US 50 West: Purcell Boulevard to Wills Boulevard (Milepost 309 to Milepost 313) and McCulloch Boulevard Intersection Improvements (Milepost 307)

Project Number: STA 050A-022
Project Code: 19056

Biological Resources Report

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FHU Reference No. 112407-02

February 2014

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List of Acronyms and Abbreviations

Ave.	Avenue
Blvd.	Boulevard
BA	Biological Assessment
BO	Biological Opinion
CDA	Colorado Department of Agriculture
CDOT	Colorado Department of Transportation
CPW	Colorado Parks and Wildlife
CWA	Clean Water Act
EA	Environmental Assessment
ESA	Endangered Species Act
EXPN	Experimental population
FC	Federal candidate species
FE	Federally endangered species
FHWA	Federal Highway Administration
FT	Federally threatened species
IPaC	Information, Planning, and Conservation System
MBTA	Migratory Bird Treaty Act
NDIS	Natural Diversity Information Source
OTIS	Online Transportation Information System
PBS-1	Pueblo Boulevard South-1
PEL	Planning and Environmental Linkages
Rd.	Road
ROW	right-of-way
SB 40	Senate Bill 40
SC	State candidate species
SE	State endangered species
SGPI	Shortgrass Prairie Initiative
ST	State threatened species
SWMP	Stormwater Management Plan
USACE	United States Army Corps of Engineers
USC	United States Code
USFWS	United States Fish and Wildlife Service
WCN-1	Williams Creek North-1
WCS-1	Williams Creek South-1
WHDC	Wild Horse Dry Creek-1
WUS	waters of the US

1. Introduction

The Colorado Department of Transportation (CDOT) is conducting an Environmental Assessment (EA) for proposed improvements to US Highway 50 (US 50) from Purcell Boulevard (Blvd.) to Wills Blvd. and the intersections of US 50 and Purcell Blvd., Pueblo Blvd., and McCulloch Blvd. (i.e., US 50 West EA) (**Figure 1** and **Figure 2**).

The Proposed Action includes elements of the recommended Preferred Alternative identified in the *US 50 West Planning and Environmental Linkages (PEL) Study* (*US 50 West PEL Study*) (2012a). The PEL recommended Preferred Alternative identified improvements to address peak-hour congestion and above average crash rates along US 50 from Swallows Road (Rd.) to Baltimore Avenue (Ave.) (**Figure 3**). Appendix A2, *US 50 West PEL Study* (CDOT, 2012a), and A3 of the EA, *US 50 West Implementation Plan* (CDOT, 2012b), include additional information on the PEL Preferred Alternative.

This biological resources assessment has been prepared in support of the US 50 West EA. This technical report describes the biological resources within and adjacent to the project area (biological resources study area), evaluates the potential for impacts as a result of the Proposed Action and No Action Alternative, and identifies proposed mitigation measures. The following resources were included in the assessment:

- Vegetation, including noxious weeds
- Potential habitat for special status species (federally-listed species, state-listed species, and non-listed rare plants)
- Migratory bird activity and nests
- Wetlands/Waters of the US (WUS)
- Senate Bill 40 (SB 40) resources

The Proposed Action for the US 50 West EA is located within CDOT's Shortgrass Prairie Initiative (SGPI) project area identified in the Programmatic Biological Opinion (BO) (2004) and Biological Assessment (BA), as discussed in more detail under **Special Status Species** in **Section 3.1.4**.

1.1 Project Description

1.1.1 Proposed Action

The Proposed Action would include widening 3.4 miles of US 50 to include a third eastbound lane from Purcell Blvd. to Wills Blvd. The Proposed Action would also provide intersection improvements at the Purcell Blvd./US 50, Pueblo Blvd./US 50, and McCulloch Blvd./US 50 intersections (**Figure 1** and **Figure 2**). The intersection improvements at Purcell Blvd. and McCulloch Blvd. would modify the northbound to eastbound turn lane geometry to US 50, and add a channelizing curb island for improved traffic flow and pedestrian/bicycle refuge. Intersection improvements at Pueblo Blvd./US 50 would include an eastbound through lane, an eastbound deceleration lane and ramp onto Pueblo Blvd., and a northbound ramp and acceleration lane onto eastbound US 50. The proposed improvements would also include widening the eastbound bridge at Wild Horse Dry Creek (CDOT Structure K-18-CW). The bridge improvements would include extending the existing piers within the Wild Horse Dry Creek drainage area, adding a third eastbound lane, and incorporating a multi-use pedestrian/bicycle trail on the bridge to accommodate

a proposed future multi-use trail on the southbound side of US 50. The multi-use trail would be a separate project to be built by others. The Proposed Action would also include drainage improvements and water quality features.

The proposed transportation and water quality improvements would be constructed within the existing CDOT right-of-way (ROW). Permanent easements for drainage would be required in three locations adjacent to CDOT ROW. The main text and figures of the EA provide additional detail about the Proposed Action, while Appendix A1 of the EA includes project drawings.

1.1.2 No Action Alternative

The No Action Alternative would include any transportation projects that have not been built, but for which funding has been committed. As identified in the *US 50 West PEL Study* (CDOT, 2012a), the No Action Alternative assumes that no major capacity improvements would occur along US 50 from Swallows Rd. to Baltimore Ave. (CDOT, 2012a). However, the No Action Alternative would include routine maintenance to keep the existing transportation network in good operating condition. The main text of the EA provides additional detail about the No Action Alternative.

Figure 1. Proposed Action – Purcell Boulevard to Wills Boulevard

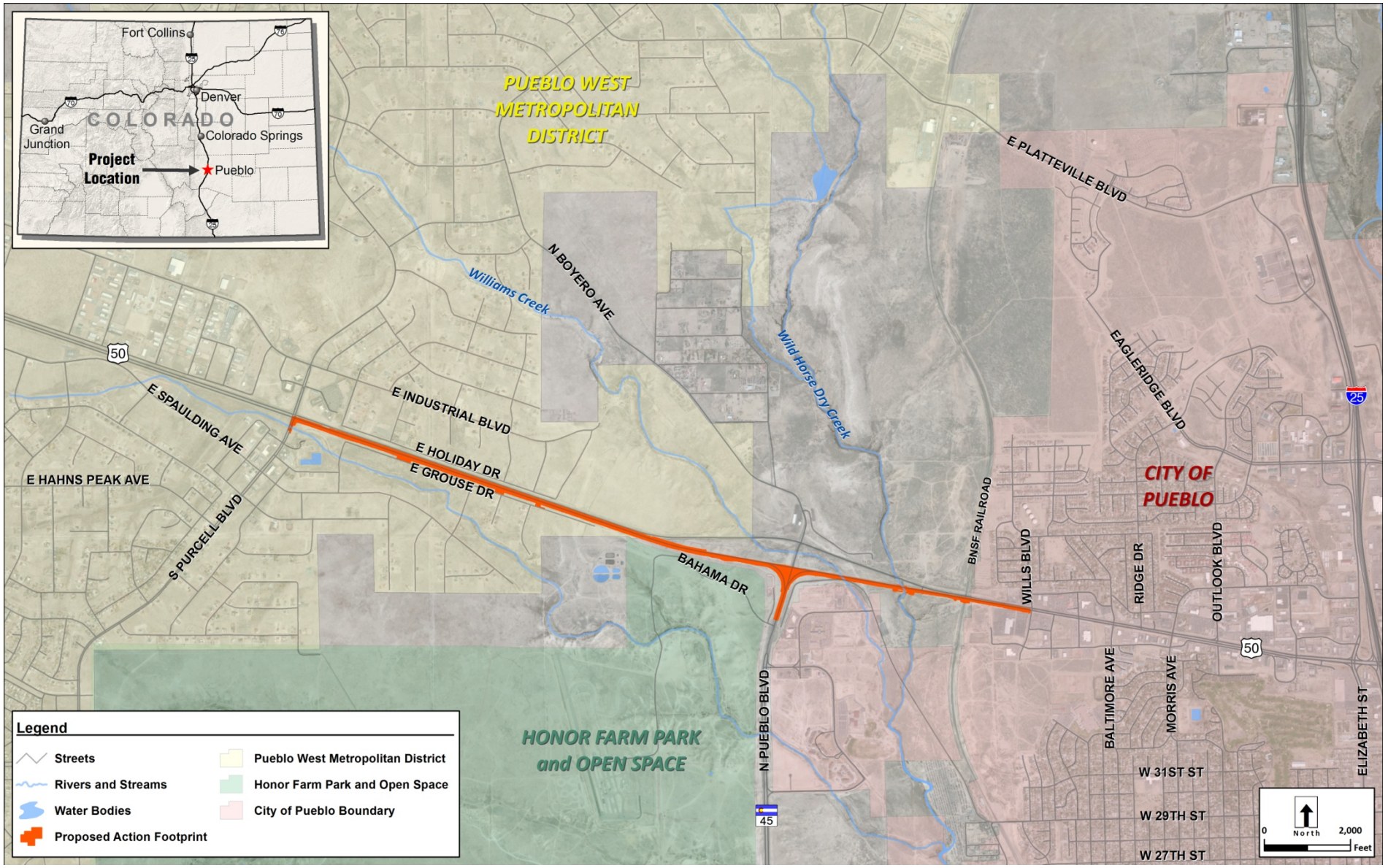


Figure 2. Proposed Action – McCulloch Boulevard / US 50 Intersection

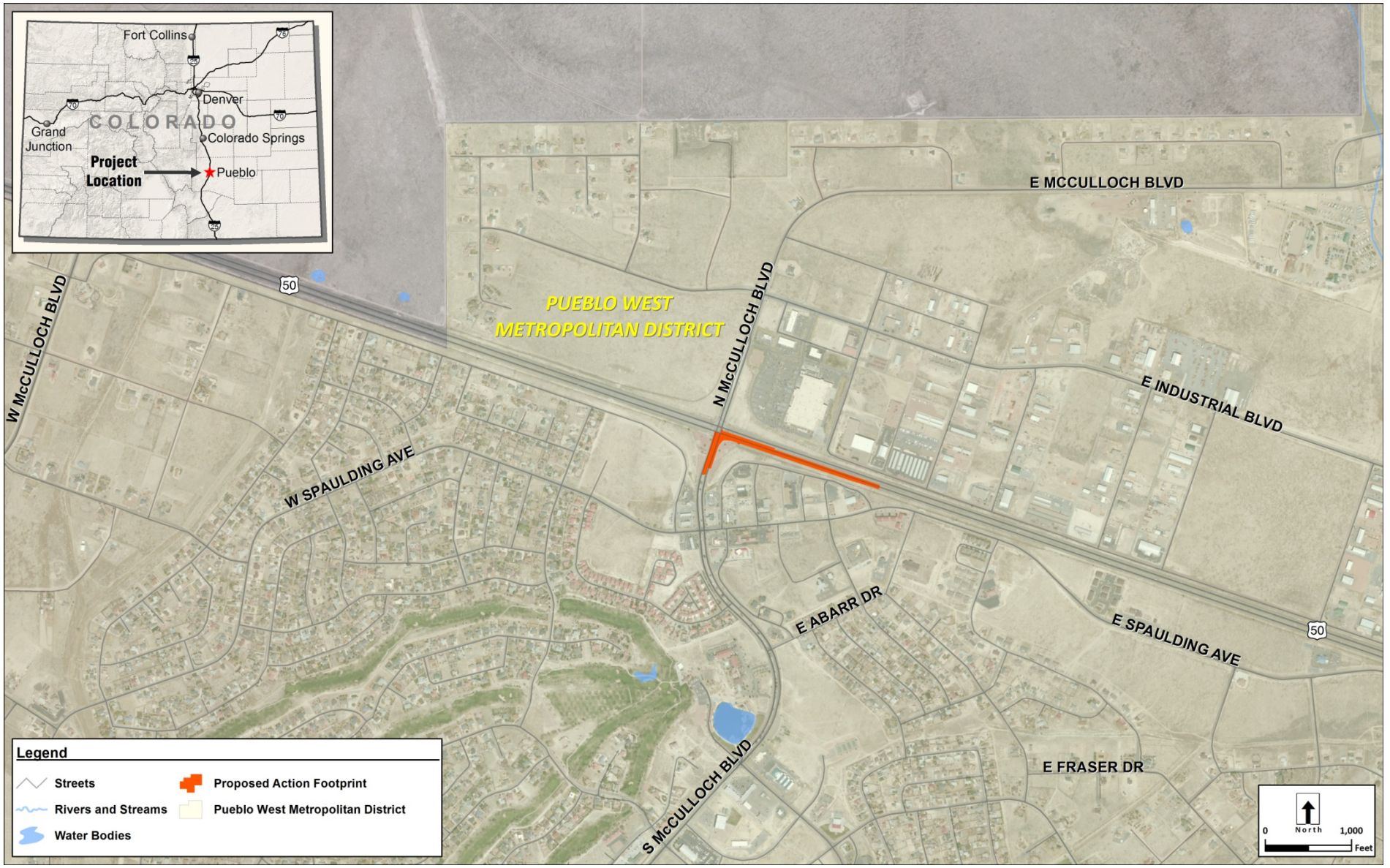
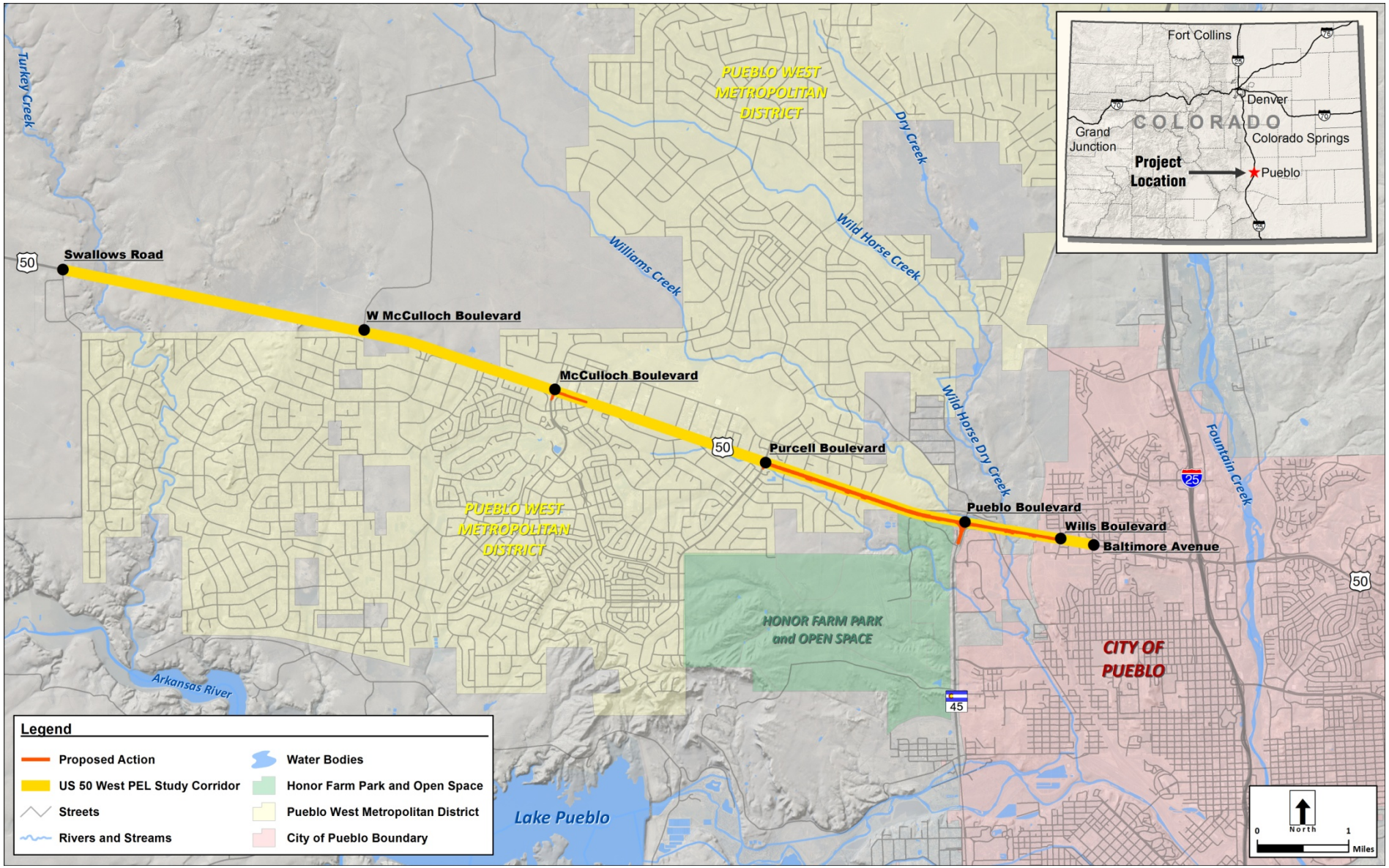


Figure 3. US 50 West PEL Study Corridor



2. Methods

The biological resources assessment included a review of previous environmental studies conducted in the project vicinity, a review of existing environmental data, and multiple field surveys to gather baseline information about the existing conditions within and adjacent to the project area (biological resources study area). **Section 4** discusses the impact assessment that was completed for the Proposed Action and No Action Alternative.

2.1 Review of Previous Environmental Studies

Before field surveys were conducted, the biological resources information from the *US 50 West PEL Study* (CDOT, 2012a) was reviewed to collect baseline information on vegetation/noxious weeds, potential habitat for special status species (federally-listed and state-listed species), and wetlands/WUS within the study area. Baseline information was then updated based on the most current conditions within the study area.

2.2 Review of Other Environmental Data

Other environmental data related to the existing biological conditions within the study area were collected and reviewed from various sources, including the Colorado Parks and Wildlife (CPW) Natural Diversity Information Source (NDIS) database, CDOT, United States Fish and Wildlife Service (USFWS), relevant research publications, aerial photography, and topographic maps.

2.3 Field Surveys

Multiple biological field surveys were conducted to collect information on vegetation/noxious weeds, wildlife species and habitats, special status species (federally-listed, state-listed, and non-listed rare plants), wetlands/WUS, and SB 40 resources within the biological resources study area.

The project team conducted an initial field survey within the Purcell Blvd. to Wills Blvd. portion of the project on June 3, 2013. The field survey included compiling an inventory of vegetation and noxious weeds; assessing wildlife, including aquatic resources, special status species, migratory bird activity and nests, and habitat; and conducting the wetland delineation.

The project team conducted additional field surveys within the Purcell Blvd. to Wills Blvd. portion of the project on June 25 and 27, and on July 10 and 31, 2013, to identify the presence/absence of any rare plants identified in the SGPI Programmatic BO/BA that are endemic to Pueblo County and the Arkansas Valley shale barren region.

The project team conducted an additional field survey around the McCulloch Blvd./US 50 intersection on October 29, 2013. This survey was conducted to identify the presence or absence of rare plants and noxious weeds, as well as to assess wildlife, including aquatic resources, special status species, migratory bird activity and nests, and habitat. It is important to note that no wetlands or other WUS, SB 40 resources, aquatic resources, or migratory bird nests were found at the McCulloch Blvd./US 50 intersection within the study area and, therefore, are not discussed further in this report.

Appendix A includes photographs from all of the 2013 field surveys.

3. Existing Conditions

3.1 Environmental Setting

Land use surrounding US 50 in the study area is predominantly rangeland with scattered residential and commercial development. Commercial development focuses on the four major arterial roads: McCulloch Blvd., Purcell Blvd., Pueblo Blvd., and Wills Blvd. Residential development is focused both to the north and south of US 50 between Pueblo Blvd. and Purcell Blvd., and in the southwest corner of the McCulloch Blvd./Purcell Blvd. intersection. The Burlington Northern Santa Fe railroad also crosses US 50 within the study area.

The study area lies within both the Dry Creek watershed and the Wild Horse Creek watershed, which are both within the Upper Arkansas River Basin. Williams Creek and Wild Horse Dry Creek cross US 50 at the Pueblo Blvd. intersection. Williams Creek flows from northwest to southeast and passes under the highway and under Pueblo Blvd. Wild Horse Dry Creek also flows from northwest to southeast and passes under the highway to the east of Pueblo Blvd. An un-named tributary to Williams Creek also exists south of US 50 and crosses under Purcell Blvd. in a narrow channelized ditch.

The McCulloch Blvd./US 50 intersection consists of formal landscaping in the two south quadrants of the intersection, which mark the gateway to Pueblo West. The landscaping consists of large beds of crushed red gravel, with clumps of shrubs and evergreen trees. The northern two quadrants of the intersection were not landscaped in the past and have very little vegetation and are dominated by prairie dog colonies.

Average annual precipitation in Pueblo County, from 1954 to 2004, was 11.8 inches (Western Regional Climate Center). Most of Pueblo County is currently experiencing a level D4 (exceptional) drought, based on the US Drought Monitor classification system. Long-term forecasts are for continued exceptional drought (USDA Drought Monitor, 2013).

Soils in the study area are a mosaic of Manvel silt loam on the plains, and Penrose-Minnequa and Penrose-rock outcrop complexes on the dissected drainages that have eroded through the underlying limestone and shale bedrock (Larsen et al., 1979). The erosion hazard is moderate in these soils. The Penrose-Minnequa complex occurs on shoulder slopes and on the side slopes of drainages and escarpments. These soils are very shallow to bedrock (usually only 10 to 12 inches deep) and have a very high proportion of rock fragments in the limited loam and silt loam matrix.

3.1.1 Vegetation

The study area is within the central shortgrass prairie of southeastern Colorado, in a region referred to as the Arkansas Valley Barrens. As previously stated, the Proposed Action associated with the US 50 West EA is located within CDOT's SGPI project area and is discussed in more detail under Special Status Species in **Section 3.1.4**.

Vegetation cover is typically sparse, growing in limited soils beneath a pavement of platy shale fragments. These conditions are characteristic of the geologic strata of the Niobrara Formation geology, including calcareous shale, limestone, and chalk layers, with clay and selenium components. Where the shale and chalk layers are exposed, they tend to form barrens with little soil development (Scott, 1964; Scott and Cobban, 1964).

Most of the vegetation present in the study area includes native shortgrass prairie grasses and wildflowers, native and non-native shrubs, and native and non-native trees. The primary native shortgrass prairie species found in the study area included blue grama (*Bouteloua gracilus*), buffalo grass (*Buchloe dactyloides*), hoary false goldenaster (*Heterotheca canescens*), crested pricklypoppy (*Argemone polyanthemos*), ten-petal blazing star (*Mentzelia decapetala*), cowboy's delight (*Sphaeralcea coccinea),* purple groundcherry (*Quincula lobata),* vervain (*Glandularia bipinnatifida),* and zinnia (*Zinnia grandiflora).* Shrub and plant species adaptive to local sandy and droughty soil conditions include sand sagebrush (*Oligosporus filifolius*), sagebrush (*Artemisia* sp.), and fourwing saltbush (*Atriplex canescens*). Other characteristic shrub, sub-shrub, and cacti species include skunkbush (*Rhus aromatic* ssp. *pilossima*), rubber rabbitbrush (*Ericameria nauseosa*), broom snakeweed (*Gutierrezia sarothrae*), yucca (*Yucca glauca*), plains prickleypear (*Opuntia polyacantha*), and other cacti. These plant and grass species occur sporadically along US 50 in the study area, with the greatest concentration within the divided eastbound and westbound lanes at US 50 and Pueblo Blvd. (**Figure 1**).

Other landscaped tree species were surveyed at McCulloch Blvd./US 50 and Purcell Blvd./US 50 This includes blue spruce (*Picea pungens*) trees, honey locust (*Gleditsia triacanthos*) trees, Rocky Mountain juniper (*Juniperus scopulorum*) trees, pinyon pine (*Pinus edulis*) trees within the ROW and Russian olive (*Elaeagnus angustifolia*) trees just outside the ROW. Otherwise, roadside disturbance and urban development have encroached and replaced much of the vegetation in proximity to US 50. The upland areas are sparsely vegetated, in contrast to the wetland and riparian vegetation within the Williams Creek and Wild Horse Dry Creek drainage channels. **Section 3.1.7** discusses wetland vegetation. SB 40 resources are discussed in **Section 3.1.8**. **Section 3.1.2** discusses non-native shrubs and weeds.

The Williams Creek riparian area contains stands of Siberian elm (*Ulmus pumila*), golden currant (*Ribes aureum*), sandbar willow *(Salix interior),* narrowleaf cattail (*Typha angustifolia*), creeping bentgrass (*Agrostis stolonifera*), small spikerush (*Eleocharis minima*), and annual sunflowers (*Helianthus annuus*). The Wild Horse Dry Creek riparian area contains stands of tamarisk, creeping bentgrass, small spikerush, Nebraska sedge (*Carex nebrascensis*), perennial pepperweed (*Lepidium latifolium*), hoary cress (*Cardaria draba*), and princes plume (*Stanleya pinnata*). These riparian areas are confined within the narrow creek channels, 10 to 12 feet below the surrounding uplands. **Section 3.1.7** and the *US 50 West – Purcell Boulevard to Wills Boulevard Project Wetland Delineation Technical Report* (CDOT, 2014b) include more information on wetlands in the study area.

Overall, the vegetation in the study area has been stressed by prolonged drought and modified by roadside earthwork, underground utility lines, the Burlington Northern Santa Fe railroad crossing, and invasive weeds and shrubs. A network of "social trails" in proximity to the Pueblo Blvd. intersection that extends under the US 50 bridges is causing erosion and soil compaction along Wild Horse Dry Creek. The vegetation growth in the study area appears to be stunted, and percent cover ranges from 0 to 15 percent. Extensive areas of bare soil and weed infestation are present, especially along the south side of US 50 within the eastbound lane ROW area. See **Section 3.1.2** for a discussion of non-native plants.

3.1.2 Noxious Weeds

Noxious weeds are non-native plants that establish themselves in disturbed soils and can quickly spread and displace native vegetation and habitat. Federal Executive Order 13112, the Colorado Noxious Weed Act (Title 35, Article 5.5), Colorado Executive Order D-006-99, and Colorado Regulations 8-CCR-1206-2 mandate the control of certain noxious weeds.

According to the Colorado Department of Agriculture (CDA), noxious weeds are plants that reduce agricultural productivity, lower real estate values, endanger human health and well-being, and damage scenic values (CDA, 2013). The CDA has classified the noxious weed species into three lists (A, B, and C) based on management requirements, as described below:

- Species on the Colorado State A list are the most invasive species found in Colorado and are targeted for eradication, when present.
- Species on the Colorado State B list are targeted for control, rather than eradication.
- Management of species on the Colorado State C list is not mandated; however, the state may provide funding to support local control efforts if local governing entities choose to control these species.

Before conducting the field surveys, the project team reviewed CDOT's Online Transportation Information System (OTIS) and the CDOT Noxious Weed Viewer, an online noxious weed mapping tool (CDOT, 2013), for information about noxious weeds within the study area. The Noxious Weed Viewer identified that CDOT surveyed the area for noxious weeds in 2009, 2010, and 2012. The project team also inspected the study area for species included on the CDA Noxious Weed List and the Pueblo County Target Species List (Pueblo County, 2013). **Table 1** and **Figure 4** through **Figure 8** present the noxious weeds that were identified within the study area using CDOT's Noxious Weed Viewer and during subsequent field surveys.

Table 1. Noxious Weeds in the Study Area

Common Name	Scientific Name	CDA: List A, B, C, or Watch List	CDOT OTIS - Noxious Weed Viewer	Pueblo County – Targeted Species	Field Surveys	Occurrence
Bull thistle	*Cirsium vulgare*	B			X	Sporadic – drainages
Canada thistle	*Cirsium arvense*	B		X	X	Dense – Williams Creek
Downy brome	*Bromus tectorum*	C			X	Sporadic
Field bindweed	*Convolvulus arvensis*	C	X		X	Common
Hoary cress	*Cardaria draba*	B		X	X	Patches – Wild Horse Dry Creek
Leafy spurge	*Euphorbia esula*	B		X	X	Patches – Wild Horse Dry Creek
Perennial pepperweed	*Lepidium latifolium*	B		X	X	Patches – Wild Horse Dry Creek
Redstem filaree	*Erodium cicutarium*	C			X	Common
Russian knapweed	*Acroptilon repens*	B		X		Sporadic
Russian olive	*Elaeagnus angustifolia*	B		X	X	Single tree – Williams Creek
Salt cedar/ tamarisk	*Tamarix chinensis*	B		X	X	Common in drainages
Scotch thistle	*Onopordoum acanthium*	B	X	X	X	Sporadic

Source: CDA, 2013

In summary, field bindweed, downy brome, and redstem filaree were observed throughout the open, native seeding areas throughout the study area. The other species were identified in or adjacent to Williams Creek, the un-named Williams Creek tributary, and Wild Horse Dry Creek (**Figure 4** through **Figure 8**).

The common occurrence of broom snakeweed (*Guttierrezia sarothrae*) and kochia (*Bassia* spp.) indicates that the vegetation in the study area is in a less than optimal state. These two species, although not listed on the Colorado Noxious Weed Act List (CDA, 2003), are common along roadsides and areas that have been disturbed by construction. These weeds are introduced species that are known to out-compete native flora.

Figure 4. Noxious Weeds Within the Study Area

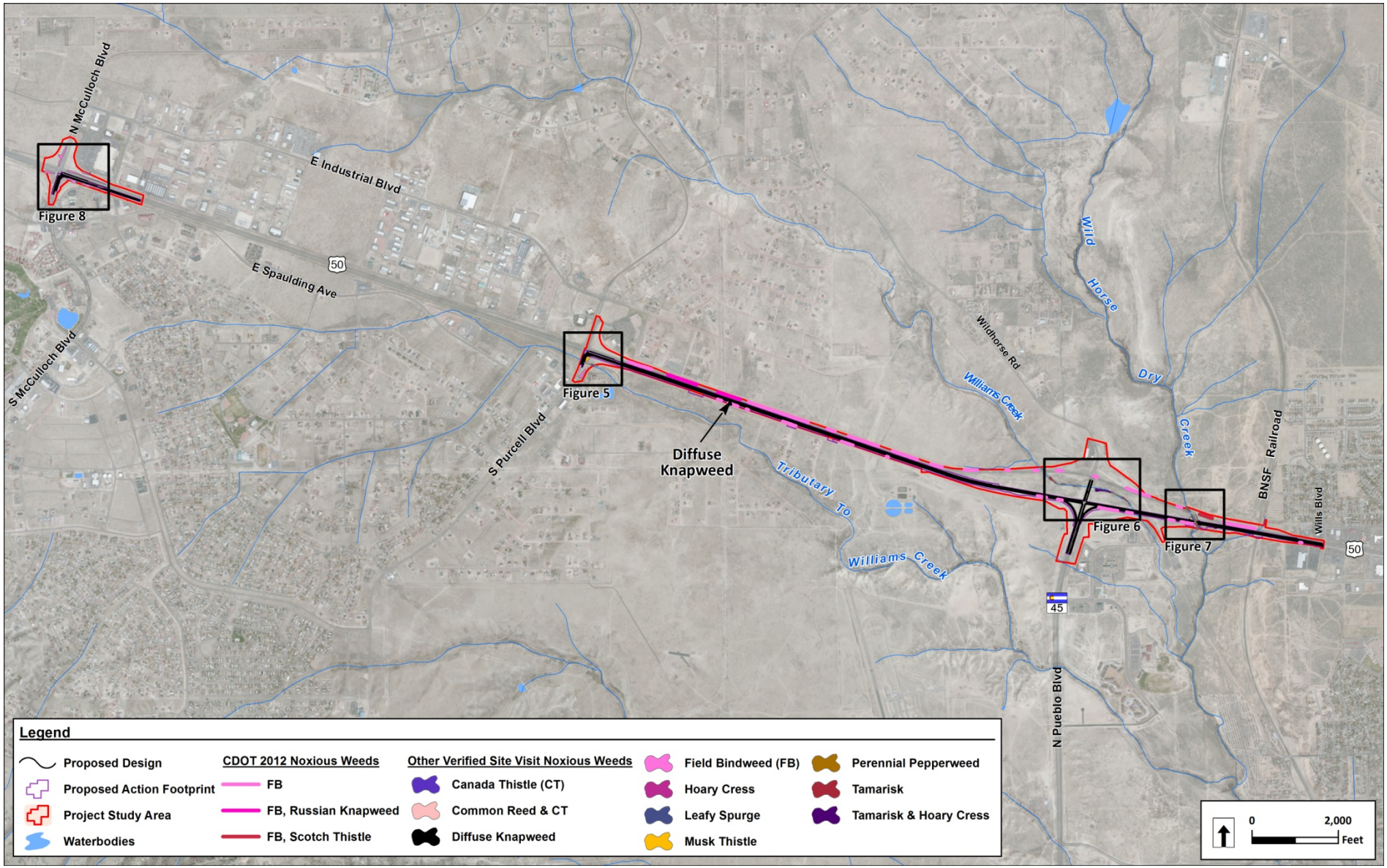


Figure 5. Noxious Weeds Within the Study Area – Purcell Boulevard/US 50 Boulevard Intersection

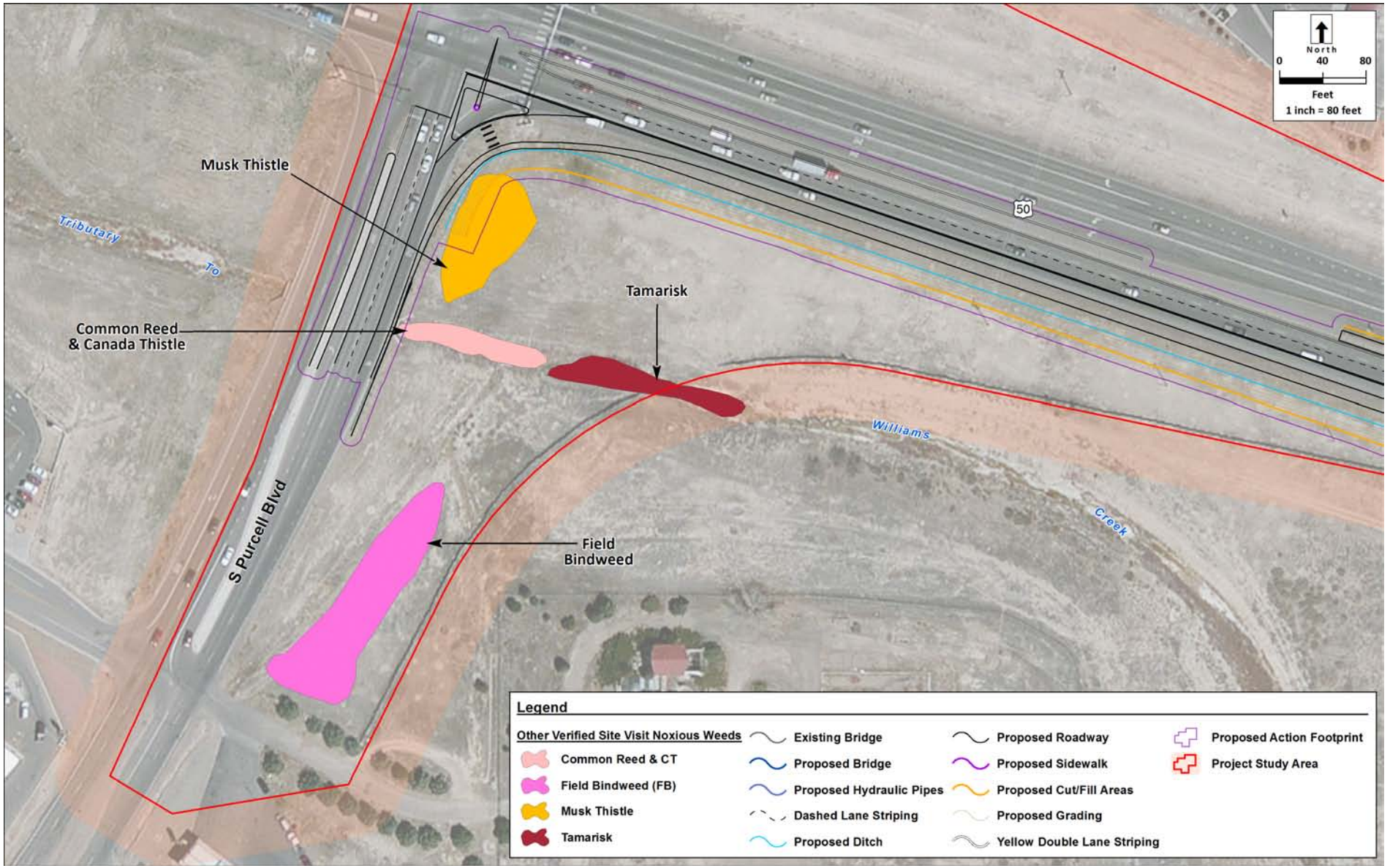


Figure 6. Noxious Weeds Within the Study Area – Pueblo Boulevard/US 50 Intersection

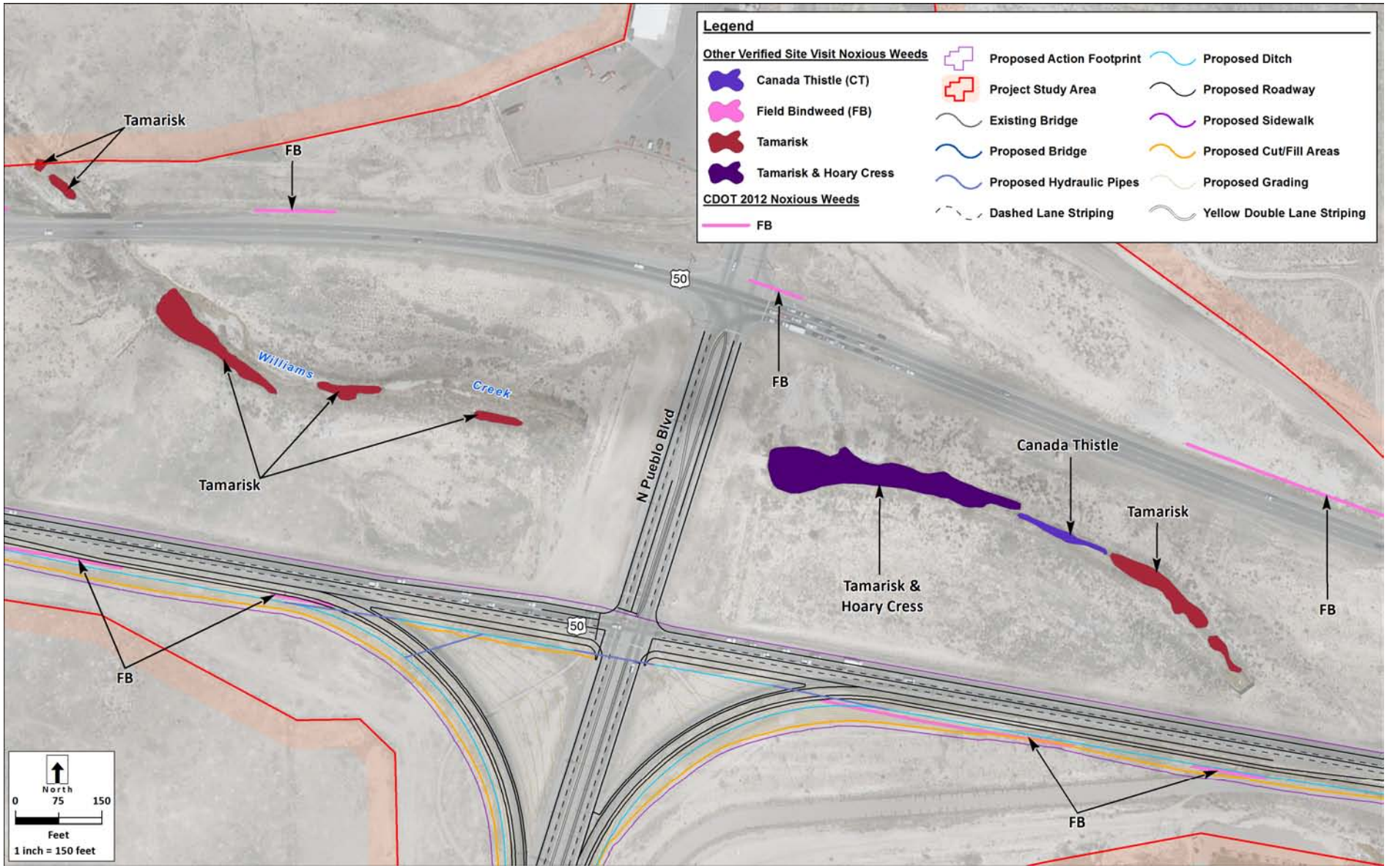


Figure 7. Noxious Weeds Within the Study Area – Wild Horse Dry Creek

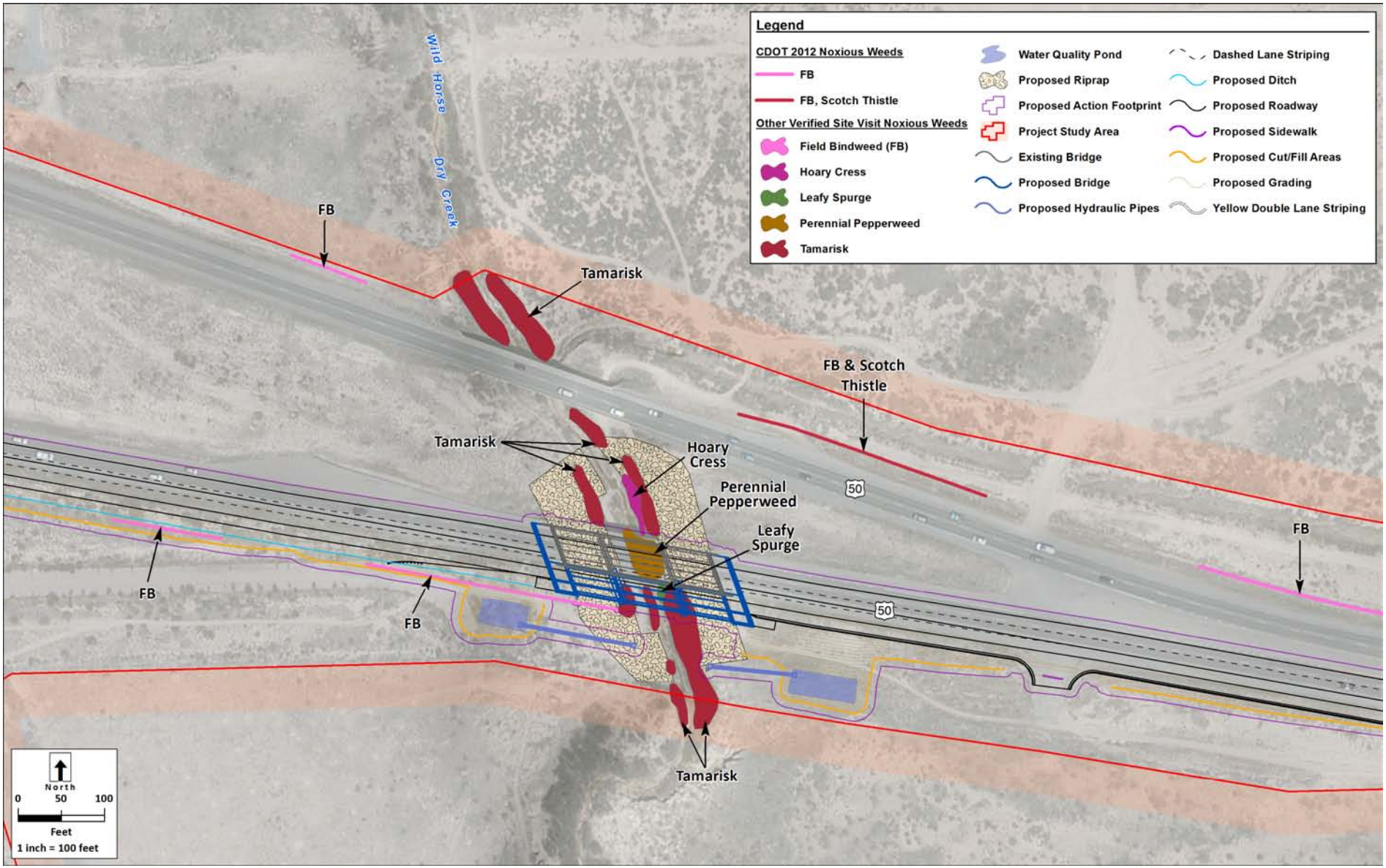
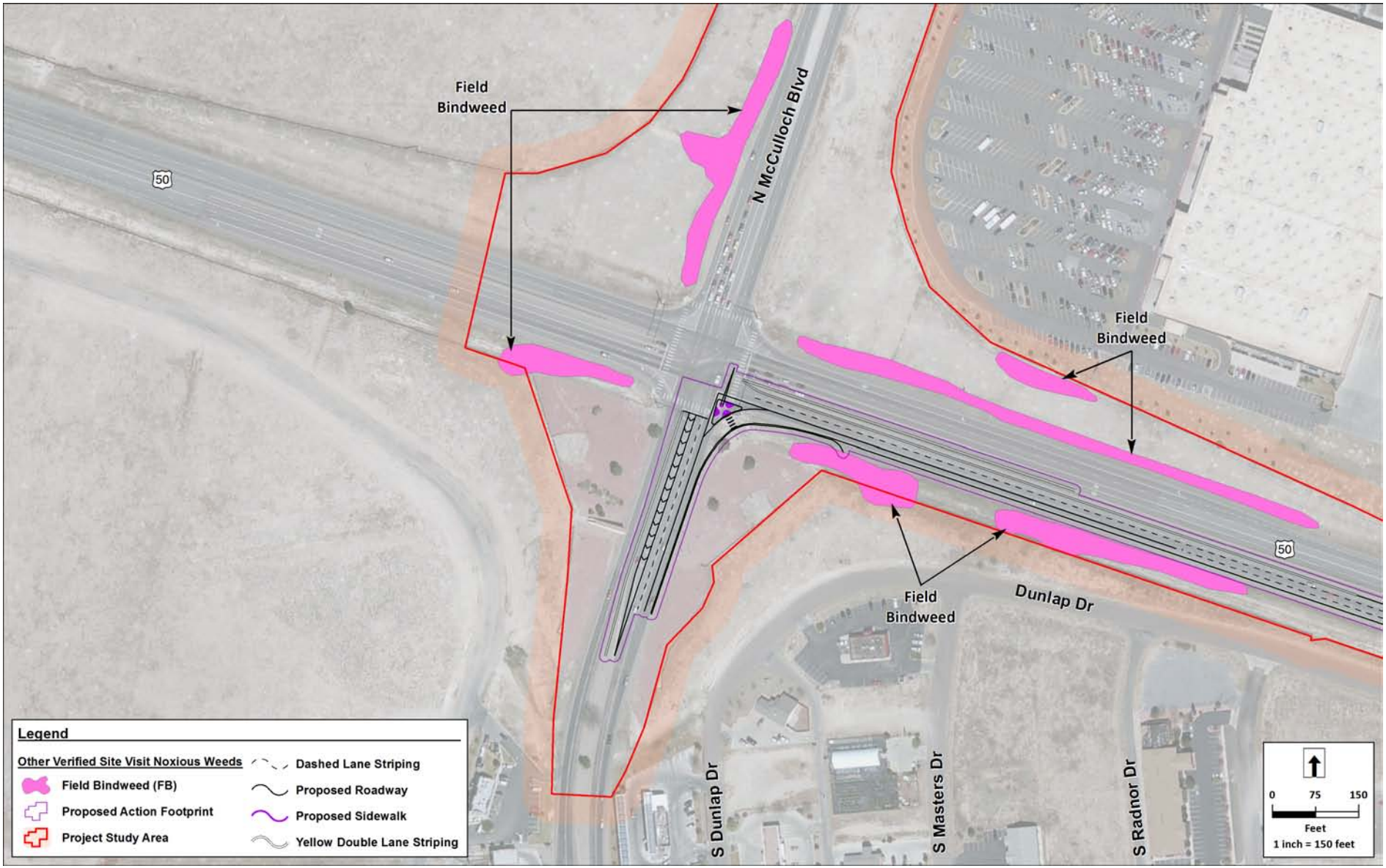


Figure 8. Noxious Weeds Within the Study Area – McCulloch Boulevard/US 50 Intersection



3.1.3 Fish and Wildlife

This section discusses the fish and wildlife species known to occupy the study area or that may be present in the study area based on the presence of suitable habitat. **Table 2** includes information gathered from field surveys on general habitat and wildlife observations. **Section 3.1.6** discusses migratory bird observations from the field surveys.

Table 2. Fish and Wildlife Field Survey Observations

Common Name	Scientific Name	Activity
Six-lined racerunners	*Cnemidophorus sexlineatus*	Observed in the uplands above Williams Creek
Desert cottontail	*Sylvilagus audubonii*	Individuals and scat observed in the Williams Creek drainage area
Coyote	*Canis latrans*	Scat and tracks also observed in the Williams Creek drainage area
Plains killifish	*Fundulus zebrinus*	Observed in the Williams Creek and Wild Horse Dry Creek channels and pools
Fathead minnow	*Pimephales promelas*	Observed in the Williams Creek channel and pools
Black-tailed prairie dogs	*Cynomys ludovicianus*	See **Section 3.1.4**, **Special Status Species,** of this report for information on black-tailed prairie dogs

Overall, ROW disturbances, such as mowing and utility installation, adjacent residential and commercial development, off-road vehicle activities near US 50/Pueblo Blvd. and the surrounding areas, and drought conditions have highly modified wildlife habitat in the study area.

3.1.4 Special Status Species

Special status species include federally-listed and state-listed species, federal candidate species, or state species of special concern. The Endangered Species Act (ESA) (16 USC 1531 et seq.) protects federally-listed threatened and endangered species. Under Section 7 of the ESA, a consultation and clearance process with USFWS is required if project activities will affect a federally-listed species or its habitat. State-listed species are not protected by statute; however, CDOT is committed to their conservation.

As previously stated, the study area is located within the Central Shortgrass Prairie ecoregion and is subject to the Central Shortgrass Prairie Programmatic BO/BA among CDOT, FHWA, USFWS, and CPW. The Programmatic BO and BA were developed to mitigate anticipated impacts on the shortgrass prairie ecosystem from CDOT projects for species listed as threatened or endangered under the ESA, and for declining non-listed species that may become listed in the future.

The project team accessed the USFWS Information, Planning, and Conservation System (IPaC) on May 30, 2013, to identify any federally-listed species that could be present in Pueblo County and the study area. Information from CPW was also reviewed to identify any state-listed species that could be in the study area and could potentially be affected by the project. As previously discussed, multiple biological field surveys were conducted as part of this project, as described in **Section 2.3**. All field survey observations were from public ROW because there was no access to private properties surrounding the project. **Table 3** lists special status species located in Pueblo County and potentially within the study area and identifies the assessment results.

Table 3. Results of Special Status Species Assessment

Name	Status	Habitat Description	Assessment Results
Mammals			
Black-footed ferret (*Mustela nigripes*)	EXPN, SE	Located within the block-clearance zone for the black-footed ferret.	No impacts are expected because the project is located within the block-clearance zone for the black-footed ferret.
Black-tailed prairie dog (*Cynomys ludovicianus*)	SC*	Form large colonies or "towns" in shortgrass or mixed prairie.	Habitat is present within the study area.
Botta's pocket gopher (*Thomomys bottae*)	SC	Distinctive plugged mounds primarily found in well-developed soils of warm valleys in southern Colorado.	The study area is out of the range for Botta's pocket gopher.
Canada lynx (*Lynx canadensis*)	FT, SE	Prefer northern coniferous forests.	No suitable habitat is present; therefore, no impacts are expected.
North American wolverine (*Gulo gulo luscus*)	PT, SE	Restricted to high elevation habitat with cold and snowy conditions.	No suitable habitat is present; therefore, no impacts are expected.
Northern pocket gopher (*Thomomys talpoides*)	SC	Distinctive plugged mounds; deep, sandy soils of the plains to shallow gravel in mountainous areas.	The study area is out of the range for northern pocket gopher.
Northern river otter (*Lontra canadensis)*	ST	Probably once occurred in major streams statewide in Colorado, although apparently have never been abundant. Disappeared from Colorado by the early part of this century. In the 1970s, CPW began to restore populations to several drainages, including the Upper Colorado, the Dolores, and the upper South Platte rivers.	No suitable habitat is present; therefore, no impacts are expected.
Swift fox (*Vulpes velox*)	SC	Inhabit grasslands, from shortgrass to midgrass prairies, over most of the Great Plains.	Potential habitat, but presence is unlikely due to the lack of large populations of prairie dogs in the study area. No indication of swift fox was observed during the June 2013 site visit. No impacts are expected.
Townsend's big-eared bat subsp. (*Plecotus townsendii pallescens*)	SC	Occupy semidesert shrublands, piñon-juniper woodlands, and open montane forests. Found throughout Colorado, except on the eastern plains. Distribution seems to be determined by availability of roosts, such as caves, mines, tunnels, crevices, and masonry structures with suitable temperatures, making the conservation of suitable roosts essential to the management of this species.	No suitable habitat is present; therefore, no impacts are expected.

Name	Status	Habitat Description	Assessment Results
Birds			
American Peregrine Falcon (*Falco peregrinus anatum*)	SC	Nest on cliffs and forages over adjacent coniferous and riparian forests. Migrants occur mostly around water bodies but may also be seen in grasslands and agricultural areas.	No suitable habitat is present; therefore, no impacts are expected.
Bald Eagle (*Haliaeetus leucocephalus*)	ST*	Occur near reservoirs and rivers. May also occur locally in semideserts and grasslands, especially near prairie dog towns, in winter.	Presence is unlikely due to the absence of large water bodies and minimal prairie dog activity in the study area. No Bald Eagle activity or nests were observed during the June and July 2013 field surveys. No impacts are expected.
Greater Sandhill Crane (*Grus Canadensis*)	SC	When breeding, found in parks with grassy hummocks and watercourses, beaver ponds, and natural ponds lined with willows or aspens. Nest in wetlands and shallow marshes. Feed in mudflats around reservoirs, moist meadows, and agricultural areas. During migration and winter, regularly feed in dry fields, returning to water at night.	No suitable habitat is present; therefore, no impacts are expected.
Interior Least Tern (*Sternula antillarum*)	SE**	Known to breed in the southeastern portion of Colorado and generally in the La Junta-Lamar area. Prefer to nest on sandy or pebbly beaches, around lakes and reservoirs during construction.	No suitable habitat is present; therefore, no impacts are expected.
Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*)	ST*	Occupy sandsage and sandsage-bluestem grasslands. May also occur at times in agricultural areas, especially in winter.	No suitable habitat is present; therefore, no impacts are expected.
Long-Billed Curlew (*Numenius americanus*)	SC*	Found in shortgrass grasslands and sometimes in wheatfields or fallow fields. Nest close to standing water.	No suitable habitat is present; therefore, no impacts are expected.
Mexican Spotted Owl (*Strix occidentalis lucida*)	FT, ST	Nest in steep canyons with dense stands of large ponderosa pine or piñon-juniper with Douglas-fir, and in mature to old-growth mixed-conifer forests with high canopy closure and open understory.	No suitable habitat is present; therefore, no impacts are expected.
Mountain Plover (*Charadrius montanus*)	SC*	Rare spring and fall migrant on eastern plains (primarily fall). Found in foothills and mountains, migrant to western valleys, eastern plains, and mountain parks. Breeding areas exist at the Pawnee National Grasslands. Inhabit prairie grasslands, arid plains, and fields.	Presence unlikely due to highly arid and sparse vegetation in the Williams Creek and Wild Horse Dry Creek basins. No impacts are expected.

Name	Status	Habitat Description	Assessment Results
Piping Plover (*Charadrius melodus*)	ST**	Occupy eastern part of Colorado in the Arkansas and South Platte River drainages as spring migrants. Arrive around the first of April and pass through by the end of May. Prefer to nest on sandy lakeshore beaches, sandbars within riverbeds, or even sandy wetland pastures.	No suitable habitat is present; therefore, no impacts are expected.
Western Burrowing Owl (*Athene Cunicularia hypugaea*)	ST*	In Colorado, migratory species found almost anywhere there are prairie dog burrows from late March or early April through October. May occupy abandoned prairie dog colonies.	No survey for Burrowing Owls was conducted; however, suitable habitat is present in the prairie dog colonies located in the study area.
Western Snowy Plover (*Charadrius alexandrinus nivosus*)	SC	Within the Central Shortgrass Prairie in Colorado, breed on shores of reservoirs near the Arkansas River between La Junta and Lamar. Arrive in mid-April. Most leave Colorado by the end of September.	No suitable habitat is present; therefore, no impacts are expected.
Fish/Reptiles/Amphibians			
Arkansas darter (*Etheostoma cragini*)	FC**	Found in the Upper Arkansas, Fountain Creek, Horse Creek, Upper Arkansas at John Martin, Big Sandy Creek, Rush Creek, Black Squirrel Creek, and Chico Creek drainages. Distribution has not changed significantly based on historic data comparisons, particularly since 1979. Colorado populations persist in large, deep pools during late summer low-water periods when streams may become intermittent. Prefers shallow, clear, sandy streams with spring-fed pools and abundant rooted aquatic vegetation.	No suitable habitat is present; therefore, no impacts are expected. No Arkansas darters present based on CDOT samples collected in June 2013.
Greenback cutthroat trout (*Oncorhynchus clarki stomias*)	FT	Require mountain stream habitat; restricted to headwaters within the Arkansas River system.	No suitable habitat is present; therefore, no impacts are expected.
Massasauga (*Sistrurus catenatus*)	SC*	Found in southeastern Colorado at elevations below about 5,500 feet and in dry plains grassland and sandhill areas. Attracted to sandy soils supporting abundant rodent and lizard populations; hibernate singly in rodent burrows, often in firm, loamy soils adjacent to sandy areas used for feeding.	Suitable habitat is present; however, no individuals were observed during the 2013 field surveys.

Name	Status	Habitat Description	Assessment Results
Northern leopard frog (*Rana pipiens*)	SC**	Nearly statewide in mountains and lowlands, but scarce or absent in most of southeastern Colorado and the Republican River drainage in northeastern Colorado. Locally common, but now rare or extirpated in many areas, particularly in the mountains. Wet meadows and the banks and shallows of marshes, ponds, lakes, reservoirs, streams, and irrigation ditches. May roam far from water during wet, mild weather. Breed in shallow, quiet areas of permanent water bodies, in beaver ponds, and in seasonally flooded areas adjacent to or contiguous with permanent pools or streams. The breeding season begins in March in lowland areas. Per the SGPI Programmatic BO/BA, the northern leopard frog is sympatric with the plains leopard frog in Pueblo county.	Potential for suitable habitat; however, no individuals were observed during the 2013 field surveys.
Plains leopard frog (*Rana blairi*)	SC	Found in Great Plains portion of the Arkansas River drainage in southeastern Colorado. May occur in the vicinity of streams, natural and artificial ponds, reservoirs, creek pools, irrigation ditches, and other bodies of water in plains grassland, sandhills, stream valleys, and canyon bottoms.	Suitable habitat is present; however, no individuals were observed during the 2013 field surveys.
Texas horned lizard (*Phrynosoma cornutum*)	SC*	Occupy southeastern Colorado, almost entirely south of the Arkansas River. Fairly common. plains grassland, particularly where there are large patches of bare ground, but generally absent from areas that are barren due to extensive plowing.	No suitable habitat is present; therefore, no impacts are expected.
Triploid Colorado checkered whiptail (*Aspidoscelis neotesselata*)	SC	Endemic to southeastern Colorado below 7,000 feet. Inhabit hillsides, arroyos, and canyons associated with the Arkansas River Valley. Roadsides, shrubby areas, and juniper-grass associations. Eggs hatch in late August to early October.	Suitable habitat present; June and July 2013 site visits identified six individuals that were photographed along the terraces above Williams Creek.

FE – federally endangered, FT – federally threatened, FC – federal candidate, EXPN – experimental population

SE – state endangered, ST – state threatened, SC – state species of special concern

** Identified as Primary/Target Species under the Shortgrass Prairie Initiative*

*** Identified as On-site Mitigation (Best Management Practices [BMPs]) Species under the Shortgrass Prairie Initiative*

Sources: USFWS 2013 – Black-Footed Ferret Block Clearance

NDIS, 2013

CPW & CDOT, 2013

Black-tailed Prairie Dog

The SGPI Programmatic BO/BA lists the black-tailed prairie dog as a primary (target) species. Several prairie dog colonies were observed within the study area (**Figure 9** and **Figure 10**). During the initial field survey (June 3, 2013), two individuals were observed in the southeast corner of the US 50/Purcell Blvd. intersection. During subsequent field visits, sporadic prairie dog activity was observed, north of US 50 and outside the project footprint:

- Two individuals were observed in a colony located north of US 50 between Purcell Blvd. and Pueblo Blvd. during one of the field surveys.
- Two individuals were also observed on the north side of US 50 during other site visits.
- Multiple individuals were observed on October 29, 2013, in a colony located at the southeast corner of US 50 and McCulloch Blvd. between the intersection and Dunlap Drive.
- Multiple individuals were observed on October 29, 2013, in a colony located at the northeast corner of US 50 and McCulloch Blvd. between the highway and Walmart.
- Prairie dog colonies were observed on October 29, 2013, at both northwest and southwest corners of US 50 and McCulloch Blvd.

Western Burrowing Owl

The SGPI Programmatic BO/BA lists the Western Burrowing Owl as a primary (target) species. Western Burrowing Owls inhabit grasslands in or near prairie dog towns and are a summer resident in eastern Colorado. Breeding birds are known to nest in abandoned prairie dog holes and usually use two prairie dog holes during the breeding season (NDIS, 2013). No Western Burrowing Owls were observed during the field surveys; however, suitable habitat is present in the study area.

Triploid Colorado Checkered Whiptail

During the June and July 2013 field surveys, several triploid Colorado checkered whiptails were observed, with most observations made in the Williams Creek drainage area. A triploid Colorado checkered whiptail was also observed along the north side of US 50, within the ROW, between Purcell Blvd. and Pueblo Blvd. in an area outside the project footprint.

Massasauga Rattlesnake

The SGPI Programmatic BO/BA lists the massasauga (*Sistrurus catenatus*) as a primary (target) species. No individuals were observed during the 2013 field surveys; however, suitable habitat is present.

Plains Leopard Frog and Northern Leopard Frog

The plains leopard frog (*Rana blairi*) is not listed in the SGPI Programmatic BO/BA; however, suitable habitat is present along Wild Horse Dry Creek and Williams Creek. Also, potential suitable habitat is present for the northern leopard frog (*Rana pipiens*) along Wild Horse Dry Creek and Williams Creek. The SGPI Programmatic BO/BA lists the northern leopard frog as a species with on-site mitigation/BMP requirements. No individuals (plains leopard frog or northern leopard frog) were observed during the 2013 field surveys.

Figure 9. Prairie Dog Colonies Within the Study Area – Purcell Boulevard to Wills Boulevard

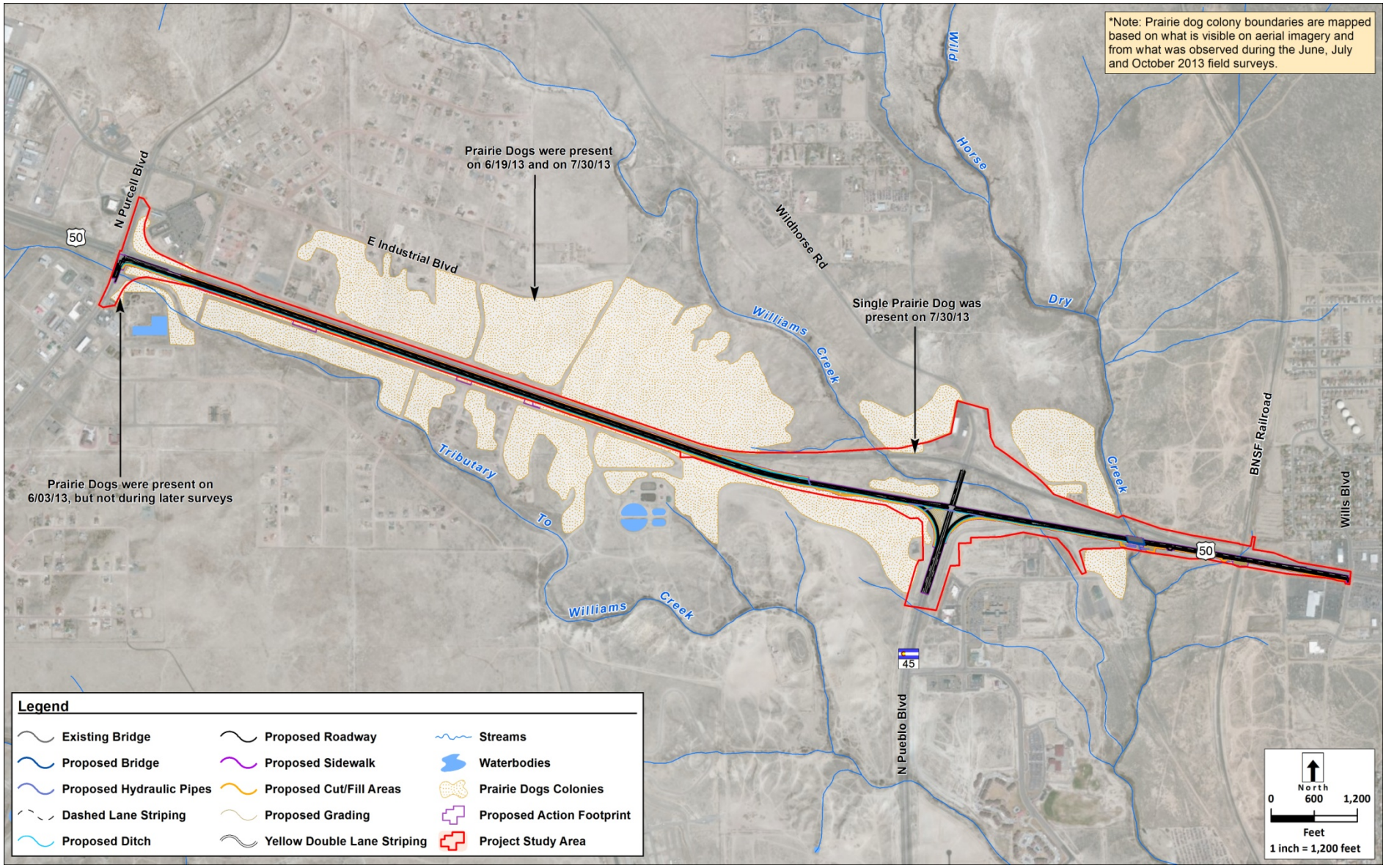


Figure 10. Prairie Dog Colonies Within the Study Area – McCulloch Boulevard/US 50 Intersection

3.1.5 Rare Plants

A rare plant survey was conducted to identify the presence of five globally imperiled rare plants identified in the SGPI Programmatic BO/BA:

- Arkansas River feverfew (*Bolophyta tetraneuris*) – Primary/Target Species
- Arkansas Valley evening primrose (*Oenothera harringtonii*) – On-Site Mitigation (BMPs) Species
- Golden blazing star (*Mentzelia chrysantha*) – On-Site Mitigation (BMPs) Species
- Pueblo goldenweed (*Oonopsis puebloensis*) – Primary/Target Species
- Round-leaf four-O'clock (*Oxybaphus rotundifolia*) – Primary/Target Species

Although the SGPI Programmatic BO/BA does not designate dwarf milkweed (*Asclepias uncialis*) as globally imperiled, CDOT conducted the survey to identify the presence of this species because the Colorado Natural Heritage Program lists this plant as globally impaired.

These plants are all associated with the Arkansas Valley and have been found in Pueblo County. **Table 4** presents the results of the rare plant survey.

Table 4. Results of Rare Plant Assessment

Name	Status	Habitat Description
Arkansas River feverfew (*Bolophyta tetraneuris*)	Rare Plant G3 S3	Tops of cliffs and bluffs of various rock types; in open piñon-juniper stands at elevations ranging from 4,800 to 5,600 feet.
Arkansas Valley evening primrose (*Oenothera harringtonii*)	Rare Plant G2G3 S2S3	Found on compacted silty clays to looser rocky and sandy soils in open grasslands at elevations ranging from 4,700 to 6,100 feet.
Golden blazing star (*Mentzelia chrysantha*)	Rare Plant G2 S2	Found on barren slopes of limestone, shale, or clay at elevations from 5,120 to 5,700 feet.
Pueblo goldenweed (*Oonopsis puebloensis*)	Rare Plant G2 S2	Barren shale outcrops of the Smoky Hill Member of the Niobrara Formation in sparse shrublands or piñon-juniper woodlands at elevations ranging from 4,800 to 5,500 feet.
Round-leaf four-O'clock (*Oxybaphus rotundifolia*)	Rare Plant G2 S2	Restricted to barren shale outcrops of the Smoky Hill Member of the Niobrara Formation in sparse shrublands or woodlands at elevations ranging from 4,800 to 5,600 feet.
Dwarf milkweed (*Asclepias uncialis*)	Rare Plant G3 G4 S2	Found in shortgrass prairie, often on sandstone-derived soils and gravelly or rocky slopes at elevations ranging from 4,000 to 6,500 feet.

G2: Globally imperiled species. At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors (NatureServe, 2013).

G3: Globally vulnerable species. At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors (NatureServe, 2013).

G4: Apparently secure globally. At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors (NatureServe, 2013).

S2: Subnational/or State imperiled (NatureServe, 2013)

S3: Subnational/or State vulnerable (NatureServe, 2013)

As part of the rare plant survey, samples were collected of two plants that appeared similar to the Pueblo goldenweed and golden blazing star and taken to the Denver Botanic Garden Herbarium and the Colorado Natural Heritage Program for assistance in identifying the plants. A botanist from the Denver Botanic Gardens (Pam Regensberg) assisted with the identification of the plants collected from the study area. It was determined that one of the plants from the study area was the leafy false goldenweed (*Oonopsis foliosa*) and the other plant was the ten petal blazing star/evening blazing star (*Mentzelia decapetala*), neither of which are considered rare plants. Based on the field survey, no rare plants were identified within the study area.

In July 2013, botanists from the Denver Botanic Gardens also conducted a rare plant survey in the area of US 50/Pueblo Blvd. According to Pam Regensberg (pers. comm.) with the Denver Botanic Gardens, no rare plants were identified during the independent survey conducted within the US 50/Pueblo Blvd. area of the Proposed Action footprint for the US 50 West EA.

3.1.6 Migratory Birds and Raptors

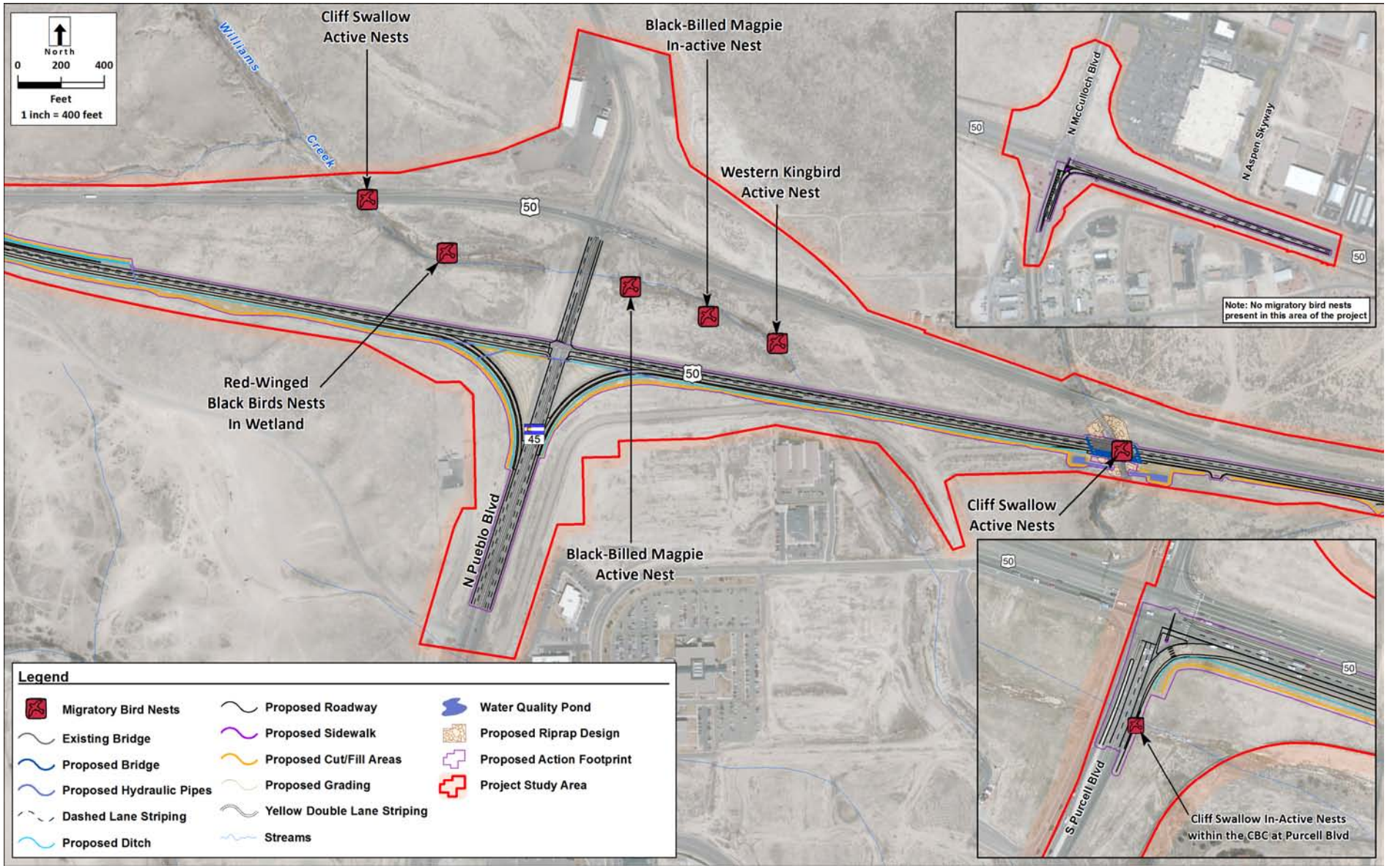
The Migratory Bird Treaty Act (MBTA) (16 USC §§ 703-712) protects migratory birds, including raptors, as well as the eggs and active nests of migratory birds. The MTBA prohibits activities that may harm or harass migratory birds during the nesting and breeding season, including the removal of active nests, which could result in the loss of eggs or young.

The study area was inspected for evidence of migratory bird activity, including nesting activity, during the field surveys conducted in June and July 2013. The areas surveyed for migratory bird nests and activity include the area under the bridge structure that spans Wild Horse Dry Creek, the culvert at Williams Creek, and the culvert at the Williams Creek tributary near US 50/Purcell Blvd. All field survey observations were from public ROW because there was no access to private properties surrounding the project. **Table 5** lists the species nests and activity identified during the field surveys. **Figure 11** shows the locations of the observed migratory bird nests.

Table 5. Migratory Bird Field Survey Observations

Migratory Bird Common Name	Migratory Bird Species Name	Migratory Bird Nest Activity
Black-billed Magpie	*Pica hudsonia*	Active nest; confirmed presence of adult breeding pair at nest site
Black-billed Magpie	*Pica hudsonia*	Inactive nest, breeding pair had secondary site they were using this year
Gambel's Quail	*Callipepla gambelii*	Observed a few adults flying from a rubber rabbitbrush thicket at the corner of Dunlap Drive/Radnor Drive.
Western Kingbird	*Tyrannus verticalis*	Active nest; confirmed presence of adult breeding pair at nest site
Cliff Swallows (Multiple Nests)	*Petrochelidon pyrrhonota*	Active nests; confirmed presence of multiple Cliff Swallows flying around feeding on insects
Red-winged Blackbirds (Multiple Nests)	*Agelaius phoeniceus*	Active nesting area; breeding pairs actively calling and flying around the cattail portion of the Williams Creek wetlands

Figure 11. Migratory Bird Nests Within the Study Area



3.1.7 Wetland Resources

In 1977, the United States Congress passed the Clean Water Act (CWA) to protect the quality of WUS, including adjacent wetlands. Section 404 of the CWA defines waters of the US as all traditional navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters. The United States Army Corps of Engineers (USACE) Regulatory Program administers and the United States Environmental Protection Agency enforces Section 404 of the CWA.

The definition of WUS under USACE jurisdiction does not include wetlands that lack a surface connection to and, therefore, are isolated from, regulated waters. However, in projects with federal funding or oversight, a second piece of legislation, Executive Order 11990, Protection of Wetlands, directs the lead federal agencies, in this instance FHWA, to protect isolated wetlands by avoiding direct or indirect support of construction in wetlands when a practicable alternative is available.

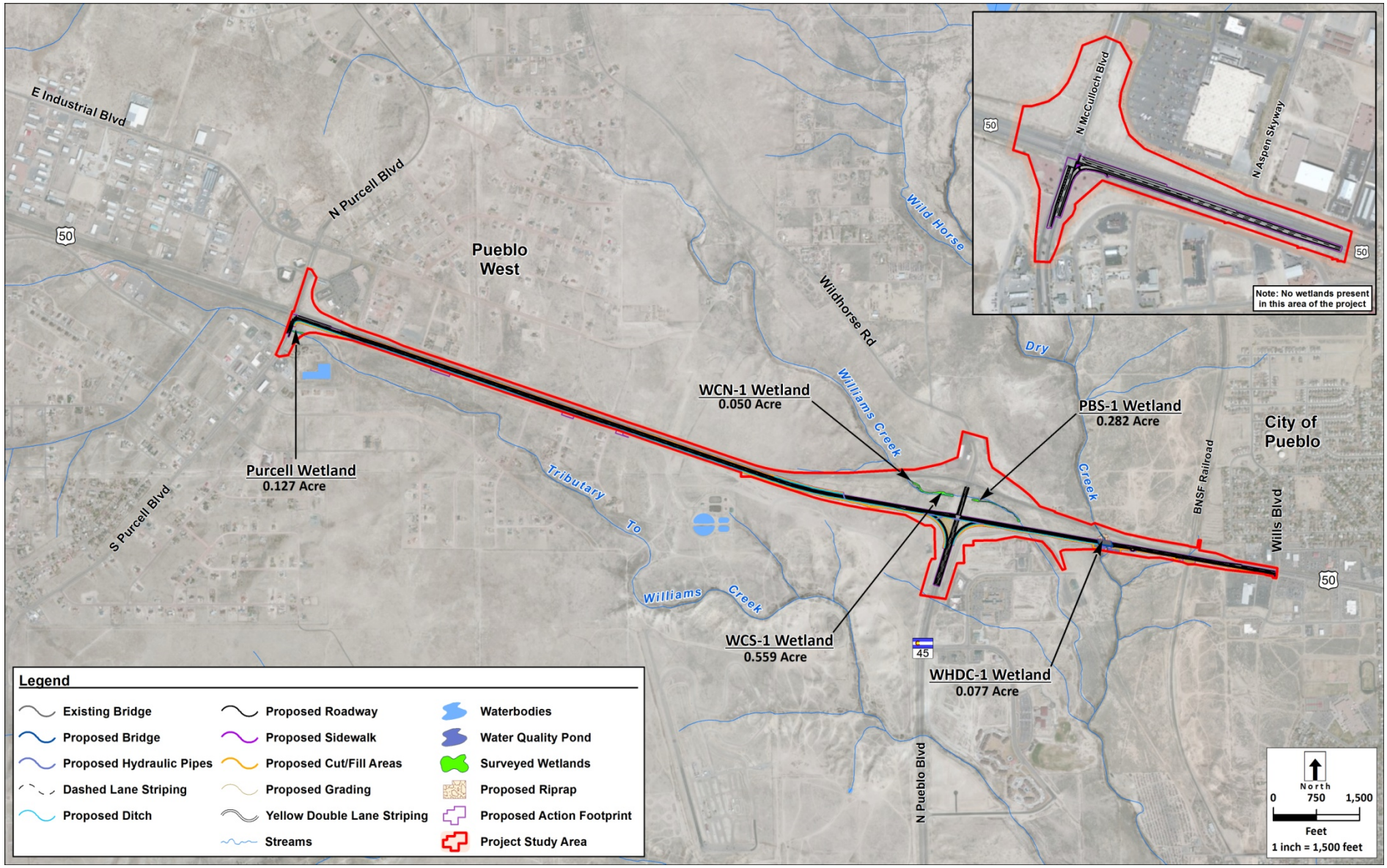
A wetland delineation was conducted on June 3, 2013, following the most current guidelines included in *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region* (Version 2.0) (USACE, 2010). **Table 6** summarizes the wetlands identified in the study area. More detailed information, such as the wetland characteristics (hydrology, soils, and vegetation) and , is included in the *US 50 West – Purcell Boulevard to Wills Boulevard Project Wetland Delineation Technical Report* (CDOT, 2014b). **Appendix A** includes site photographs.

The study area contains five wetlands associated with Wild Horse Dry Creek, Williams Creek, and an un-named tributary to Williams Creek (Purcell Wetland, Williams Creek North-1 [WCN-1], Williams Creek South-1 [WCS-1], Pueblo Boulevard South-1 [PBS-1], and Wild Horse Dry Creek-1 [WHDC-1]) (**Table 6** and **Figure 12**). All sites exhibited all three wetland indicators: wetland vegetation, wetland hydrology, and hydric soils. At each location, the vegetation is dense within a narrow riparian zone along each channel. Dominant wetland vegetation included tamarisk, narrowleaf cattail, Canada thistle, creeping bentgrass, and common spikerush. The study area also contains scattered Siberian elm and plains cottonwood (*Populus deltoides*). The total wetland area delineated within the study area is 1.095 acres. **Section 4** includes expected impacts based on the project footprint.

Table 6. Summary of Wetlands in the Study Area

Wetland ID	Existing Area (acres)
Purcell Wetland	0.127
Williams Creek North-1 (WCN-1)	0.050
Williams Creek South-1 (WCS-1)	0.559
Pueblo Boulevard South-1 (PBS-1)	0.282
Wild Horse Dry Creek-1 (WHDC-1)	0.077 (4 separate areas)
TOTAL	**1.095**

Figure 12. Wetlands in the Study Area



3.1.8 Senate Bill (SB) 40 and Non-SB 40 Resources

SB 40 resources and Non-SB 40 resources were surveyed for within the study area to identify all potential trees and shrubs that require mitigation. A project falls under SB 40 (33-5-101-107, CRS 1973 as amended) guidelines if the project has an impact on a jurisdictional stream bed, stream bank, or riparian area along a jurisdictional stream. Williams Creek or Wild Horse Dry Creek are considered SB 40 jurisdictional streams based on the following criteria identified in the *Guidelines for Senate Bill 40 Wildlife Certification* (CPW & CDOT, 2013):

- Perennial streams identified on USGS 7.5 minute topographical quadrangle maps
- Streams providing live water beneficial to fish and wildlife (plains killifish, desert cottontail, and other wildlife previously mentioned)
- Streams containing riparian vegetation or wetlands

Table 7 lists the SB 40 and Non-SB 40 species identified in the study area during the field surveys. **Section 4** includes a discussion of expected impacts based on the project footprint. For more information on Wild Horse Dry Creek SB 40 resources, refer to the *US 50 West Senate Bill 40 Formal Wildlife Certification Report* (CDOT, 2014a). The *US 50 West Senate Bill 40 Formal Wildlife Certification Report* (CDOT, 2014a) only discusses the areas where SB 40 impacts will occur due to project construction. No SB 40 impacts would occur at Williams Creek or to the un-named tributary to Williams Creek.

Table 7. SB 40 and Non-SB 40 Resources Within the Study Area

Tree or Shrub Species	SB 40 Trees/Shrubs	Non-SB 40 Trees/Shrubs
Blue Spruce	N/A	1 tree
Plains cottonwood	16 trees	N/A
Honey locust	N/A	2 trees
Pinyon pine	N/A	4 trees
Rocky Mountain juniper	N/A	3 trees
Russian olive	N/A	6 trees
Siberian elm	16 trees	10 trees
Tamarisk	56,343 sq. ft.	N/A
Rubber rabbitbrush	N/A	Sporadic throughout ROW
Fourwing saltbush	N/A	Sporadic throughout ROW
Golden currant	Williams Creek Drainage – Not quantified because no work associated within Williams Creek Drainage for this project	N/A

4. Impacts

This section describes the impacts of the Proposed Action and the No Action Alternative on the biological resources identified in the study area, including vegetation, noxious weeds, wildlife, special status species (including migratory birds), wetlands, and SB 40 resources. Permanent impacts from the Proposed Action were determined based on the project design footprint and included the areas of ground disturbance from the following project elements:

- Addition of a third eastbound lane and intersection improvements at Purcell Blvd./US 50 and McCulloch Blvd./US 50
- Bridge widening, including pier work, at Wild Horse Dry Creek
- Placement of riprap for erosion control
- Drainage outfall structures

Temporary impacts were determined based on the areas of ground disturbance that will be re-seeded and re-vegetated following construction.

As previously discussed, no wetlands or other WUS, SB 40 resources, aquatic resources, or migratory bird nests were found at the McCulloch Blvd./US 50 intersection within the study area and, therefore, are not discussed further in this report.

4.1 Vegetation and Noxious Weeds

4.1.1 Proposed Action

Construction of the Proposed Action would result in a loss of vegetation in terms of cover and species composition. Specifically, the Proposed Action would result in the permanent removal of approximately 7.27 acres of shortgrass prairie (including grasses and shrubs) due to construction activities that would add impervious surfaces to the landscape. The increase in impervious surfaces would cause an increase in stormwater runoff and the exposure of the surrounding vegetation to higher levels of pollutants. Also, soil disturbance from construction equipment also creates favorable conditions for the introduction and further spread of noxious weeds. **Appendix B** includes detailed shortgrass prairie impact mapping.

Table 8. Vegetation Impacts

Proposed Action Impacts	No Action Alternative Impacts
US 50 between Purcell Blvd. and Wills Blvd.	
7.23 Acres Permanent Impact 18.46 Acres Temporary Impact Removal of one upland tree (honey locust) at the Purcell Blvd. intersection.	0 Acres Permanent Impact 0 Acres Temporary Impact
US 50/McCulloch Blvd. Intersection	
0.04 Acre Permanent Impact 0.22 Acre Temporary Impact	0 Acres Permanent Impact 0 Acres Temporary Impact

* Temporary impacts generally occur from the short-term disturbance necessary for activities like construction access and grading. These areas will be re-vegetated once construction is completed.

4.1.2 No Action Alternative

No permanent or temporary vegetation impacts would occur from the No Action Alternative.

4.2 Fish and Wildlife

4.2.1 Proposed Action

As identified is **Section 4.1.1**, construction of the Proposed Action would result in a loss of 7.27 acres of shortgrass prairie, which would directly result in a permanent loss of habitat for terrestrial species, and potential cover for aquatic species.

Effects to wildlife due to the Proposed Action would include permanent habitat loss, degradation/disruption of habitat (for example, noise effects), and fragmentation of habitat due to the construction of the additional lane. Specifically, long-term impacts to wildlife due to the construction and operation of roadways can include altered movement patterns and direct mortality due to wildlife-vehicle collisions during crossings of the roadway when daily and/or seasonal movements across the landscape occur. The study area is not located in a known migration area for larger species such as deer or elk; therefore, impacts would primarily be to small and medium-sized animals such as desert cottontail, black-tailed prairie dogs, coyotes, low-flying birds, and reptiles. In the long term, increased obstacles, such as the widened roadway, would make it more difficult for some wildlife to meet their biological needs, such as accessing food, breeding, etc. Wildlife mortality from construction-related ground clearing and earth-movement activities could also affect small terrestrial species and/or burrowing animals.

No permanent impacts to aquatic resources, such as impeding fish movement, are associated with the Proposed Action.

Construction of the Proposed Action would also cause the temporary loss of 18.68 acres of shortgrass prairie, which would cause temporary habitat loss, restrictions on wildlife movement, and the short-term temporary displacement of certain wildlife species due to the increased noise and

human presence associated with construction activities (for example, construction noise and night lighting). Other temporary effects could be caused by the introduction and spread of noxious or invasive weed species, which further degrades wildlife habitat.

The Proposed Action, once constructed, would improve the riparian and aquatic habitats adjacent to the Wild Horse Dry Creek stream channel through the removal of noxious weeds, the revegetation of the riparian corridor with native vegetation, and closing off social trails through the CDOT ROW.

Impacts would occur primarily in the in the areas with minimal development where wildlife would be more likely to occur, such as in the areas near Williams Creek and Wild Horse Dry Creek.

4.2.2 No Action Alternative

Under the No Action Alternative, some effects to wildlife would be expected. Impacts to wildlife would include additional loss, degradation, and fragmentation of habitat due to development in the surrounding landscape. Also, increased traffic in the study area may lead to increased noise disturbance to wildlife and the potential for increased mortality from animal-vehicle collisions. Other impacts from the No Action Alternative would include continual degradation of the Wild Horse Dry Creek stream channel and surrounding riparian habitat due to the presence of noxious weeds and compaction from the use of social trails within the ROW. No temporary impacts are associated with the No Action Alternative.

4.3 Special Status Species

4.3.1 Proposed Action

As identified is **Section 4.1.1**, construction of the Proposed Action would result in a loss of 7.27 acres of shortgrass prairie, which would directly result in a permanent loss of habitat for terrestrial species, and potential cover for aquatic species. Three of the SGPI primary/target species identified in the Programmatic BO/BA are known to be present in the study area or suitable habitat is present in the study area, including the black-tailed prairie dog (state species of special concern), Western Burrowing Owl (state-threatened), and the massasauga rattlesnake (state species of special concern).

Construction of the Proposed Action would permanently impact prairie dog colonies in the areas of Purcell Blvd./US 50 and McCulloch Blvd./US 50 due to the construction of right-turn lanes onto eastbound US 50. Specifically, impacts would occur to the prairie dog colony in the southeast quadrant of the Purcell Blvd./US 50 intersection and the southeast quadrant of the McCulloch Blvd./US 50 intersection. Due to the potential presence of Western Burrowing Owls associated with the prairie dog colonies within the study area, there is also the potential for Western Burrowing Owls to be affected by project construction.

Additionally, due to the presence of the triploid Colorado checkered whiptail (state species of special concern) and suitable habitat for the plains leopard frog (state species of special concern) within the study area, there is a potential for permanent impacts to these species due to loss of habitat and direct mortality from construction activities.

Other permanent and temporary impacts to special status species would be similar to the impacts to fish and wildlife species discussed in **Section 4.2.1**.

Rare plants were not identified within the study area; therefore, there would be no permanent or temporary impacts due to the construction of the Proposed Action.

4.3.2 No Action Alternative

There would be no impacts to special status species, including rare plants due to the No Action Alternative.

4.4 Migratory Birds

4.4.1 Proposed Action

Multiple Cliff Swallow nests were observed during the 2013 field surveys on the eastbound US 50 bridge over Wild Horse Dry Creek and within the concrete box culvert at Purcell Blvd. for the unnamed tributary to Williams Creek. Construction activities associated with the bridge widening at Wild Horse Dry Creek would have permanent impacts on the nests at Wild Horse Dry Creek. Short-term temporary impacts due to the increased noise and human presence associated with construction activities associated with the entire project (for example, construction noise and night lighting) would also affect migratory birds within the study area.

4.4.2 No Action Alternative

There would be no permanent or temporary impacts to migratory birds due to the No Action Alternative.

4.5 Wetlands

4.5.1 Proposed Action

There would be no permanent or temporary wetland impacts due to the construction of the Proposed Action.

4.5.2 No Action Alternative

There would be no permanent or temporary wetland impacts due to the No Action Alternative.

4.6 Senate Bill 40 Resources

4.6.1 Proposed Action

Tamarisk, which is present in the Wild Horse Dry Creek, Williams Creek, and the unnamed tributary to Williams Creek drainage areas and within the CDOT ROW, is classified as an SB 40 shrub resource based on the SB 40 Guidelines established in a 2013 programmatic agreement between CPW and CDOT (CPW & CDOT, 2013). Based on consultations with CDOT Region 2 environmental staff, these noxious weeds/SB 40 shrubs would be removed by hand and sprayed

with an aquatic-safe herbicide as part of the noxious weed treatment at Wild Horse Dry Creek, permanently impacting 12,523 sq. ft. of SB 40 shrubs. Because there are no other shrub species or trees present in the Wild Horse Dry Creek drainage, there would be no other SB 40 resource impacts. The Proposed Action would have no construction impacts in the Williams Creek and unnamed tributary to Williams Creek drainage areas.

4.6.2 No Action Alternative

There would be no impacts to SB 40 resources due to the No Action Alternative.

5. Mitigation

Mitigation strategies are required for the Proposed Action and are identified for each resource, as discussed below. As previously discussed, the entire project area falls under the SGPI Programmatic BO/BA. Therefore, mitigation for permanent impacts has already occurred and is incorporated by reference through the SGPI Programmatic BO/BA for the presence of federally threatened/endangered species, including any candidate, and species of concern potentially located within the study area (**Section 3.1.2**). In addition, the Programmatic BO/BA includes the implementation of on-site BMPs for certain species concern, which are discussed in **Section 5.3**.

5.1 Vegetation and Noxious Weeds

5.1.1 Off-Site Shortgrass Prairie Conservation and On-Site Best Management Practices

Permanent impacts to approximately 7.27 acres and temporary impacts to approximately 18.68 acres of shortgrass prairie habitat are expected as part of the construction of the Proposed Action. Mitigation for impacts to shortgrass prairie, through the Programmatic BO/BA, are included is **Section 5.3**. Temporary vegetation impacts will be revegetated following construction of the project.

5.1.2 Tree Replacement

One upland tree (honey locust) would be impacted at the Purcell Blvd./US 50 intersection, one upland tree (honey locust) would be impacted east of Purcell Blvd./US 50, and three upland trees (one honey locust and two pinyon pines) would be impacted at the McCulloch/US 50 intersection. These trees will be replaced on a 1:1 basis and coordinated with Pueblo West. If any additional tree or shrub species are impacted during construction, they will be replaced at a 1:1 ratio and will be coordinated with CDOT and Pueblo West. Tree replacement should be considered successful as per the specification 214 (Planting) of the CDOT Standard Specifications for Road and Bridge Construction (CDOT, 2011b).

5.1.3 Vegetation Enhancement/Restoration

Vegetation enhancement/restoration along Wild Horse Dry Creek would also be implemented as part of this project, as discussed in the SB 40 Resources **Section 5.5**.

5.1.4 Noxious Weed Management

Specific BMPs will be required during and after construction to reduce the potential for introduction and spread of noxious weed species. CDOT will incorporate the management of the noxious weed populations into the project plan set in a project special specification 217 (Herbicide Treatment) of the CDOT Standard Specifications for Road and Bridge Construction (CDOT, 2011c) to be included with the construction plans. Areas cleared of tamarisk will be replanted with sandbar willow brush cuttings and managed in accordance with specification 214 (Planting) of the CDOT Standard Specifications for Road and Bridge Construction (CDOT, 2011b) included with the construction plans.

Noxious weed management objectives will generally be met by implementing the following actions in the project area:

- The area of ground disturbance will be kept to the minimum necessary.
- All equipment will be thoroughly cleaned before entering and exiting the study area. Cleaning and disposal of weed infested soil shall be included in the cost of Item 626 Mobilization. The contractor shall submit to the engineer a statement certifying that all equipment has been cleaned before initial site arrival.
- Areas with dense noxious weed populations will not be used for topsoil salvage.
- Only herbicides approved for use in water will be used in or within 25 feet of wetlands or other water features.
- Broadcast herbicide spraying will be approved only through written consent of the engineer and shall be applied when weather conditions (including wind) are suitable for such work.
- Engineer will be notified 24 hours before herbicide is applied.
- The project will be surveyed for noxious weeds throughout construction to identify and treat weeds.
- If treatments for future weed infestations are required, coordination with the CDOT Region 2 Environmental staff should occur.

5.2 Fish and Wildlife

BMPs to prevent and minimize temporary impacts to vegetation would be developed and implemented prior to construction, which will be included in a Stormwater Management Plan (SWMP). The SWMP will also identify erosion control features to minimize erosion impacts as part of construction of the project.

5.3 Special Status Species

Mitigation for permanent impacts (7.27 acres of shortgrass prairie habitat) to federally threatened/endangered species habitat has already occurred and is incorporated by reference through the SGPI Programmatic BO/BA for federally-listed threatened/endangered species, including candidate species, and species of concern potentially located within the study area. In addition, Appendix A of the Programmatic BO/BA includes a "Conservation Strategy for Non-Listed Species" that includes the implementation of on-site BMPs for black-tailed prairie dog (state

species of special concern), Western Burrowing Owl (state-threatened), and the massasauga rattlesnake (state species of special concern) (see **Appendix C** of this report). As part of this project, CDOT will implement the BMPs identified in the Programmatic BO/BA in areas of presumed presence for these relevant species that would be disturbed during construction. These mitigation measures are outlined below.

5.3.1 Black-Tailed Prairie Dogs and Western Burrowing Owl

Mitigation for potential impacts on black-tailed prairie dogs is covered per the Programmatic BO/BA and includes off-site habitat conservation and implementation of the BMPs identified in the Programmatic BO/BA (USFWS, 2004). As stated in the Programmatic BO/BA, CDOT will avoid and minimize impacts on known black-tailed prairie dog colonies within the project footprint. CDOT's *Impacted Black-Tailed Prairie Dog Policy* (2009) will also be followed for all activities that affect black-tailed prairie dogs within the project footprint.

Because prairie dogs can expand their colonies into previously unoccupied areas over time, an additional site investigation should be conducted before beginning construction activities to verify the current status of prairie dog colonies in the project vicinity.

Due to the potential presence of Western Burrowing Owls associated with the prairie dog colonies within the study area, there is also the potential for Western Burrowing Owls to be affected by project construction. Mitigation for the presumed presence of Western Burrowing Owls, as stated in the Programmatic BO/BA, will include:

- 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 MBTA and is not covered by this strategy. 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).
- 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 between August 15 through October 31 (Craig, 2001).
- 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).
- If a project that would 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 CDOT staff biologist will survey the project area 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.

5.3.2 Massasauga Rattlesnake

Mitigation for the presumed presence of the massasauga rattlesnake, as modified from the Programmatic BO/BA, will include the following measures.

In areas with high population densities of the target species, underpasses and drift fences will be installed where practicable, as part of reconstruction projects. Because Hammerson (1999) counsels caution in placing such devices, the CDOT staff biologist and the Service will be consulted before

construction activities begin in known massasauga rattlesnake habitat to determine that crossings are properly placed and determine if road signs should be included.

As part of this project, orange construction fencing will be installed to mitigate any impacts to the massasauga rattlesnake. Also, the revegetated riparian corridor underneath the Wild Horse Dry Creek bridge will improve potential massasauga rattlesnake habitat. This species will require no other mitigation.

5.3.3 Plains Leopard Frog and Northern Leopard Frog

BMPs for the plains leopard frog and northern leopard frog identified under the Programmatic BO/BA will be implemented and include:

- If construction activities are to occur between March 1 and July 31 at sites that contain habitat for the plains leopard frog and northern leopard frog, the CDOT staff biologist and the CPW will be consulted prior to construction to determine actions necessary to avoid and minimize impacts.
- Pesticide application near permanent bodies of water will be restricted during the period of frog metamorphosis (June to August).

Also, vegetation enhancement/restoration along Wild Horse Dry Creek will also be implemented as part of this project, as discussed in the SB 40 Resources Section mitigation section below, which will enhance habitat for the plains leopard frog and northern leopard frog following construction.

BMPs developed and identified within the SWMP will sufficiently mitigate potential impacts to the plains leopard frog and northern leopard frog.

5.3.4 Triploid Colorado Checkered Whiptail

BMPs developed and identified within the SWMP will sufficiently mitigate potential impacts to the triploid Colorado checkered whiptail.

5.3.5 Migratory Birds

To avoid and minimize activities that will have an impact on migratory birds and their nests, CDOT will include in project construction plans a standard special specification 240 (Protection of Migratory Birds) for Road and Bridge Construction controls during project construction to limit activity around nests from April 1 to August 31 (CDOT, 2011d). If necessary, a biologist will conduct a migratory bird survey if construction occurs within the typical nesting season of migratory birds (April 1 to August 31).

5.4 Wetlands

No impacts to wetlands will occur due to the Proposed Action; therefore, no mitigation for wetlands is required.

5.5 Senate Bill 40 Resources

All BMPs outlined in the SB 40 Guidelines (CPW & CDOT, 2013) will be incorporated into this project and included in the SWMP. BMPs include reseeding all disturbed areas with a mix of native grasses and forbs. Mitigation will also require that equipment be certified "clean" before arriving at and upon leaving the construction site to avoid the spread of invasive species. All areas cleared of tamarisk will be replanted with a combination of sandbar willow (1:1 mitigation ratio), other shrubs, and a grass seed-mix. The replanting will include approximately 1,100 willow brush cuttings, 9,950 square feet seeded with mixed shrub species (golden currant, fourwing saltbrush, and rubber rabbitbrush), and 20,068 square feet of grass seed-mix. For more information on SB 40 resources, refer to the *US 50 West Senate Bill 40 Formal Wildlife Certification Report* (CDOT, 2013a).

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Appendix A
Site Photographs

Photo 1 — Wetlands WCN-1 in the background and WCS-1 in the foreground.
View looking north from in the bottom of the drainage/arroyo.

Photo 2 — Looking northwest out over Wetland WCN-1 showing the vegetation present in the channel.

Photo 3 — Wetland WCS-1, looking northwest toward the westbound bridge.

Photo 4 — Looking southeast from the box culvert on Williams Creek under Pueblo Blvd. toward Dry Creek, Wetland PBS-1.

Photo 5 — Looking west from Pueblo Blvd. from in the median.

Drought has had a severe impact on upland vegetation.

Photo 6 — Looking southeast from the median at Pueblo Blvd., showing the typical upland and depressional (arroyo) geomorphology of the area.

Photo 7 — Looking east along Williams Creek.

This riparian zone has the highest quality vegetation in the study area.

Photo 8 — Picture showing areas of typical Niobrara shale substrate.

Photo 9 — Looking south from under the eastbound bridge.

This channel is very narrow and filled with noxious weeds.

Photo 10 — Looking north from under the eastbound bridge.

Pedestrian off-road vehicle use
in the area has eroded and damaged wetlands.

Photo 11 — Looking north next to the box culvert under Purcell Blvd., for the tributary to Williams Creek.

This drainage is highly channelized and filled with noxious weeds.

Photo 12 — The Purcell Wetland had vegetation growing within the channel.

Photo 13 — Looking east over the Purcell Wetland, filled with common reed and tamarisk.

Photo 14 — Cliff Swallow nests on the Wild Horse Dry Creek bridge.

Photo 15 — Migratory bird nest found in the Williams Creek drainage near Pueblo Blvd.

Photo 16 — Black-billed Magpie nest in the Williams Creek drainage near Pueblo Blvd.

Photo 17 — False leafy goldenweed found throughout the study area.

Photo 18 — Ten-petal blazing star near Pueblo Blvd.

Photo 19 — Prickly poppy found throughout the Williams Creek drainage.

Photo 20 — Triploid Colorado checkered whiptail found in the Williams Creek drainage near Pueblo Boulevard.

Photo 21 — A six-lined racerunner found in the study area.

Photo 22 — Looking northwest at the intersection of US 50 and McCulloch Boulevard from Dunlap Drive.

Photo 23 — Looking west toward McCulloch Blvd. from Dunlap Drive.

Gambel's Quail at the southwest corner of Dunlap Drive and Radnor Drive.

Photo 24 — Looking north from US 50 toward the Walmart Supercenter development.

Active prairie dog colony at northeast corner of US 50 and McCulloch Blvd.

Photo 25 — Looking north from southwest corner of US 50 and McCulloch Blvd.

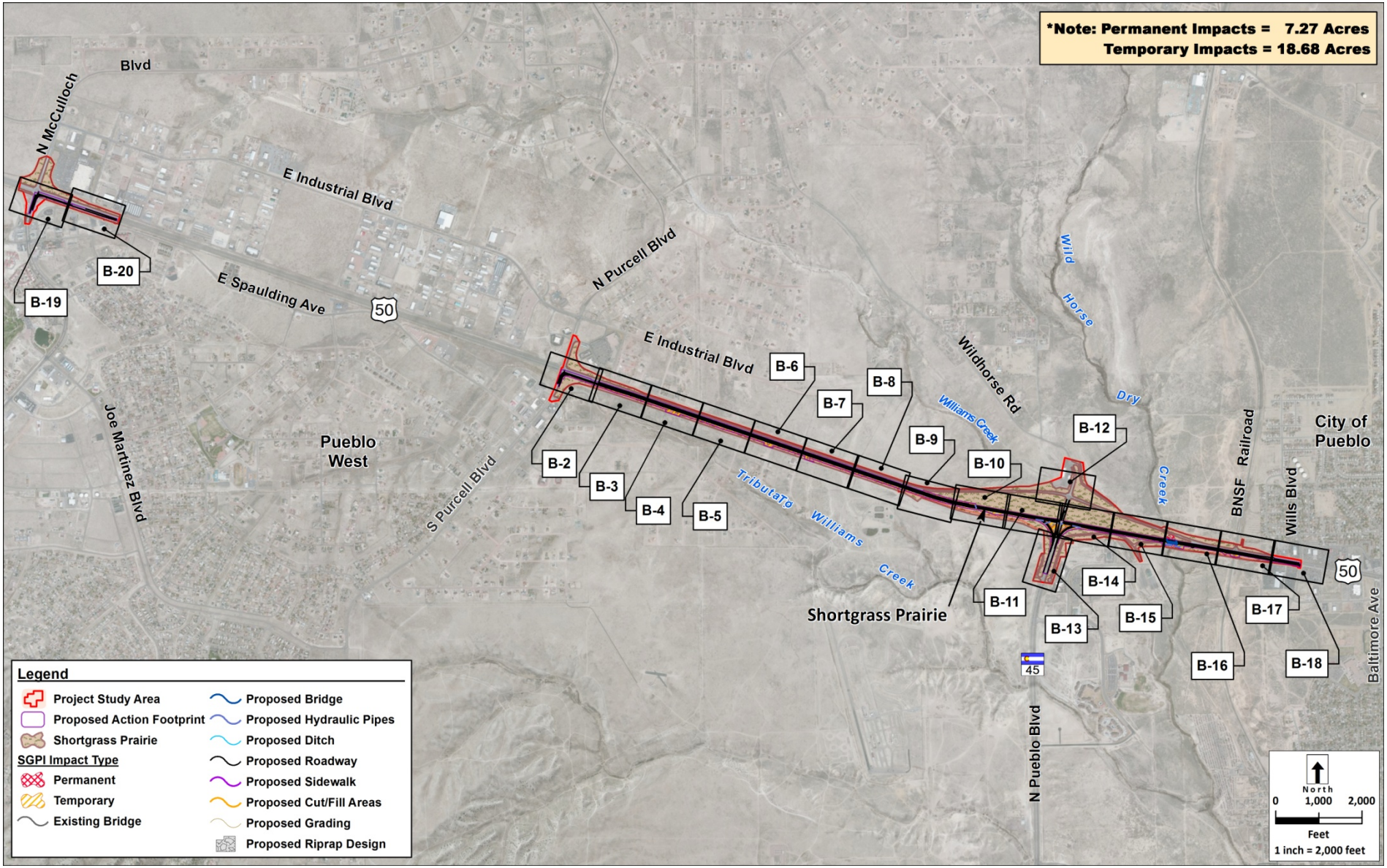
Pueblo West intersection landscaping

Photo 26 — Southwest corner of US 50 and McCulloch Blvd.

Pueblo West intersection landscaping project donor plaque

Appendix B
Shortgrass Prairie Initiative
Impact Mapping

Figure B-1. Shortgrass Prairie Impacts Index Map



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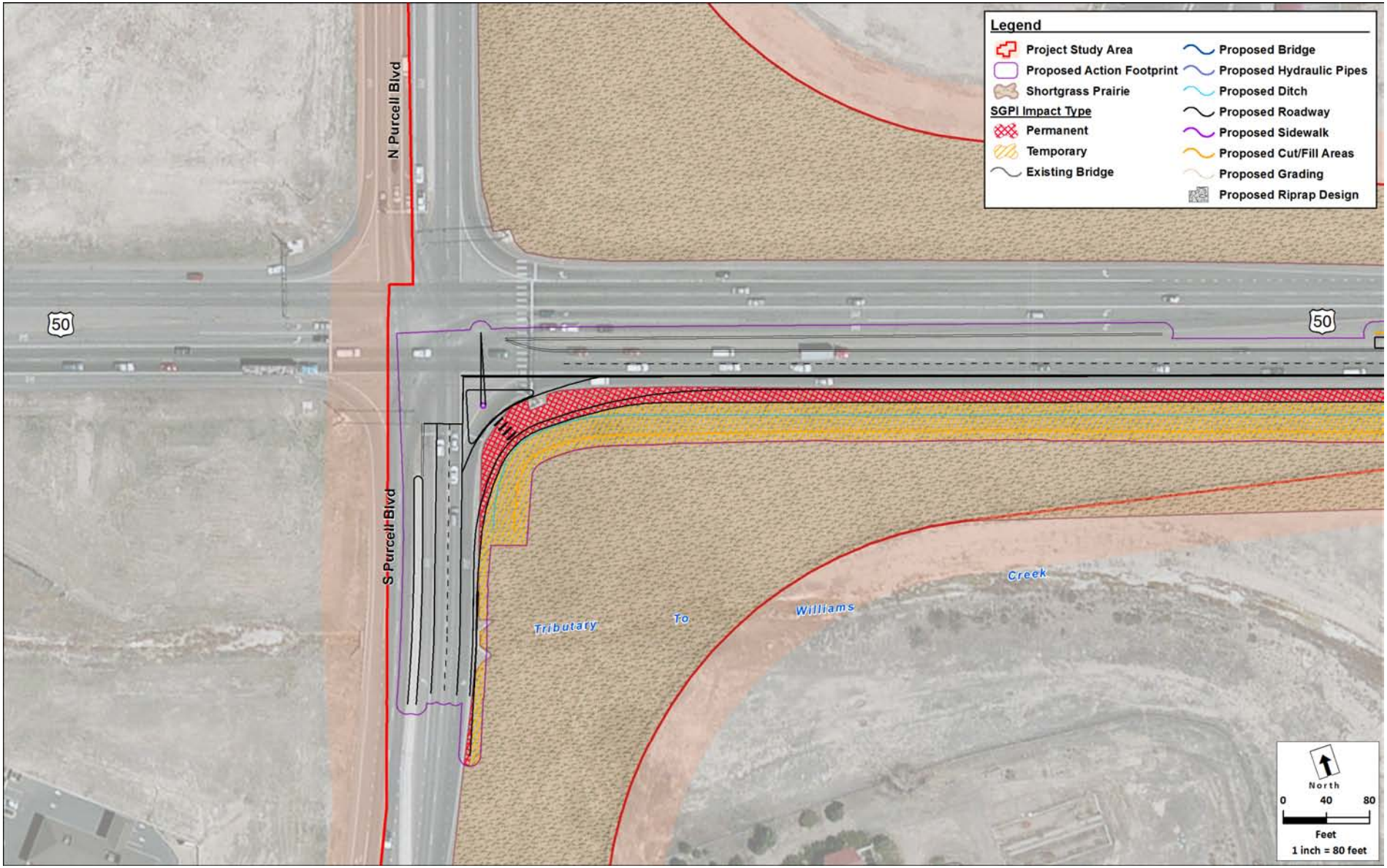

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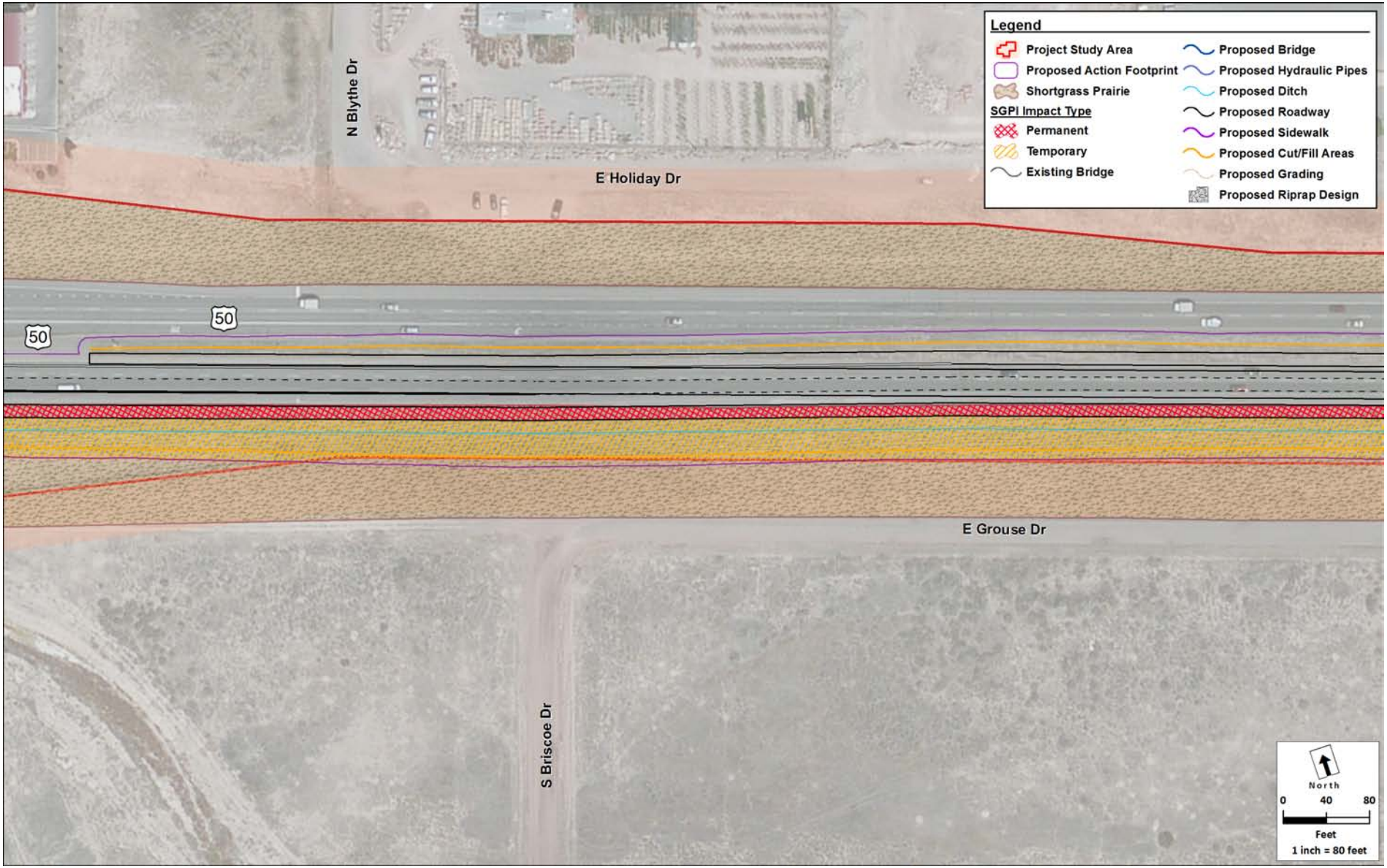

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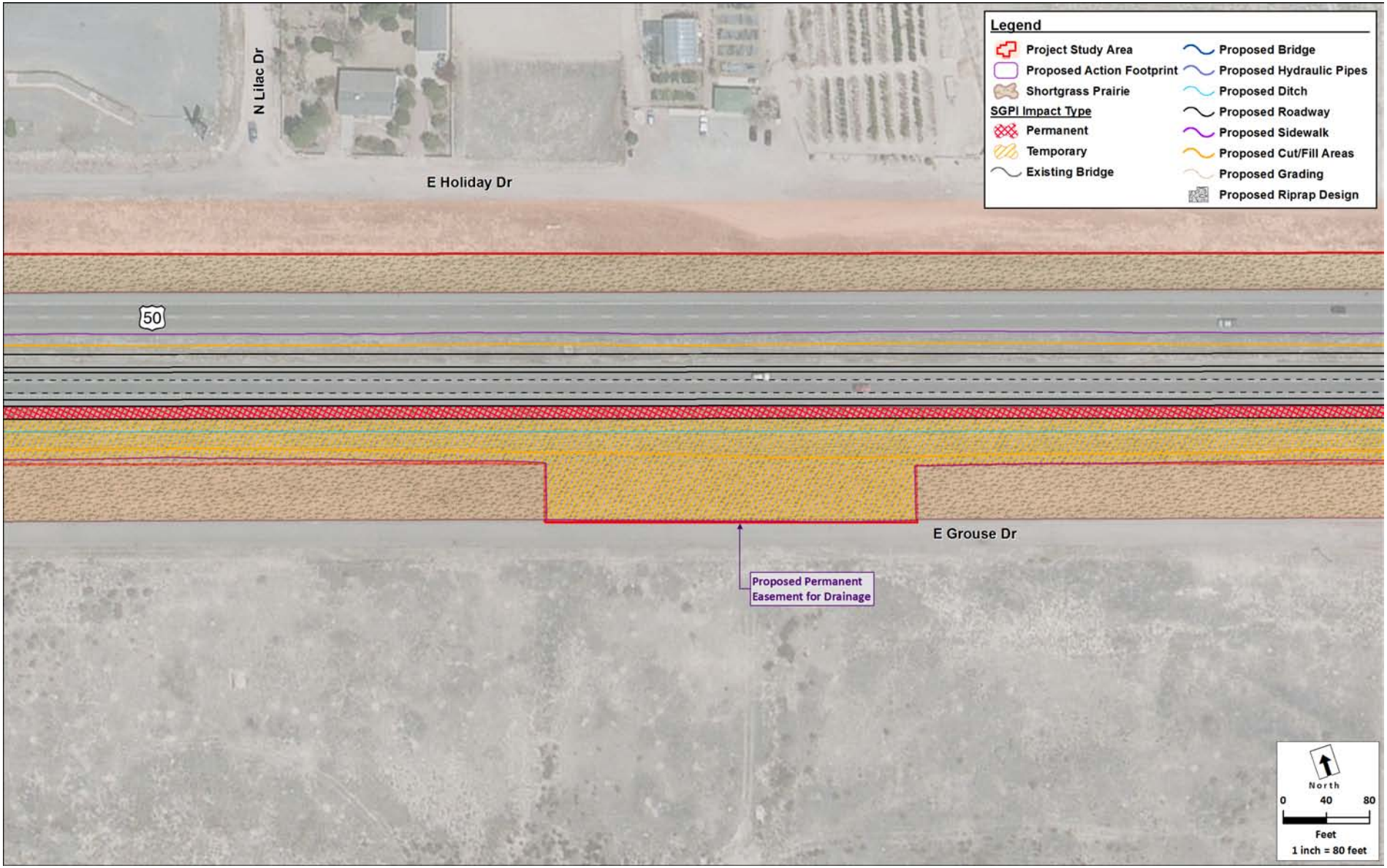

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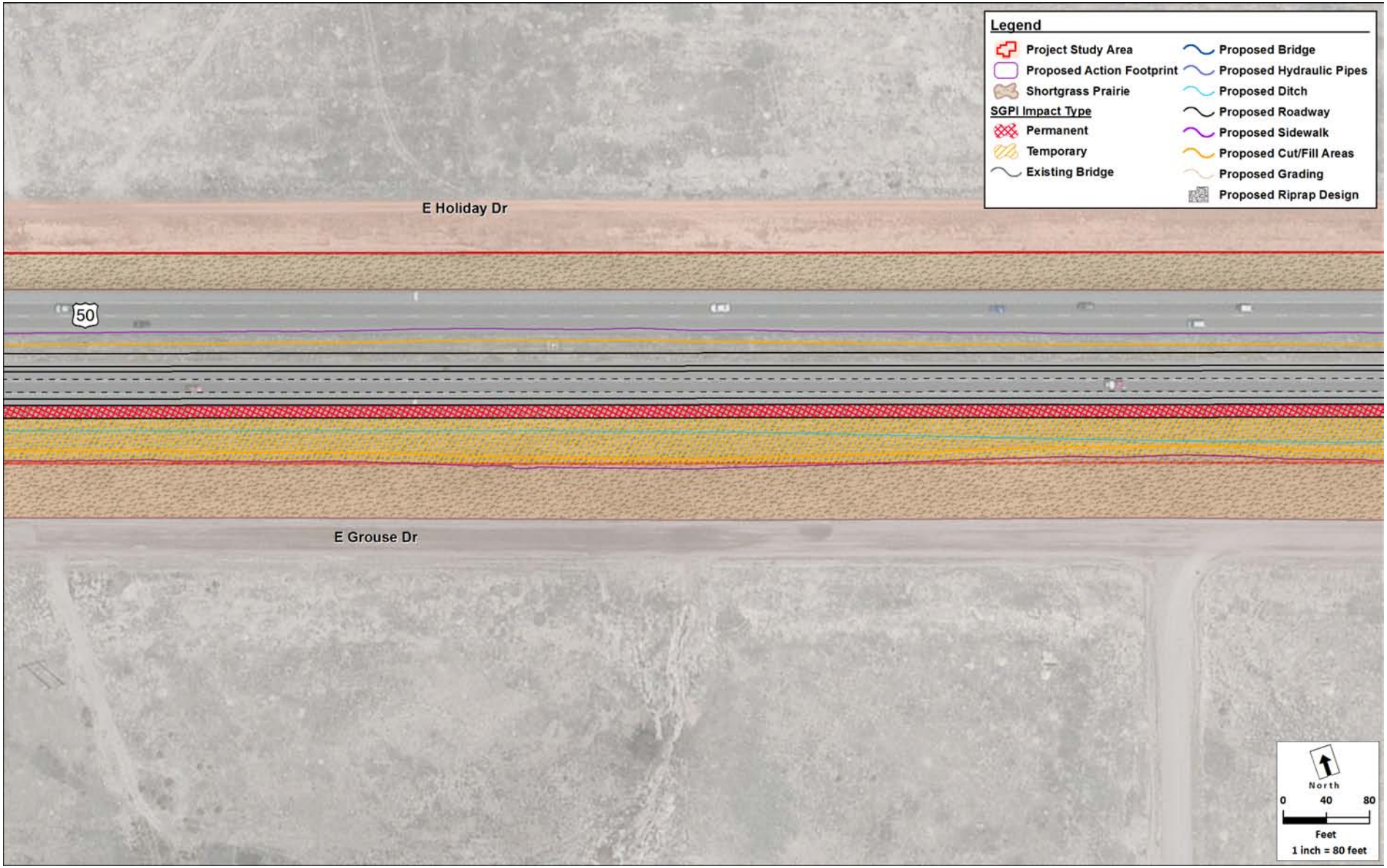

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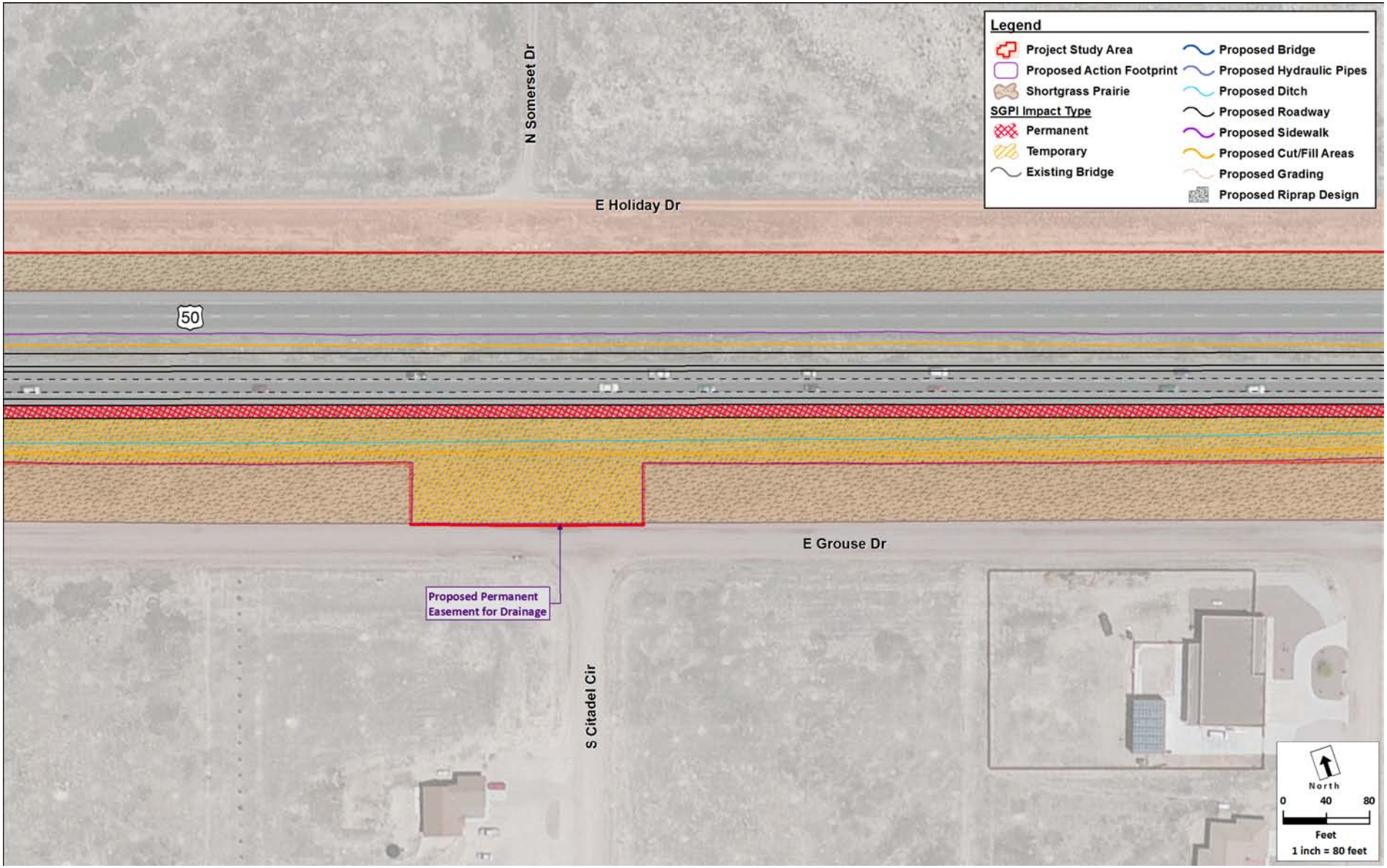

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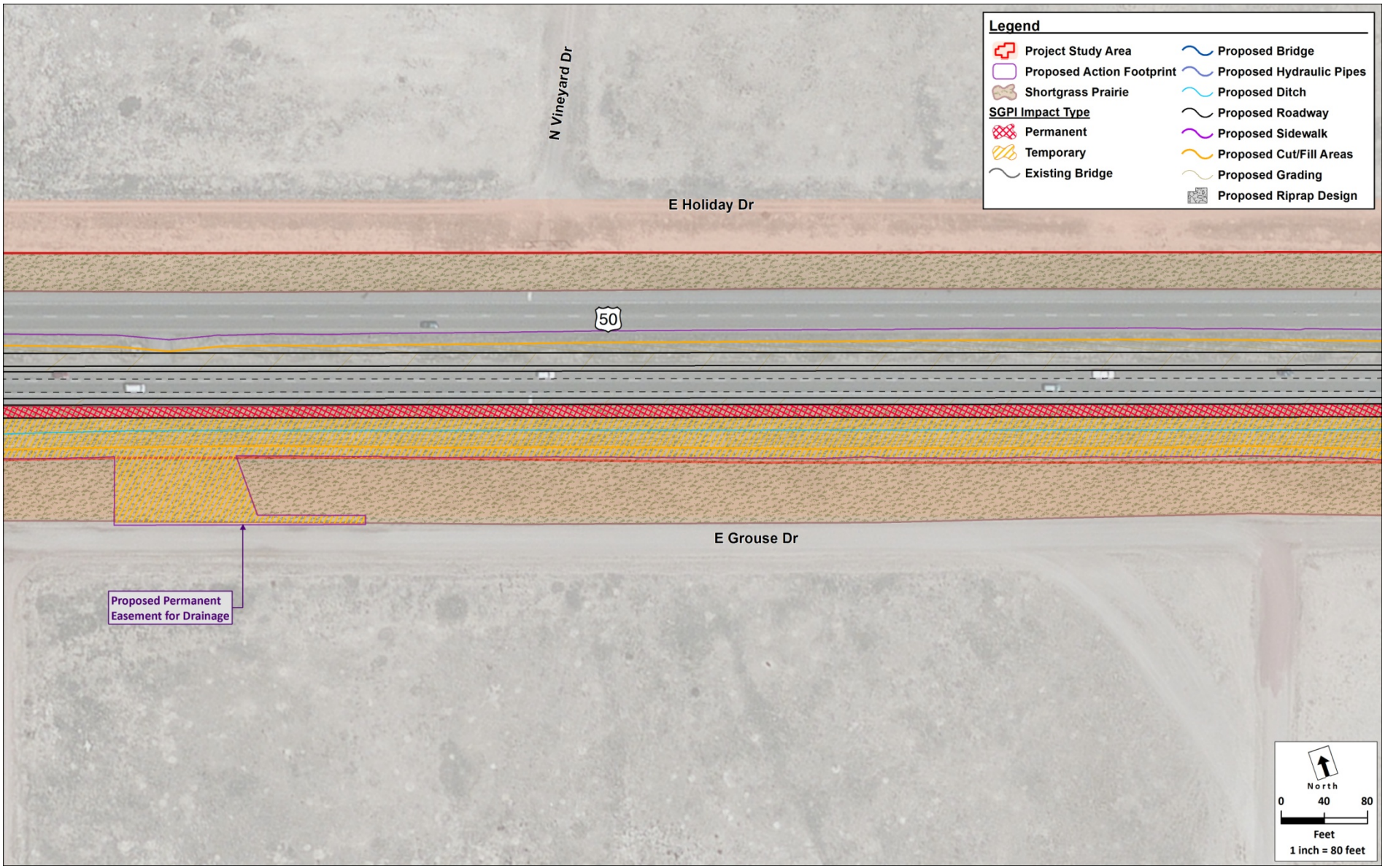

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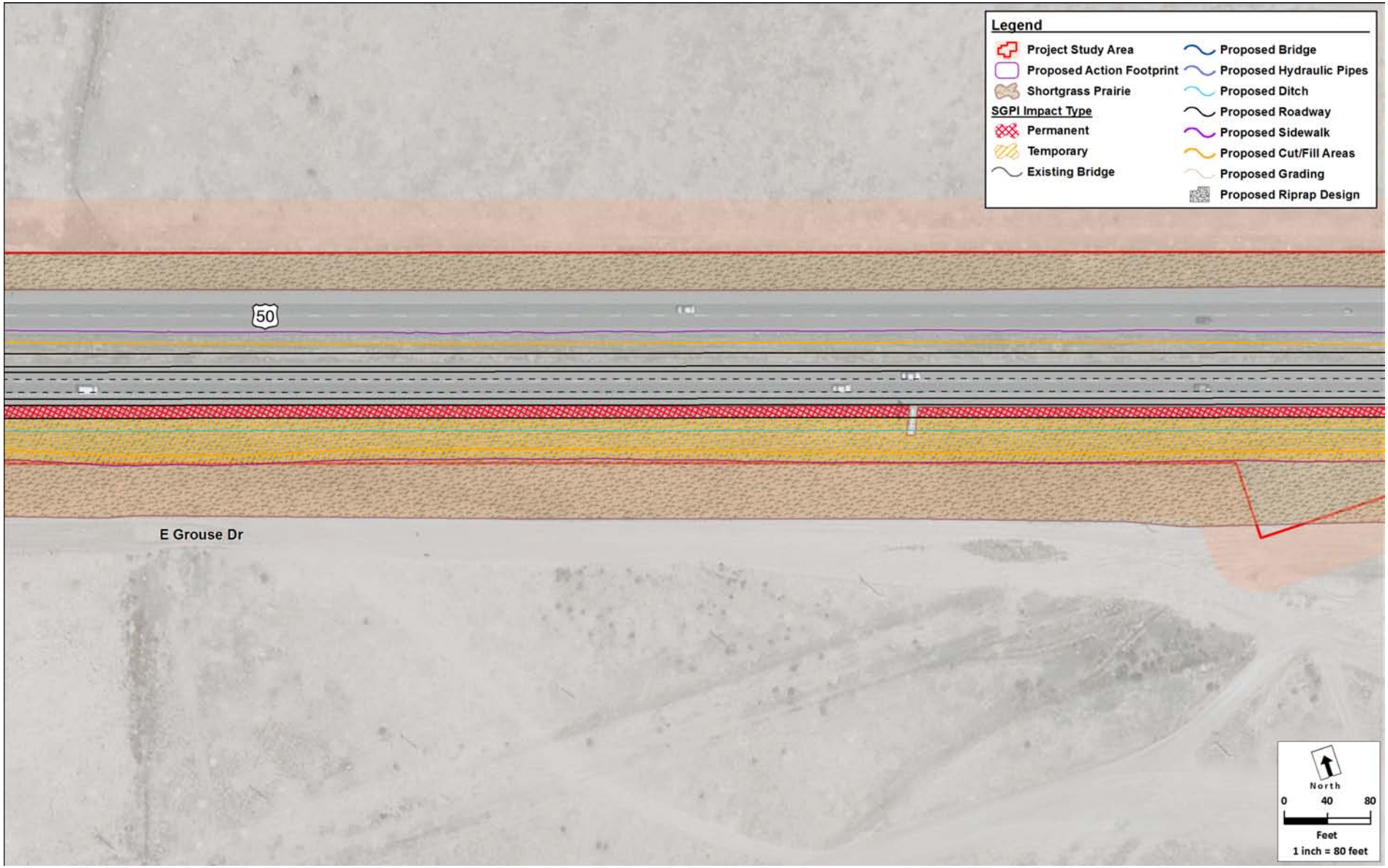

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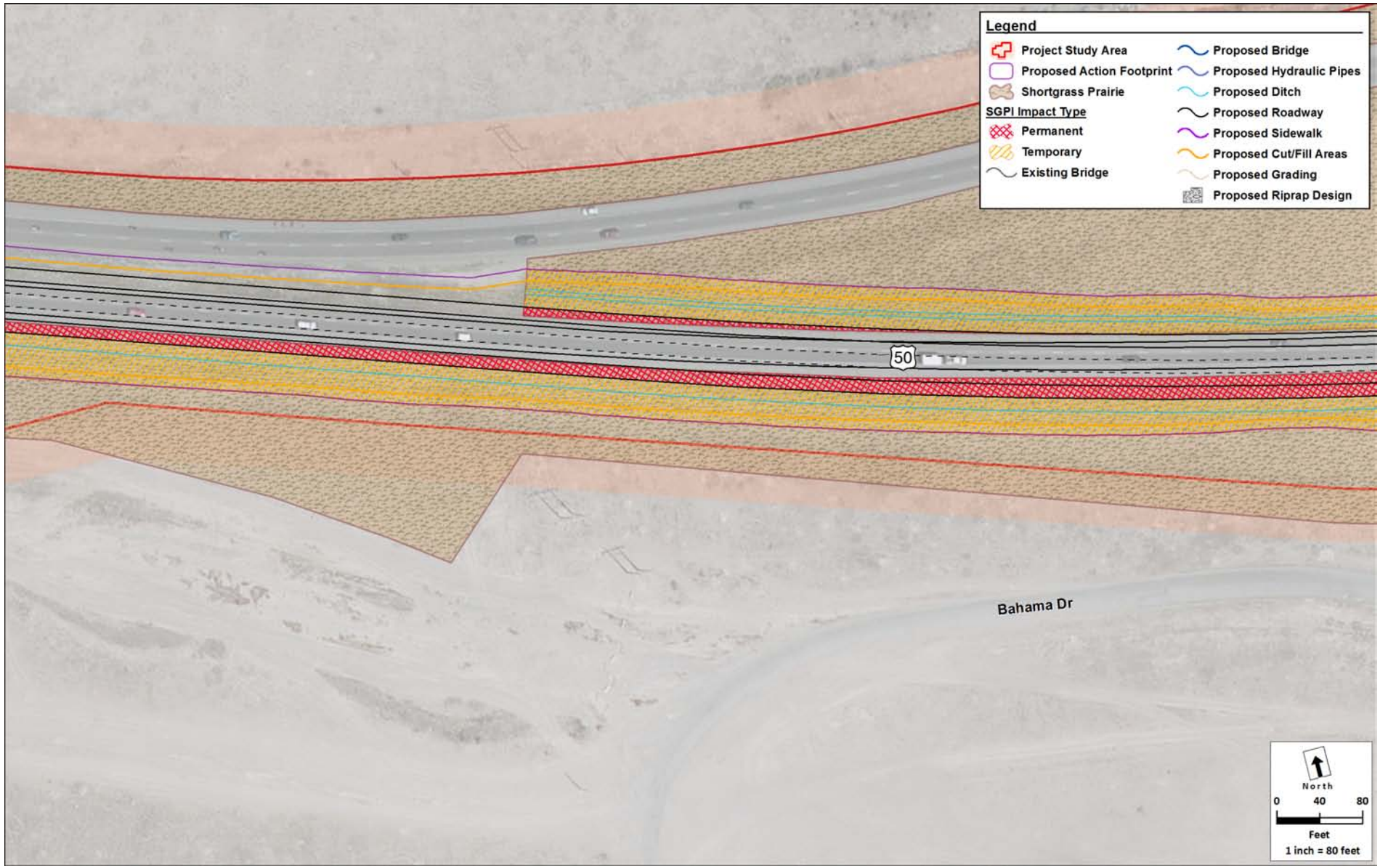

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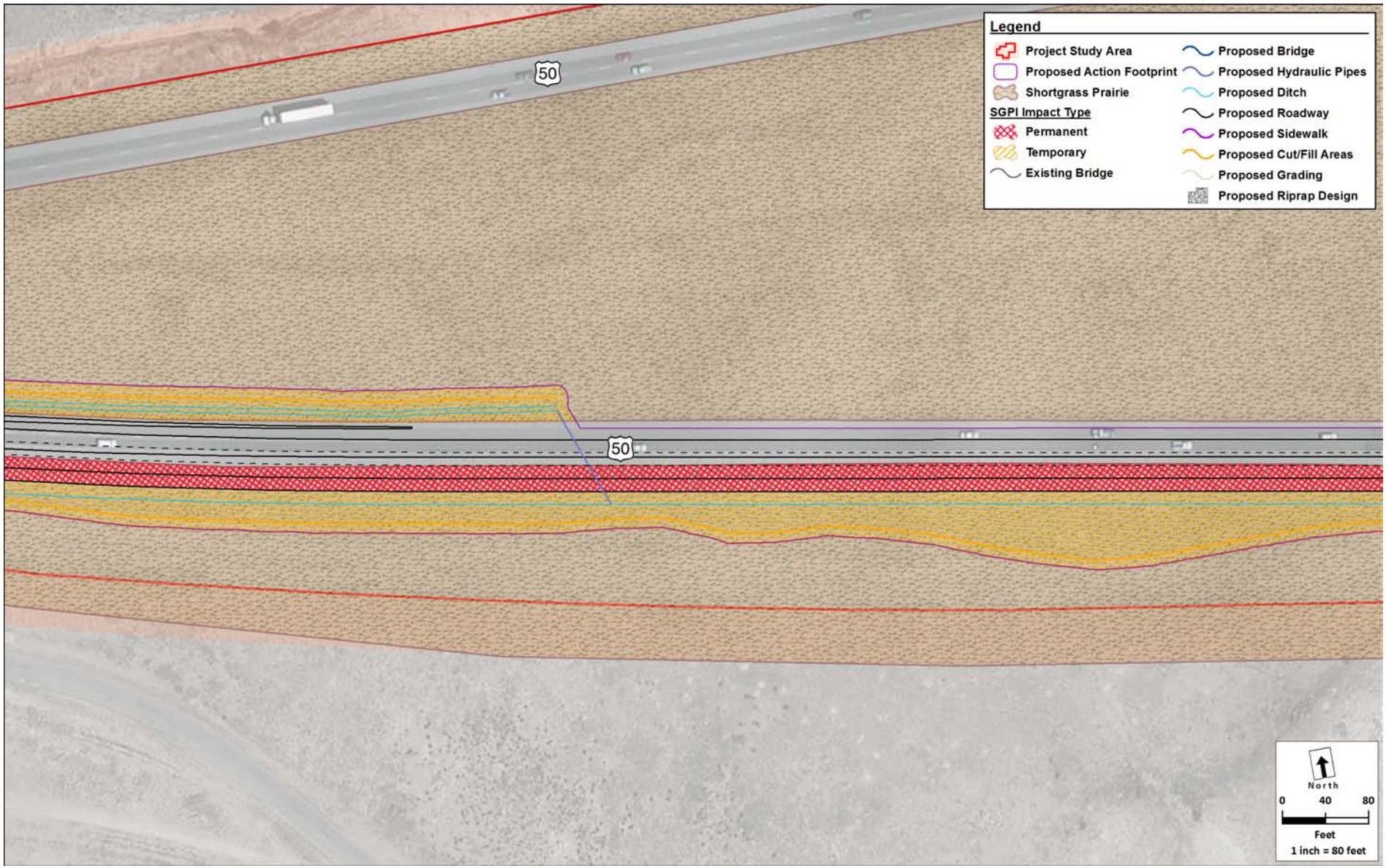

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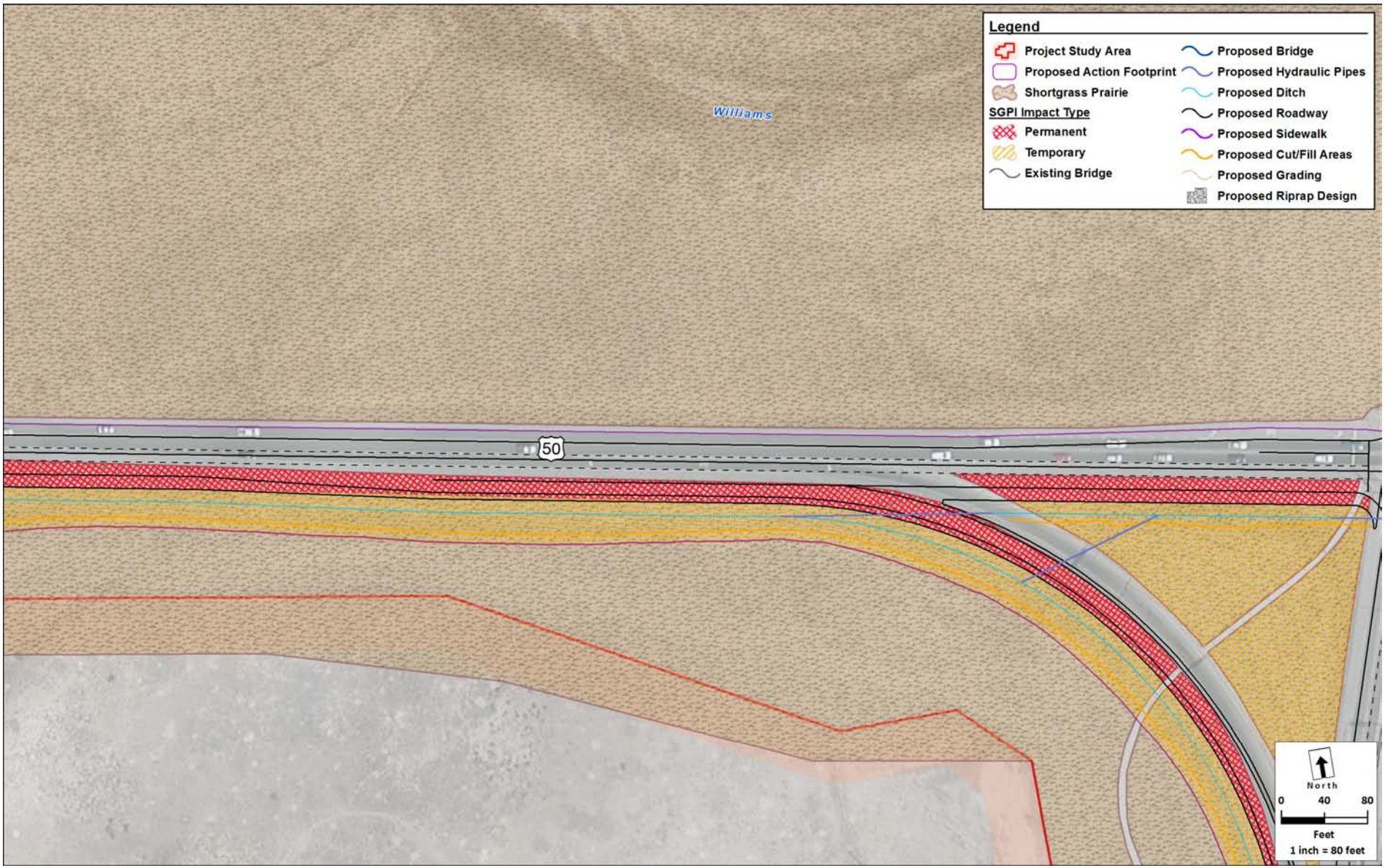

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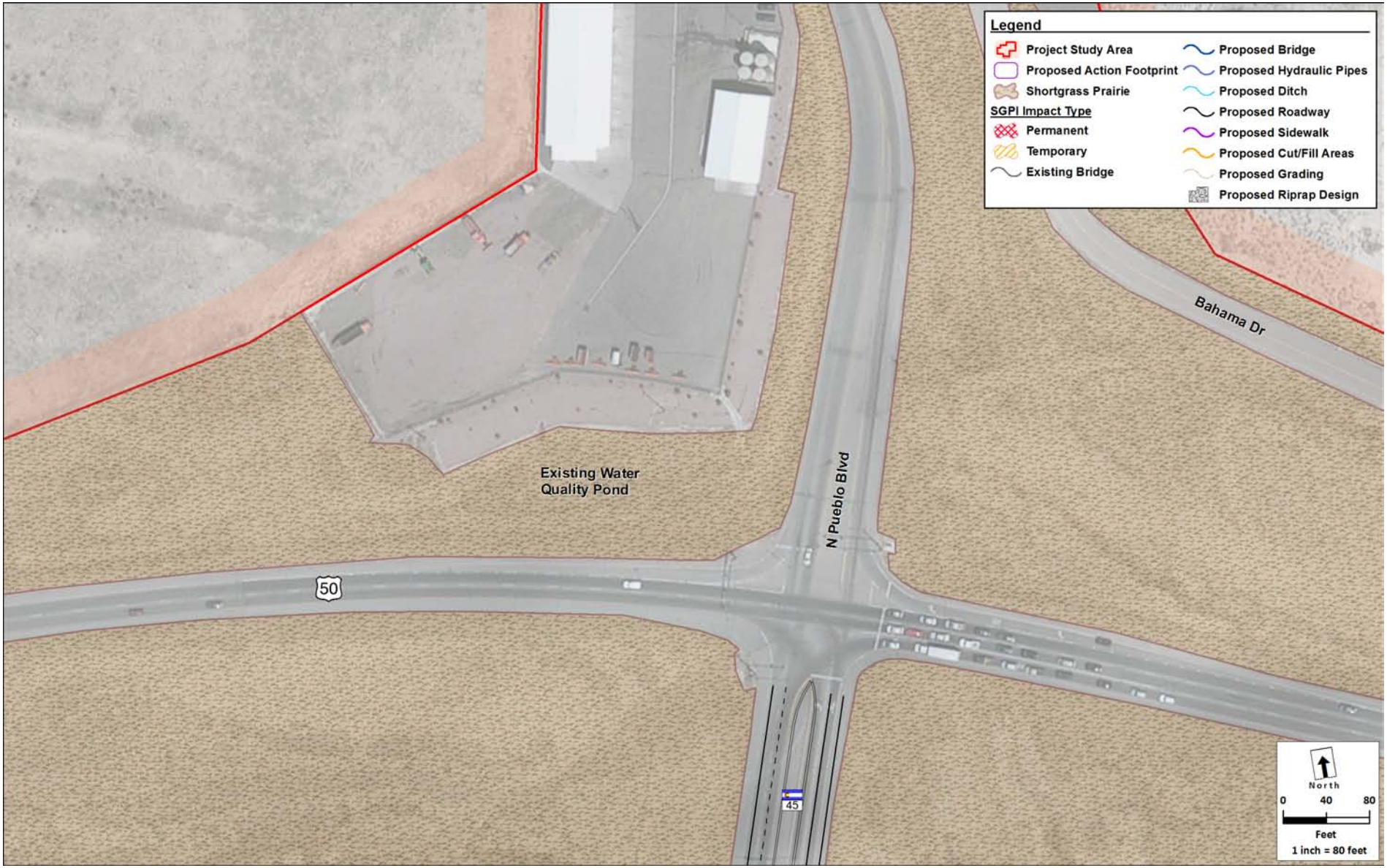

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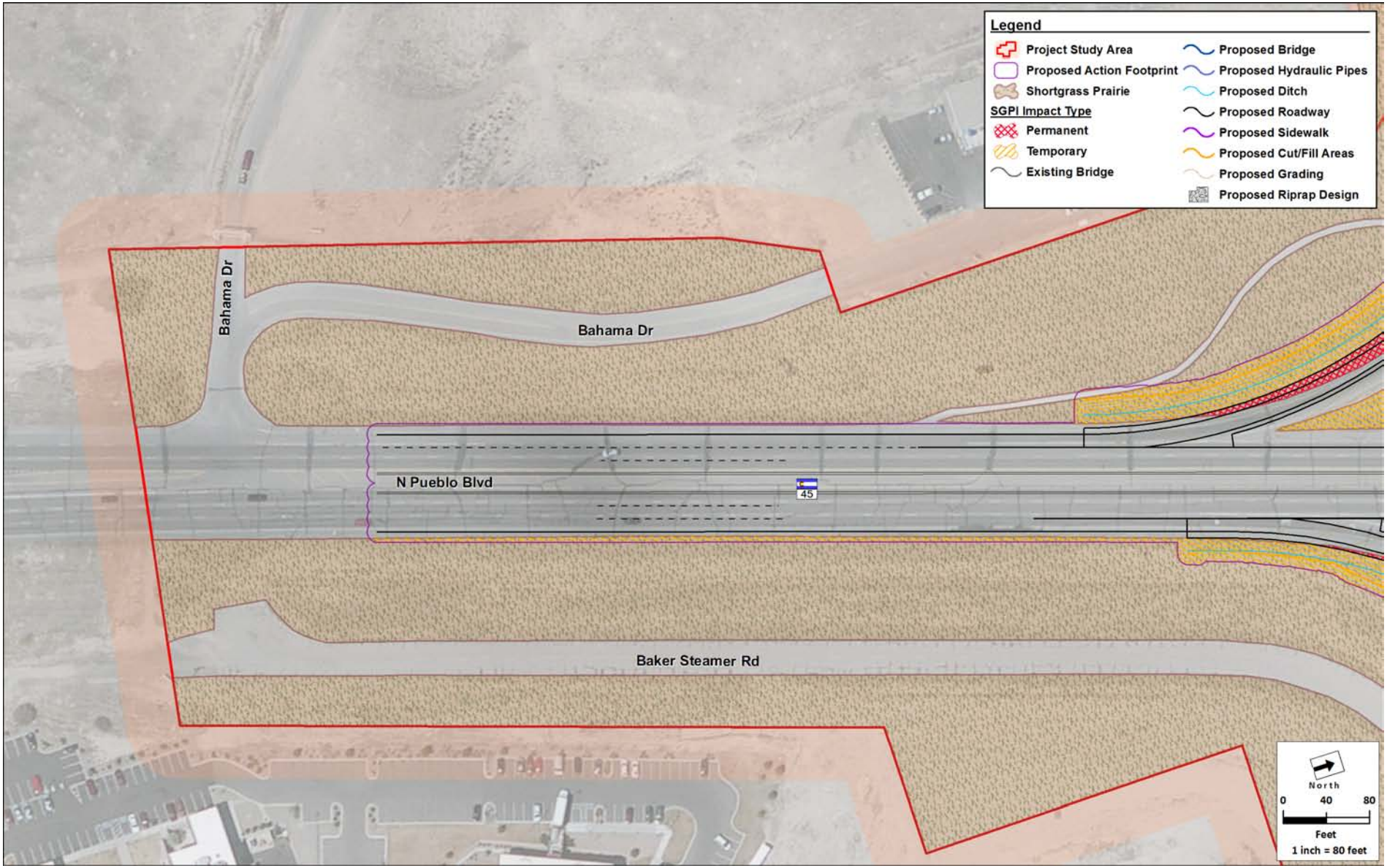

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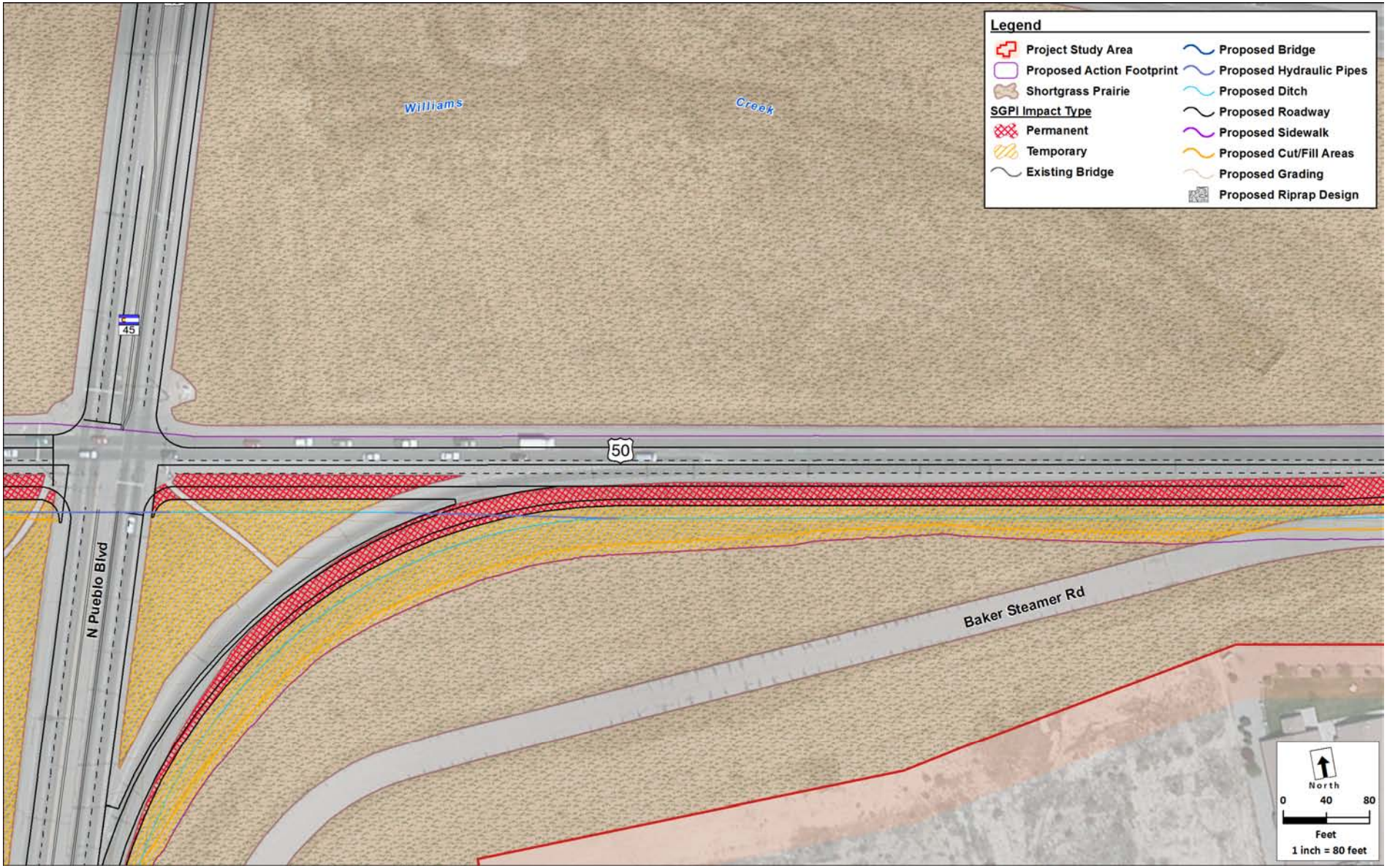

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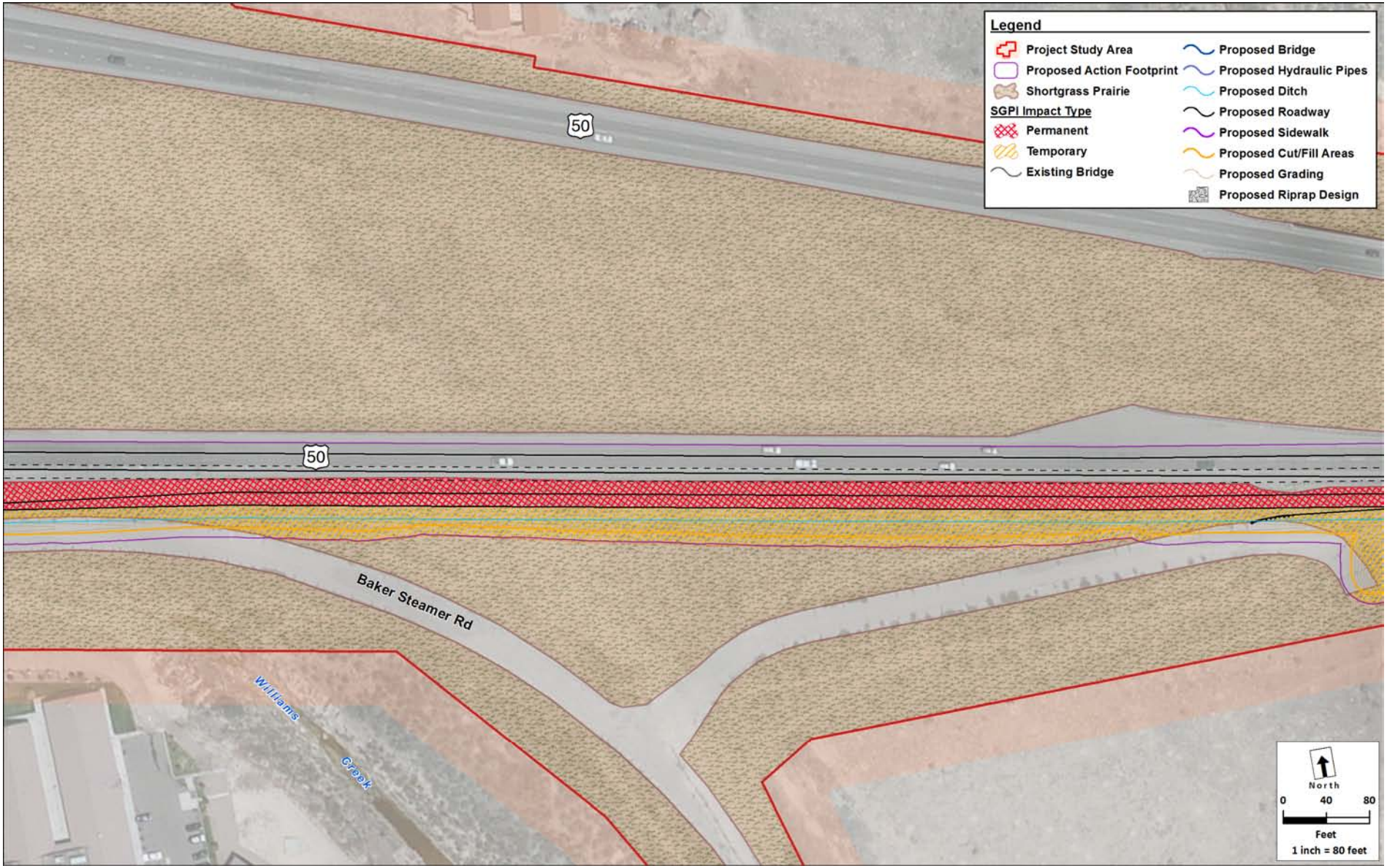

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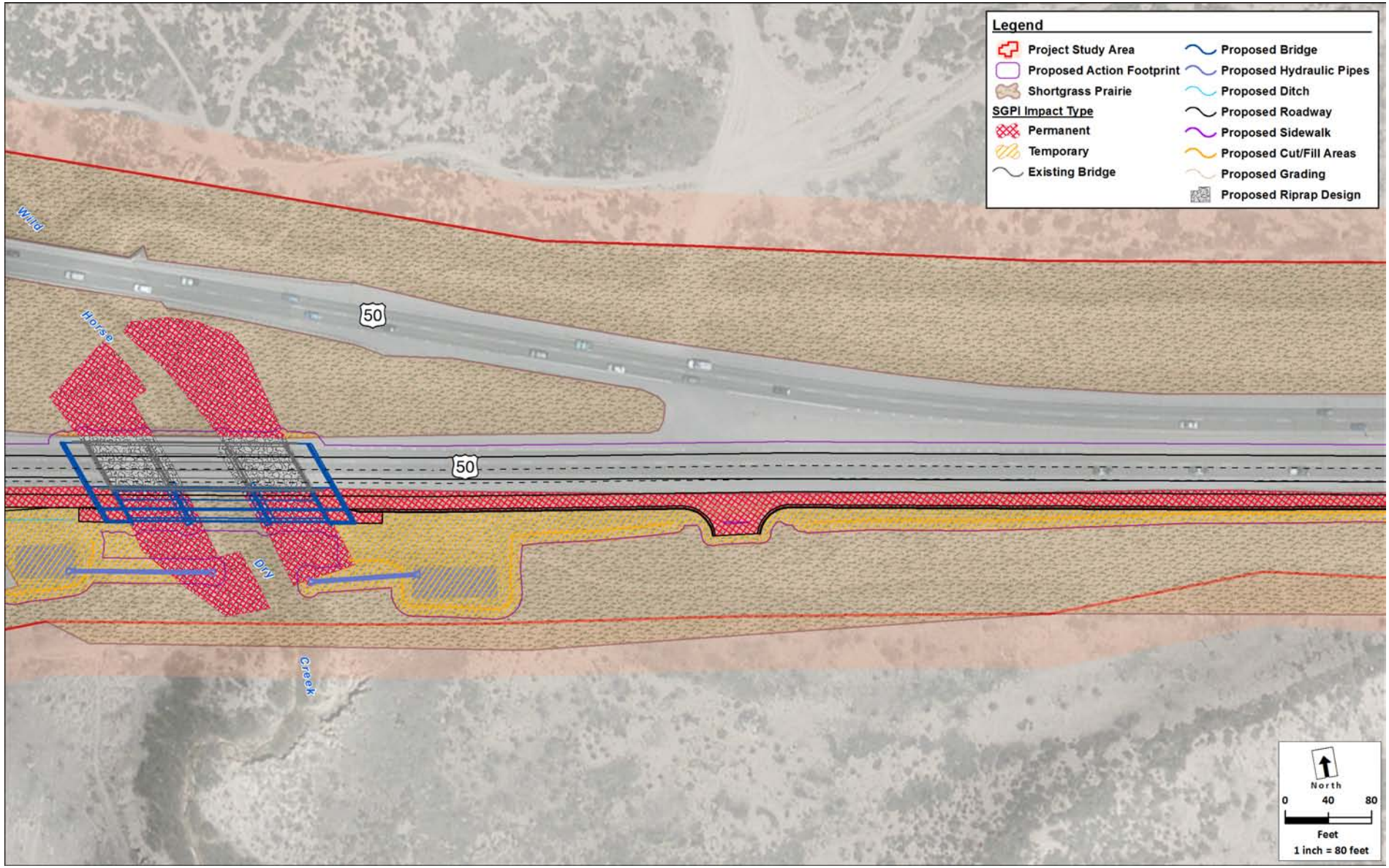

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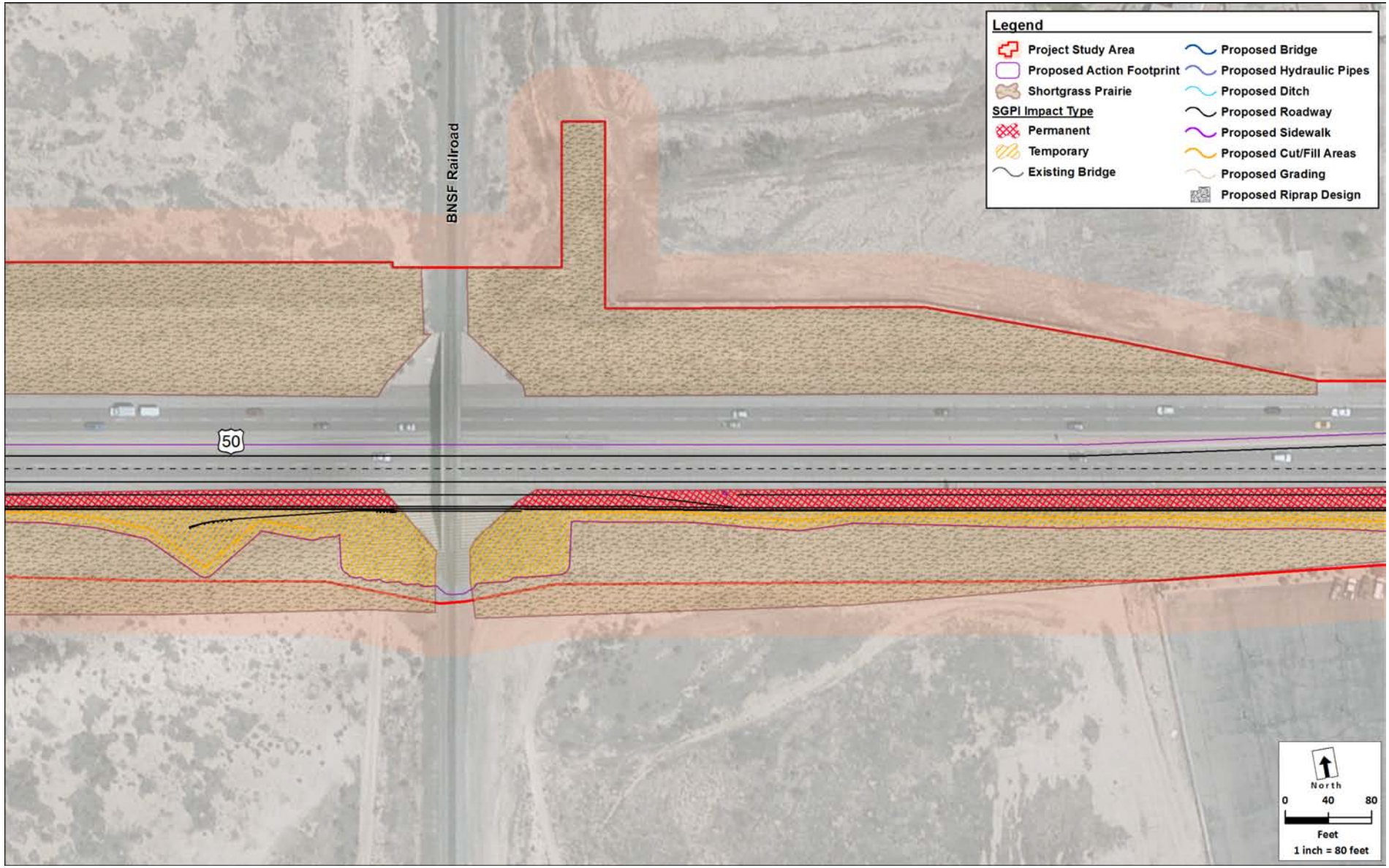

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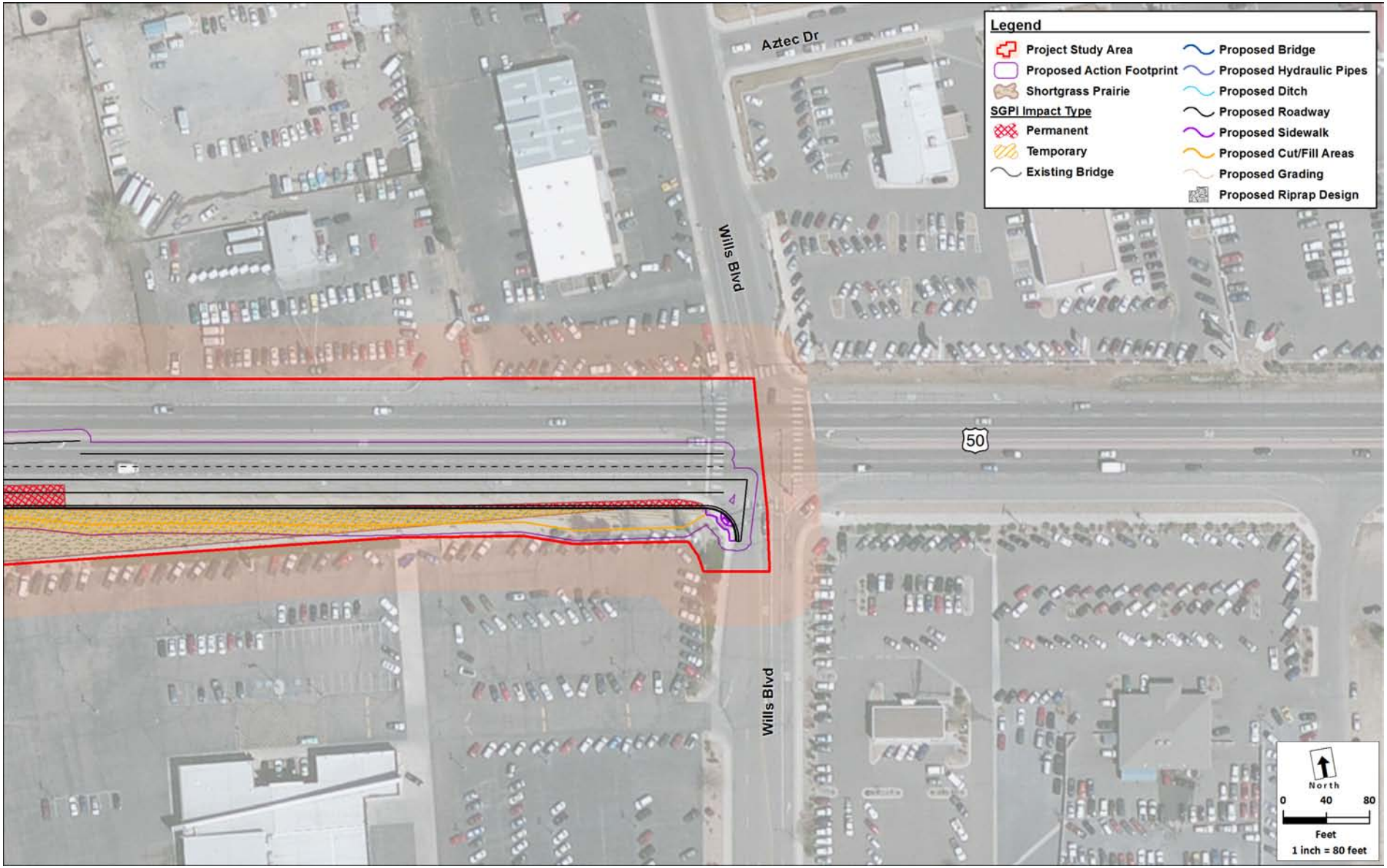

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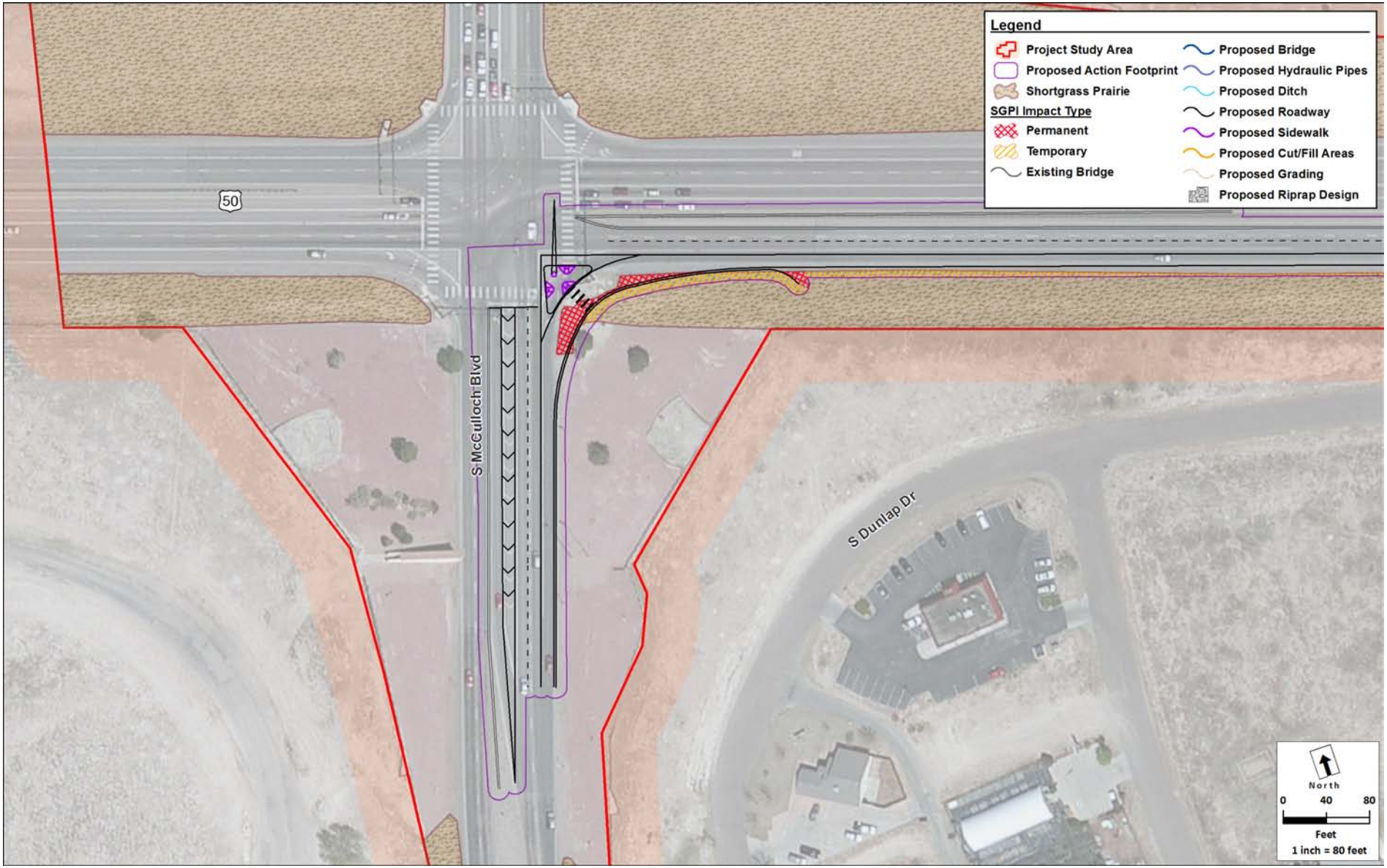

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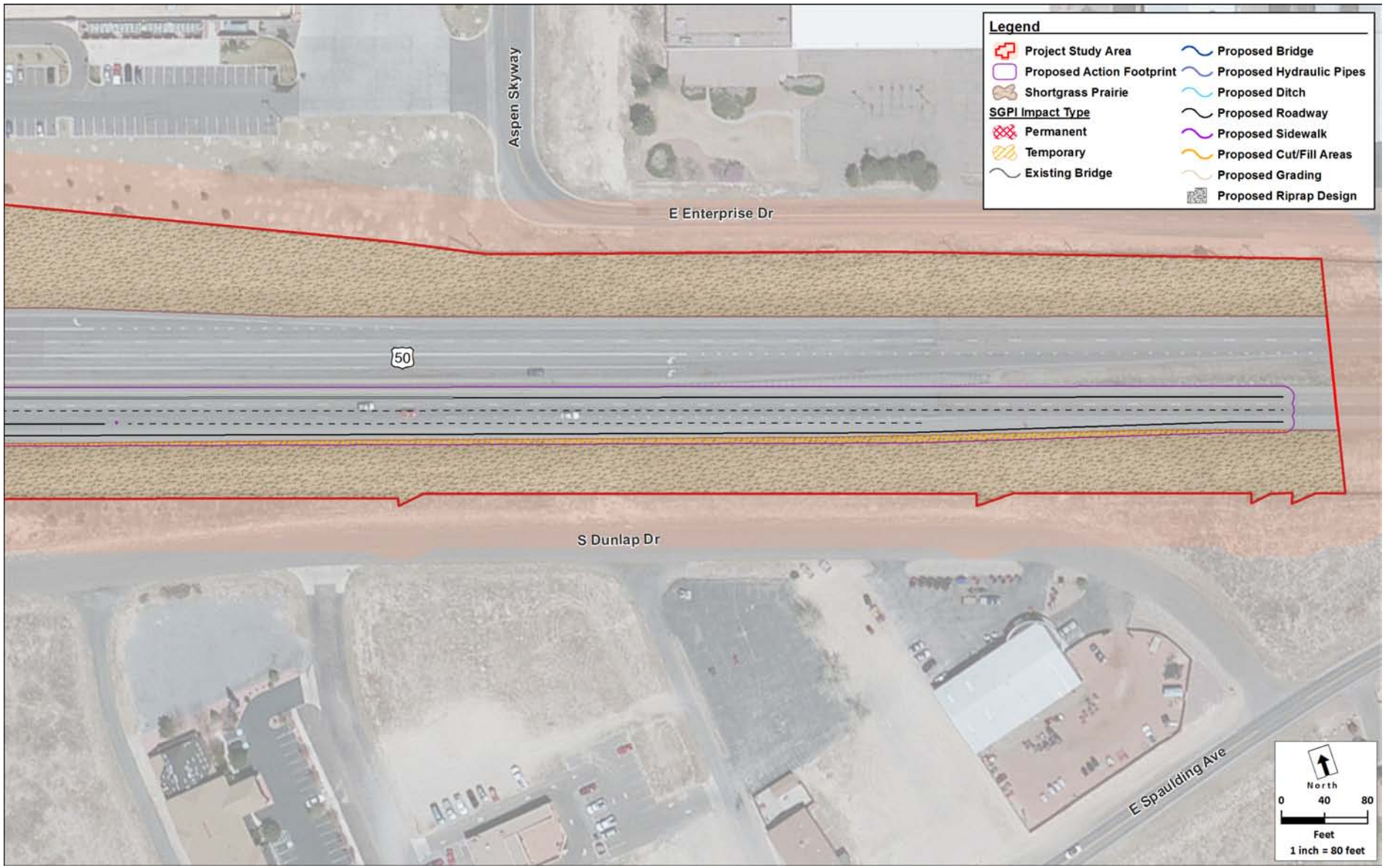

Appendix C
Shortgrass Prairie Initiative
Conservation Strategy for Non-Listed Species

Appendix A: Conservation Strategy for Non-listed Species

Conservation Strategy for Non-listed Species

INTRODUCTION

The purpose of this Conservation Strategy for Non-listed Species is to accompany the Central Shortgrass Prairie Programmatic biological opinion and provide information regarding the three candidate and the thirty-one non-listed species addressed in FHWA/CDOT's programmatic strategy to minimize and compensate for impacts from transportation improvement projects on Colorado's central shortgrass prairie. Supplemental information on the three listed species for which we concurred with a "may affect, not likely to adversely affect" determination, is also given here in the event reinitiation is required. The information in this appendix will be presented using the same general outline as the biological opinion, but will present only additional information. Nothing in this document *replaces* anything in the biological opinion.

One purpose of FHWA/CDOT's programmatic strategy is to treat non-listed species as if they were listed by protecting them into perpetuity with upfront habitat protection and management with the intention that, should any of those species become listed, they can be incorporated into the biological opinion without the need to change the proposed activities because those activities have already been modified to minimize the impact of take. In addition, compensation has already been provided that is commensurate with the anticipated impact. If the Service proposes to list a species, the Service will notify FHWA, and FHWA will prepare a Biological Assessment, incorporating by reference the information already contained in this document, along with any new information. The Service can complete consultation either formally, or informally, as appropriate.

CONSERVATION STRATEGY

Conservation Measures

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 benefitting 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 (*Spilogale 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*).

Best Management Practices

These BMPs will be employed within areas of presumed presence (as described previously in this biological opinion) for relevant target species. Maps depicting presumed presence for species on the primary species list are included in the report "Estimating Impacts of Highway Projects on Select Rare, Sensitive, or Declining Species on Colorado's Central Shortgrass Prairie" (Grunau and Lavender 2002), which was submitted to the Service with the Biological Assessment. Maps depicting where presence of species was presumed and for which BMPs are the primary conservation strategy are also included in that document. Maps for fish species represent current known distribution and planned recovery areas, as identified by CDOW (pers. comm. Nesler,

2002). 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.

Interior Least Tern and Piping Plover

(1) 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.

Black-tailed Prairie Dogs

(2) CDOT will avoid and minimize impacts from projects to known black-tailed prairie dog colonies within the project footprint.

Burrowing Owls

(3) 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 strategy. 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).
(4) 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).
(5) 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).
(6) 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.

Ground-nesting Birds (Cassin's sparrow, lark bunting, long-billed curlew, McCown's longspur, and mountain plover)

(7) Mowing in CDOT Maintenance Zone 1 (see Figure 2 in biological opinion) 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.
(8) 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

(9) There are currently no known lesser prairie-chicken leks near any CDOT roadways (pers. comm., Kindler 2002). If any CDOT projects are undertaken in known lesser prairie-chicken habitat, CDOT will consult with CDOW and the Service 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.

Native Fish and Mussels (Arkansas darter, brassy minnow, common shiner, flathead chub, plains minnow, plains topminnow, southern redbelly dace, suckermouth minnow, cylindrical papershell, and giant floater)

(10) 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.
(11) 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.
(12) 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.
(13) 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.
(14) 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.
(15) 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.
(16) 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.
(17) 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.
(18) 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 (arogos skipper, hops feeding azure, ottoe skipper, and regal fritillary)

(19) 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.
(20) Within presumed presence for the regal fritillary as demonstrated by the sensitive habitat delineation, mowing in all Maintenance Zones (see Figure 2 in the biological opinion) 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).
(21) 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.
(22) 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.
(23) 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.
(24) 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.
(25) 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.
(26) 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

(27) 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 and the Service will be consulted prior to construction to determine actions necessary to avoid and minimize impacts.
(28) 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

(29) In areas with high population densities of the target species, underpasses and drift fences will be installed where practicable, as part of reconstruction projects. Because 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 and the Service will be consulted before construction activities begin in known Texas horned lizard, Massasauga or Western Box Turtle habitat to determine that crossings are properly placed and determine if road signs should be used.

Rare Plants (Arkansas Valley evening primrose, Colorado butterfly plant, and golden blazing star)

(30) 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.
(31) 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.
(32) 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.
(33) Where road widening results in alteration of the hydrologic regime, efforts will be made to ensure that water flow is not interrupted.
(34) 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.

Status of the Species

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 the Act (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 Reservoir on the border of Bent and Otero counties, and Adobe Creek Reservoir on the border of Bent and Kiowa counties, during 1978 (Chase 1979). In 1990, they were confirmed to be nesting again at Adobe Creek Reservoir and also at Neenoshe Reservoir in Kiowa County (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 in Bent County, and Neenoshe Reservoir (Nelson 2001).

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).

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).

There are three distinct population segments of the piping plover, all listed under the Act. 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).

On December 11, 1985, the piping plover was listed as endangered under the Act in the Great Lakes portion of its range, and was listed as threatened in the other portions of its range including Colorado. Final critical habitat was designated on September 11, 2002, but was not designated within Colorado. On August 5, 2002, the Notice of Availability for review and comment of the draft recovery plan for the Great Lakes population was published in the Federal Register. The piping plover occurs along shorelines of lakes, peninsulas, and islands, as well as river channels and their sandbars and islands. Piping plover breeding sites have been found in Prowers, Bent, Kiowa and Baca Counties in southeastern Colorado.

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 with 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 Faanes 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 initiate 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).

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 approximately 17,000 acres (6,880 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).

The Colorado butterfly plant was listed as threatened throughout its range under the Act (50 CFR 62302) on October 18, 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 U.S. Forest Service sensitive species, though its presence on U.S. 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 (1,524 and 1,951 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 Act 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).

Arkansas 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 CaZon 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).

The Arkansas darter was included as a federal candidate species (61 FR 40) February 28, 1996. It is listed as threatened under State law in Colorado and Kansas, endangered in Oklahoma, rare in Arkansas, and is a U.S. 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 State's 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).

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, buffalo grass, 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 has been documented (Knowles 1985), though most dispersal occurs within two kilometers.

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 107 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 1,087 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.

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, 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 Act, 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 U.S. 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., Currey 2002).

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).

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.

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 5,000 to 11,000 birds (USFWS 2003).

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, which is a large percentage of the USFWS (2003) global estimate of 5,000 to 11,000 birds. More recently, RMBO estimated 4,850 individuals in eastern Colorado (USFWS 2003). 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 breeds in South Park, which currently appears to be the most productive breeding area in 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. Carter et al. (1996) determined that mountain plovers occur at very low densities in ten eastern Colorado counties, being most numerous in Kiowa and Park counties. At one time, they were believed to be most numerous in Weld County, but later inventories found them to be more widely distributed, with 75 percent occurring south of Weld County (USFWS 2003). Clearly, therefore, the eastern plains of Colorado represent a significant component of the remaining habitat for this species.

The mountain plover was proposed threatened on February 16, 1999, throughout its entire range. The comment period on the proposal was reopened on December 5, 2002, due to new information regarding the species' biology and listing factors. A 4(d) rule was simultaneously proposed. The comment period reopened again on February 21, 2003. On September 9, 2003, the Service published a final rule, which determined that the action of listing the mountain plover as threatened is not warranted, and consequently withdrew the proposed rule and the proposed special rule. We made this determination because threats to the species as identified in the

proposed rule are not as significant as earlier believed, and current available data do not indicate that the threats to the species and its habitat, as analyzed under the five listing factors described in section 4(a)(1) of the Act, are likely to endanger the species in the foreseeable future throughout all or a significant portion of its range. 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 U.S. 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 U.S. 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 U.S. 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.

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 Act, 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.

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).

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).
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 Service 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).

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).

The Cassin's sparrow is not protected under the Act, but is included on the Service's "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).

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.

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 Service 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).

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 toward 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.

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.

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).

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, piZon-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 highway 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.

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).

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 the precocial chicks hatch, adults move them 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.

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 and Hutchings 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).

The McCown's longspur is not protected under the Act. 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 plant 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.

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 2002b).

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 2002b). It is found in low numbers in the South Platte and Republican River basins (CDOW 2002b). 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 2002b).

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., Nesler 2002). 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 2002b). 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.

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 2002b). It is considered native to the Arkansas River Basin, though this has been questioned by Fausch and Bestgen (1996).

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.

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).

The flathead chub was a candidate species for listing under the Act, but was removed from that category February 28, 1996 (USFWS 1996). It is a U.S. 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.

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). 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 2002b).

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 Act. In 1996 it was removed from the list of candidate species (61FR40), though it remains a species of management concern. It is a U.S. 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 2002b), 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.

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 (Jordan 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).

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.

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 Robinson 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 2002b).

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 2002b). 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.

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 Robinson 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 2002b).

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 2002b). 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.

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 1982a, 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 1982a). 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.)

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 (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., Livo 2002). In Colorado, it is found on sunny, muddy, or marshy edges of ponds, reservoirs, streams, and irrigation ditches (Hammerson and Langlois 1981; Hammerson 1982a; 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.

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 1982a, 1986), forage on land or in shallow water (Post 1972; Hammerson 1982a), 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 1982a).

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 frog 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 1982a, 1999). In some areas, reduced or extirpated leopard frog populations are associated with the presence of bullfrogs (Hammerson 1982b). 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).

The northern leopard frog has been designated a U.S. 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 1982a, 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.

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.

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.

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 1982a, 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).

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.

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 approximately 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 approximately 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 5,500 feet (1,676 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).

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.

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 can grow to 114 millimeters (4.5 inches) 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.

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 the Service 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).

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 (4 - 7.5 inches) 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).

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 the Service 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).

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.

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 U.S. 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, little bluestem, and switchgrass (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.

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 5,300 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.

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 5,300-6,500 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.

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 big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), needle-and-thread (*Stipa* spp.), and bluegrass (*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 milkweed (*Asclepias* spp.), echinacea (*Echinacea purpurea*), sunflower (*Helianthus* spp.), lettuce (*Lactuca* spp.), alfalfa (*Medicago sativa*), prickly pear cactus (*Opuntia* spp.), and vetch (*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).

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 (Pineda and Ellingson 1997). They avoid weedy conditions (Ferris and Brown 1981; Scott 1986). Larval host plants include big bluestem (***Andropogon gerardii***), little bluestem (***Schizachyrium scoparium***), sideoats grama (***Bouteloua curtipendula***), needle-and-thread (***Stipa*** spp.), and bluegrass (***Poa*** spp.) (Scott 1986; Royer 2001). Adult nectar plants include flowers of milkweed (***Asclepias*** spp.), echinacea (***Echinacea purpurea***), sunflower (***Helianthus*** spp.), lettuce (***Lactuca*** spp.), alfalfa (***Medicago sativa***), prickly pear cactus (***Opuntia*** spp.), and vetch (***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.

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 milkweed *(Asclepias* spp.), bellflower *(Campanula* spp.), thistle *(Cirsium* spp.), echinacea (*Echinacea* spp.), fleabane (*Erigeron* spp.), blanketflower (*Gaillardia* spp.), mint (*Monarda* spp.), gayfeather (*Liatris* spp.), and black-eyed susan (*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).

The regal fritillary is a U.S. Forest Service sensitive species and was formerly a C2 candidate for listing under the Act (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.

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).

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 CaZon District (Spackman et al. 1997). It was formerly a Category 2 species under the Act.

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-CaZon City area of the Arkansas River Valley. It is often found in association with stemless hymenoxys (***Tetraneuris acaulis***) (Weber and Wittmann 1999) and in communities composed of Colorado piZon 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.

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).

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.

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 CaZon 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).

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 Fremont 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 Fremont 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.

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).

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 piZon-juniper woodlands at an elevations range of 4,800-5,500 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., Rondeau 2002). 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.

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 CaZon City (Spackman et al. 1997). It has also been found on the U.S. Army's PiZon Canyon maneuver site in the Purgatoire River drainage (Colorado Native Plant Society 1997).

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 Act.

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.), piZon 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.

Environmental Baseline

The Environmental Baseline describes the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process. [50 CFR §402.02] According to the section 7 handbook (Endangered Species Consultation Handbook. U.S. Fish and Wildlife Service and National Marine Fisheries Service. March 1998.), the Environmental Baseline provides a "snapshot" of species health at a specified point it time, and describes the status of the species and factors affecting the species environment in the action area.
The biological opinion contains a description of the current status of Colorado's central shortgrass prairie and the bald eagle. The status of the remaining listed species as well as the non-listed species in the action area is presented here. The description of the baseline is meant to stand alone, therefore some information or effects common to each member of a certain taxon (e.g., prairie birds), is present the description of each species.

Native Plains Fishes

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 non-native species (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 of 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 of 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., Pague 2002), and direct mortality due to actions of humans (pesticide application, roadkill, collection [Hammerson 1986; McDiarmid 1995]). Of these, loss of habitat may have 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., Pague 2002; unpublished data, Livo).

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 United States 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 the Act. 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 United States (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 United States 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, mussels along this river have probably always had a limited distribution. However, 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).

Interior Least Tern

In Colorado, least terns have consistently been found nesting in Bent, Otero, and Kiowa counties since 1978, though the number of nesting pairs and nests has fluctuated since that time.

Within Colorado's central shortgrass prairie, there has been a loss of nesting areas due to reduced river flows and the development of sandbars along the Platte and Arkansas Rivers caused by reservoirs and irrigation diversions.

Piping Plover

Piping plovers are known to breed in Prowers, Bent, Kiowa, and Baca Counties in the southeast corner of Colorado (Nelson 1998b). The number of birds nesting in this area has consistently been low since 1991, ranging from three to eight pairs. Nesting attempts have occurred at John Martin Reservoir, Adobe Reservoir, and the four Great Plains Reservoirs in Kiowa County (Neesopah, Neegronda, Neeskah, and Neenoshe) (Nelson 1998b).

Colorado Butterfly Plant

Surveys for the Colorado butterfly plant have confirmed its occurrence in north central Colorado on land owned by the City of Fort Collins, adjacent to I-25, the only known extant location in the state. The population is believed to be stable at that location.

Arkansas Darter

In Colorado, Arkansas darters have been found as far north as Limon and as far west as CaZon City. They are known to occur in the Fountain Creek, Rush Creek, Big Sandy Creek, Horse Creek, and Chico Creek drainages. In addition, Arkansas darters have been introduced to ten previously unoccupied sites within the known range of the species since 1980.

Black-tailed Prairie Dog

The black-tailed prairie dog occurs in all of Colorado's eastern counties, and are especially common in those counties bordering on the Front Range. The range of the species has not changed considerably in Colorado since the early 1900s however, the size of the colonies has sharply decreased. According to EDAW (2000), 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.

Plague is a serious threat to the persistence of prairie dogs, although this disease is apparently less prevalent in eastern Colorado than in the Front Range (EDAW 2000). EDAW (2000) states that Center for Disease Control maps of known plague-positive black-tailed prairie dog colonies in Colorado show little incidence of plague in eastern Colorado although 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 southeastern Colorado, 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. 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.

Lesser Prairie-chicken

Colorado's lesser prairie-chicken population is estimated at 2,000-4,000 birds found primarily in the Comanche National Grasslands in Otero, Bent, Baca, and Las Animas counties, and on private lands south of the Cimarron River. Colorado's population has increased since 1977 largely due to habitat protection on the Comanche National Grassland, and 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).

Mountain Plover

Colorado is one of the two most important breeding sites for the mountain plover. The species is widely distributed throughout the state occurring in low densities in ten eastern Colorado counties, but being the most numerous in Kiowa and Park Counties. Park County, which is not considered part of Colorado's central shortgrass prairie, currently is the most productive breeding area. Mountain plover numbers have sharply declined in the Pawnee National Grasslands in Weld County since the mid-1990s.

Burrowing Owl

Along the Front Range of Colorado, burrowing owls have largely disappeared from much of their historic range (Jones 1998). Breeding burrowing owls currently occur 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).

Cassin's Sparrow

Cassin's sparrows breed primarily in southeastern Colorado and irregularly into northeastern Colorado (Melcher 1998). Potentially 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). 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).

Ferruginous Hawk

In Colorado, ferruginous hawks have been Ferruginous hawks occur in Colorado year round (Preston 1998; Gillihan and Hutchings 2000), where populations have been stable from 1979-1992 (Olendorff 1993). 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.

Lark Bunting

In Colorado, lark bunting numbers are highest in the shortgrass prairies of extreme eastern Colorado near the Kansas border (Kingery 1998). The species is 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.

Loggerhead Shrike

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). Great Plains populations, including populations within Colorado's central shortgrass prairie, appear to be healthy and stable or increasing slightly. Colorado Breeding Bird Atlas workers found breeding shrikes to be conspicuous and, like raptors, sparsely distributed. The vast majority of nesting in Colorado occurs in eastern Colorado (Carter 1998).

Long-billed Curlew

The breeding distribution of long-billed curlews within Colorado occurs in three clusters in 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). Birds in this last cluster occur in lower densities than in the other two clusters, and select prairies bordering the South Platte River and, occasionally, on the Pawnee National Grassland.

McCown's Longspur

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), all within Colorado's central shortgrass prairie. Winter range includes extreme southeastern Colorado.

Brassy Minnow

The brassy minnow is found in low numbers in the South Platte and Republican River basins (CDOW 2002b). In the South Platte, it is restricted to portions of the mainstem and most abundant in the eastern portion of the plains (Propst 1982). 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 2002b).

Common Shiner

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 2002b) at the western periphery of the project area. At one time it was found in four South Platte River tributaries (Propst 1982) but more recently it has been found at only six sites in the St. Vrain and West Plum Creek systems of the South Platte River basin (Nesler et al. 1997).

Flathead Chub

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).

Plains Minnow

In Colorado's central shortgrass prairie, the plains minnow occurs in the South Platte River between Ft. Morgan and Sterling, and the Arkansas River basin in Kiowa County.

Plains Topminnow

The plains topminnow is found in Colorado's central shortgrass prairie in intermittent prairie streams, and the lower mainstem of the South Platte River (Woodling 1985; Nesler et al. 1997). It occurs on the Pawnee National Grasslands in Coal Creek, Willow Creek, and tributaries of Pawnee Creek (Roosevelt National Forest, Arapaho National Forest and Pawnee National Grassland FEIS).

Southern Redbelly Dace

In Colorado, 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 2002b).

Suckermouth Minnow

In Colorado's central shortgrass prairie, the suckermouth minnow occurs in the Lodgepole Creek drainage of the mainstem South Platte, as well as in the mainstem Arkansas River between John Martin Reservoir and the Kansas state line (CDOW 2002b).

Northern Cricket Frog

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.)

Northern Leopard Frog

In Colorado, the northern leopard frog occurs throughout the state except in the Republican River drainage and south of the Arkansas River in southeastern Colorado (Hammerson 1986, 1999). The northern leopard frog 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 1982a, 1999). In some areas, reduced or extirpated leopard frog populations are associated with the presence of bullfrogs (Hammerson 1982b). 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).

Massasagua

Colorado's massasagua 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). Recent records show massasaugas in Lincoln, El Paso, Pueblo, Crowley, Otero, Bent, Kiowa, Cheyenne, Prowers, Baca, and Las Animas Counties.

Texas Horned Lizard

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).

Western Box Turtle

Western box turtles occur throughout most of eastern Colorado below 5,500 feet (1,676 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).

Cylindrical Papershell

In Colorado, the cylindrical papershell is found only in the Platte River drainage, primarily in Boulder County, but has also been 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.

Giant Floater

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).

Arogos Skipper

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).

Hops Feeding Azure

The hops feeding azure was formally described in 1998 (Scott and Wright 1998). It 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 5,300 feet (Pineda 2002) at the western edge of Colorado's central shortgrass prairie.

Ottoe Skipper

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).

Regal Fritillary

The regal fritillary occurs in eastern Colorado north of the Arkansas River (Opler et al. 1995). 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).

Arkansas River Feverfew

In Colorado, the Arkansas River feverfew 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).

Arkansas Valley Evening Primrose

Ten occurrences (two historical) of the Arkansas Valley evening primrose have been documented in El Paso, Fremont, Huerfano, Las Animas, Pueblo and Otero Counties (Spackman et al. 1997). have been documented (Spackman 1996).

Golden Blazing Star

There have been 14 reported occurrences of the golden blazing star in Colorado's central shortgrass prairie in Fremont and Pueblo 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).

Pueblo Goldenweed

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

Roundleaf Four-o'clock

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 CaZon City (Spackman et al. 1997). It has also been found on the U.S. Army's PiZon Canyon maneuver site in the Purgatoire River drainage (Colorado Native Plant Society 1997).

Effects of Action

Effects of the action include the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. These effects are considered along with the environmental baseline and the predicted cumulative effects to determine the overall effects to the species for purposes of preparing a biological opinion on the proposed action. [50 CFR §402.02]

General effects from FHWA/CDOT's routine maintenance and upgrade activities have already been described in the biological opinion. Although the piping plover, the interior least tern, and the Colorado butterfly plant are already listed, the effects of the proposed action to these species are presented in this section because those effects are not likely to adversely affect them for reasons already described. This information is also included here in the event that reinitiation of consultation is required. The description for each species is meant to stand alone, therefore some information or effects common to each member of a certain taxon (e.g., prairie birds), is present in the description of each species.

Additional effects specific to the non-listed species include those of fragmentation, which could possibly prevent populations of some species, especially the herpetofauna, from migrating along historical movement corridors or accessing entire home ranges. Some of the species considered in this Conservation Strategy for Non-listed Species may be directly killed by construction equipment or workers.

Interior Least Tern

CDOT activities will not affect sandbars and islands in rivers or on lakes because these impacts are generally caused by actions such as water diversion or channelization, neither of which will occur as part of the proposed action. Therefore, CDOT activities should have little 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 previously described in 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.

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. Additionally, CDOT activities are not likely to affect water flows or sandbar deposition because these impacts are generally caused by actions such as water diversion or channelization, neither of which will occur as part of the proposed action. However, there may be impacts associated with road widening that could disrupt surface flows or groundwater movement in or near piping plover feeding habitat. BMPs as previously described in this document will be implemented at any transportation improvement project site near feeding areas for piping plovers in order to minimize these impacts.

Colorado Butterfly Plant

According to the City of Fort Collins (pers. comm., Comstock 2002), the only known plants are at least one-half mile away from I-25. Transportation improvement projects and maintenance activities are not 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.

Arkansas Darter

The primary concern from the proposed activity for the Arkansas 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., Nesler 2002). On-site BMPs will minimized the effects of the proposed activities.

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 (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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 our 12-month administrative finding, the Service 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. However, 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 project area.

Lesser Prairie-chicken

There is 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 (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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., Kindler 2002).

Mountain Plover

There is 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 (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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.

Burrowing Owl

There is 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).

CDOT activities that are most likely to result in permanent habitat loss are road widening (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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.

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).

Cassin’s Sparrow

There is 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.

CDOT activities that are most likely to result in permanent habitat loss are road widening (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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 2,284 acres. This represents approximately 0.055% of the identified habitat in the project area (Grunau and Lavender 2002).

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.

CDOT activities that are most likely to result in permanent habitat loss are road widening (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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 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).

Lark Bunting

There is 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.

CDOT activities that are most likely to result in permanent habitat loss are road widening (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards, rest area construction, 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 12,124 acres. This represents approximately 0.054% of the identified habitat in the project area (Grunau and Lavender 2002).

Loggerhead Shrike

There is 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.

CDOT activities that are most likely to result in permanent habitat loss are road widening (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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.

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).

Long-billed Curlew

There is 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.
CDOT activities that are most likely to result in permanent habitat loss are road widening (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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 5,058 acres. This represents approximately 0.049% of the identified habitat in the project area (Grunau and Lavender 2002).

McCown's Longspur

There is 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.

CDOT activities that are most likely to result in permanent habitat loss are road widening (including shoulder work, lane addition, interchange improvements, etc.), maintenance yards and stockpiling, rest area construction, 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).

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).

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., Nesler 2002). On-site BMPs will avoid impacts to the fish.

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., Nesler 2002). 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). On-site BMPs will avoid impacts to the fish.

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., Nesler 2002). On-site BMPs are expected to avoid impacts to this fish.

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 2002b). 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., Nesler 2002). On-site BMPs will avoid impacts to this fish.

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 or 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., Nesler 2002). On-site BMPs will avoid impacts to this species.

Southern Redbelly Dace

The primary concern for the southern redbelly dace is 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., Nesler 2002). An accidental spill of any toxicant into the stream could easily eliminate these populations of southern redbelly dace. On-site BMPs will avoid impacts to the species.

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., Nesler 2002). On-site BMPs will avoid impacts to this fish.

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., Loeffler 2002; pers. comm.,. Livo 2002; pers. comm., Mackessy 2002). Changes in local hydrology will be avoided through implementation of on-site BMPs.

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., Livo 2002). On-site BMPs will avoid impacts due to alterations in local hydrology.

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

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., Mackessy 2002). CDOT activities that result in increased speed and traffic volume, such as road widening, may lead to an increase in roadkill.

Roads may attract reptiles for basking or hunting prey (pers. comm., Livo 2002; Mackessy 1998). In addition, massasaugas cross roads when moving between hibernation and foraging areas in Lincoln County, and likely elsewhere (pers. comm., Mackessy 2002). 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., Mackessy 2002).

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).

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., Mackessy 2002). CDOT activities that result in increased speed and traffic volume, such as highway widening, 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).

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., Livo 2002).

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., Livo 2002), and population effects are not readily observable in a short time frame (pers. comm., Pague 2002). 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).

Cylindrical Papershell

CDOT projects could negatively impact the cylindrical papershell if they result in increased runoff or siltation, or disruption of surface or groundwater flow. Bridge repair resulting 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 because the disturbance mechanism (the road) is already present (pers. comm., Loeffler 2002).

Giant Floater

CDOT projects could negatively impact the cylindrical papershell if they result in increased runoff or siltation, or disruption of surface or groundwater flow. Bridge repair resulting 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., Loeffler 2002).

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., Kondratieff 2002; pers. comm., Pineda 2002). 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).

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.

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).

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).

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., Coles 2002; pers. comm., Rondeau 2002). Road clearing, road widening, and herbicide application could extirpate local populations (pers. comm., Coles 2002; pers. comm., Spackman 2002). BMPs to avoid impacts will be implemented.

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

Arkansas Valley Evening Primrose

Almost all known occurrences of the Arkansas Valley evening primrose are along roads (pers. comm., Spackman 2002). Herbicide spraying, road widening, and growing-season mowing would be particularly harmful to this species (pers. comm., Spackman 2002). BMPs will be employed that will avoid impacts to the species.

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., Kelso 2002; pers. comm., Coles 2002). BMPs to avoid impacts will be implemented.

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., Coles 2002). Road widening, mowing, or pesticide use could all have negative impacts on the Pueblo goldenweed. BMPs will be employed to avoid impacts to this species.

The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 82 acres (Grunau and Lavender 2002).

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., Kelso 2002; pers. comm., Spackman 2002). BMPs will be implemented that will avoid impacts to this plant.

The maximum potential for permanent habitat loss from transportation improvement projects was estimated to be 117 acres (Grunau and Lavender 2002).

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Arkansas Darter

Any activity resulting in loss or fragmentation of habitat could negatively affect the Arkansas darter. Such activities include development in riparian areas that lead 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 could also be threatened by overgrazing, which can lead 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 such as increased grazing, pollution, or water diversions resulting in modified flow regimes. Natural dispersal may be impeded by increased pollution or siltation, physical obstructions such as dams or culverts, 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).

Black-tailed Prairie Dog

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 developed or cultivated lands.

Lesser prairie-chicken

According to TNC (1998), approximately 91 percent of Colorado's central shortgrass prairie is privately owned. Continued habitat loss on these private lands, largely through conversion from native prairies to cultivated fields, could result in lesser prairie-chicken population declines. Additionally, removal of brush to enhance pasture could continue to degrade habitat. 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).

Mountain Plover

Because the mountain plover 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., Knopf 2002).

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., Knopf 2002).

Burrowing Owl

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), and if these activities continue, they could contribute to additional declines. This intensification of land use could result in additional 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 could eliminate 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) and increases in these activities will worsen the situation. 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.

Cassin's Sparrow

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).

Ferruginous Hawk

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.

Lark Bunting

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). Continued destruction in the form of urbanization, conversion to crops, or intense grazing will remove additional habitat.

Loggerhead Shrike

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).

Long-billed Curlew

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).

McCown's Longspur

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 contributing to declines in abundance and range contractions, as has use of pesticides, especially insecticides (With 1994; Kuenning 1998; Gillihan and Hutchings 2000; Dechant et al. 2001e). Continuation of these activities could have deleterious effects on the McCown's longspur and its habitat.

Brassy Minnow

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 from agricultural or other activities such as golf courses, and mainstem impoundments that alter natural flow regimes (Echelle et al. 1995).

Common Shiner

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 from agricultural activities or golf courses, and mainstem impoundments that alter natural flow regimes. Other threats across its range include dewatering of rivers from irrigation and degradation of riparian areas from overgrazing or development (Echelle et al. 1995).

Flathead Chub

The greatest threats to the flathead chub include nonpoint source pollution from agricultural activities or golf courses, dewatering of stream channels for irrigation, and mainstem impoundments that alter natural flow regimes (Woodling 1985; Echelle et al. 1995; Ostlie et al. 1997).

Plains Minnow

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 include nonpoint source pollution from agricultural activities or golf courses, and mainstem impoundments impacting natural flow regimes. Other threats include dewatering of rivers from irrigation and degradation of riparian areas from overgrazing or development (Echelle et al. 1995).

Plains Topminnow

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 for agriculture, channelization, siltation (which covers spawning substrates), and urbanization in the Front Range corridor (Nesler et al. 1997).

Southern Redbelly Dace

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).

Suckermouth Minnow

In Colorado, habitat loss has resulted from dewatering, channelization, and siltation (which covers spawning and feeding substrates). Current threats also include nonpoint source pollution from agriculture or other activities, and mainstem impoundments that impact natural flow regimes. Threats across its range include dewatering of rivers from irrigation and degradation of riparian areas from overgrazing or development (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).

Northern Cricket Frog

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). Any activity resulting in habitat degradation or pesticide use could negatively affect the northern cricket frog.

Northern Leopard Frog

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). Any activity resulting in habitat degradation or pesticide use could negatively affect the northern leopard frog.

Massasauga

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). Activities resulting in loss of habitat or in habitat fragmentation such as development or conversion to incompatible agricultural use could negatively affect the massasauga.

Texas Horned Lizard

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).

Western Box Turtle

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).

Cylindrical Papershell

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).

Giant Floater

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).

Arogos Skipper

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.

Hops Feeding Azure

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.

Ottoe Skipper

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.

Regal Fritillary

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).

Arkansas River Feverfew

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

Arkansas Valley Evening Primrose

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., Spackman 2002).

Golden Blazing Star

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 negative effects on the golden blazing star.

Pueblo Goldenweed

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

Round-leaf Four-o'clock

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).

Future Consultations

If the Service proposes to list a species that is addressed in this Conservation Strategy, the Service will notify FHWA, and FHWA will prepare a Biological Assessment, incorporating by reference the information already contained in Appendix A, along with any and all new information. The Service and FHWA can complete consultation either formally or informally, as appropriate.

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