.

Impact zone:
Use of on-site BMPs better conservation approach than off-site land protection.

17 Aug 2000 **Core Project Team Meeting.** Attendees: Alison Michael, Lee Grunau, Jennie Slater, Nancy Smith (TNC Government Relations), Marie Venner.

Impact Analysis:
After discussion of data provided by the Division for Transportation Development on planned bridge improvements and projected budget for off-system bridge improvements, the biologists on the core project team considered such off-system bridges negligible in the impact analysis due to their small number. Of the ~550 bridges in the system, there are only five bridges off-system – four of which are within urban metro areas scheduled for improvements. Discussion of input regarding fish from Tom Nesler (CDOW fish expert), who suggested that impacts from transportation projects less than one year in duration were not considered problematic for plains fish because these types of temporary impacts (i.e., low water, high sediment) mimic the disturbance patterns of the summer storms that these fish are adapted to. The core project team agreed that the most appropriate mitigation approach for fish would be implementation of BMPs at project sites, rather than off-site mitigation through land protection elsewhere. Stream restoration partnerships could also be considered should opportunities arise. The first draft of the GIS impact analysis was reviewed. The original draft results from the first round of GIS calculations reported all habitat types in the CSP, rather than only those considered suitable habitat for targeted species. The group agreed that Chris Pague, Jennie Slater, and Gary Skiba (CDOW, Threatened & Endangered Species Coordinator) would refine vegetation affinities for vertebrate species on the list to fine-tune the impact analysis.

Memorandum of Agreement:
Review of the draft MOU between CDOW, USFWS, CDOT, FHWA, TNC. The group agreed that CNHP/CSU would not be a signatory on the MOA, but would rather function as a consultant to CDOT in this process. Two options for funding of operations and maintenance of conservation areas were discussed: including funding for O&M as a CDOT responsibility in the MOU, or transferring a lump sum to TNC (or another conservation entity) for both land purchase and O&M. The team agreed to investigate these options further. Various editorial changes to the wording of the MOA were agreed upon.

19 Sep 2000 **Core Project Team Meeting.** Attendees: Marie Venner, Lee Carlson, Lee Grunau, Amy Lavender, Alison Michael.

Impact Analysis:
The issue of adding additional percentage of mitigation to offset temporary impacts was raised again and the decision to take a conservative approach to impact assessment of the ROW (assuming impact to all of the ROW even though in most cases of construction, only a portion of that is impacted, and most of that portion only temporarily) was reviewed. Questions to evaluate further: regarding reptiles – can you mitigate roadkill by protecting habitat? [This question was addressed with Dr. Stephen Mackessy in May 2002 – notes from that meeting are included below.] Regarding fish – Do upcutting and downcutting around bridges constitute permanent habitat alteration? If so, habitat restoration in addition to BMPs may be required. This question was not answered directly, but Marie Venner agreed to pursue development of BMPs in conjunction with opportunities to assist CDOW with recovery strategies. Lee Carlson questioned the status of Woodhouse's toad, and why it was not included on the species list. This species was not included because, according to Hammerson's 1999 field guide, Woodhouse's toad is widespread and abundant, and is "easily […] the state's most commonly encountered amphibian." The core project team agreed that likelihood of federal listing was low. Chris Pague and Lee Carlson agreed the most appropriate conservation approach for amphibians would be to treat them the same as fish – i.e., with BMP/on-site mitigation rather than off-site habitat protection.

28 Oct 2000 **Expert Meeting - Jerry Craig (CDOW)** – expert on raptors. Telephone interview with Lee Grunau.

Impacts:
Eagles tend not to frequent areas where there is a lot of traffic. Adaptation to existing roads has already occurred. Where eagles occur near roads, they are already adjusted to activities on the road. CDOT projects should not directly affect. However, eagles rely heavily on black-tailed prairie dogs in the winter, so any CDOT impact to prairie dogs would also impact eagles. Loss of prairie dog colonies would equal lost resources to eagles. Not aware of any problems associated with bridgework. As population of breeding eagles expands, use of prairie dogs increases. Nesting populations would be more immediately and profoundly impacted (by impacts to prairie dogs).

Impact zone:
Impact to eagles should be measured the same as impacts to prairie dogs.

23 Jan 2001 **Core Project Team Meeting.** Attendees: Alison Michael, Jerry Powell, Chris Pague, Marie Venner, Amy Lavender, Lee Grunau.

Target Species List and Impact Analysis:
Agreed to move both pocket gopher subspecies to secondary list. Based on very limited range, the species would require a site-specific, project-based approach to mitigation rather than a programmatic approach. The team agreed to include the bald eagle in the GIS analysis based on concerns raised by Jerry Powell. Jerry Powell agreed to get input on assumptions for analysis (e.g., defining the impact zone) from Jerry Craig (CDOW raptor expert). Question: can mitigation habitat be anywhere in the plains? Subsequent discussion concluded that habitat must be mitigated within the species' normal range, but was not required to be within the same local area as the impact.

30 Jan 2001 **Core Project Team Meeting.** Attendees: Marie Venner, Alison Michael, Jerry Powell, Gary Skiba, Chris Pague, Lee Grunau.

Impact Analysis:
Regarding the impact zone for bald eagle: Jerry Powell discussed this issue with Jerry Craig. The proposal was that the impact zone equals all ROW within 15 miles of roost sites documented in CDOW's WRIS database ("Wildlife Resource Information System") within defined vegetation affinities. [Chris Pague and Gary Skiba subsequently drafted vegetation affinities, which were then reviewed by Jerry Craig.]
Regarding prairie dogs: Decision not to use EDAW prairie dog data for presumed presence because they were incomplete, covered existing colonies only, and did not consider potential habitat. Considering all potential habitat, as opposed to occupied habitat only, was considered a more ecologically conservative approach. Discussion of categorizing vegetation types within impact zones into major habitat types that could be used to identify potential conservation areas. The team agreed that all vegetation types being impacted (potentially) may be grouped into four habitat types: shortgrass, playa, midgrass, shrub. Lee Grunau agreed to develop a table to cross-reference vegetation types, species habitat affinities, and these four habitats for review and analysis by the core project team. The team further agreed that the number of habitat types for mitigation could potentially expand to six depending on how the final impact results turn out.

14 Mar 2001 **Core Project Team Meeting.** Attendees: Marie Venner, Alison Michael, Gary Skiba, Lee Carlson, Edrie Vinson; Pat Melhop (USFWS Grasslands Coordinator), Dana Jacobsen (Department of Interior Solicitor); Jerry Powell, Dennis Buechler (USFWS Region 8), Lee Grunau.

Regulatory Vehicles:
Discussion of the relative merits of doing a Habitat Conservation Plan. The group agreed that a December completion date would be ideal if a contractor could be found to write the document(s). A meeting was suggested for March 21 with a FHWA NEPA biologist to discuss what documentation would be required. A suggestion was made to determine what major landowners (e.g., federal) owned/managed property within the impact zones, because these parties may need to be consulted if an HCP were developed. Discussion of whether mitigation land management would be done through TNC or CDOW; no final decision was made. Both CDOW and TNC would require stewardship funds in order to assume management responsibility.

Off-site Mitigation:
A detailed discussion was held on potential conservation areas, distribution of sites, and what mitigation obligations would be met with various alternatives. [Sensitive details regarding private landowners not included in this summary.] Chris Pague suggested adding the issue of landscape context into the discussion on potential conservation areas. No potential conservation areas were identified to address lesser prairie-chicken. Gary Skiba agreed to identify potential sites for this species. It was noted that large prairie-dog colonies would need treatment (i.e., more intensive management); for most other species, conservation easement rather than fee purchase would work. Regarding plants, the question of extent to which populations intersect ROW as opposed to adjacent land was raised for future investigation. Gary Skiba agreed to identify potential conservation areas that could meet playa mitigation requirements, though impacts were very low in this area. CDOT stated that they would like to have a recommendation from the site selection panel for $2million worth of land/easement by May 2001.

3 May 2001 **Core Project Team Meeting.** Attendees: Lee Carlson, Gary Skiba, Alison Michael, Marie Venner, Nancy Smith, Chris Pague, Renee Rondeau (CNHP Ecologist), Tom Blickensderfer (DNR Endangered Species Coordinator), Lee Grunau.

Regulatory Vehicles:
Review of feedback from FHWA headquarters NEPA trainers, including Pam Stephenson, that we should not do NEPA on this; the conservation purchases qualify as a CatEx and there is not a sufficient federal action to trigger NEPA. NEPA documents on future projects can reference the conservation plan/BO. There was brief discussion of how the banking system would occur; i.e. by habitat type. CDOT will begin using the conservation bank as soon as the BO is complete. There was some discussion of who might be available to write the Programmatic Section 7 or HCP document, but no decision was made. There was a note that any

management bids that are received from others must include biological tracking.

Off-site Mitigation:
Discussion of potential sites for mitigation easements, and what information needs to be collected. [Sensitive details relative to private landowners not included in this summary.] The team agreed that the following baseline information would be needed for potential conservation areas: size and condition; land use (including adjacent); vegetation (size and condition of patches); restoration potential; presence of species (if possible); digitized boundaries of prairie dog colonies where possible. Summary: need baseline and a repeatable way to show change over time. Lee Carlson agreed that the above list of baseline data is sufficient for the regulatory document and as a baseline for mitigation and long-term management. The suggestion was made that mitigation be viewed as threat abatement via management. Chris Pague agreed to draft a white paper on preservation and why a 1:1 mitigation ratio very adequately provides for conservation. His rationale would describe how a baseline condition plus management would equal more birds than would ever be found on roadsides. Other constituencies to potentially involve in the project: Colorado Cattleman's Association, Farm Bureau, NRCS, Bent County Cattleman's Association, state Department of Agriculture. CDOT held meetings with the Farm Bureau in April, May, and June, as well as with the Colorado Cattleman's Association in May and June. Marie Venner agreed to try to get this project on the agenda for the CDOW Environmental Roundtable meeting May 15. Chris Pague and Gary Skiba agreed to identify a list of people who may be proposed as additions to the site identification panel within the next two weeks.

20 Jul 2001 **Core Project Team Meeting.** Attendees: Alison Michael, Jerry Powell, Gary Skiba, Chris Pague, Lee Grunau.

Impact Analysis (federally-listed birds):
Evaluate refined information on distribution and potential impacts for western snowy plover, piping plover, and least tern. It appeared that the acreage of potential impact from the initial analysis was too high. Input from Chris Pague, Gary Skiba, Renee Rondeau, Dr. Fritz Knopf, and Veronica Estelle (a biologist who worked for about a year on these birds a few years ago) suggested that there would be no reason to expect adverse impacts to these birds from any CDOT projects. The initial impact analysis included potentially suitable habitat along the entire Colorado plains section of the South Platte River. However, all available information suggested that these birds only occur in Colorado around the reservoirs in southeast Colorado (Arkansas River drainage). Renee Rondeau and Lee Grunau photographed the habitat along the state and federal highways in this reservoir area, and did not find suitable habitat for

these birds along the roadways. The group agreed that there was not likely to be measurable impact from CDOT projects. Jerry Powell suggested that there was one drainage along Highway 50 where these birds have been known to nest (Luber's drainage). Jerry expressed concern about potential indirect impacts from potential hydrologic alteration relative to any future bridgework, etc. The impact analysis approach for all other bird species in the project was calculation of potential habitat loss. If we were to retain consistency in approach, there would be no impact to these species measured because they occur outside the ROW. The group discussed doing project-by-project evaluations for these birds (for projects within known distribution of the birds) rather than including them in the programmatic agreement. However, other alternatives identified were: retain the original (over-) estimate of impact and attempt to find mitigation lands (not likely to be successful given the extremely limited distributions); re-calculate potential impacts minus the South Platte River and attempt to find mitigation lands; delineate the known existing location at Luber's drainage and substitute this for presumed presence (this method would probably result in a no-impact result because the occurrence is outside the ROW); make a professional judgment about how many acres should be mitigated (Chris Pague suggested five acres). The last alternative would be difficult to justify objectively. Jerry Powell and Alison Michael both suggested that CDOT would not be able to get mitigation credit for contributing money to existing efforts to improve habitat/manage birds at the reservoir. Therefore, it would probably not be possible to identify other potential conservation areas, because the only other known location was the site of potential impact. The group agreed to propose to the core project team that these birds be deleted from the project list. Later, it was decided to more closely examine the subject area to get the most accurate assessment of potential impact or lack thereof; the lack of impact was documented and will be included in the programmatic BA.

30 July 2001 **Regulatory Meeting**. Lee Carlson, Dana Jacobson, Dennis Buechler (USFWS Region 8), Alison Michael, Edrie Vinson, Marie Venner, and George Gerstle.

Regulatory Issues:
Reviewed the process thus far, the habitat approach taken in the NWF v. Babbitt decision and parts important to CDOT effort that were upheld: characterization and biological evaluation of conservation areas rather than impact areas, global ratio of 1 acre of impact to .5 acres of mitigation. CDOT, FHWA, and USFWS agreed that as a conservation measure, CDOT would identify and conserve in perpetuity high quality ecosystems and priority conservation areas in acreage equal to that within the ROW (impact area identified by the expert panels) for all highway miles which could receive safety, reconstruction, or capacity improvements (all CDOT

work beyond overlays, which were determined to have no effect) under the 20 year plan (estimated to be 22 percent of the roadway network). Though all of these acres in the ROW would not in fact be permanently impacted when the individual transportation projects occur, this liberal calculation of acres of various habitats within various species ranges that could potentially be impacted was used to effect a greater conservation outcome and to avoid re-opening section 7 consultation in the future, based on greater impacts than currently calculated. Independent experts had advised that the ROW is not desirable habitat for most species given proximity to fast moving vehicles and current maintenance practices of the ROW, in particular heavy mowing. In NWF v. Babbitt, Judge Levi also upheld a habitat approach, saying that counting of listed species was not required and upholding USFWS's ability and obligation to make decisions on the best available data.

Dennis suggested an addendum to the BA for candidate species. As part of the B.O. there would be no decision on jeopardy for the non-listed species, but USFWS would include a statement that if the package and management occurred as intended that would be beneficial for the species and habitats. Non-listed species would become part of the BO and formally covered as they are listed. Conservations measures and the project description are to be included in both the BA and the BO; that will be the conservation strategy. Adaptive management will be covered in the incidental take statement in the BO. The BA and BO should say they satisfy the section 7 portion of the NEPA process so don't have to revisit that every time. May want to include a boilerplate 2-page BA and BO with brief project description and accounting, to facilitate the envisioned process of fast and easy inclusion of species in the BO as future listings occur. Could changes that occur on the property over time as part of an adaptive management strategy present federal actions if CDOT is owner and federal funding of management?

20 Aug 2001 **Core Project Team Meeting.** Attendees: Gary Skiba, Renee Rondeau, Marie Venner, Chris Pague, Francie Pusateri (new CDOW Grassland Species Coordinator replacing Jennie Slater on the core project team), Lee Carlson, Anne Ruggles (consulting biologist), Edrie Vinson, Tom Blickensderfer, Nancy Smith, Alison Michael, Jerry Powell, Lee Grunau.

Off-site Mitigation:
There was agreement that the Beaman property was important enough to continue research and examination of options. Discussion about neighbors, prairie dog control, possibility of incentive money from CDOW for neighbors for prairie dog management. Further discussion about other potential conservation areas and what mitigation obligations would be met with various scenarios. [Sensitive details relative to private landowners not included in this summary.] Possible ways to get input

from farming/ranching community were discussed. Open nominations were suggested as a possible alternative, along with a proposal that Ken Morgan (Farm Bureau) join TNC and CDOW in identifying criteria for nominated lands. Tom Blickensderfer agreed to call Ken Morgan. There was agreement to add Rocky Mountain Bird Observatory to the site selection committee.

Target Species List:
There was a debrief from the July 20 meeting to discuss impacts to western snowy plover, piping plover, and least tern. The core project team decided to delete these species from the project list, based on the assessment of the biologists at the July 20 meeting that there were no measurable impacts. The team agreed to retain the butterfly plant on the project list even though the only known site in Colorado (i.e., the only potential conservation area) is also the impact site. The team agreed to move the swift fox to the secondary "also protected" list based on expert input that there was not measurable impact.

Mitigation Habitats:
The team collectively developed a table summarizing the acreage of each mitigation habitat type that would be protected on each of the potential mitigation parcels being evaluated. As a result of the July 20 decision regarding the western snowy plover, piping plover, and least tern, the "playa" category was deleted from the mitigation habitat list as these birds were the only species relying upon that habitat type. A "forest" category was added to the mitigation habitat list (differentiated by pinon-juniper and riparian). Each parcel was also ranked for restoration potential. There were still no potential conservation areas proposed for lesser prairie-chicken or the Colorado butterfly plant. CDOW agreed to identify conservation areas for lesser prairie-chicken.

10 Oct 2001 Attendees: Marie Venner, Jerry Powell, Alison Michael. Actions were established for remainder of 2001 on how CDOT would proceed to identify areas with rare plants in the ROW and educate maintenance staff to take appropriate care. First session to be held in Region 4. Region 2 targeted for next, with attention to area along Hwy 50.

20 Dec 2001 **Core Project Team Meeting.** Attendees: Marie Venner, George Gerstle, Chris Pague, Alison Michael, Jerry Powell, Francie Pusateri, Nancy Smith, Lee Grunau, and Renee Rondeau.

Black-tailed Prairie Dog:
Francie distributed information from the Colorado plan for the black-tailed prairie dog. Primary target objectives for the U.S. are to increase the range to approximately 1.9 million occupied acres by 2011. Secondary

objectives include maintain at least the current occupied acreage in the 2 complexes greater than 5,000 acres that now occur on or adjacent to national forest lands in South Dakota and Wyoming and development and maintenance of a minimum of nine additional complexes greater than 5,000 acres, with each state managing or contributing to at least one complex greater than 5,000 acres by 2011.

Off-site Mitigation:
Marie provided an update on the Beaman Ranch, CDOT approval of the second appraisal in November, SLB lease issues, and CDOT purchase contingent on reassignment of the SLB lease. A management plan for Beaman is under development. Reviewed site criteria, baseline data, and annual reporting requirements. Discussed amount of mitigation acreage available in each habitat at sites under different scenarios within the range of each species, and acres extra or of shortage in each category. The proposed multi-species site will be examined for further Cassin's sparrow and loggerhead shrike habitat. Other shortages are in some of the rare plants near Hwy. 50. Lesser prairie-chicken site(s) have still not been identified. Reviewed conversations with State Land Board staff regarding potential for reassignment of Clayton Beaman's lease, should CDOT purchase the property; SLB members have several main concerns: 1) potential erosion of the value of the property due to prairie dogs, 2) reaction of local governments, and 3) the logistics of how potential detrimental effects to surrounding private properties and SLB lands would be controlled. There was group discussion of the undesirability of setting precedents regarding poisoning prairie dogs on mitigation lands or offering to do such for surrounding property owners. Marie also reviewed the transportation improvement projects in Bent County in the 20-year plan.

Target Species List:
Reviewed species not included in the off-site mitigation and why, including the pocket gopher in Douglas County, which CDOT will deal with on a site-by-site basis, the swift fox with no discernable impact according to consulted experts, and aquatic species to be addressed through on-site BMPs.

Regulatory Vehicles:
Regarding regulatory document, it was decided that a conference report on the mountain plover would form the core of the BA.

Next Steps:
Schedule of upcoming events and deadlines: Jan 15 – firm up biological goals for Beaman; Jan 15-31 – partners to meet with Bent County commissioners (Tom and George), local reps, NRCS Ben Berliner, CDOW Tim Davis, and state representatives in Denver (Tom and

George); Feb 14 – State Land Board presentation; mid-Feb through mid-March – larger outreach effort(s) in Bent County; internal coordination within CDOW starting in January. USFWS to comment on "assessing baseline condition" by mid-January. USFWS and Chris Pague to draft annual reporting requirements (i.e., monitoring criteria) by end Feb. Renee and Chris to propose how to use criteria for mitigation credits by end January.

23 Jan 2002 **Site Identification Panel Meeting.** Attendees: Francie Pusateri, Renee Rondeau, Chris Pague, Lee Grunau, Jerry Powell and Alison Dean via conference call for part.

Off-site Mitigation (conservation goals and management):
The committee began the first draft of conservation goals and management objectives for Beaman. Agreement that the goals should be relative to size, condition, and composition of habitat. There was a suggestion that documenting numbers of birds would not be required as a goal, but a desired baseline could potentially be described based on how many birds similar habitat is know to support elsewhere as a hope for what could be maintained. The committee agreed that it would be desirable to know the current stocking rates on this ranch (i.e., how the current condition has been achieved). It was suggested that TNC ask the local NRCS representative to discuss current grazing practices with Mr. Beaman, and then make a recommendation to the committee regarding appropriate language to include in the State Land Board lease. The committee agreed to request clarification of definition/intended use of "baseline condition criteria" as drafted by USFWS before commenting. It was unclear whether these criteria were to be attached to legal easement documentation, or simply descriptions of current condition. Chris Pague agreed to submit the draft goals/objectives for Beaman to Terri Schultz (TNC ecologist), Jerry Powell, Alison Michael, Kevin Kaczmarek (CDOW biologist), Bruce Goforth (CDOW biologist), and Dr. Fritz Knopf for review by January 25. [This document was never reviewed by Kevin K., Bruce G. or Fritz K.]

31 Jan 2002 **Site Identificational Panel Meeting.** Attendees: Ted Toombs, Francie Pusateri, Chris Pague, Lee Grunau.

Off-site Mitigation:
The committee updated the draft of Beaman conservation goals and management objectives. Discussion of grazing objectives, fire objectives, fencing, weed management, management of/for prairie dogs. CNHP has three-page overview of this available.

7 Feb 2002 **Core Project Team Meeting.** Attendees: Chris Pague, Matt Moorhead (TNC Southeast Colorado Program Manager), Nancy Smith, Marie Venner, George Gerstle, Renee Rondeau, Ted Toombs (Rocky Mountain Bird Observatory biologist), Tom Blickensderfer**,** Alison Michael, Francie Pusateri, CDOW guest Steve Kieffer, Lee Grunau. Anne Ruggles was present for the last part of the meeting.

Off-site Mitigation:
Update on discussions regarding potential conservation areas [details regarding private landowners not included], possibility of expanding partnerships (i.e., partnering with Fort Carson military installation, who is also interested in a conservation easement on one of the potential conservation areas), potential easement boundaries, range of value/cost for easements. In terms of a managing entity, Tom Blickensderfer reported some pressure to work with the CDOW, but the team noted that some local landowners would prefer to work with private conservation entities rather than government agencies. There was some discussion of relative easement values and approximate costs of various potential sites [details not included]. Discussion of how to cover mitigation needs for sand sage and lesser prairie-chicken. Agreement that letters of recommendation for two additional conservation areas were needed from site selection committee members. There was discussion regarding buffering roads through conservation areas (so as not to count roadside habitats for mitigation). Chris Pague agreed to document approach to buffering roads through conservation areas for purpose of calculating credits. It was noted that the City of Fort Collins owns the only existing Colorado site for the Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*), and that working with the City on management/restoration may qualify for mitigation credit for this plant. It was agreed that CDOT's local representative in Fort Collins should approach the City about a possible partnership.

Prairie Dog Issues:
There was a debrief from a meeting with Bent County commissioners and issue of prairie dog control along property boundaries. TNC expressed concern that allowing policy (e.g., regarding prairie dog control) to dictate management on private lands would be a bad precedent. The cost of transactions would be too high, and it would be difficult to demonstrate compliance (i.e., did you try or did you succeed). The goal should be good ecosystem management. RMBO suggested that perimeter control (i.e., of prairie dogs) was not a biological issue, and the cost of control would be very high. They are not aware of any barriers that work. An alternative to required perimeter control may be voluntary management agreements with neighbors.

5 Mar 2002 **Core Project Team Meeting and Site Identification Panel Meeting.** Attendees: Lee Carlson, Alison Michael, Jerry Powell, Marie Venner, Chris Pague, Lee Grunau, Nancy Smith, Edrie Vinson, Tom Blickensderfer, George Gerstle, Francie Pusateri.

Regulatory Issues:
Edrie Vinson provided a NEPA process review. NEPA is excluded for activities not leading to construction. Input from FHWA headquarters indicated that doing NEPA on a planning project would set an undesirable precedent. Furthermore, USFWS would not do NEPA on a Section 7 consultation (what this project is) because the federal action would be FHWA's. USFWS does do NEPA on Habitat Conservation Plans because they are the lead agency and the federal action would be signing the HCP.

Site Identification Panel Meeting

Off-site Mitigation:
The site recommendation team updated the annual reporting requirements. It was noted that if undesirable changes were noted during monitoring, then considering the management in surrounding landscape would be necessary. The team agreed to utilize the best available aerial photographs in habitat assessments, and to review every five years for successional changes.

The group discussed Ted Toombs' proposal regarding purchasing SLB lands and transferring them to the Forest Service and located the properties in question. In the final analysis, the group expressed a strong preference for the private land transaction over the potential transaction involving State Land Board property and transfer to the Forest Service, given the uncertainty in the process. FHWA expressed concerns about transferring land to the Forest Service and the potential impact on species from the FS policy of multiple uses and little management restriction. USFWS expressed similar concerns but offered that a change in ratio might accommodate those concerns. Alternatively, the Forest Service could include the designated areas as a "special interest area" in their management plan. The group identified some of the benefits of conservation on federal lands, including mitigation required for minimum development, NEPA required for oil and gas leasing, section 7 consultation required on any action, and land sale being less of an issue overall. Edrie Vinson asked if mitigation at this site would involve a public input process and NEPA; a changed use of the site has to go through NEPA and involves amendment of the management plan and going through section 7. Guaranteeing in perpetuity management for the species of concern could be difficult. Furthermore, grazing would be necessary to achieve those goals and the Forest Service might not always agree to that. The group agreed to check further regarding perceived

degree of difficulty. The group's first choice being a private transaction without the necessity for permissions and plan revisions from multiple agencies, Francie Pusateri agreed to follow up with regional CDOW staff to clarify that conservation acreages larger than the minimum conservation area size (78 acres) would be possible if needed in order to find a mitigation opportunity and/or achieve the conservation objective.

The team reviewed and affirmed an approach to mitigation focusing on the majority habitat type utilized by each target species, mainly shortgrass prairie. Chris Pague advocated including whatever mix of habitats used by the species it took to get to the acreage total. To carefully assess/re-check the implications of that decision, Alison Michael guided the group through a review of each species and its habitat needs, especially focusing on the importance of the minority habitat types used by each species, to make sure the needs of that species would be adequately covered. Further comments: sand sage within 10 miles of irrigated agriculture is important for lesser prairie chicken, mitigation of which would focus on sand sage. Loggerhead shrike is covered between shortgrass prairie and sparse pinon-juniper for structure, and there may be coverage for Cassin's sparrow (see discussion below). Sand dune shrub (9 percent for massasauga) was judged not critical to the life cycle of the species. For the western box turtle, desert shrub is available as part of a mix, but it was not digitized on the maps. Alison reviewed the approach with Lee Carlson and confirmed that USFWS agreed "the majority habitat approach is the way to go." It was clarified that there is no take parameter on plants, and on private property rare and listed plant species are virtually unprotected. Discussion will continue on the best way to mitigate for unavoidable impact to rare plants along Hwy. 50. Marie Venner and George Gerstle agreed to arrange a meeting with CDOT Region 2 to discuss the issue, the potential for a project approach or a project investment in mitigation, and whether the issue is on their radar screen. [April follow up: Phone and e-mail discussions occurred with Region 2; however, they are reluctant to take time to schedule a meeting when there are no plans to widen Hwy 50 west during the next twenty years.]

<u>Target Species List</u>:
Additional birds of interest to RMBO were discussed. Discussion focused on whether the following species would be included as targets. The group reviewed biological information. Decisions are noted below.

Loggerhead Shrike

This species was originally included at the request of Jennie Slater. Decision was that if mitigation requirements could be met with existing portfolio of proposed conservation areas (this appeared to be the case), then the species would be retained on the project list.

Ferruginous Hawk

Data indicated that this species shows a 1.5 to 3.5 increase annually over 40 years, so does not seem to be under threat; however, it is a frequently listed species of conservation concern. Shortgrass prairie and prairie dog colonies in particular are its prime habitat. Decision was to calculate potential impacts using the same vegetation affinities as those used for the prairie dog, plus rock outcrops if those can be identified in the GAP vegetation data. If existing portfolio of proposed conservation areas provides required mitigation for this species (the team anticipated that it would), then this species would be added to the project list.

Prairie Falcon

The initial screening by the core project team and the consulted experts ranked this species low potential for federal listing. The team decided to include on the secondary species list, but not the primary list because of low impact by CDOT.

Northern Harrier This species was not evaluated as part of the initial screening because of high representation in the physiographic area and low potential for impact by CDOT.

Core Project Team Meeting, 1-2 p.m.

Off-site Mitigation:
Marie Venner provided an update on the State Land Board position associated with a lease on the Beaman Ranch. The SLB's staunch opposition is making conservation of this parcel less likely; the SLB went so far in expressing opposition as to suggest problems with renewing Mr. Beaman's lease, for his lack of and/or ineffective prairie dog control. The decision was made to forestall a public meeting in Bent County. Marie described some of the risks about departing from fair market value assessment to pursue a conservation valuation, which the Board indicated as a possibility. The group was also skeptical about departing from FMV. Report from George Gerstle and Tom Blickensderfer on CDOT and CDNR. Mr. Walcher and Mr. Norton spoke briefly about the shortgrass prairie initiative, but may not have addressed current issues in Bent County. Tom Blickensderfer spoke with Greg Walcher and Russell George briefly and they indicated if it was going to be extremely difficult to further pursue Beaman, it might not be worth it. Tom B. agreed to follow up further. Francie Pusateri and Lee Grunau agreed to provide him a map of the largest prairie dog colonies overlaid with SLB land to facilitate a discussion regarding how the SLB would be involved in any

case with any state effort to ensure those largest colonies are protected to the maximum extent practicable.

4 Apr 2002 **Core Project Team Meeting**. Attendees: Chris Pague, Edrie Vinson, Francie Pusateri, Lee Grunau, Renee Rondeau, Ted Toombs, and Marie Venner.

Report on Hwy 50 Plants:
In the morning the plant specialists met and reported out in the afternoon. Discussion focused mainly on the plants for which mitigation is incomplete: golden blazing star, Arkansas Valley evening primrose, and Pueblo goldenweed. In particular, the group discussed the methods used in the impact analysis and the potential differences in measuring occurrence areas only, rather than Potential Conservation Areas. The group also investigated the potential for either on-site mitigation or off-site mitigation in locations aside from the proposed rare plant site. Seventy-five percent of **Golden blazing star** occurrences are in the CDOT ROW. The plant is not present on the proposed rare plant site. The group found that the impact acreage is significantly over-estimated if the interest is only in occurrences or occupied habitat vs. potential habitat. There are occurrences in four locations, which could present the potential for off-site mitigation, but the landowners are unknown. CNHP does have a staff member with landowner data from Pueblo County, but these would be cold calls. Furthermore, the occurrence patches are not large, and it is possible that even if all four of these other occurrence patches could be procured, they would not sum to the size of patches that could be taken along Hwy 50. The biologists concurred that on-site mitigation can only occur through avoidance; the species does not transplant well. If CDOT cannot successfully mitigate this species, it might need to be dropped from the conservation initiative. Conservation measures for species maintenance in the ROW include seeking avoidance, protection of occurrences (mainly on steeper slopes with little vegetation) including no mowing until after the plant flowers, and no spraying or herbicide use. Only 7 acres of occurrences of **Arkansas Valley evening primrose** are known on the proposed rare plant site. Sixty-five acres of occurrences appear along Hwy 50, nearly all roadside, and avoidance may not be possible. (There are 138 acres of Potential Conservation Areas, including other species.) There are three occurrences that might present potential for off-site mitigation; however two of them are D-ranked occurrences (i.e., of questionable viability) and the landowners are unknown. The third occurrence is that on the proposed rare plant site, which is not big enough to meet CDOT needs by itself. This species cannot be mitigated adequately on-site. As it is not present every year, it cannot be adequately surveyed for clearance purposes in one year. **Pueblo goldenweed** was not examined in the same detail due to time constraints at this meeting. It was left until last as 66 of the 82 needed acres are available on the proposed

rare plant site, from initial rough surveys, and the acres available for mitigation on the site are expected to increase based on further surveying and refinements of the digitizing. Chris and Renee are comfortable with this method and CNHP will revisit all the plant species for consistency.

Recommended Baseline/Annual Reporting Requirements:
The team reviewed and revised the recommended baseline and the annual reporting requirements for conservation areas, with the aim of finalizing this version. USFWS subsequently (4/23) agreed and so the following were considered final:

1. Best available information on type of plant communities/habitats present
    - Estimated size of each
    - General condition of each (address any weed infestations, relative abundance)
    - Description of plant communities present and geographical relationship of communities
    - Estimated percent cover of each community

2. Brief description of land use on-site and in surrounding areas documented in initial baseline. Annual report briefly describing changes.

3. Success of Recommendations from previous year and suggested modifications to management plan. (These will be coarse measures to start. A management plan will be developed in the first year after acquisition of the real estate interest and updated at least every five years.).

4. General observations on wildlife diversity, activity, and general trends, noting presence or absence of targeted species (i.e. field notes. Surveys and quantitative data are not required).

5. Photo points at established permanent locations according to protocols to be developed in the management plan.

6. Acquire new or existing aerial photos as they become available, as applicable and appropriate. Label habitat on existing aerial photos. If photos are unavailable, a map may be developed on USGS topographical quadrangles.

The team agreed that the above must be performed by a qualified person, but declined to outline the exact qualifications.

Potential Lesser Prairie-chicken Conservation areas:
Francie Pusateri talked with Rick Schneiderbeck with the USFWS regarding an approximately 2000-acre sand sage prairie property. The landowners are tentative about working with the federal government. Jim Hamilton, NRCS in Springfield, might be able to offer further information. RMBO has a second possibility but will wait to find out more about the one Francie is bringing forward.

16 May 02 **Expert Meeting - Dr. Stephen Mackessy** (follow-up discussion): Chris Pague and Renee Rondeau met again with Steve Mackessy regarding his input as to whether or not the proposed multi-species site was adequate mitigation for all the future CDOT impacts to reptiles that are on the project list, in particular connectivity/roadkill impacts. Although Dr. Mackessy had not been specifically to the proposed multi-species site, he was familiar with the general area. All the photographs and maps of the potential easement area were reviewed. Dr. Mackessy agreed that the proposed multi-species site was excellent habitat for all of the targeted reptiles, and that the proposed easement would be excellent mitigation for future impacts. He did not consider the county roads on the proposed multi-species site to be problematic because of the low density of vehicles in that area. Roadkill on state and federal highways in other parts of Colorado are serious in places and are of concern for the reptiles. With that said, he still agreed that the proposed multi-species site would be an excellent opportunity to mitigate those impacts.

7 May 2002 **Core Project Team Meeting.** Attendees: Alison Michael, Chris Pague, Edrie Vinson, Francie Pusateri, Jerry Powell, Lee Grunau, George Gerstle, Renee Rondeau, Tom Blickensderfer, Sonja Chavez de Baca (CDOT Environmental Planner), Marie Venner.

Jerry Powell provided an update on CDOT activities marking rare areas in the ROW and training CDOT maintenance regarding plants pertinent to Shortgrass Prairie MOA. It was agreed that Renee Rondeau would accompany Jerry Powell and Alison Michael to the sites along Hwy 50 and otherwise share presence information for the protection of these plants.

Updates on proposed conservation areas (Multi-species Site)**:**
The conservation easement area would be 50,137. With a quarter mile buffer on all roads, the mitigation credit would be 41,651 acres. Though exact mitigation acres for loggerhead shrike and Cassin's sparrow habitat were still being determined, the proposed multi-species site would appear to provide all the mitigation CDOT needs for all target species besides:

- McCown's longspur (which requires a different shortgrass prairie management regime and is more plentiful in the target area adjacent to the Pawnee National Grasslands.)

- Plant species, particularly those along Hwy 50, for which some mitigation can be achieved on the proposed rare plant site.
- Lesser Prairie-chicken.

The proposed conservation easement would not directly address prairie dogs; rather two managements were proposed. The inner zone would be adaptively managed for native shortgrass prairie system. Natural processes would be allowed to take their course in this zone. Note: this central area of the proposed easement includes the current prairie dog complex, which is close to 5 miles from the nearest boundary with another property owner. This central zone would be surrounded by a three-mile strip where historical management methods would continue, and the property would be managed for longer grass species. Chris Pague clarified that as longer grasses would also inhibit spread of the prairie dog town into this section, the second zone could be presented to Bent County as a buffer area.

TNC reported that the landowner was aware of the Bent County guidelines and was still interested in pursuing a conservation easement.

Prairie Dog Issues:
DNR, DOW, and CDOT discussed Public involvement issues relative to coordination with the Bent County Commission and future public involvement. Francie Pusateri expressed concern about the spread of Bent County-type prairie dog guidelines and noted that DOW is obligated to consult with local communities on conservation areas. Tom Blickensderfer said he got a call from Larry Nelson, the new staff person at DOW coordinating T&E in this regard. Francie expressed concern that the spread of anti-prairie dog guidelines is counterproductive to recovery and could ultimately lead to listing. Marie Venner noted that both County Administrator Gary Pritchard and the Farm Bureau cautioned us against thinking that the guidelines were aimed at or would necessarily apply to CDOT, though we have maintained a cautious approach. The Farm Bureau thought the guidelines could be targeted to the prairie dog incentive program, though they are concerned about impacts to all landowners and plans to meet with the Commissioners. Chris expressed a deeper concern that prairie dog specific conservation efforts could be endangering larger shortgrass prairie conservation efforts that benefit a large number of other species, rather than this shortgrass prairie conservation project endangering efforts to protect the prairie dog, such as the incentive program. He emphasized that mountain plovers are more widespread and subject to more imminent federal listing than the prairie dog. Big picture and long-term solutions are needed but have difficulty happening when conservation doesn't or can't occur due to the obstacles and reasons we've discussed. The issues at hand have to do with private property rights and landowners being able to enter conservation easements if they want to. If we do not keep the big picture in mind, we won't have

the freedom to pull the tools out to achieve that. Chris also said that, in his experience, conversations with key individuals are more effective than public hearings. Chris continued that we should look at this effort as an experiment, and present it as such in our outreach. This is a chance for the community to see how conservation works, in a situation where a respected rancher can report back to members of the community on the implications, costs, etc. rather than speculation and fears dictating the course of action. Francie offered that Ken Morgan might be able to provide a voice of reason on this matter as well. Marie noted that we have been in touch with him regularly, and described his involvement with the Farm Bureau's local meetings with Bent County.

Proposed Rare Plant Site:
GOCO, Ft. Carson, and TNC are moving forward pursuing an easement on the proposed rare plant site. It is not certain that all the area of interest to CDOT would be included; the landowner is reluctant to relinquish development rights there. USFWS has offered to do a site appraisal for these partners, as USFWS has appraisers familiar with doing this type of conservation valuation. For the record, CDOT has not been involved in any discussions with the landowner. George met with Dick Annand, Environmental Manager in CDOT Region 2, recently and he is reluctant to support any habitat mitigation for the plants, as widening of Hwy 50 is not anticipated in the 20-year plan and he believes that maintenance can be handled to protect this species. The group discussed questions surrounding impacts to plants, once listed under the ESA, and CDOT's responsibilities. Jerry and Alison gave the opinion that off-site mitigation for the three plants in question on the proposed rare plant site would stand up in the future and allow CDOT to proceed with unavoidable removal and unintentional damage or destruction resultant from any transportation improvements over the 20-year period. George approved including the proposed rare plant site in a site recommendation package for CDOT consideration.

Prospective Lesser Prairie-chicken (and Cassin's Sparrow) Habitat:
Marie reported on discussions with Jim Hamilton of the NRCS in SE Colorado. Recommendations for sites for the lesser prairie-chicken and Cassin's sparrow should be available in the next week where landowners would be agreeable to discussing easements. All are in the sand sage area that presently supports a population of the LPC. Ken Giesen of the Division of Wildlife assisted with locating the general areas that would be most beneficial to the LPC as well as the Cassin's sparrow.

Marie and Lee solicited George's input on a small area adjacent to I-25 near the Douglas and El Paso County borders that the ecoregion leaves out. George confirmed that CDOT would like to see that included and Lee

said CNHP would not be able to re-crunch the numbers to update the impact analysis to include that until August.

4 Jun 2002 **Core Project Team Meeting.** Attendees: Alison Michael, Lee Carlson, Edrie Vinson, Dennis Durban (FHWA Trainee), Francie Pusateri, Jerry Powell, Tom Blickensderfer, Marie Venner

Pueblo Army Depot:
Francie Pusateri reviewed attributes of the Pueblo Army Depot as a conservation area for prairie dogs and the Army's request that DOW take up conservation activities in the area. Lee Carlson clarified that mitigation credit would be unlikely as USFWS can already ask for conservation measures under section 7 with the Army as owner. Francie inquired about credit for long-term management of the site that might be otherwise unfunded. Lee said in a different situation where the Army disbursed themselves of the site and development was an imminent threat, credit might be possible. The group also discussed contamination issues on the site and legal liability that could arise from that. There is shrapnel on the surface of the site and some chemical contamination from TNT; red well water was noted during DOW's site visit. Tom Blickensderfer had also discussed the Pueblo Army Depot in his conversation with Bent County Commissioners Jim Coffield and Frank Wallace, who were enthused about focusing prairie dog mitigation outside of their county.

Bent County Outreach:
George Gerstle had spoken with George Tempel and Tom Blickensderfer had spoken with him, Bent County Commissioners Jim Coffield and Frank Wallace, John Stulpe of the State Land Board, and State Representative Brad Young. Tom also accompanied Governor Owens when he was in that part of the state for a ribbon-cutting at John Martin Reservoir and other gatherings in case questions came up about prairie dog conservation efforts. He also toured the area with DOW staff Steve Kieffer and Jeff Yost. Tom's message was "It is an individual private owner's decision whether to participate, and conservation efforts will improve the prairie dog issue from their (the wider community's) standpoint." The Commissioners and Frank Wallace in particular are of the opinion that prairie dog impacts from transportation projects are an issue where most of the transportation dollars are being spent (i.e., the Front Range) and should be solved there. There was some group discussion on the implications for the agricultural community if prairie dogs are listed, but it was evident that that concern is not at the top of the County Commissioners' minds. As in the past, the issue of perimeter control also arose. The Commissioners were in favor of the landowner with/encouraging prairie dogs paying surrounding landowners for prairie dog control. While none of the agencies are ready to endorse this approach, and some raised problems with it, it has the advantage of not

paying to kill prairie dogs on the same property agencies are paying to conserve prairie dogs. Still problems of precedent remain as well as the widespread occurrence of prairie dog colonies, often across property lines. Furthermore, as George indicated, prairie dogs devalue property; how does one make the link or justification from that to the much higher conservation values that Stulpe is seeking? Marie mentioned the CSU study that indicated that seven prairie dogs eat as much grass as one cow.

Tom mentioned again that Larry Nelson is inclined to look to more amenable communities than Bent County to do this sort of work. Lee Carlson raised the concern that if we "run" or disengage from Bent County, other counties will just take a page from Bent County's book or strategy and we will have more problems affecting conservation.

County Efforts to Regulate Wildlife/Prairie Dog and State Response:
Tom said he is taking the Bent County guidelines as a "shot across the bow" and not a serious effort. He noted that the $25,000/daily penalty appeared to have been borrowed from the federal Clean Water Act and that it is far beyond their authority, whereas Baca County appeared to have consulted an attorney and limited their fine to $1,000/day.

Post meeting note: Marie acquired a copy of the Baca County guidelines, which are exactly the same as Bent's except for the $1000/day fine. Lee said that Bent and Baca County are sending a message and we need to figure out what that is and how to deal with it. Tom said he thinks the intransigence is focused in Bent County Commissioner Wallace. John Stulpe, on the other hand, though a staunch opponent in the SLB last public meeting in February, is a realist. He realizes we have to work together somehow.

The question was raised whether DOW can allow local regulation of wildlife. Francie responded that Boulder regulates where people can build based on wildlife. Lee Carlson said if local governments are fining people for animals moving off their land, in this case prairie dogs, that antelope will be next. DOW will be in trouble if this is allowed to continue. This point was reiterated again toward the end of the meeting.

Progress on Addressing Endangered Species Issues at the State Land Board:
Tom has been talking with the State Land Board (Board Member Stulpe, Executive Director Chris Castillian, and Sue McCannon) about prairie dog and mountain plover issues and the need for an Endangered Species Policy, which SLB staff are developing. Mike Shay, formerly of NRCS, is now working at the SLB office in Pueblo. The policy will be ready in the next few months and will incorporate threatened and endangered species and mitigation considerations. Laurie Rink and RMBO are hoping to

acquire some SLB land for their Prairiebank, so that is also helping to keep the issue afloat. Chris and Kelly Rowe have a prairie dog relocation and poisoning company and are expanding that with 3 properties targeted.

Lee offered for USFWS to draft a statement of support to "bless it" if appropriate and if the policy would protect wildlife. Lee also suggested looking at the drought as a way to get federal dollars for species and habitat conservation on the Eastern Plains. (Related note: In the past week the BLM has asked lessees to cut back on grazing).

RFP Update and Discussion:
George Gerstle has reviewed the RFP and concept with CDOT's contact in the state Attorney General's office, Harry Morrow, and will be meeting with CDOT Purchasing and Tom Norton in the near future. Tom Blickensderfer expressed interest in the meeting with Norton and George said he'd let him know when the time comes.

CDOT plans to issue two RFPs, one for prairie dog relocation and one for the shortgrass prairie initiative. They will be making continued efforts to keep the two efforts separate in the minds of those who could be confused.

While a longer advertising period or wider notification strategy was discussed, FHWA advised that CDOT stick to the standard periods and methods for advertising the RFP.

Miscellaneous Issues:
It was confirmed again that accounting for the effective conservation bank will be in bulk by acre and roadway mile. The Eastern Mobility Study has identified that Ports to Plains will likely occur via improvements to existing roads. Tom and George will talk about follow up with George Tempel. Lee Carlson asked if CDOT would want USFWS to publish the BA/BO? Comments could be solicited or not.

Marie reported on Renee Rondeau and Chris Pague's meeting with Steve Mackessy (UNC) regarding potential roadkill/connectivity impacts to herps, which he had mentioned in the initial experts meetings. Renee had talked with Marie about Steve's response by phone prior to our meeting, which Marie reported on (i.e., Steve thought the amount and quantity of habitat conservation at the proposed multi-species site would compensate for any other types of impacts such as roadkill/connectivity; USFWS and CDOT [Jerry] differed in their assessment) but Renee's later written summary of their meeting with Steve is included below. Nevertheless, CDOT indicated interest in and willingness to implement culvert crossings for herps in targeted locations to be identified by Steve Mackessy.

Post meeting: Marie has followed up with him with a request for identification of such locations so that we can incorporate that into the BA. George noted that project areas where culverts would need to be included during reconstruction need to be flagged internally somehow at CDOT.

A note for the BMPs and the DOW-CDOW MOU — any wildlife crossings/culverts need to be maintained free of tumbleweed and sand.

Post meeting: As dates Renee has proposed have not worked out to go down to Hwy 50 with Jerry and Alison, CNHP has agreed to send the Element Occurrence Record shape files to CDOT for CDOT's on-site identification. If needed, Renee will be down in the southern part of the state the last week of June. Alison and Jerry are looking at the end of the month to finish this work.

Post meeting: Good feedback has been received from CDOT engineers who are reviewing the project descriptions. The species accounts are also under revision and we are working on pieces of the history and conservation strategy, to have a final draft by the end of June. Alison expressed confidence about the quality of the document.

Post meeting: George reports that the RFP process is moving along.

Post meeting: Survey of the potential lesser prairie chicken site at Schnaufers will likely occur at the end of the month. TNC opted not to be involved in contacting the landowner about this potential site, for the time being; Marie has been in contact with various NRCS, DOW, and CNHP staff. Renee will also be on the proposed multi-species site the last week of June to perform the final baseline inventory for loggerhead shrike and Cassin's sparrow, and supplement any habitat quality information.

Post meeting: We have draft biological goals for the prospective properties now, which will be incorporated into the BA and Conservation Strategy. Many thanks to Chris for his work on that before leaving town. Jerry provided some edits, which we are incorporating.

12 Sept 02 CDOT discussion with USFWS on further input from Steve Mackessey regarding connectivity issues with herps and whether such impacts might be mitigated with higher ratios of habitat conservation. Mackessey registered his opinion earlier that the (amount/quality, etc?) habitat conservation being contemplated at the proposed multi-species site would compensate for the roadkill issue; however, USFWS and CDOT agree that connectivity and habitat conservation issues are apples and oranges. USFWS agreed that CDOT's consideration of amphibian crossings/appropriate culverts in higher density locations would cover the

connectivity concerns; i.e. when existing culverts are replaced as part of reconstruction, CDOT will size culverts considering reptile and amphibian needs and look at whether additional attributes are needed to facilitate approach and dry crossing (i.e. ledges inside culverts).

8 Oct 02 **Core Project Team Meeting.** Attendees: Edrie Vinson, Alison Michael, Francie Pusateri, Nancy Smith, Renee Rondeau, Lee Grunau, and Marie Venner. Matt Moorhead joined briefly for one agenda item, and Chris Pague submitted comments in advance on two agenda topics for discussion.

Potential project partner:
Marie reported that John Sidle, grasslands T&E species coordinator for the U.S. Forest Service, is interested in working with CDOT/FHWA on this effort if opportunities arise. They are particularly interested in acquisition of in-holdings within national grasslands (and possibly adjacent parcels as well), and in protection/management of large prairie dog towns. Mr. Sidle assured Marie that Forest Service land would be able to be managed for conservation of target species in perpetuity. The Forest Service was informed that two potential sites were adjacent to the Pawnee and Comanche National Grasslands, respectively, that given the current orientation and priorities of the state, conservation easements were preferred over acquisition, and that given the advanced state of our conservation site identification process, and that CNHP's biological reviews have been concluded, it was uncertain whether we would be able to act on any proposals the Forest Service might be able to bring to the table in the near future. However, he was encouraged to present any opportunities that come up, given the conservation interests of the team, for future partnerships if not as part of this effort. As it turns out, the team's sense after discussion of other agenda items was that it would be helpful to this effort to continue to be aware of any other possibilities, including those from the Forest Service. Matt Morehead indicated that TNC would also be interested in FS priorities, as part of TNC's own process.

RFP Timeline:
The RFP is making its way through the CDOT review process. No release date was available at this time.

USFWS Review of Biological Assessment, Conference Report, and Conservation Strategy:
Alison Michael reported that she has reviewed the draft Biological Assessment, Conference Report, and Conservation Strategy, and that it looks good. The biological arguments appear to provide sufficient support for the determinations presented in the document. Alison is revising the project descriptions to include more detail on the types of projects to be

covered, and the corresponding BMPs may be revised as well. (In a call after the meeting, she confirmed to Marie that this would be done within a month), after which a BO could be completed within six weeks. Alison agreed to work with Becky Vickers (CDOT), Roland Wostl (CDOT), and Jerry Powell (CDOT) to ensure that there is adequate review and buy-in of the proposed BMPs by pertinent CDOT regions. Alison reported that discussions with Lee Carlson suggest that they anticipate a "may affect—likely to adversely affect" determination only for mountain plover. This species is not yet listed, but the opinion would be included in the Conference Report and the BO would be updated to reflect this once listing occurs.

Proposed Conservation Areas:
Nancy Smith noted that TNC is proceeding with alternative funding strategies for protection work on some of the identified conservation areas. The group discussed that as identification and biological evaluation of the properties has proceeded with anticipation of them serving as CDOT/FHWA conservation measures for the targeted species, the timing of when protection actually occurs and easements should not make a difference from a credit perspective. There are other contract considerations that would need to be evaluated at that time, and TNC would need to make sure that easements had been written to accomplish the objectives outlined in the conservation strategy. Matt Moorhead reviewed the management concepts that had been discussed with potential private conservation partners/landowners—consistent with management prescriptions designed earlier by Chris Pague in conjunction with Renee (CNHP) and Francie (DOW).

McCown's longspur:
The McCown's longspur property may not be available by the time the CDOT RFP is issued. The timeline for this deal is more urgent to the landowners than may be feasible for this project, given the RFP timeline. However, CNHP, the Forest Service, and CDOW indicated that they could identify further alternatives on a short timeframe, with known biological value, if this or other potential conservation areas became unavailable. Marie asked them to do so, as a backup. TNC expects to know more about the status of the longspur property by the beginning of November.

Lesser Prairie Chicken:
The property visited by Renee this summer is one section (640 ac.) of sand sage habitat that is bounded on three sides by Comanche National Grasslands. This property is within range of three known lesser prairie-chicken lek sites, and Ken Giesen (CDOW) feels certain that there are nests on the site (perhaps as many as 3). The site is showing some ill effects from heavy winter grazing. This, combined with sustained drought, is adversely impacting the bunchgrasses. However, the site has high

restoration potential, as all the right components (i.e., species) are present (although not currently in the desired ratios), and the surrounding landscape is in excellent condition with minimal invasive weeds. Planting a native seed mix of grasses and forbs, moisture, and altering grazing to allow for residual plant cover in spring (nesting season) should be sufficient to restore the property. Maintenance after restoration would not be expected to be labor-intensive or costly.

Renee noted that the landowners have been approached by NRCS to apply for "habitat improvement" funds. This would pay for the planting of trees and installation of a watering system. These efforts would be counter-productive from a prairie-chicken standpoint. Renee did not know current status of this possibility. Nancy Smith will speak with the appropriate TNC staff about making contact with the landowner.

Gaura:
We know of only one extant location in Colorado. The impact measured was 2 acres, based on CNHP's potential conservation areas (larger than the occurrence area). The site is owned by the City of Fort Collins, and managed by Wastewater Utilities. There is a grazing lease back to the grazing association from which this property was originally purchased. Relative to I-25, the closest plants are approximately half a mile—or further—from the highway. No direct impacts to known occurrences are anticipated, though direct impacts to potential habitat (where the plant could exist in the future) in the ROW is possible. Conceivably, plants further from the highway could be affected by a change in hydrology.

The biologists on the core project team agreed that it was likely that habitat adjacent to the ROW was probably the same as habitat in the ROW (not only for Gaura, but also for the other target species), except in cases where heavily grazed land, tilled fields, or development lay on the other side of the ROW fence. While CNHP indicated they cannot forecast the likelihood that additional populations of Gaura could be discovered in the ROW over the 20-year planning horizon, CNHP can say their botantists have searched extensively for this plant and feels that it is highly unlikely that new occurrences will be found.

Gaura is currently on the primary species list—which means that the goal would be "off-site" habitat protection. This isn't an option, since the site that could be impacted indirectly is the only off-site mitigation option and what is currently in the right-of-way counting as a potential direct impact area is only potential (future) habitat; plants have not been documented in the ROW in that area. An easement on the site one-half mile off the ROW would still constitute threat abatement even though it is already publicly owned land, because land that is managed by Wastewater Utilities is sometimes eyed for recreational uses by some groups in the city.

According to Mr. Comstock, recreational use has been suggested in portions of the larger parcel in the past, though not necessarily where Gaura occurs. The plant's wetland location greatly inhibits its development potential. The City indicated greater amenability to a "research and management plan" since there would be less "wild-eyed politics." The parcel of interest has had a grazing lease on it since the City purchased the parcel with that provision. The City is not likely to make any significant changes to the current grazing regime, especially since the stream provides water to the two best grazing allotments. (There is no indication that the plants are being harmed by the grazing, but management control would be uncertain at best in any feasible arrangement with the City.) They are interested in developing multi-species management plans (they also have plover, Preble's, and others), but the Gaura site is low priority for them in developing such a management plan, as it is not an area that will ever undergo "treatment" (i.e., spreading of treated solid waste).

CNHP and Marie discussed the pros and cons of using the off-site mitigation parcel. Alison reported that both she and Lee Carlson were in agreement that on-site BMPs seemed to be the most appropriate conservation approach for this species. The core project team concurred with this suggestion. Alison will review the BMPs that Renee and Lee have written for plants to ensure adequate coverage for Gaura. TNC and CNHP will make an effort—within their available resources and other constraints—to stay in touch with the City regarding maintenance/ protection of this population.

<u>BMP training for maintenance and regions</u>:
In discussing how to get the necessary review of the BMPs for practical implementation and buy-in from the Regions, Alison expressed the opinion that FHWA is the lead agency in training and verification of DOT performance per commitments. Edrie said she would do what she could and that there might be some potential funding for this work. Nevertheless, Alison agreed to be the primary contact to CDOT environmental programs and Becky Vickers regarding how to bring this about.

<u>Calculating Credits</u>:
Regarding the possibility of covering rail construction or reconstruction, FHWA said this should be covered under the current programmatic approach, though the possibility exists, as with the Denver-Boulder corridor, that the rail line departs from the ROW in many cases. The team then discussed the likelihood of whether habitat was likely to be similar on the other side of the CDOT ROW fence. Consulting the biologists present (DOW, USFWS, CNHP), the team concurred that this was likely and a reasonable assumption to make, absent development, or tilled or

overgrazed vegetation in the private lands on the other side of the fence (which would be lower quality habitat). Thus it would be legitimate to utilize an acre-credit approach where credits were needed outside of but adjacent to the ROW.