Final Tier 1 Environmental Impact Statement and Preliminary Section 4(f) Evaluation

Appendix E14, Biological Resources Technical Memorandum

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Table of Contents

Tables

Figures

Acronyms

°F	degrees Fahrenheit
A	Aquatic (as used in Table E14-10)
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
ARPC	Arizona Rare Plant Committee
ARS	Arizona Revised Statute
AWLWG	Arizona Wildlife Linkages Working Group
AZDA	Arizona Department of Agriculture
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
CAP	Central Arizona Project
CFR	Code of Federal Regulations
Draft Tier 1 EIS	Draft Tier 1 Environmental Impact Statement and Preliminary Section 4(f) Evaluation
EO	Executive Order
ESA	Endangered Species Act
FNAEC	Flora of North America Editorial Committee
FR	Federal Register
GIS	Geographic Information System
HDMS	Heritage Data Management System
HS	Highly Safeguarded
I	Interstate
LE	Listed Endangered
LT	Listed Threatened
MBTA	Migratory Bird Treaty Act of 1918
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPL	Arizona Native Plant Law
NW	Federally Listed Noxious Weed
Petition	Species petitioned to be listed under the ESA (as used in Special Status Species tables)
Pima	Listed in Pima County as Sensitive (as used in Special Status Species tables)
PNW	State listed Prohibited Noxious Weed (as used in Table E14-10)

RGNW	State Listed Regulated Noxious Weed
RNW	State Listed Restricted Noxious Weed
S	Sensitive (as used in Special Status Species tables)
SC	Species of Concern (as used in Special Status Species tables)
SGCN	Species of Greatest Conservation Need
SR	Salvage Restricted (as used in Special Status Species tables only)
SR	State Route
Study Area	I-11 Corridor Study Area
SWAP	Arizona State Wildlife Action Plan 2012 – 2022
T	Terrestrial (as used in Table E14-10)
TMC	Tucson Mitigation Corridor
US	United States
U.S.C.	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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This appendix updates the affected environment and analysis for the Purple, Green, and Orange Alternatives in response to Cooperating Agency comments, which informs the analysis of the Recommended and Preferred Alternatives in Final Tier 1 EIS **Section 3.14** (Biological Resources).

E14 Biological Resources Technical Memorandum

This technical memorandum describes and discusses the biological communities, both flora and fauna, within the Interstate 11 (I-11) Corridor Study Area (Study Area). The technical memorandum is divided into three subsections: biotic communities, special status species, and wildlife connectivity. Although the discussion is divided into these topic areas, the components are interrelated. Within each of these technical subsections the resources are described by alternative within each of the South, Central, and North geographic sections of the Study Area.

Biological resources include general wildlife; plant and animal species that have received special designations by federal, state, or local governmental agencies; and vegetative communities that provide habitat for these species. This section provides an overview of the biological resources within the vicinity of the Build Corridor Alternatives for I-11 between Nogales and Wickenburg, Arizona.

E14.1 Regulatory Setting

Under Title 17 of the Arizona Revised Statutes (ARS), the Arizona Game and Fish Department (AGFD) by and through the Arizona Game and Fish Commission, has jurisdictional authority and public trust responsibilities for the management of state fish and wildlife resources except where superseded by federal law (e.g., the Migratory Bird Treaty Act of 1918 [MBTA] and the Endangered Species Act of 1973 [ESA]). State laws and regulations relating to wildlife generally apply on federal land, with management of those lands under the jurisdiction of the specific land managing agencies. State wildlife laws and regulations however do not apply on Tribal lands. Wildlife on Tribal lands is administered by the Tribal governments (Favre 2003). Protected species are species of plants or animals that, because of their scarcity or documented declining population numbers (within a state, region, or nationally), have been designated by a federal, state, or local governmental agency as having special status for protection and/or management. Regulatory compliance requirements vary based on the authorities under which the species has received the protective status. The regulatory framework pertaining to natural habitats and wildlife includes key federal and state statutes, executive orders (EOs), and agency and local government policies described in the following sections.

E14.1.1 Federal

Endangered Species Act

The purpose of the ESA, as amended (16 United States Code [U.S.C.] 1531 et seq.), is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the United States Fish and Wildlife Service (USFWS), the Department of Commerce National Marine Fisheries Service (NMFS), and Tribal authorities (Department of the Interior and Department of Commerce 1997). USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife such as whales and anadromous fish such as salmon (USFWS 2015d).

Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is at risk of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened. The ESA defines species to include subspecies, varieties, and, for vertebrates, distinct population segments.

Additional categories of listing under the ESA are as follows:

- **Proposed**: Species identified by USFWS under the ESA that are proposed in the Federal Register (FR) to be listed as threatened or endangered.
- **Candidate**: Species for which USFWS has sufficient information on biological vulnerability and threats to support proposals to list them as endangered or threatened, but listing is precluded due to higher priority listing activities.
- **Critical Habitat**: Specific geographic areas (whether occupied by listed species or not) that are determined to be essential for the conservation and management of some threatened or endangered species.
- **Conservation Agreement**: Although not an official listing category, conservation agreement species have special management plans that obligate land and resource management agencies or other entities to certain conservation actions. The implementation of these plans often provides the basis upon which USFWS has precluded listing under the ESA.
- **Petitioned**: Plant or animal species that have been formally requested to be listed by USFWS or NMFS under the ESA.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) was enacted to protect fish and wildlife when federal actions result in a modification of a natural stream or body of water. If a modification to a natural stream or waterbody is expected, coordination with USFWS and with state fish and wildlife agencies is required.

Migratory Bird Treaty Act

The MBTA, as amended (16 U.S.C. 703-712), is the domestic law that affirms, or implements, the United States' (US') commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protects selected species of birds that occur in these countries at some point during their annual life cycle. The MBTA protects migratory birds and their nests, eggs, young, and parts thereof from possession, sale, purchase, barter, transport, import, export, and take. For purposes of the MBTA, take is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 Code of Federal Regulations [CFR] 10.12). The MBTA applies to migratory birds identified in 50 CFR 10.13. Overall, the MBTA protects all birds occurring in the US except for several non-native species (e.g., house sparrow, European starling, and rock pigeon) and non-migratory upland game birds. USFWS implements and enforces the MBTA and is the lead federal agency for managing and conserving migratory birds in the US. USFWS regulates the take of migratory

birds for educational, scientific, and recreational purposes. Special Purpose Permits of the MBTA are required if an action would take, possess, or involve the sale or transport of birds protected by the MBTA (50 CFR 21.27). Currently no permitting mechanism exists for take related to lawfully executed construction projects.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 (BGEPA), and as amended (16 U.S.C. 668 - 668d), prohibits anyone without a permit issued by USFWS from "taking" bald or golden eagles including their parts, nests, or eggs. The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." For purposes of these guidelines, "disturb" means "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

Federal Noxious Weed Act

The Federal Noxious Weed Act (7 U.S.C. 2801 et seq.) established a federal program to control the spread of invasive and noxious weeds. The law also requires any environmental assessments or environmental impact statements that may be required to implement plant control agreements that must be completed within 1 year of the time when the need for the document is established.

Wilderness Act of 1964

The Wilderness Act of 1964 (16 U.S.C. 1131-1136, 78 Stat. 890) directed the Secretary of the Interior, within 10 years, to review all roadless areas 5,000 acres or larger and all roadless islands, regardless of size within National Wildlife Refuge and National Park Systems, and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions to be made by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas within the National Forest System. The Act provides criteria for determining suitability and establishes restrictions on activities that can be undertaken on a designated area. It authorizes the acceptance of gifts, bequests, and contributions in furtherance of the purposes of the Act and requires an annual report at the opening of each session of Congress on the status of the wilderness system.

Wilderness designations resulting from the Wilderness Act of 1964 prohibit or limit activities such as the use of motorized vehicles and equipment, mining, utility corridor construction, and other surface-disturbing activities on protected federal public lands. Excerpts from the Wilderness Act indicate that "...each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area", and "...wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use..." Wilderness character consists of five qualities that guide the NPS management and protection of the Saguaro Wilderness: (1) Natural - Ecological systems are substantially free from the effects of modern civilization; (2) Untrammeled - Wilderness is essentially unhindered and free from the intentional actions of modern human control or manipulation; (3) Undeveloped - Wilderness is essentially without permanent improvements or

the sights and sounds of modern human occupation; (4) Opportunities for solitude or primitive and unconfined recreation - Wilderness provides opportunities for solitude or a primitive and unconfined type of recreation; (5) Other features of value - Wilderness may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

In Arizona, the Saguaro Wilderness Area, located within Saguaro National Park, was designated as wilderness in 1976. The Arizona Wilderness Act of 1984 designated over 1.1 million acres of wilderness near the Grand Canyon and released 540,000 acres of federal land for multiple use, including mining and grazing, in adjacent non-wilderness areas. The Arizona Desert Wilderness Act of 1990 designated more than 1.1 million acres of wilderness on Bureau of Land Management (BLM) and USFWS refuge lands in Arizona.

Organic Act of 1916

The Organic Act of 1916 (16 U.S.C. 1 et seq.) created the National Park Service (NPS) within the Department of Interior with responsibility for protecting the 35 national parks and monuments then managed by the department and those yet to be established. The Organic Act establishes that the fundamental purpose of the parks is to conserve scenery, natural resources, historic objects, and wildlife in them and to provide for the enjoyment of them “in such manner and by such means as will leave them unimpaired for future generations.” An Executive Order in 1933 transferred 56 national monuments and military sites from the Forest Service and the War Department to the NPS.

Executive Order 13112

EO 13112, Invasive Species (64 FR 6183 et seq.) requires that a Council of Departments dealing with invasive species be created to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause (USFWS 2012b).

Executive Order 13186

EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, directs federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding with USFWS that promotes the conservation of migratory bird populations. EO 13186 outlines specific requirements of the Memorandum of Understanding.

Executive Order 13751

EO 13751 (81 FR 88609 et seq.), Safeguarding the Nation from the Impacts of Invasive Species, amends EO 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species. This order maintains the National Invasive Species Council and the Invasive Species Advisory Committee; expands the membership of the Council; clarifies the operations of the Council; incorporates considerations of human and environmental health, climate change, technological innovation, and other emerging priorities into federal efforts to address invasive species; and strengthens coordinated, cost-efficient federal action (US Department of Agriculture [USDA] 2017).

Bureau of Land Management Special Status Species Policy

Under the authorities of the Federal Land Policy Management Act of 1976 (43 U.S.C. 1701 et seq.), ESA, and other federal laws and regulations, the BLM manages BLM-administered lands in accordance with the regulatory framework of the "multiple use" mandate. Special status species are managed in accordance with BLM Manual 6840, *Special Status Species Management* (BLM 2008). The manual establishes policy to manage species listed or proposed for listing pursuant to the ESA and BLM sensitive species that are found on BLM-administered lands. The BLM special status species policy aims to conserve and/or recover listed species and their habitats and to initiate proactive conservation measures that minimize or avoid threats to BLM sensitive species to prevent them from requiring listing in the future. BLM Handbook 6840 defines special status species as (1) species listed or proposed for listing under the ESA and (2) species requiring special management consideration to promote their conservation and minimize the likelihood and need for future listing under the ESA, which are designated as BLM sensitive by the BLM State Director(s) (BLM 2008).

E14.1.2 State of Arizona

Title 17 of the Arizona Revised Statutes, Game and Fish

This set of statutes is comprised of the sections within Arizona's Game and Fish laws and rules that are relevant to the possession and take of wildlife, including the authority of AGFD by and through the Arizona Game and Fish Commission to regulate wildlife. ARS Section 17-102 establishes that most wildlife in Arizona are the property of the state.

AGFD has established a Nongame and Endangered Wildlife Management Program. The purpose of the Nongame and Endangered Wildlife Management Program is to protect, restore, preserve, and maintain nongame and endangered wildlife as part of the natural diversity of Arizona and to provide opportunities for the public to enjoy nongame and endangered wildlife. "Nongame wildlife" is all wildlife except game mammals, game birds, furbearing animals, predatory animals, and game fish (AGFD 2017b). "Endangered wildlife" are those species listed by the Department as Tier 1a of Species of Greatest Conservation Need or by USFWS as endangered, threatened, or a candidate for such status.

Arizona's State Wildlife Action Plan (SWAP) (AGFD 2017a) provides a comprehensive vision for managing Arizona's fish, wildlife, and wildlife habitats for a 10-year period, beginning when it was originally developed in 2005. The original plan included input from resource professionals, federal and state agencies, sportsmen groups, conservation organizations, Native American Tribes, recreational groups, local governments, and private citizens. The plan is renewed at a minimum every 10 years by the USFWS (AGFD 2012a). The current revision was issued in 2012.

Arizona Native Plant Law

The Arizona Native Plant Law of 1993 (ARS 7, Section 3-901 et seq.) is administered by the Plant Services Division of the Arizona Department of Agriculture (AZDA). The law is applicable to state-owned and private land and is not applicable to federally owned or Tribal land. Under Arizona law landowners have the right to destroy or remove plants growing on their land, but 20 to 60 days prior to the destruction of any protected native plants, landowners are required to notify the AZDA. Except in an emergency, if a state agency (or federal cooperating agencies)

proposes to remove or destroy protected native plants over an area of state land (or federal land managed by a cooperating agency) exceeding 0.25 acre, the agency shall notify the department in writing as provided in ARS 7, Section 3-904 at least 60 days before the plants are destroyed, and any such destruction must occur within 1 year of the date of destruction disclosed in the notice. The landowner also has the right to sell or give away any plant growing on the land. However, protected native plants may not be legally possessed, taken, or transported from the growing site without a permit and tags obtained from the AZDA (AZDA 2017).

The law identifies protected plants belonging to the following four categories (AZDA 2017):

- **Highly Safeguarded**: Arizona native plants whose prospects for survival in the state are in jeopardy or that are in danger of extinction throughout all or a significant portion of their ranges, or are likely to become so in the foreseeable future, including federally listed species.

- **Salvage Restricted**: Arizona native plants that are not included in the highly safeguarded category but are subject to damage by theft or vandalism.

- **Salvage Assessed**: Arizona native plants that are not included in either the highly safeguarded or salvage restricted category but have a sufficient value if salvaged to support the cost of salvage.

- **Harvest Restricted**: Arizona native plants that are not included in the highly safeguarded category but are subject to excessive harvesting or overcutting because of their intrinsic value.

Arizona Noxious Weed Law

The Arizona Noxious Weed Law is set out in ARS Section 3-201 et seq. and establishes that the AZDA may treat, spray, control, suppress, or eradicate invasive and noxious weeds, crop pests, or diseases through a county-wide, area-wide, or state-wide program or programs that have been approved or authorized by the AZDA. If such county-wide, area-wide, or state-wide program or programs affect cotton, the program or programs also must be approved by the Cotton Research and Protection Council. The director may take whatever actions are necessary to assist, support, or enforce such programs, including entering any fields to treat, spray, control, suppress, or eradicate invasive and noxious weeds, crop pests, or diseases under these authorized or approved programs (Arizona State Legislature 2017).

Protection of Riparian Areas

State of Arizona Governor EO 91-6 recognizes that the protection and restoration of riparian areas are of critical importance to the state, encourage the development of practices that would enhance and restore degraded riparian areas, promote public awareness about riparian areas, and seek cooperation from regulatory and resource agencies to help in the protection and preservation of these areas (State of Arizona 1991).

E14.1.3 Local Ordinances

Pima County is the only local jurisdiction within the Study Area with ordinances protecting biological communities.

Pima County Native Plant Ordinance

The Pima County Native Plant Ordinance (Pima County Zoning Code Chapter 18.72) adopts comprehensive requirements for the preservation-in-place, transplanting on-site, and mitigation of protected native plants and native plant communities. The ordinance provides requirements and regulations for the preparation and implementation of preservation plans (Pima County 2017).

In June 1998 Pima County adopted by resolution the *Native Plant Preservation Manual* (Pima County 1998). The purpose of the Manual is to provide standards and procedures for implementing the requirements of the Pima County Native Plant Ordinance.

Pima County's Sonoran Desert Conservation Plan

Following the 1997 listing of the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) as a federally endangered species, the Pima County Board of Supervisors initiated the *Sonoran Desert Conservation Plan* to satisfy the need for a multi-species conservation plan, which was required for an ESA Section 10 Permit to be issued. The purpose of the *Sonoran Desert Conservation Plan* was to develop a regional plan to address the long-term conservation and preservation of the County's natural and cultural resources (Pima County 2016b).

The multi-species conservation plan represents the culmination of many years of planning and studies in the development of the biological element of the *Sonoran Desert Conservation Plan*. That work effort was guided by the *Sonoran Desert Conservation Plan* biological goal, as established by the Science Technical Advisory Team. In 2001, the Pima County Board of Supervisors adopted the *Pima County Comprehensive Land Use Plan Update* (Pima County 2001), which incorporated land use concepts, policies, and principles of conservation that were identified in the *draft Preliminary Sonoran Desert Conservation Plan* (Pima County 2000). Other milestones in the development of the *Sonoran Desert Conservation Plan* include defining land-protection priorities, securing funds for land acquisitions, acquiring and managing new preserves, and revising and updating County regulations. In 2016, USFWS approved the *Sonoran Desert Conservation Plan* and issued Pima County an ESA Section 10 Permit, allowing the County to move forward with development activities in full compliance with ESA in exchange for implementing the conservation commitments outlined in the *Sonoran Desert Conservation Plan*. These commitments include implementing various Pima County conservation ordinances and policies, and conserving in perpetuity lands acquired to serve as mitigation for the *Sonoran Desert Conservation Plan*.

Pima County Maeveen Marie Behan Conservation Lands System

Pima County's Conservation Lands System, which was developed with the assistance of the Bureau of Reclamation and USFWS among other agencies, scientists, and land managers, is a key element of the *Sonoran Desert Conservation Plan* and serves as a foundation for the federally approved multi-species conservation plan. The Conservation Lands System is specifically designed to preserve the contiguity of habitat at the landscape level and retain the connectivity of natural open space reserves with functional wildlife corridors. The Conservation Lands System identifies, maps, and establishes landscape-level conservation goals for areas where priority biological resources occur within Pima County. The Conservation Lands System has been formally adopted as part of each County Comprehensive Land Use Plan update since 2001.

Pima County Floodplain and Erosion Hazard Management Ordinance 2010

Chapter 16.30 of this ordinance, Watercourse and Riparian Habitat Protection and Mitigation Requirements, specifies avoidance and mitigation criteria for habitat included on the riparian classification maps adopted by the Pima County Board of Supervisors. Justification for non-avoidance of this habitat is required when disturbance is proposed. This ordinance outlines the process for developing property containing riparian habitat, provides guidance for mitigating impacts, and requires mitigation for disturbance to riparian habitat that exceeds 1/3 acre. This ordinance protects riparian habitat and ensures the long-term stability of natural floodplains, which allows the survival of plants and animals native to Pima County.

City of Tucson Habitat Conservation Plan

The *City of Tucson Habitat Conservation Plan* addresses proposed development activities in three City of Tucson planning sub-areas: Southlands, Avra Valley, and Santa Cruz River (City of Tucson 2018). Species proposed for coverage by the *City of Tucson Habitat Conservation Plan* include eight species: cactus ferruginous pygmy-owl, Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*), western burrowing owl (*Athene cunicularia hypugaea*), Tucson shovel-nosed snake (*Chionactis occipitalis klauberi*), ground snake (valley form) (*Sonora semiannulata*), needle-spined pineapple cactus (*Echinomastus erectocentrus* var. *erectocentrus*), pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*), and western yellow-billed cuckoo (*Coccyzus americanus occidentalis*).

City of Tucson Avra Valley Habitat Conservation Plan

The City of Tucson owns over 21,000 acres of land west of the City limits in the Avra Valley area of Pima County. These former farmlands were purchased in the 1970s and 1980s to secure the water rights, preserve groundwater for urban use, and allow for the future development of water infrastructure supply projects. Since purchased, some of the formerly cleared lands have recovered to a more naturally vegetated state and now support native plants and animals, including some federally recognized species. The City of Tucson and USFWS began working on the *Avra Valley Habitat Conservation Plan* in 2004 and the final draft plan was submitted to USFWS in 2014 (City of Tucson 2014a, 2014b). Species proposed for coverage by the *Avra Valley Habitat Conservation Plan* include seven species: lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), pale Townsend's big-eared bat, western yellow-billed cuckoo, cactus ferruginous pygmy-owl, western burrowing owl, Sonoran desert tortoise (*Gopherus morafkai*), and Tucson shovel-nosed snake.

E14.2 Methodology

Biological resources are described at a landscape-level (i.e., large-scale) within the Study Area as defined during the Alternative Selection Report of the I-11 study. Regional vegetation communities, Large Intact Blocks, and riparian areas were identified using available literature and digital spatial data, much of which was provided by AGFD. Specific wildlife data also provided by AGFD is used in analyzing potential impacts to wildlife and their habitat. This section identifies and considers Project effects on general wildlife, special status species, special management areas, and Habitat Conservation Plans within the Study Area. The Study Area encompasses a number of the wildlife linkages identified in the Arizona's Wildlife Linkages Working Group (AWLWG) Assessment (2006a) and from later wildlife corridor identification.

E14.2.1 Biotic Communities (Vegetation and Wildlife)

Potential environmental consequences on biotic communities are evaluated for each alternative. Regional vegetation communities, Large Intact Blocks, riparian areas, and site-specific dominant vegetation are identified using available literature and aerial photography. The evaluation calculated the acreage of each biotic community within each Build Corridor Alternative and considered what percentage of the Study Area was represented within the corridor that could be impacted, to determine whether implementation within any one of the corridors would be disproportionately affected.

The potential for the spread of invasive and noxious plant species will be considered. Invasive species and noxious weeds have been previously introduced within some natural systems within the Study Area that have choked out native species in some areas and further limit the native habitat available to wildlife populations. The Arizona Department of Transportation (ADOT) maintains a list of invasive and noxious species (ADOT 2010). Potential mitigation strategies or measures are provided as examples for further consideration in the Tier 2 analysis. The examples of mitigation measures for ecological resources reflect ideas provided through cooperating agencies.

E14.2.2 Special Status Species

Special status species, which include plant and animal species that have received special designation by federal, state, or local government agencies, are analyzed to identify potential impacts.

Special status species include:

- Species Protected under ESA
- Other federally protected species
- Arizona Species of Greatest Conservation Need and Protected Native Plants

County occurrence and specific locality occurrence data within the Study Area are presented. Available literature, aerial photography, and other data also are reviewed to determine the presence of suitable habitat for potentially occurring ESA-listed species. AGFD provided a species list in their initial scoping comments related to the development of the I-11 Tier 1 EIS *Alternatives Selection Report* (ADOT 2017g). The data are a list of species retrieved from the AGFD Heritage Data Management System (HDMS) Environmental Review On-Line Tool identifying the species listed under the ESA that may occur within the Study Area or within 3 miles of the Study Area boundary.

The identification of critical habitat is based on designated critical habitat as established by USFWS. Other important habitats have been determined based upon literature review and coordination with AGFD, USFWS, BLM, US Forest Service (USFS), and other pertinent organizations and agencies.

Potential effects on species, designated critical habitats, or specified habitat requirements are evaluated by determining whether suitable habitat exists within the Study Area. Effects on ESA-listed species are based on the potential for each species' habitat to be physically disturbed or the quality of that habitat affected by presence of the facility. Because there are hundreds of bird species in Arizona, the discussion of bird species protected under the MBTA is more qualitative

than the discussion for ESA-listed species. Potential mitigation strategies or measures are provided as examples for further consideration in Tier 2 analysis. These examples of mitigation measures for special status species reflect ideas provided by cooperating agencies.

E14.2.3 Wildlife Connectivity

This section identifies major wildlife corridors within the Study Area, using data from the AWLWG as well as through coordination with AGFD, other federal and state agencies, local jurisdictions, and conservation organizations. This information, along with the evaluations related to vegetation, wildlife, and wildlife habitat, is used to evaluate the potential impacts of the Build Corridor Alternatives on wildlife movement and connectivity. Potential mitigation strategies or measures are provided as examples for further consideration in Tier 2 analysis. These examples of mitigation measures for wildlife connectivity reflect ideas provided through cooperating agencies.

E14.3 Affected Environment

E14.3.1 Biotic Communities (Vegetation and Wildlife)

Biotic communities are characterized by distinct assemblages of plants and animals that are characteristic of the surrounding soils, geology, climate, and other environmental conditions that interact to develop their distinctiveness from other communities within a region. The Study Area crosses six major biotic communities. In addition to these major biotic communities, the Build Corridor Alternatives cross several local ecological communities and/or special conservation areas, such as riparian areas and designated Important Bird Areas (Audubon Arizona 2017), which provide important habitat for birds and wildlife.

Several of the biotic communities are common to multiple Project sections (South, Central, and North). The description of the biotic communities is arranged by section from south to north. A relatively detailed description of a biotic community is provided within the first section in which it occurs.

Table E14-1 summarizes climatological data for representative cities or towns within each of the biotic communities.

South Section

The South Section encompasses five different biotic communities:

- Semidesert Grassland
- Madrean Evergreen Woodland
- Sonoran Desertscrub Lower Colorado River Valley Subdivision (Lower Colorado River Desertscrub)
- Sonoran Desertscrub Arizona Upland Subdivision (Arizona Upland Sonoran Desertscrub)
- Interior Chaparral

Of the five biotic communities within the South Section of the Study Area, Semidesert Grassland, Arizona Upland Sonoran Desertscrub, and Lower Colorado River Desertscrub are crossed by one or more of the Build Corridor Alternatives (**Figure E14-1**) (Brown 1994).

Table E14-1. Climatological Data for Representative Locations within or Adjacent to the Study Area

City/Biotic Community	Ave High Temp	Hottest Month/Ave High Temp	Ave Low Temp	Coldest Month/Ave Low Temp	Ave Annual Precipitation	Wettest Month/Inches	Driest Month/Inches
Nogales/Semidesert Grassland	80.3	June/96	43.5	January and December/28	18.11	August/4.45	May/0.28
Santa Rita Experimental Range (Santa Rita Mountains southeast of Green Valley – Madrean Evergreen Woodlands)	76.4	June/92.9	51.9	January/37.7	22.18	July/4.87	May/0.24
Green Valley/Arizona Upland Sonoran Desertscrub (on edge of Semidesert Grassland)	83.0	June and July/99	54.0	January and December/37	14.13	August/2.95	May/0.24
Tucson/Arizona Upland Sonoran Desertscrub	83.7	July/101	58.1	January and December/42	11.92	August/2.24	May/0.20
Eloy/Lower Colorado River Desertscrub	87.7	July/106	53.6	January and December/36	10.62	August/1.65	June/0.16
Gila Bend/Lower Colorado River Desertscrub	89.5	July/109	58.4	December/40	7.01	August/1.22	June/0.00
Buckeye/Lower Colorado River Desertscrub	88.3	July/108	53.3	December/36	7.89	August/1.22	June/0.08
Morristown/Arizona Upland Sonoran Desertscrub	83.8	July/102	57.3	January and December/42	15.05	August/2.36	June/0.12
Wickenburg/Arizona Upland Sonoran Desertscrub	82.8	July/102	49.0	December/32	12.14	August/2.13	June/0.12

SOURCES: Western Regional Climate Center 2016 (Santa Rita Experimental Range); YourWeatherService.com 2017.

NOTE: Temperatures in ºF and precipitation in inches. Abbreviations in table: Ave = Average, Temp = Temperature.

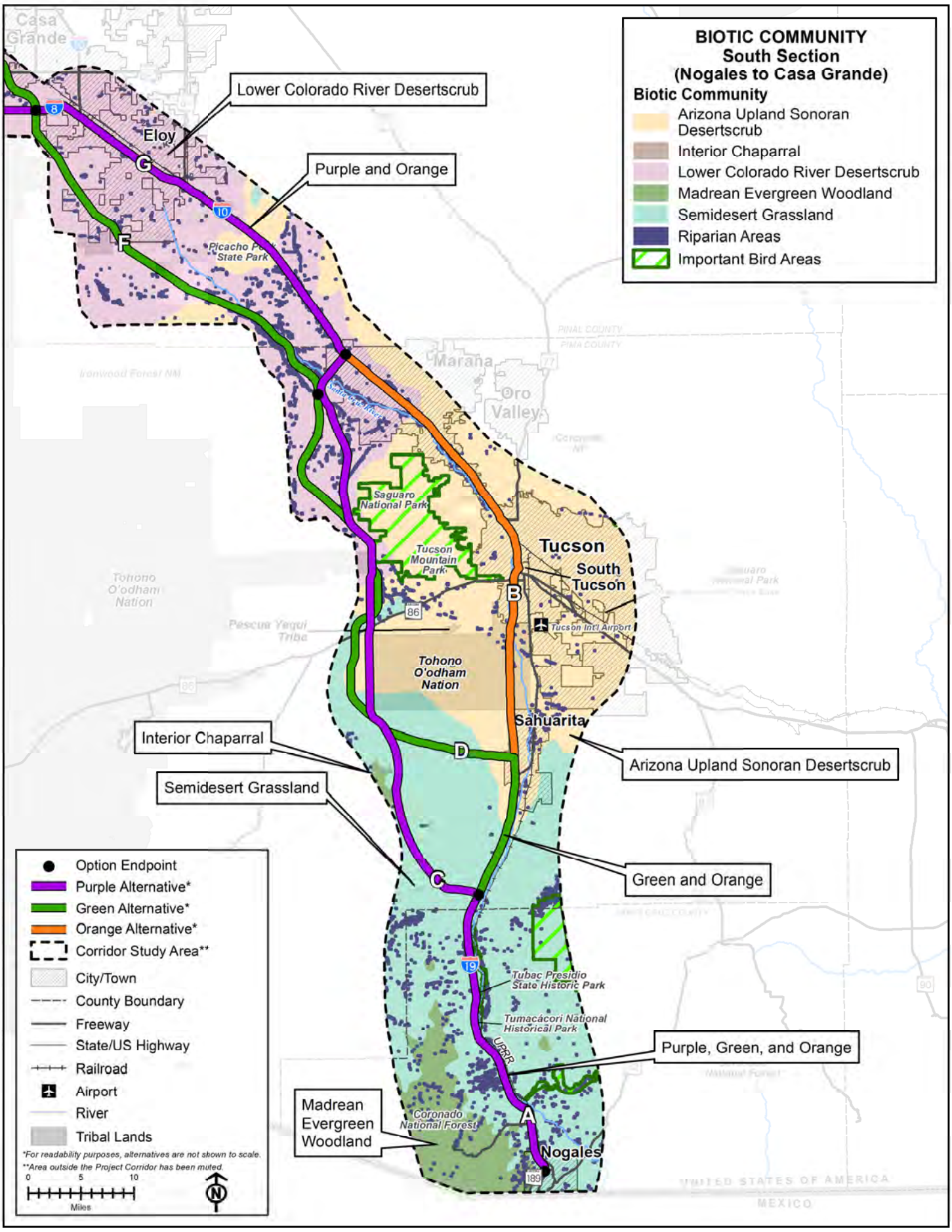

Figure E14-1. Biotic Communities – South Section

Semidesert Grassland (South Section)

Semidesert Grassland (**Figure E14-2**) occurs throughout southeastern Arizona, southwestern New Mexico, northeastern Sonora, and northwestern Chihuahua at elevations ranging from 3,600 to 5,600 feet above mean sea level. These grasslands are mostly bounded by Chihuahuan desert at the lowest elevations and Madrean Evergreen Woodland or plains grassland at the higher elevations. Within the South Section the Semidesert Grasslands abut Arizona Upland Sonoran Desertscrub. Winter temperatures are relatively mild with freezing temperatures occurring less than 100 days out of the year. Summers are warm to hot with several days over 100 degrees Fahrenheit (°F) (Brown 1994).

Figure E14-2. Semidesert Grassland on I-19 One-quarter Mile South of State Route 189 (SR 189) in Nogales

This community is unique in that it has become largely extirpated within the state with only severely degraded fragments remaining (AGFD 2012a). The Semidesert Grassland biotic community encompasses approximately 31.6 percent of the South Section, or 430,718 acres, and approximately 16.1 percent (435,029 acres) of the entire Study Area (**Table E14-2**).

1

Table E14-2. Biotic Communities within the Study Area

Biotic Community	South Section		Central Section		North Section		Overall	
	Acres	% Total Area	Acres	% Total Area	Acres	% Total Area	Acres	% Total Area
Lower Colorado River Desertscrub	387,235	28.4	640,498	80.2	230,621	42.8	1,258,350	46.6
Arizona Upland Sonoran Desertscrub	472,095	34.6	157,856	19.8	301,608	56.0	931,560	34.5
Semidesert Grassland	430,718	31.6	0	0.0	4,311	<1	435,029	16.1
Interior Chaparral	222	<0.1	0	0.0	0	0.0	222	<0.1
Madrean Evergreen Woodland	72,657	5.3	0	0.0	0	0.0	72,657	2.7
Mohave Desertscrub	0	0.0	0	0.0	2,301	<1	2,301	<0.1
Total	**1,362,927**	**100**	**798,354**	**100**	**538,841**	**100**	**2,700,119**	**100**
Riparian								
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	123	0.01	0	0.0	0	0.0	123	<0.01
North American Warm Desert Riparian Woodland and Shrubland	2,372	0.17	4,593	0.57	447	0.08	7,411	0.27

Biotic Community	South Section		Central Section		North Section		Overall	
	Acres	% Total Area	Acres	% Total Area	Acres	% Total Area	Acres	% Total Area
North American Arid West Emergent Marsh	121	0.01	0	0.0	0	0.0	121	<0.01
North American Warm Desert Riparian Mesquite Bosque	8,341	0.61	2,527	0.31	843	0.16	11,711	0.43
North American Warm Desert Wash	82	0.01	1	<0.01	1	<0.01	83	<0.01
Invasive Southwest Riparian Woodland and Shrubland	93	0.01	3,521	0.44	1	<0.01	3,615	0.13
Open Water	596	0.04	632	0.08	20	<0.01	1,248	0.05
Total Riparian	**11,727**	**0.86**	**11,273**	**1.4**	**1,312**	**0.24**	**24,312**	**0.9**

SOURCES: Surface area values based on a digital map of the biotic communities of Arizona based on Brown and Lowe's (1979) descriptions (Nature Conservancy in Arizona 2004) and of the distribution of the different types of riparian areas in Arizona (US Geological Survey [USGS] 2004).

Most often found in low valleys and on rolling hills, this community was originally dominated by perennial bunch grasses. As a result of over-grazing and drought, Semidesert Grasslands now mostly consist of a mix of grasses with a wide variety of shrub, tree, cactus species, and non-native grasses. Tobosa grass (*Pleuraphis mutica*) and black grama (*Bouteloua eriopoda*) are the most dominant grasses in Semidesert Grassland; other grasses include slender grama (*B. repens*), spruce top grama (*B. chondrosioides*), several species of three-awn (*Aristida* spp.), and bush muhly (*Muhlenbergia porteri*). The predominant shrubs include mesquite (*Prosopis* spp.), broom snakeweed (*Gutierrezia sarothrae*), burroweed (*Ambrosia dumosa*), creosote bush (*Larrea tridentata*), and catclaw acacia (*Acacia greggii*). Except for mesquite and one-seed juniper (*Juniperus monosperma*), trees are uncommon and usually restricted to drainages. Other characteristic plant species include sotol (*Dasylirion texanum*), beargrass (*Nolina microcarpa*), agaves (*Agave* spp.), yuccas (*Yucca* spp.), and cacti, such as the barrel cactus (*Echinocactus* spp. and *Ferocactus* spp.), cane cholla (*Cylindropuntia spinosior*), and hedgehog cactus (*Echinocereus* spp.) (Brown 1994).

Within the Study Area, Semidesert Grasslands probably have the greatest diversity of wildlife primarily due to the somewhat larger amount of precipitation the biotic community receives. Semidesert grasslands support many of the species from adjoining scrub and desert biotic communities (Brown 1994). Wildlife occurs in and uses every habitat type in the state and often relies on variability within and among habitat types to survive (AGFD 2012a).

Table E14-3 provides a list of the plant and animal species commonly associated with the Semidesert Grassland biotic community.

Table E14-3. Wildlife Species Commonly Associated with Semidesert Grasslands

Class	Common Name	Scientific Name
Mammals	Badger	*Taxidea taxus*
	Banner-tailed kangaroo rat	*Dipodomys spectabilis*
	Black-tailed jackrabbit	*Lepus californicus*
	Coyote	*Canis latrans*
	Desert bighorn sheep	*Ovis canadensis nelsoni*
	Hispid cotton rat	*Sigmodon hispidus*
	Hispid pocket mouse	*Perognathus hispidus*
	Javelina	*Pecari tajacu*
	Merriam's kangaroo rat	*Dipodomys merriami*
	Mule deer	*Odocoileus hemionus*
	Ord's kangaroo rat	*Dipodomys ordii*
	Southern grasshopper mouse	*Onychomys rorndus*
	Spotted ground squirrel	*Xerospermophilus spilosoma*
	Tawny-bellied cotton rat	*Sigmodon fulviventer*
	White-footed mouse	*Peromyscus leucopus*
	White-tailed deer	*Odocoileus virginianus*
	Wood rat	*Neotoma* spp.

Class	Common Name	Scientific Name
Birds	American kestrel	*Falco sparverius*
	Ash-throated flycatcher	*Myiarchus cinerascens*
	Barn swallow	*Hirundo rustica*
	Black-tailed gnatcatcher	*Polioptila melanura*
	Black-throated sparrow	*Amphispiza bilineata*
	Brown-headed cowbird	*Molothrus ater*
	Burrowing owl	*Athene cunicularia*
	Cactus wren	*Campylorhynchus brunneicapillus*
	Cassin's sparrow	*Aimophila cassinii*
	Common poorwill	*Phalaenoptilus nuttallii*
	Curve-billed thrasher	*Toxostoma curvirostre*
	Eastern meadowlark	*Sturnella magna*
	Gambel's quail	*Callipepla gambelii*
	Horned lark	*Eremophila alpestris*
	House finch	*Carpodacus mexicanus*
	Ladder-backed woodpecker	*Picoides scalaris*
	Lark sparrow	*Chondestes grammacus*
	Loggerhead shrike	*Lanius ludovicianus*
	Mockingbird	*Mirnus polyglottos*
	Mourning dove	*Zenaida rnacroura*
	Prairie falcon	*Falco mexicanus*
	Roadrunner	*Geococcyx californianus*
	Say’s phoebe	*Sayornis saya*
	Scaled quail	*Callipepla squamata*
	Scott's oriole	*Icterus parisorum*
	Swainson's hawk	*Buteo swainsoni*
	Verdin	*Auriparus flaviceps*
	Western kingbird	*Tyrannus verticalis*
	Western meadowlark	*Sturnella neglecta*
	Chihuahuan raven	*Corvus cryptoleucus*
Reptiles	Arizona striped whiptail	*Aspidoscelis arizonae*
	Chihuahuan hooknose snake	*Gyalopion canum*
	Desert grassland whiptail	*Aspidoscelis uniparens*
	Checkered gartersnake	*Thamnophis marcianus*
	Great Plains skink	*Plestiodon obsoletus*
	Mexican hog-nose snake	*Heterodon kennerlyi*
	Milksnake	*Lampropeltis triangulum*
	Southwestern earless lizard	*Sceloporus cowlesi*
	Southwestern fence lizard	*Cophosaurus texanus scitulus*
	Texas horned lizard	*Phrynosoma cornutum*
	Western green toad	*Anaxyrus debilis insidior*
	Western hog-nose snake	*Heterodon nasicus*
	Western hooknose snake	*Gyalopion canum*
	Western yellow box turtle	*Terrapene ornata luteola*

Class	Common Name	Scientific Name
Amphibians	Couch's spadefoot	*Scaphiopus couchii*
	Mexican spadefoot	*Spea multiplicata*
	Western green toad	*Anaxyrus debilis insidior*

SOURCES: Brennan and Holycross 2006; Brown 1994.

Madrean Evergreen Woodlands (South Section)

This mild winter, wet summer, woodland reaches northward from Mexico to the mountains of southeastern Arizona, north-westward to Yavapai County, southwestern New Mexico, and Trans-Pecos Texas. Madrean Evergreen Woodlands are typically found on low mountains and hills at elevations ranging from 5,000 to 7,000 feet above mean sea level. At its lower elevations the woodland is typically open-sometimes very open. The trees are generally evergreen oaks (*Quercus* spp.) (from 18 to 50 feet or more in height), junipers, and Mexican pinyon (*Pinus cembroides*) in unequal proportions (Brown 1994).

The Madrean Evergreen Woodland community encompasses approximately 5.3 percent of the South Section, or 72,657 acres, and approximately 2.7 percent (72,657 acres) of the entire Study Area (**Table E14-2**).

In the mountainous regions of Arizona, such as the Santa Rita, Tumacácori, and Sierrita Mountains, the most prevalent oaks are Emory oak (*Quercus emoryi*), Arizona white oak (*Q. arizonica*), and Mexican blue oak (*Q. oblongifolia*). Silverleaf oak (*Q. hypoleucoides*) and netleaf oak (*Q. rugosa*) are the characteristic oaks of the restricted oak·pine zone in southeastern Arizona and extreme southwestern New Mexico (Brown 1994).

The more prevalent grass species in this “savanna” zone include bunchgrasses such as *Muhlenbergia* spp., woolspike (*Elyonurus barbiculmis*), and cane bluestem (*Bothriochloa barbinodis*); and at lower elevations includes grassland species such as wolftail (*Lycurus phleoides*), little bluestem (*Schizachyrium scoparium*), plains lovegrass (*Eragrostis intermedia*), blue grama (*Bouteloua gracilis*), sideoats grama (*B. curtipendula*), hairy grama (*B. hirsuta*), tanglehead (*Heteropogon contortus*), and green sprangletop (*Leptochloa dubial*). Herbaceous weeds, shrubs, and forbs such as penstemons (*Penstemon* spp.), lupines (*Lupinus* spp.), bricklebushes (*Brickellia* spp.), sages (*Salvia* spp.), indigobushes (*Dalea* spp.), buckwheats (*Eriogonum* spp.), Louisiana sagebrush (*Artemesia ludoviciana*), flatsedges (*Cyperus* spp.), rose-mallows (*Hibiscus* spp.), and woodsorrels (*Oxalis* spp.) and others are relatively common (Brown 1994).

Many of the cacti and leaf succulents of the semidesert grassland extend well up into the Madrean Evergreen Woodland habitats. These include the spiny hedgehog cactus (*Echinocereus dasyacanthus*), barrel cactus, cane cholla, Engelmann prickly pear (*Opuntia engelmannii*), purple prickly pear (*O. Gosseliniana*), Schott yucca (*Yucca schottii*), Thornber yucca (*Y. baccata* var. *thornberi*), Palmer agave (*Agave palmeri*), Parry agave (*A. parryi*), and beargrass (*Nolina microcarpa*). Several cacti such as the cream cactus (*Mammillaria gummifera*), the pin-cushion (*Mammillaria orestera*), the hedgehogs (*Echinocereus triglochidiatus* and *E. ledingii*) and the Santa Cruz beehive cactus (*Coryphantha recurvata*), are largely centered in this biotic community.

Average annual precipitation for stations in the southwestern US within this biotic community is between 17.9 inches and 24.7 inches (Brown 1994), with annual precipitation for this biotic

community within the Study Area approximately 22 inches (**Table E14-1**). Summer (June, July, and August) rainfall accounts for approximately 44 percent of the annual total.

Madrean Evergreen Woodland is the principal biotic community for the white-tailed deer (*Odocoileus virginianus*) in the southwest, and its oak-pine zone is a major habitat-type for the coati (*Nasua narica*). The biotic community also has a rich assortment of bird species.

Table E14-4 provides a more comprehensive list of the plant and animal species commonly associated with the Madrean Evergreen Woodland biotic community.

Sonoran Desertscrub Arizona Upland Subdivision (South Section)

The Sonoran Desertscrub Arizona Upland Subdivision (Arizona Upland Sonoran Desertscrub) (**Figure E14-3**) is located in south-central Arizona and northern Sonora, Mexico (**Table E14-3**). This community contains numerous mountain ranges and valleys that are narrower than those of the Lower Colorado River Valley subdivision. Typically found on low mountains, hills, and bajadas at elevations ranging from 980 to 3,500 feet above mean sea level, this community occurs in the highest and coldest portion of the Sonoran Desert. This cactus-rich community includes saguaro (*Carnegiea gigantea*), chain-fruit cholla (*Cylindropuntia fulgida*), cane cholla, staghorn cholla (*C. versicolor*), pencil cholla (*C. ramosissima*), organ pipe (*Stenocereus thurberi*), senita (*Pachycereus schottii*), night-blooming cereus (*Peniocereus greggii*), pincushion cactus (*Mammillaria* spp.), California barrel cactus (*Ferocactus cylindraceus*), and Emory's barrel cactus (*F. emoryi*). Trees are common on rocky slopes as well as drainages, and saguaros (*Carnegiea gigantea*) are found everywhere but on the valley floors. Dominant trees include yellow palo verde (*Parkinsonia microphylla*), blue palo verde (*P. florida*), ironwood (*Olneya tesota*), and mesquite. Common shrubs include catclaw acacia, brittlebush (*Encelia farinosa*), and triangle-leaf bursage (*Ambrosia deltoidea*). Invasive non-native grasses now occur in much of the landscape (Brown 1994).

Average annual precipitation for weather stations in this subdivision lies mainly between 7.8 inches and 16 inches (Brown 1994), with annual precipitation for this biotic community within the Study Area around 11 to 14 inches (**Table E14-1**). Summer (June, July, and August) rainfall accounts for 30 to 60 percent of the annual total with smaller proportions to the north and larger to the south.

Some habitats in the Arizona Upland Sonoran Desertscrub support moderate densities of mule deer (*Odocoileus hemionous*) and javelina. Numerous smaller mammals reside within this biotic community, including the California leaf-nosed bat (*Macrotus californicus*), California myotis (*Myotis californicus*), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), Arizona pocket mouse (*Perognathus amplus*), Bailey's pocket mouse (*Chaetodipus baileyi*), cactus mouse (*Peromyscus eremicus*), white-throated woodrat (*Neotoma albigula*), gray fox (*Urocyon cinereoargenteus*), and Harris' antelope squirrel (*Ammospermophilus harrisii*).

Areas of the Arizona Upland Sonoran Desertscrub also support rich birdlife populations. Common species include the Harris' hawk (*Parabuteo unicinctus*), white-winged dove (*Zenaida asiatica*), Inca dove (*Columbina inca*), elf owl (*Micrathene whitneyi*), brown-crested flycatcher (*Myiarchus tyrannulus*), and pyrrhuloxia (*Cardinalis sinuatus*).

Figure E14-3. Arizona Upland Sonoran Desertscrub on West Gates Pass Road at Tucson Estates Trail

Table E14-4. Wildlife Species Commonly Associated with Madrean Evergreen Woodlands

Class	Common Name	Scientific Name
Mammals	Bailey's pocket mouse	*Chaetodipus baileyi*
	Coati	*Nasua narica*
	Eastern cottontail	*Sylvilagus floridanus*
	Mexican fox squirrel	*Sciurus nayaritensis*
	Southern pocket gopher	*Thomomys umbrinus*
	White-tailed deer	*Odocoileus virginianus*
	Yellow-nosed cotton rat	*Sigmodon ochrognathus*
Birds	Acorn woodpecker	*Melanerpes formicivorus*
	Arizona woodpecker	*Picoides arizonae*
	Black-throated gray warbler	*Setophaga nigrescens*
	Bridled titmouse	*Baeolophus wollweberi*
	Buff-breasted flycatcher	*Empidonax fulvifrons*
	Bushtit	*Psaltriparus minimus*
	Hutton's vireo	*Vireo huttoni*
	Montezuma quail	*Cyrtonyx montezumae*
	Western bluebird	*Sialia mexicana*
	Whiskered screech-owl	*Megascops trichopsis*
	Woodhouse's scrub jay	*Aphelocoma woodhouseii*
Reptiles	Arizona black rattlesnake	*Crotalus cerberus*
	Black-tailed rattlesnake	*Crotalus molossus*
	Brown vinesnake	*Oxybelis aeneus*
	Canyon spotted whiptail	*Aspidoscelis burti*
	Chihuahan spotted whiptail	*Cnemidophorus exsanguis*
	Greater short-horned lizard	*Phrynosoma hernandesi*
	Green ratsnake	*Senticolis triaspis*
	Madrean alligator lizard	*Elgaria kingii*
	Mountain skink	*Plestiodon callicephalus*
	Rock rattlesnake	*Crotalus lepidus*
	Sonoran mountain kingsnake	*Lampropeltis pyromelana*
	Sonoran spotted whiptail	*Aspidoscelis sonorae*
	Sonoran whipsnake	*Coluber bilineatus*
	Striped plateau lizard	*Sceloporus virgatus*
	Yarrow's spiny lizard	*Sceloporus jarrovii*
Amphibians	Arizona treefrog	*Hyla wrightorum*
	Barking frog	*Craugastor augusti*
	Canyon treefrog	*Hyla arenicolor*
	Lowland leopard frog	*Lithobates yavapaiensis*
	Tarahumara frog	*Rana tarahumarae*

SOURCES: Brennan and Holycross 2006; Brown 1994.

In addition to having a generous complement of Sonoran and other desert reptiles, this subdivision also is the distribution center for a number of lizard species and snakes more limited in range. These include the regal horned lizard (*Phrynosoma solare*), western whiptail (*Aspidoscelis tigris*), Gila monster (*Heloderma suspectum*), Arizona glossy snake (*Arizona elegans*), Arizona coral snake (*Micruroides euryxanthus*), and tiger rattlesnake (*Crotalus tigris*).

Table E14-5 provides a more comprehensive list of the plant and animal species commonly associated with the Arizona Upland Sonoran Desertscrub biotic community. The Arizona Upland Sonoran Desertscrub biotic community encompasses approximately 34.6 percent of the southern section of the Study Area, or 472,095 acres, and approximately 34.5 percent (931,560 acres) of the entire Study Area. This community is unique in that it has become largely extirpated within the state with only severely degraded fragments remaining (AGFD 2012a). The Semidesert Grassland biotic community encompasses approximately 31.6 percent of the South Section, or 430,718 acres, and approximately 16.1 percent (435,029 acres) of the entire Study Area (**Table E14-2**).

Table E14-5. Wildlife Species Commonly Associated with the Arizona Upland Sonoran Desertscrub

Class	Common Name	Scientific Name
Mammals	Arizona pocket mouse	*Perognathus amplus*
	Bailey's pocket mouse	*Chaetodipus baileyi*
	Black-tailed jackrabbit	*Lepus californicus*
	Cactus mouse	*Peromyscus eremicus*
	California leaf-nosed bat	*Macrotus californicus*
	California myotis	*Myotis californicus*
	Desert cottontail	*Sylvilagus audubonii*
	Gray fox	*Urocyon cinereoargenteus*
	Harris's antelope squirrel	*Ammospermophilus harrisii*
	Javelina	*Pecari tajacu*
	Mule deer	*Odocoileus hemionous*
	White-throated woodrat	*Neotoma albigula*

Class	Common Name	Scientific Name
Birds	Black-tailed gnatcatcher	*Polioptila melanura*
	Brown-crested flycatcher	*Myiarchus tyrannulus*
	Cactus wren	*Campylorhynchus brunneicapillus*
	Curve-billed thrasher	*Toxostoma curvirostre*
	Elf owl	*Micrathene whitneyi*
	Gambel's quail	*Lophortyx gambelii*
	Gila woodpecker	*Melanerpes uropygialis*
	Gilded flicker	*Colaptes chrysoides*
	Greater roadrunner	*Geococcyx californianus*
	Harris's hawk	*Parabuteo unicinctus*
	Inca dove	*Columbina inca*
	Ladder-backed woodpecker	*Picoides scalaris*
	Phainopepla	*Phainopepla nitens*
	Pyrrhuloxia	*Cardinalis sinuatus*
	Verdin	*Auriparus flaviceps*
	White-winged dove	*Zenaida asiatica*
Reptiles	Arizona coral snake	*Micruroides euryxanthus*
	Arizona glossy snake	*Arizona elegans*
	Common chuckwalla	*Sauromalus ater*
	Ornate tree lizard	*Urosaurus ornatus*
	Gila monster	*Heloderma suspectum*
	Nightsnake	*Hypsiglena* spp.
	Regal horned lizard	*Phrynosoma solare*
	Rosy boa	*Lichanura trivirgata*
	Sonoran collared lizard	*Crotaphytus nebrius*
	Speckled rattlesnake	*Crotalus mitchellii*
	Tiger rattlesnake	*Crotalus tigris*
	Variable sandsnake	*Chilomeniscus stramineus*
	Western banded gecko	*Coleonyx variegatus*
	Western diamond-backed rattlesnake	*Crotalus atrox*
	Western lyresnake	*Trimorphodon lambda*
	Western patch-nosed snake	*Salvadora hexalepis*
	Western threadsnake	*Leptotyphlops humilis*
	Western (tiger) whiptail	*Aspidoscelis tigris*
Amphibians	Couch's spadefoot	*Scaphiopus couchii*
	Great plains toad	*Anaxyrus cognatus*
	Red-spotted toad	*Bufo punctatus*
	Sonoran Desert toad	*Incilius alvarius*

SOURCES: Brennan and Holycross 2006; Brown 1994.

Sonoran Desertscrub Lower Colorado River Valley Subdivision (South Section)

The Sonoran Desertscrub Lower Colorado River Valley Subdivision (Lower Colorado River Desertscrub) (**Figure E14-4**) encompasses an area surrounding the lower Colorado River and consists of flat valleys with widely scattered, small mountain ranges of almost barren rock. This biotic community consists of brushy flatlands transected by dry washes, at elevations ranging

from 80 to 1,300 feet above mean sea level (Brown 1994). Summer temperature highs may exceed 120°F, with surface temperatures approaching 180°F (Arizona-Sonora Desert Museum 2017b). Sandy substrates are common. A combination of low annual rainfall and high temperatures (**Table E14-1**) make this Arizona's driest biotic community. Plant growth is typically both open and simple, reflecting the intense competition existing between plants for the scarce water resource.

Figure E14-4. Lower Colorado River Desertscrub along I-8 13.5 miles East of Exit 119

The Lower Colorado River Desertscrub biotic community encompasses approximately 28.4 percent of the South Section of Study Area, or 387,235 acres, and approximately 46.6 percent (1,258,350 acres) of the entire Study Area. This community is unique in that it has become largely extirpated within the state with only severely degraded fragments remaining (AGFD 2012a). The Semidesert Grassland biotic community encompasses approximately 31.6 percent of the South Section, or 430,718 acres, and approximately 16.1 percent (435,029 acres) of the entire Study Area (**Table E14-2**).

Drainages in the Lower Colorado River Desertscrub assume two forms. In the drier parts of the desert, if relief is low, the channels conveying the infrequent flows are connected into a network of shallow rills that fail to provide through flow. The drainage pattern is dendritic and occurs in areas of greater rainfall and/or relief.

The dominant vegetation in this biotic community includes creosote bush, white bursage (*Ambrosia dumosa*), and desert saltbush (*Atriplex polycarpa*). Species commonly found along larger drainages include small trees, such as western honey mesquite (*Prosopis glandulosa* var. *torreyana*), ironwood, blue palo verde, and smoketree (*Psorothamnus spinosus*). These species, except smoketree, also are found both inside and outside the washes and are considered facultative wash species. Other species that are found almost entirely within wash habitats include smoketree desert willow (*Chilopsis linearis*), chuparosa (*Justicia californica*), desert honeysuckle (*Anisacanthus thurberi*), and canyon ragweed (*Ambrosia ambrosioides*). Shrub species that are found along minor water courses include catclaw acacia, burrobrush (*Ambrosia salsola* var. *pentalepis*), Anderson thornbush (*Lycium andersonii*), and desert broom (*Baccbaris sarothroides*) (Brown 1994).

Common cacti found predominantly in this subdivision are silver cholla (*Cylindropuntia echinocarpa*), diamond cholla (*C. ramosissima*), beavertail prickly pear (*C. basilaris*), teddy bear cholla (*C. bigelovii*), Kunze club cholla (*C. stanlyi* var. *kunzei*), common fishhook cactus (*Mammillaria tetrancistra*), gearstem cactus (*Peniocereus striatus*), night-blooming cereus, Engelmann hedgehog (*Echinocereus engelmannii*), and compass barrel cactus (*Ferocactus acanthodes*) (Brown 1994).

Two ungulates that have adapted to the Lower Colorado River Desertscrub are desert bighorn sheep (*Ovis canadensis nelsoni*), and Sonoran pronghorn (*Antilocapra americana sonoriensis*). Bighorn sheep favor open terrain that is rough, rocky, and steep. Sonoran pronghorn inhabits dry plains in southwestern Arizona and are found in broad alluvial valleys separated by mountain ranges and mesas. Otherwise, large mammals, including the coyote and introduced burro, are rare (Brown 1994).

Table E14-6 provides a list of the animal species commonly associated with the Lower Colorado River Desertscrub biotic community.

Table E14-6. Wildlife Species Commonly Associated with the Lower Colorado River Desertscrub

Class	Common Name	Scientific Name
Mammals	Coyote	*Canis latrans*
	Desert bighorn sheep	*Ovis canadensis nelsoni*
	Desert kangaroo rat	*Dipodomys deserti*
	Desert pocket mouse	*Chaetodipus penicillatus*
	Harris' antelope squirrel	*Ammospermophilus harrisii*
	Kit fox	*Vulpes macrotis*
	Merriam's kangaroo rat	*Dipodomys merriami*
	Round-tailed ground squirrel	*Xerospermophilus tereticaudus*
Birds	Black-tailed gnatcatcher	*Polioptila melanura*
	Black-throated sparrow	*Amphispiza bilineata*
	Common poorwill	*Phalaenoptilus nuttallii*
	Le Conte's thrasher	*Toxostoma lecontei*
	Lesser nighthawk	*Chordeiles acutipennis*
	Loggerhead shrike	*Lanius ludovicianus*
	Verdin	*Auriparus flaviceps*

Class	Common Name	Scientific Name
Reptiles	Common chuckwalla	*Sauromalus ater*
	Desert horned lizard	*Phrynosoma platyrhinos*
	Desert spiny lizard	*Sceloporus magister*
	Fringe-toed lizard	*Uma rufopunctata*
	Glossy snake	*Arizona elegans*
	Long-tailed brush lizard	*Urosaurus graciosus*
	Mohave rattlesnake	*Crotalus scutulatus*
	Sidewinder	*Crotalus cerastes*
	Tiger whiptail	*Aspidoscelis tigris*
	Variable sandsnake	*Chilomeniscus stramineus*
	Western shovel-nosed snake	*Chionactis occipitalis*
	Zebra-tailed lizard	*Callisaurus draconoides*
Amphibians	Couch's spadefoot	*Scaphiopus couchii*
	Lowland burrowing treefrog	*Smilisca fodiens*
	Sonoran Desert toad	*Incilius alvarius*
	Sonoran green toad	*Anaxyrus retiformis*

SOURCES: Brennan and Holycross 2006; Brown 1994.

Central Section

The Central Section encompasses two different biotic communities, the Lower Sonoran Desertscrub and the Arizona Upland Sonoran Desertscrub (**Figure E14-5**) (Brown 1994).

Sonoran Desertscrub Arizona Upland Subdivision (Central Section)

The Arizona Upland Sonoran Desertscrub biotic community encompasses approximately 19.8 percent of the Central Section of the Study Area, or 157,856 acres, and approximately 34.5 percent (931,560 acres) of the entire Study Area. This community is unique in that it has become largely extirpated within the state with only severely degraded fragments remaining (AGFD 2012a). The Semidesert Grassland biotic community encompasses approximately 31.6 percent of the South Section, or 430,718 acres, and approximately 16.1 percent (435,029 acres) of the entire Study Area (**Table E14-2**).

See page E14-19 for a description of the characteristics of the Arizona Upland Sonoran Desertscrub.

Sonoran Desertscrub Lower Colorado River Valley Subdivision (Central Section)

The Lower Colorado River Desertscrub biotic community encompasses approximately 80.2 percent of the Central Section, or 640,498 acres, and approximately 46.6 percent (1,258,350 acres) of the entire Study Area (**Table E14-2**). See page E14-23 for the characteristics of the Lower Colorado River Desertscrub.

North Section

The Study Area for the North Section encompasses four biotic communities, the Lower Sonoran Desertscrub, Arizona Upland Sonoran Desertscrub, Semidesert Grassland, and Mohave Desertscrub (**Figure E14-6**) (Brown 1994).

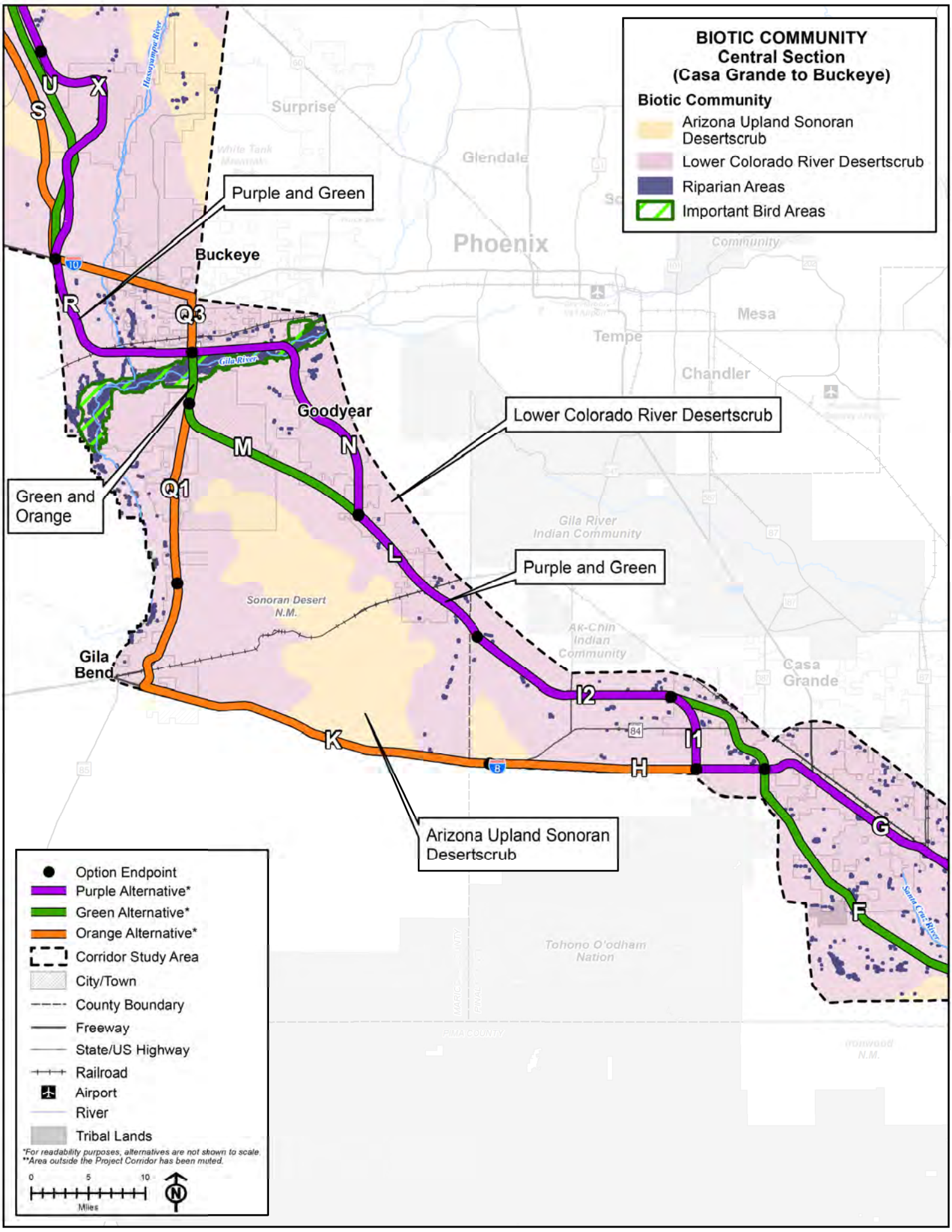

Figure E14-5. Biotic Communities – Central Section

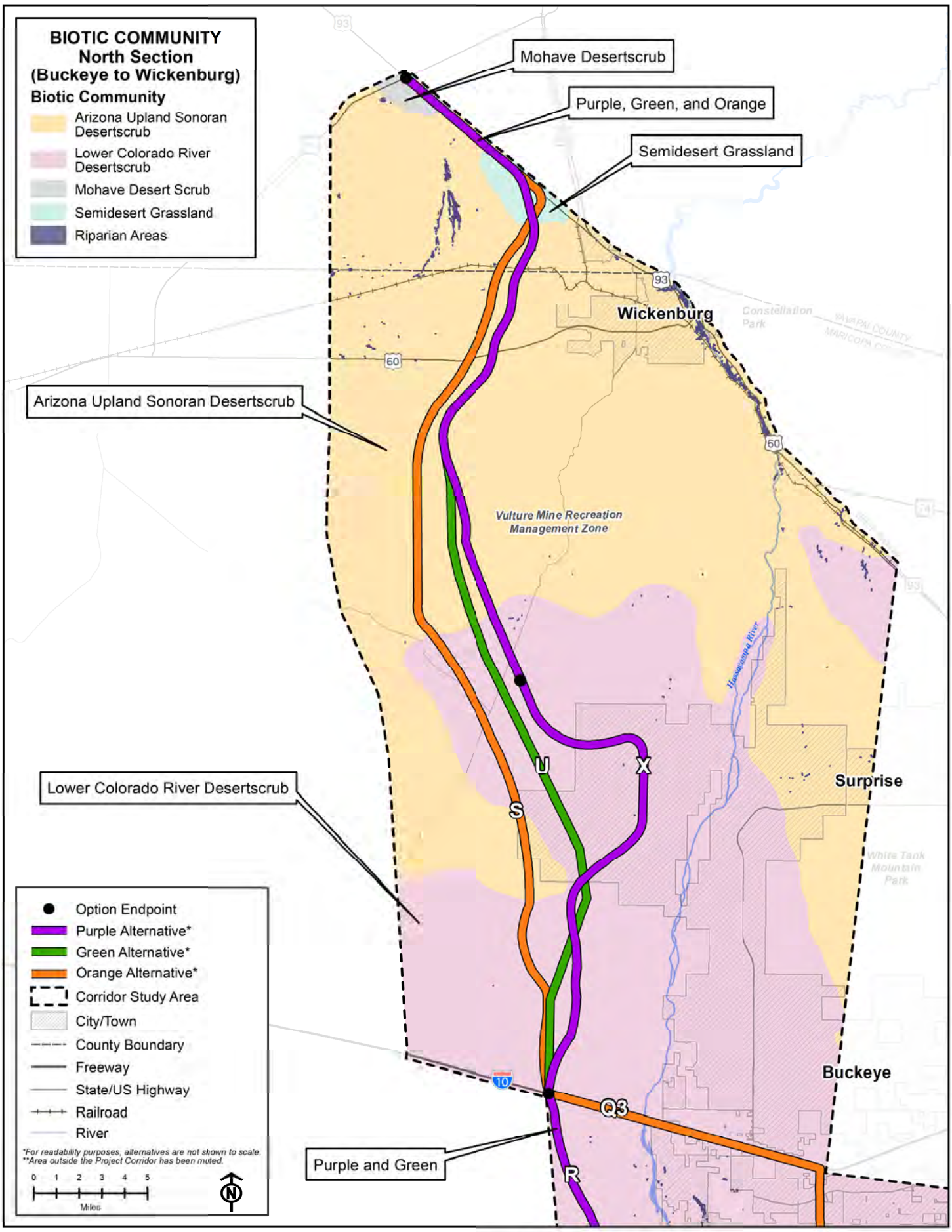

Figure E14-6. Biotic Communities – North Section

Semidesert Grassland (North Section)

The Semidesert Grassland biotic community encompasses less than 1 percent of the North Section, or 4,311 acres, and approximately 16.1 percent (435,029 acres) of the entire Study Area (**Table E14-2**). See page E14-13 for the characteristics of the Semidesert Grassland biotic community.

Sonoran Desertscrub Arizona Upland Subdivision (North Section)

The Arizona Upland Sononran Desertscrub biotic community encompasses approximately 56.0 percent of the North Section, or 301,608 acres, and approximately 34.5 percent (931,560 acres) of the entire Study Area (**Table E14-2**). See page E14-19 for a description of the characteristics of the Arizona Upland Sonoran Desertscrub.

Sonoran Desertscrub Lower Colorado River Valley Subdivision (North Section)

The Lower Colorado River Desertscrub biotic community encompasses approximately 42.8 percent of the North Section, or 230,621 acres, and approximately 46.6 percent (1,258,350 acres) of the entire Study Area. This community is unique in that it has become largely extirpated within the state with only severely degraded fragments remaining (AGFD 2012a). The Semidesert Grassland biotic community encompasses approximately 31.6 percent of the South Section, or 430,718 acres, and approximately 16.1 percent (435,029 acres) of the entire Study Area (**Table E14-2**).

See page E14-23 for the characteristics of the Lower Colorado River Desertscrub.

Mohave Desertscrub (North Section)

In Arizona, this community mainly occurs in the northwest portion of the state. Topography in this community includes flatlands, plains, low hills, and bajadas, at elevations ranging from 980 to 4,270 feet above mean sea level. This elevational range is broader than that of other Desertscrub biomes. Annual rainfall is low, generally between 3.5 and 9.9 inches. In the North Section, annual rainfall is approximately 10 inches (Brown 1994). Conspicuous shrubs include creosote bush, desert holly, Mojave yucca (*Yucca schidigera*), brittlebush, burrobrush, shadscale saltbush (*Atriplex confertifolia*), and blackbrush (*Coleogyne ramosissima*). Joshua tree (*Yucca brevifolia*) (**Figure E14-7**) is only found in this biotic community. Cacti are well represented, and include Wiggin's cholla (*Opuntia wigginsii*), various prickly pear and barrel cactus species, and matted cholla (*Grusonia parishii*) (Brown 1994). Wildlife commonly associated with this biotic community is listed in **Table E14-7**.

The Mohave Desertscrub biotic community encompasses less than 1 percent (2,301 acres) of the entire Study Area (**Table E14-2**).

Figure E14-7. Joshua Trees (One of the Characteristic Species of the Mohave Desertscrub)

Table E14-7. Wildlife Species Commonly Associated with the Mohave Desertscrub

Class	Common Name	Scientific Name
Mammals	Cactus mouse	*Peromyscus eremicus*
	Canyon mouse	*Peromyscus crinitus*
	Desert bighorn sheep	*Ovis canadensis nelsoni*
	Desert woodrat	*Neotoma lepida*
	Harris' antelope squirrel	*Ammospermophilus harrisii*
	Little pocket mouse	*Perognathus longimembris*
	Long-tailed pocket mouse	*Chaetodipus formosus*
	Merriams' kangaroo rat	*Dipodomys merriami*
	Southern grasshopper mouse	*Onychomys torridus*
Birds	Bendire's thrasher	*Toxostoma bendirei*
	Costa's hummingbird	*Calypte costae*
	Curve-billed thrasher	*Toxostoma curvirostre*
	Le Conte's thrasher	*Toxostoma lecontei*
	Scott's oriole	*Icterus parisorum*

Class	Common Name	Scientific Name
Reptiles	Common chuckwalla	*Sauromalus ater*
	Desert iguana	*Dipsosaurus dorsalis*
	Desert horned lizard	*Phrynosoma platyrhinos*
	Desert night lizard	*Xantusia vigilis*
	Desert spiny lizard	*Sceloporus magister*
	Great Basin collared lizard	*Crotaphytus bicinctores*
	Long-nosed leopard lizard	*Gambelia wislizenii*
	Long-tailed brush lizard	*Urosaurus graciosus*
	Western lyresnake	*Trimorphodon biscutatus*
Amphibians	Canyon treefrog	*Hyla arenicolor*
	Great plains toad	*Anaxyrus cognatus*
	Lowland leopard frog	*Lithobates yavapaiensis*
	Red-spotted toad	*Bufo punctatus*
	Woodhouse's toad	*Anaxyrus woodhousii*

SOURCES: Brennan and Holycross 2006; Brown 1994.

Riparian Habitats and Important Bird Areas

Riparian Habitats

Seven different riparian habitats are described in the USGS's National Gap Analysis Program report Provisional Digital Land Cover Map for the Southwestern US (USGS 2004). Some of the major riparian habitats within the Study Area include Sonoita Creek and the Santa Cruz, Gila, and Hassayampa Rivers. Segments of Sonoita Creek, the Santa Cruz River, and the Gila River, within the Study Area, also are included in Important Bird Areas. This community is unique in that it has become largely extirpated within the state with only severely degraded fragments remaining (AGFD 2012a). The Semidesert Grassland biotic community encompasses approximately 31.6 percent of the South Section, or 430,718 acres, and approximately 16.1 percent (435,029 acres) of the entire Study Area (**Table E14-2**).

Table E14-2 summarizes the total area occupied by these habitats within the Study Area.

North American Warm Desert Lower Montane Riparian (Lower Montane Riparian) habitats are riparian woodlands and shrublands found in the foothills and mountain canyons and valleys of southern Arizona, New Mexico, and adjacent Mexico. They are usually narrow wet habitats along the streams, with a patchy mosaic of open woodlands or forests, willows, rushes, sedges, and moist herbs and grasses. Common trees include narrowleaf cottonwood (*Populus angustifolia*), Fremont cottonwood (*P. fremontii*), Arizona sycamore (*Platanus wrightii*), Arizona walnut (*Juglans major*), velvet ash (*Fraxinus velutina*), and wingleaf soapberry (*Sapindus saponaria*). Coyote willow (*Salix exigua*), plum (*Prunus* spp.), Arizona alder (*Alnus oblongifolia*), and mulefat (*Baccharis salicifolia*) are common shrubs. Vegetation is dependent upon annual or periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction (USGS 2004).

North American Warm Desert Riparian Woodland and Shrubland (Desert Riparian Woodland) habitats are woodlands and shrublands that occur along lower elevation rivers and streams in desert valleys and canyons in the southwestern US (**Figure E14-8**). Common trees include box-elder (*Acer negundo*), velvet ash, Fremont cottonwood, Goodding's willow (*Salix gooddingii*),

arroyo willow (*S. lasiolepis*), netleaf hackberry (*Celtis reticulate*), and Arizona walnut. The shrublands are often composed of coyote willow (USGS 2004).

Figure E14-8. Hassayampa River

North American Arid West Emergent Marsh (Emergent Marsh) habitats are natural marshes that occur in depressions, as fringes around lakes, and along slow-flowing streams and rivers. These habitats are frequently or continually flooded with water depths up to 6 feet deep, but have rooted, mostly grass-like plants. Common emergent and floating vegetation includes species of bulrush (family Cyperaceae), cattail (*Typha* spp.), rush (*Juncus* spp.), pondweed (*Potamogeton* spp.), knotweed (*Polygonum amphibium*), pond-lily (*Nymphaea odorata*), and canary grass (*Phalaris canariensis*) (USGS 2004).

The North American Warm Desert Riparian Mesquite Bosque (Riparian Mesquite Bosque) habitat consists of low-elevation riparian corridors along perennial and intermittent streams in valleys of the warm desert regions of the Southwestern US and adjacent Mexico. Rivers include the Gila, Santa Cruz, Salt, and their tributaries that occur in the desert portions of their range. Dominant trees include honey mesquite and velvet mesquite (*Prosopis velutina*). Shrub dominants include mulefat, arrow weed (*Pluchea sericea*), and coyote willow. Woody vegetation is relatively dense, especially when compared to drier washes. Vegetation, especially the mesquites, utilize groundwater below the streambed when surface flows subside. Vegetation is dependent upon annual rise in the water table for growth and reproduction (NatureServe 2017).

North American Warm Desert Wash (Desert Wash) communities consist of intermittently flooded washes or arroyos, which often bisect alluvial fans, mesas, plains, and basin floors throughout the warm deserts of North America. Although often dry, the stream processes define this type, which are often associated with rapid sheet and gully flow. Desert wash plants may be sparse and patchy to moderately dense, typically occurring along the banks, but occasionally within the channel. Plants are quite variable and are mostly shrubs and small trees such as apache plume (*Fallugia paradoxa*), black greasewood (*Sarcobatus vermiculatus*), catclaw acacia, desert-willow, desert almond (*Prunus fasciculata*), littleleaf sumac (*Rhus microphylla*), desert broom, palo verde, ragweed, and mesquite. Washes are important habitat for many animals in the desert (USGS 2004).

Invasive Southwest Riparian Woodland and Shrub-land (Invasive Riparian) habitats are dominated by introduced (invasive) plant species such as tamarisk (*Tamarisk* spp.). These habitats are spontaneous and self-perpetuating. Land occupied by introduced vegetation is generally permanently altered or converted unless restoration efforts are undertaken. Specifically, land cover is significantly altered/disturbed by introduced riparian and wetland vegetation (USGS 2004). An example of this type of an introduced riparian system is shown in **Figure E14-9**.

Figure E14-9. Gila River at SR 85 Dominated by Invasive Salt Cedar (*Tamarisk* spp.)

Open water habitats are relatively permanent waterbodies that are primarily unvegetated. Open water habitats include ponds, lakes, streams, and canals.

Table E14-8 lists some of the wildlife species commonly associated with riparian areas.

Table E14-8. Wildlife Species Commonly Associated with Riparian Areas

Class	Common Name	Scientific Name
Mammals	Desert pocket mouse	*Chaetodipus penicillatus*
	Hispid cotton rat	*Sigmodon hispidus*
	Muskrat	*Ondatra zibethicus*
	North American beaver	*Castor canadensis*
	Raccoon	*Procyon lotor*
	Ringtail	*Bassariscus astutus*
	White-footed mouse	*Peromyscus leucopus*
Birds	Arizona Bell's vireo	*Vireo bellii arizonae*
	Bald eagle	*Haliaeetus leucocephalus*
	Brown-headed cowbird	*Molothrus ater*
	Common black hawk	*Buteogallus anthracinus*
	Green heron	*Butorides virescens*
	Killdeer	*Charadrius vociferus*
	Northern cardinal	*Cardinalis*
	Red-winged blackbird	*Agelaius phoeniceus*
	Southwestern willow flycatcher	*Empidonax traillii extimus*
	Summer tanager	*Piranga rubra*
	Yellow-billed cuckoo	*Coccyzus americanus*
Reptiles	Black-necked gartersnake	*Thamnophis cyrtopsis*
	Checkered gartersnake	*Thamnophis marcianus*
	Northern Mexican gartersnake	*Thamnophis eques megalops*
Amphibians	Canyon tree frog	*Hyla arenicolor*
	Chiricahua leopard frog	*Lithobates chiricahuensis*
	Lowland leopard frog	*Lithobates yavapaiensis*
	Red-spotted toad	*Bufo punctatus*
	Sonoran Desert toad	*Incilius alvarius*
	Woodhouse's toad	*Anaxyrus woodhousii*

SOURCES: Brennan and Holycross 2006; Brown 1994.

Important Bird Areas

Several areas have been identified by the Arizona Important Bird Area Program. The Arizona Important Bird Area program is run by the Arizona Audubon and the Tucson Audubon Society in partnership with AGFD (Audubon Arizona 2017). Objectives of the Important Bird Area program include:

- Compiling of information to help guide conservation of these important avian habitats
- Recognition given to the land managers whose habitat stewardship has provided for exceptional avian habitats and bird populations
- Development of local site conservation commitment by people participating in citizen-science and habitat conservation projects

- Enhancement and/or restoration of species of conservation concern
- Facilitation of long-term conservation of these most important avian habitats and their avian communities

The Important Bird Area program exists on several scales. This is a global program founded by BirdLife International in the 1980s. Since then, over 8,000 sites in 178 countries have been identified as Important Bird Areas (AZIBA 2011).

The Important Bird Area partner for the US is the National Audubon Society, which began to establish individual Important Bird Area programs state by state in 1995. The National Audubon Society oversees all the state-level Important Bird Area Programs. The Arizona Important Bird Area program identifies areas using internationally agreed upon criteria as being globally important for the conservation of bird populations.

Six Arizona Important Bird Area sites are located within the Study Area (AZIBA 2011) and are shown on **Figure E14-1** and **Figure E14-5**. These sites include the following:

South Section

- Sonoita Creek State Natural Area/Patagonia Lake Important Bird Area (Sonoita Creek Important Bird Area)
- Upper Santa Cruz River Important Bird Area
- Santa Rita Mountains Important Bird Area (Santa Rita Important Bird Area)
- Tanque Verde Wash/Sabino Canyon Important Bird Area (Tanque Verde Important Bird Area)
- Tucson Sky Islands Important Bird Area (Sky Island Important Bird Area)

Central Section

- Lower Salt and Gila Riparian Ecosystem Important Bird Area (Gila River Important Bird Area)

Many of the Important Bird Areas within the Study Area, such as the Sonoita Creek Important Bird Area, Upper Santa Cruz River Important Bird Area, and Gila River Important Bird Area, are associated with riparian habitats. Other Important Bird Areas, such as the Santa Rita Mountains and the Tucson Sky Islands Important Bird Areas, are associated with large, relatively undisturbed Large Intact Blocks. Bird species listed for the major biotic communities within the Study Area can be expected to be found within these Important Bird Areas.

No Important Bird Area sites fall within the North Section of the Study Area. **Table E14-9** summarizes the acreages of Important Bird Areas within each section.

Table E14-9. Important Bird Areas within the Study Area

Important Bird Areas	South		Central		North		Corridor Study Area	
	Acres	% of Area	Acres	% of Area	Acres	% of Area	Acres	% of Area
Sonoita Creek State Natural Area/Patagonia Lake	3,193	0.2	0	0.0	0	0.0	3,193	0.1
Upper Santa Cruz River	2,184	0.2	0	0.0	0	0.0	2,184	<0.1
Santa Rita Mountains	13,565	1.0	0	0.0	0	0.0	13,565	0.5
Tanque Verde Wash/Sabino Canyon	26	<0.1	0	0.0	0	0.0	26	<0.1
Tucson Sky Islands	47,183	3.5	0	0.0	0	0.0	47,183	1.7
Lower Salt and Gila Riparian Ecosystem	0	0.0	27,125	3.4	0	0.0	27,125	1.0
Total Area	**66,151**	**4.9**	**27,125**	**3.4**	**0**	**0.0**	**93,275**	**3.5**

Species of Economic and Recreational Importance

Some of the more common species associated with the biotic communities within the Study Area also are Species of Economic and Recreational Importance within the state. As previously described, Arizona's SWAP (AGFD 2012a) describes five factors that are important in modeling areas for conservation potential. One of the factors is the economic importance of the landscape, which is represented by the Species of Economic and Recreational Importance.

This category represents the economic and recreational importance of 13 of Arizona's huntable species. The distribution of these species influences important aspects of wildlife-related recreation and the distribution of consumer spending across the state. Together, the economic and recreational importance of game species to hunters, the community, and AGFD provide a realistic view of the importance of game habitat for conservation. Arizona's SWAP provides a description of the model and its various elements (AGFD 2012a).

The AGFD and the Theodore Roosevelt Conservation Partnership conducted a survey of randomly selected Arizona hunters/anglers, asking them to identify their most valued areas of Arizona for hunting and fishing. A map depicting the results of the survey (AGFD 2016) suggests that a high to moderate number of participants found portions of the Study Area to be of value to them for hunting mule deer, whitetail deer, javelina, desert bighorn sheep, quail, dove, waterfowl, and other small game species. Respondents also noted they valued a few areas within the Study Area for warmwater sportfishing (AGFD 2018c).

Invasive Species

Invasive and noxious species are a major concern in Arizona and across the country. These species are generally well suited to colonizing disturbed areas such as roadways. Because these species can readily adapt, they frequently supplant the native species, affecting the overall viability of the biotic community. ADOT tracks the location of invasive and noxious species within road rights-of-way for which they have responsibility and attempts to eradicate or control the spread of these species. **Table E14-10** lists the non-native invasive and noxious plants known to occur within the Study Area. The list is not an all-inclusive list as much of the Study Area is located in undeveloped lands where invasive and noxious weed surveys have not previously occurred.

Table E14-10. Non-Native Invasive Plant Species Found in the Study Area

Common Name	Scientific Name	Status (defined in table note)	Habitat
African lovegrass	*Eragrostis echinochloidea*	–	T
African sumac	*Rhus lancea*	ADOT	T
Annual rabbitsfoot grass	*Polypogon monspeliensis*	–	T
Arabian schismus	*Schismus arabicus*	ADOT	T
Asian mustard	*Brassica tournefortii*	ADOT	T
Athel tamarisk	*Tamarix aphylla*	–	T
Bermudagrass	*Cynodon dactylon*	–	T
Bird-of-paradise shrub	*Caesalpinia gilliesii*	–	T
Blessed milkthistle	*Silybum marianum*	–	T
Buffelgrass	*Pennisetum ciliare*	ADOT AZDA - PNW, RGNW	T
Buttongrass	*Dactyloctenium radulans*	–	T
Camelthorn	*Alhagi maurorum*	ADOT AZDA - RNW	T
Cheeseweed mallow	*Malva parviflora*	–	T
Common Mediterranean grass	*Schismus barbatus*	ADOT	T
Common sowthistle	*Sonchus oleraceus*	–	T
Common water hyacinth	*Eichhornia crassipes*	ADOT AZDA - PNW, RGNW, RNW	A
Crimson fountaingrass	*Pennisetum setaceum*	ADOT	T
Field bindweed	*Convolvulus arvensis*	ADOT AZDA - PNW, RGNW	T
Giant reed	*Arundo donax*	–	T
Glandular Cape marigold	*Dimorphotheca sinuata*	–	T
Globe chamomile	*Oncosiphon piluliferum*	ADOT	T
Herb sophia	*Descurainia sophia*	–	T
Horehound	*Marrubium vulgare*	–	T
Johnsongrass	*Sorghum halepense*	–	T
Lehmann lovegrass	*Eragrostis lehmanniana*	ADOT	T

Common Name	Scientific Name	Status (defined in table note)	Habitat
Littleseed canarygrass	*Phalaris minor*	–	T
London rocket	*Sisymbrium irio*	–	T
Maltese star-thistle	*Centaurea melitensis*	ADOT	T
Mouse barley	*Hordeum murinum*	–	T
Nettleleaf goosefoot	*Chenopodium murale*	–	T
Onionweed	*Asphodelus fistulosus*	ADOT USDA - NW	T
Pinnate mosquitofern	*Azolla pinnata*	ADOT USDA - NW	A
Poison hemlock	*Conium maculatum*	–	T
Prickly lettuce	*Lactuca serriola*	–	T
Prickly Russian thistle	*Salsola tragus*	ADOT	T
Puncturevine	*Tribulus terrestris*	ADOT AZDA - PNW, RGNW	T
Red brome	*Bromus rubens*	ADOT	T
Redstem stork's bill	*Erodium cicutarium*	–	T
Rescuegrass	*Bromus catharticus*	ADOT	T
Ripgut brome	*Bromus diandrus*	ADOT	T
Russian thistle	*Salsola sp.*	*S. vermiculata* is ADOT and USDA - NW	T
Saltcedar	*Tamarix ramosissima*	ADOT	T
Sowthistle	*Sonchus sp.*	*S. arvensis* is ADOT and AZDA - PNW	T
Spiny sowthistle	*Sonchus asper*	–	T
Stinkgrass	*Eragrostis cilianensis*	–	T
Tamarisk	*Tamarix sp.*	ADOT	T
Tree of heaven	*Ailanthus altissima*	ADOT	T
Uruguayan pampas grass	*Cortaderia selloana*	–	T
Waterthyme	*Hydrilla verticillata*	ADOT USDA – NW AZDA - PNW	A
Weeping lovegrass	*Eragrostis curvula*	ADOT	T
Wild mustard	*Sinapis arvensis*	ADOT	T
Wild oat	*Avena fatua*	ADOT	T
Yellow nutsedge	*Cyperus esculentus*	–	T

SOURCES: ADOT 2010; NatureServe 2017; USDA, APHIS, PPQ 2012; USGS-SBSC 2007.

NOTE: A = Aquatic; ADOT = Arizona Department of Transportation; AZDA = Arizona Department of Agriculture; NW = Federally listed as a Noxious Weed; PNW = State listed Prohibited Noxious Weed; RGNW = State listed Regulated Noxious Weed; RNW = State listed Restricted Noxious Weed; T = Terrestrial; USDA = United States Department of Agriculture.

E14.3.2 Special Status Species

Special status species, which include plant and animal species that have received special designation by federal, state, or local government agencies, are analyzed to identify potential impacts.

Endangered Species Act Species

ESA threatened, endangered, proposed, candidate, petitioned, and conservation agreement species information is available online from the USFWS Information for Planning and Consultation. Special status species potentially occurring in Santa Cruz, Pima, Pinal, Maricopa, and Yavapai Counties were reviewed to determine whether any of these species could potentially occur in the vicinity of the Study Area. Twelve species listed as threatened or endangered, and critical habitat for five species, occur within the Study Area. Only species listed as threatened or endangered were analyzed as ESA-listed species, with the exception of Sonoran desert tortoise (*Gopherus morafkai*), a Candidate Conservation Agreement species. The Sonoran desert tortoise was given Candidate status (under ESA) on December 14, 2010, and on October 6, 2015, USFWS determined that listing this species was not warranted at this time due in part to the Candidate Conservation Agreement (USFWS 2015a) developed in cooperation with AGFD, USFWS, ADOT, and 13 other federal agencies. The tortoise was included in the ESA species analysis due to potentially large detrimental impacts of the project to this species, and because ADOT is a signatory to the tortoise Candidate Conservation Agreement. Other species protected under a conservation agreement were included with other sensitive species in this analysis. No proposed, candidate, or petitioned species were identified as being in the Study Area. The potential for an ESA species to occur within the South, Central, and North Sections is denoted in **Table E14-11**, which provides information on habitat and distribution to determine the likelihood that habitat for a particular species may be present in the vicinity of the Study Area.

Habitat Conservation Plans

Several Habitat Conservation Plans cover areas within the Study Area. Habitat Conservation Plans are formal agreements between a local jurisdiction (e.g., Pima County or the City of Tucson) that provide specific conservation measures for the protection of one or more ESA-listed species, but that also allow specific types of development within the area covered by the conservation plan.

Pima County's Maeveen Marie Behan Conservation Lands System is a key component of Pima County's *Sonoran Desert Conservation Plan*. The Conservational Lands System, which has guided land use planning in Pima County since 2001, identifies areas where conservation should be prioritized, and areas that are more suitable for development, along with mitigation goals aiming to maintain and improve landscape-level connectivity (AGFD 2012f). Areas where priority biological resources occur in Pima County are assigned project-specific mitigation and include:

- **Important Riparian Areas**: Landscape-level goal is to conserve at least 95 percent of the lands within this designation. Project-specific mitigation is determined via compliance with Pima County's Watercourse and Riparian Habitat Protection and Mitigation Requirements ordinance.

1 **Table E14-11. Distribution of ESA-Protected Species within the Study Area**

Common Name	Scientific Name	Status [a]	South Section	Central Section	North Section	Habitat Requirement
Amphibians						
Chiricahua leopard frog with critical habitat	*Lithobates chiricahuensis*	USFWS - LT, AGFD SGCN 1A, Pima	X	–	–	Permanent or semi-permanent streams, rivers, backwaters, ponds, and stock tanks that are mostly free from introduced fish, crayfish, and bullfrogs. Elevation: 3,300 – 8,900 feet (AGFD 2015a).
Birds						
Mexican spotted owl with critical habitat	*Strix occidentalis lucida*	USFWS - LT, AGFD SGCN 1A	X	–	–	Mature, multi-storied, uneven-aged forests with high canopy cover and diverse understories of shade-tolerant species, or rocky canyons with water, cool microclimates, and vertical cliffs containing crevices, ledges, and caves. Cover types include pine-oak, mixed-conifer, riparian, or Madrean woodlands. Elevation: 4,100 – 9,000 feet (AGFD 2005c; USFWS 2013a, 2012a).
Southwestern willow flycatcher with critical habitat	*Empidonax traillii extimus*	USFWS - LE, AGFD SGCN 1A, Pima	X	X	X	Dense riparian vegetation with thickets of trees and shrub along rivers, streams, perimeters of lakes, or other wetlands. Generally requires surface water or saturated soil. Dominant plant species, vegetation height and density, size and shape of habitat patches, and canopy structure vary widely, but generally flycatchers are not found nesting in areas without willows, tamarisk, or both. Elevation: sea level to over 8,500 feet (AGFD 2002h; USFWS 2014d).

Common Name	Scientific Name	Status [a]	South Section	Central Section	North Section	Habitat Requirement
Yellow-billed cuckoo (Western Distinct Population Segment) with proposed critical habitat	*Coccyzus americanus*	USFWS - LT, USFS - S, AGFD SGCN 1A, Pima	X	X	X	Highly variable. Occurs in riparian woodlands, mesquite woodlands, or Madrean evergreen woodlands in perennial, intermittent, or ephemeral drainages, from dense contiguous patches of trees on wide floodplains to narrow stringers and small groves of scattered trees in more xero-riparian habitats. Canopy closure varies between and often within drainages. Elevation: sea level to 7,000 feet (AGFD 2017d; Halterman et al. 2015; USFWS unpublished data).
Yuma Ridgway's rail	*Rallus obsoletus yumanensis*	USFWS - LE, AGFD SGCN 1A	–	X	–	Cattail and bulrush marshes interspersed with areas of open water, mudflats, and drier upland benches with riparian trees and shrubs along rivers and backwaters. Also occurs in drains or sumps supported by irrigation water. Habitat value decreases over time due to natural marshland succession unless periodic flooding, fire, or management intervention occurs. Elevation: below 1,500 feet (AGFD 2006g; USFWS 2015b, 2010).
Fish						
Gila topminnow	*Poeciliopsis occidentalis*	USFWS - LE, AGFD SGCN 1A, Pima	X	–	–	Shallow, warm margins of perennial and intermittent rivers, streams, pools, backwaters, and springs with slow currents and aquatic vegetation for cover. Can tolerate relatively high water temperatures and low dissolved oxygen. Elevation: below 5,000 feet (AGFD 2001g; USFWS 2015g, 2008).

Common Name	Scientific Name	Status [a]	South Section	Central Section	North Section	Habitat Requirement
Sonora chub with critical habitat	*Gila ditaenia*	USFWS - LT, AGFD SGCN 1A	X	–	–	Regularly confined to pools near cliffs, boulders, or other cover during arid periods, but prefers riverine habitats with fairly swift current over sand and gravel substrates. Elevation: below 3,900 feet (AGFD 2001k; USFWS 2013b).
Mammals						
Jaguar with critical habitat	*Panthera onca*	USFWS - LE, AGFD SGCN 1A	X	–	–	Although no habitat use studies have been conducted for jaguars in Arizona, based on limited records, Arizona jaguars appear to be associated with Madrean evergreen woodland and semidesert grassland biotic communities, usually in intermediately rugged to extremely rugged terrain with low human disturbance, within 6.2 miles of water. Elevation: all Arizona records are between 3,400 and 9,000 feet (AGFD 2004c; Culver 2016; USFWS 2016, 2014a).

Common Name	Scientific Name	Status [a]	South Section	Central Section	North Section	Habitat Requirement
Ocelot	*Leopardus pardalis*	USFWS - LE, AGFD SGCN 1A	X	–	–	Although no habitat use studies have been conducted for ocelots in Arizona, based on limited records, Arizona ocelots appear to be associated with Madrean evergreen woodland, semidesert grassland, and Great Basin grassland biotic communities. Recorded locations in Arizona on average were <1.5 miles from perennial water, had 23 percent tree cover, and were >3.5 miles from a major road. Elevation: on average 5,500 feet (AGFD 2010c; Avila-Villegas and Lamberton-Moreno 2013; Culver 2016; USFWS 2016).
Plants						
Huachuca water-umbel	*Lilaeopsis schaffneriana* ssp. *recurva*	USFWS - LE, NPL - HS, Pima	X	–	–	Wide range of marshland communities including cienegas, rivers, streams, and springs in permanently wet, muddy, or silty substrates. Generally occurs in perennial, shallow, slow-flowing, or quiet waters, or in active stream channels containing refugial sites where plants can escape scouring by floods. Considered a taxon of perennial water but can survive short periods without water. Elevation: 2,000 – 7,100 feet (AGFD 2003e; USFWS 2017c, 2014b).
Pima pineapple cactus	*Coryphantha scheeri* var. *robustispina*	USFWS - LE, NPL - HS, Pima	X	–	–	Ridges in semidesert grassland and alluvial fans in Sonoran desertscrub. Occurs on alluvial hillsides in rocky, sandy soils. Habitat type is primarily desert grassland. Elevation: 2,300 – 5,000 feet (AGFD 2003k).

Common Name	Scientific Name	Status [a]	South Section	Central Section	North Section	Habitat Requirement
Reptiles						
Northern Mexican gartersnake	*Thamnophis eques megalops*	USFWS - LT, USFS - S, AGFD SGCN 1A, Pima	X	–	–	Lotic and lentic habitats with edges of dense emergent vegetation, including cienegas, ponds, stock tanks, and lower gradient rivers and streams with pools, protected backwaters, braided side channels, and beaver ponds. Uses cover in terrestrial habitats during gestation and periods of inactivity and can occur up to 1 mile from surface water. Adequate ground cover important, canopy cover less so. Elevation: 3,000 – 5,000 feet, but up to 6,500 feet (rangewide up to 8,500 feet) (AGFD 2012c; Emmons and Nowak 2016; USFWS 2017b, 2014c).
Sonoran desert tortoise	*Gopherus morafkai*	USFWS - CCA, USFS - S, BLM-S; AGFD SGCN 1A, Pima	X	X	X	Primarily rocky (often steep) hillsides and bajadas of Mojave and Sonoran desertscrub. May encroach into desert grassland, juniper woodland, interior chaparral, and pine communities. Washes and valley bottoms are used in dispersal. Elevation: 500 – 5,300 feet (AGFD 2015d).

SOURCE: X = documented species presence (AGFD 2017b).

[a] 1A = Tier of SGCN species for which AGFD has entered into an agreement or has legal or contractual obligation, or warrants the protection of a closed season; 1B = Tier of SGCN species that are not Tier 1A species; AGFD = Arizona Game and Fish Department; CCA = Candidate Conservation Agreement under the ESA ; HS = Highly Safeguarded under Arizona Native Plant Law; LE = Listed as Endangered under Endangered Species Act (ESA); LT = Listed as Threatened under ESA; NPL = Arizona Native Plant Law; Pima = Listed by Pima County as Sensitive; S = Sensitive Species SGCN = Species of Greatest Conservation Need; ; USFS = US Forest Service; USFWS = US Fish and Wildlife Service.

- **Biological Core Management Areas**: Landscape-level goal is to conserve at least 80 percent of the lands with this designation. The project-specific mitigation ratio is four conserved acres for each acre disturbed (4:1).

- **Special Species Management Areas**: Landscape-level goal is to conserve at least 80 percent of the lands with this designation. The project-specific mitigation ratio is four conserved acres for each acre disturbed (4:1).

- **Multiple Use Management Areas**: Landscape-level goal is to conserve at least 66.66 percent of the lands with this designation. The project-specific mitigation ratio is two conserved acres for each acre disturbed (2:1).

Critical and Protected Habitat

Table E14-12 provides information on critical habitat for ESA species that occur within the Build Corridor Alternatives. In addition to ESA proposed and designated critical habitat, other protected habitats, such as USFWS 10(j) Experimental Population/Reintroduction Areas for the Mexican wolf (*Canis lupus baileyi*) and the Sonoran pronghorn (*Antilocapra Americana sonoriensis*), are provided. Sonoran desert tortoise BLM Category I and II habitat, as well as habitat modeled by USFWS as "High Value Potential Habitat" (USFWS 2015a) are included. Critical habitat for Sonora chub does not occur within the corridor options; therefore, this species is not included in the table.

Other Sensitive Species

In addition to species protected under the federal ESA (**Table E14-11** and **Table E14-12**), additional sensitive species analyzed include species deemed sensitive by BLM, USFS, and USFWS; protected by the BGEPA; state-listed Species of Greatest Conservation Need (SGCN); Pima County-listed species, and plant species protected under the Arizona Native Plant Law as Salvage Restricted or Highly Safeguarded. SGCN Tier 1A species are those species that are considered vulnerable by AGFD and are either (1) listed under the ESA as threatened, endangered, or candidate species; (2) protected under a Candidate Conservation Agreement; (3) recently removed from the ESA and require monitoring; or (4) warrant the protection of a closed season. SGCN 1B species are those species that are considered vulnerable but do not fall under one of the categories of a Tier 1A species. All species were analyzed to determine whether they occur within the Study Area. **Table E14-13** lists these species and their protection/conservation status and identifies which sections of the Study Area the species occur in. Geographic Information System (GIS) data provided by AGFD (AGFD 2017b) along with Pima County's list of sensitive species and Pima County Priority Conservation Area coverages (Pima County 2013, 2016a) were utilized to include any species that were within the Study Area but not included on the AGFD HDMS list. The majority of the species listed in the Tohono O'odham Nation list of sensitive species are included in the analyses as these species are considered sensitive by other land management entities. Given that the Build Corridor Alternatives avoid Tribal land, the remaining Tohono O'odham Nation sensitive species were not analyzed.

Table E14-12. Total Surface Area Covered by ESA Critical Habitat, USFWS 10(j) Experimental Population Areas, and Other Protected Habitats within the Study Area

Critical/Protected Habitat	South Section		Central Section		North Section		Overall	
	Acres	% Total Area	Acres	% Total Area	Acres	% Total Area	Acres	% Total Area
USFWS Designated or Proposed Critical Habitat								
Chiricahua leopard frog	54	<0.1	0	0.0	0	0.0	54	<0.1
Mexican spotted owl	40,027	2.9	0	0.0	0	0.0	40,027	1.5
Southwestern willow flycatcher	4,536	0.3	0	0.0	468	<0.1	5,003	0.2
Yellow-billed cuckoo (Western Distinct Population Segment)	4,398	0.3	12,961	1.6	1,110	0.2	18,468	0.7
Jaguar	127,179	9.3	0	0.0	0	0.0	127,179	4.7
Total Critical Habitat Excluding Species Overlap	138,388	10.1	12,961	1.6	1,149	0.2	152,498	5.6
USFWS 10(j) Experimental Population/Reintroduction Areas								
Mexican wolf 10(j) Area Zone 2	516,675	37.9	0	0.0	6,100	1.1	522,775	19.4
Mexican wolf 10(j) Area Zone 3	846,253	62.0	798,531	100.0	532,740	98.9	2,177,350	80.6
Sonoran pronghorn 10(j) Area - overall	846,253	62.0	798,531	100.0	2,868	0.5	1,647,500	61.0
Sonoran pronghorn Reintroduction Area A	0	0.0	2,798	0.4	0	0.0	2,798	0.1
Sonoran pronghorn Reintroduction Area D	0	0.0	11,925	1.5	0	0.0	11,926	0.4
Sonoran Desert Tortoise Habitat								
BLM Category I	7,290	0.5	154,265	19.3	0	0.0	161,555	6.6
BLM Category II	0	0.0	84,623	10.6	200,816	37.3	285,439	16.0
USFWS High Value Potential Habitat	96,138	7.05	114,324	8.38	115,978	8.50	326,440	23.93

SOURCES: Surface area values based on digital data of designated critical habitat assigned to species protected under the ESA (USFWS 2017a), USFWS Sonoran pronghorn and Mexican wolf 10(j) Experimental Population/Reintroduction Areas (USFWS 2015f, 2011), and based on digital data of Sonoran desert tortoise habitat as designated by BLM (BLM 2009), and USFWS (USFWS 2015c).

NOTE: 10(j) = section of the Endangered Species Act (ESA) authorizing the establishment of experimental populations outside a species' current range, but within its historical range; HDMS = Arizona Game and Fish Department (AGFD) Heritage Data Management System, OERT = AGFD Online Environmental Review Tool; USFWS = US Fish and Wildlife Service.

1 **Table E14-13. Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area**

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Amphibians						
Arizona toad	*Anaxyrus microscaphus*	USFWS - SC, Petition, BLM S AGFD - SGCN 1B	–	–	X	Rocky streams and canyons in the pine-oak belt. Also occurs in lower deserts (e.g., Agua Fria River area). Known from southwest Utah and southeast Nevada, and along Mogollon Rim of southwest New Mexico and central Arizona. Elevation: below 8,000 feet (AGFD 2013a).
Lowland leopard frog	*Lithobates yavapaiensis*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1A, Pima	X	X	X	Habitat generalist. Inhabits manmade (cattle tanks, canals, wells) and natural aquatic systems (rivers, streams, pools, cienegas) in desert grasslands to pinyon-juniper habitats. Elevation: 480 – 6,200 feet (AGFD 2006c).
Sonoran green toad	*Anaxyrus retiformis*	BLM - S, AGFD - SGCN 1B	I	X	–	Rain pools, wash bottoms, and other areas near ephemeral water sources in mesquite grassland, creosote desert, and upland desertscrub vegetation. Elevation: 500 – 3,300 feet (AGFD 2005d).
Tarahumara frog	*Lithobates tarahumarae*	USFWS - SC, USFS - S, AGFD SGCN 1A	I	–	–	Permanent pools within slow-moving, small streams in canyons within semi-desert grassland and Madrean evergreen woodland plant communities. Extirpated in Arizona, but reintroduced into a few canyons in Santa Rita Mountains. Elevation: 3,500 – 6,200 feet (AGFD 2006f).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Western barking frog	*Craugastor augusti cactorum*	USFS - S, AGFD SGCN 1B	X	–	–	Rock outcrops or caves on rocky slopes, often in scrubby oak or pine-oak woodlands within the Madrean evergreen woodlands and woodland-grassland ecotones. Permanent water is not a necessary component of their habitat. Elevation: 4,200 – 6,200 feet (AGFD 2009b).
Western narrow-mouthed toad	*Gastrophryne olivacea*	BLM - S, AGFD - SGCN 1C	X	X	–	Near streams, springs, and rain pools within mesquite semi-desert grassland to oak woodland. More terrestrial than aquatic. Often found in deep, moist crevices or burrows or under flat rocks, logs, or other debris near water. Elevation: 1,400 – 4,700 feet in Arizona. (AGFD 2013h).
Birds						
Abert's towhee	*Melozone aberti*	Pima	X	I	I	Habitats with dense understory and damp soil. Highest densities in lowland riparian thickets containing cottonwoods, willows and mesquite. Elevation: 80 – 4,900 feet (Corman and Wise-Gervais 2005).
American peregrine falcon	*Falco peregrinus anatum*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1A	X	I	–	Steep, sheer cliffs overlooking woodlands, riparian areas or other habitats supporting avian prey species in abundance. Elevation: 400 – 9,000 feet (AGFD 2002a).
Arizona Bell's vireo	*Vireo bellii arizonea*	Pima	X	I	I	Lowland riparian areas with dense, shrubby vegetation, such as willow, mesquite, and seep willows. Elevation: <3,500 feet (AGFD 2002b).
Arizona grasshopper sparrow	*Ammodramus savannarum ammolegus*	USFS - S, BLM - S, AGFD SGCN 1B	X	–	–	Prefers large expanses of intermediate height grass, which often include some low, woody shrub component. Elevation: 3,800 – 5,300 feet (AGFD 2010a).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Azure bluebird	*Sialia sialis fulva*	AGFD SGCN 1B	X	–	–	Prefers areas with open canopy with scattered trees, forest edges, and burned or cut-over woodlands where snag density is high. This species utilizes secondary cavity nests and uses mature to late succession forest patches for both foraging and nesting. Elevation: 4,000 – 5,170 feet (AGFD 2001b).
Bald eagle - winter population	*Haliaeetus leucocephalus*	USFWS - SC, BGEPA, USFS - S, BLM - S, AGFD SGCN 1A	X	X	–	Wintering areas are near open water (such as river rapids, impoundments, dam spillways, lakes, and estuaries) and have an adequate food supply and available perches. Elevation: Varies (AGFD 2011b).
Bald eagle - Sonoran Desert population (pop. 3)	*Haliaeetus leucocephalus*		–	X	–	In Arizona, breeding habitat in Lower and Upper Sonoran biotic life zones near open water with adequate food supply, perches, and large trees or cliffs for nests. Elevation: 400 – 8,000 feet (AGFD 2011b).
Black-capped gnatcatcher	*Polioptila nigriceps*	AGFD SGCN 1B	X	–	–	Prefers riparian woodland and associated bushy areas. Nests are found in the upper branches of mesquite, Arizona sycamore, and hackberry trees. Elevation: 2,625 – 4,595 feet (AGFD 2002c).
Buff-collared nightjar	*Antrostomus ridgwayi*	USFS - S, AGFD SGCN 1B	X	–	–	In Arizona, near open arid canyons or ravines with steep to moderate slopes and rocky bottoms with thorny trees and shrubs. Sonoran desertscrub, semi-arid grasslands, and intermittent drainages with sycamore/cottonwoods and nearby thickets of hackberry, mesquite, and Madrean evergreen oaks. Elevation; 2,600 – 4,600 feet (Corman and Wise-Gervais 2005).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	X	–	–	Dense riparian deciduous woodlands and Sonoran desertscrub with high levels of structural diversity and interspersed open areas. Elevation: 1,300 – 4,000 feet (AGFD 2001e; Corman and Wise-Gervais 2005).
Elegant trogon	*Trogon elegans*	USFS - S, AGFD SGCN 1B	X	–	–	Canyons containing pine-oak or riparian woodlands with high canopy closure. Occurs within sky island mountain ranges. Elevation: 3,400 – 6,800 feet (AGFD 2014b).
Five-striped Sparrow	*Amphispiza quinquestriata*	AGFD SGCN 1B	X	–	–	Prefers dense bushy vegetation and grasses on steep hillsides, especially with acacia, mesquite, or riparian vegetation. Elevation: 3,500 – 4,000 feet (AGFD 2003c).
Golden eagle	*Aquila chrysaetos*	BGEPA, BLM - S, AGFD SGCN 1B	X	–	–	Utilizes a variety of habitats from desertscrub to open conifer forests. Requires tall cliffs or canyons for nesting with adjacent open foraging areas. Elevation: 4,000 – 10,000 feet (AGFD 2002f).
Gray hawk	*Buteo plagiatus*	USFWS - SC	X	–	I	Riparian woodlands with large trees (cottonwoods), usually near mesquite forests. Found within Sonoran Riparian Deciduous Forest and Woodlands and to a lesser extent Madrean Evergreen Woodland plant communities near the Arizona-Sonora border. Elevation: 1,900 – 5,000 feet (Corman and Wise-Gervais 2005; AGFD 2013d).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Le Conte's thrasher	*Toxostoma lecontei*	AGFD SGCN 1B	–	X	I	This species is a year-round resident in Arizona. Preferred habitat includes desertscrub, mesquite, tall riparian brush and less frequently chaparral. Elevation: varies (Cornell Lab of Ornithology 2017).
Northern beardless-tyrannulet	*Camptostoma imberbe*	USFS - S,	X	–	–	Fairly open woodlands, including lower canyons and heavily wooded dry washes. Mainly occurs with riparian tree species and mesquite. Elevation: 1,900 – 4,600 feet (Corman and Wise-Gervais 2005).
Rose-throated becard	*Pachyramphus aglaiae*	USFS - S, AGFD SGCN 1B	X	–	–	In Arizona, primarily breeds along perennial or intermittent mountain foothill drainages and canyons with tall, shady riparian woodlands. Elevation: 3,500 – 4,100 feet (Corman and Wise-Gervais 2005).
Rufous-winged sparrow	*Aimophila carpalis*	Pima AGFD SGCN 1B	X	–	–	Level or gently rolling areas with a combination of Sonoran Desert trees and shrubs and semi-desert grassland. Areas dominated by paloverde, mesquite, acacia, desert hackberry, graythorn, ocotillo, prickly pear, and cholla. Ground cover grasses include tobosa grass and false gramma. Elevation: 2,000 – 4,100 feet (Corman and Wise-Gervais 2005).
Swainson's hawk	*Buteo swainsoni*	Pima	X	I	–	Grasslands, semi-desert grasslands, and desertscrub vegetation. Sometimes found in agricultural areas and low–density residential developments near grassland. Elevation: 1,800 – 5,700 feet (AGFD 2013g).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Swainson's thrush	*Catharus ustulatus*	AGFD SGCN 1B	X	–	–	Prefers coniferous forests and high elevation willow and alder thickets along streams and aspen forests. Canopy closure, understory, tree density are important habitat components. Elevation: 7,375 – 9,230 feet (AGFD 2001l).
Thick-billed kingbird	*Tyrannus crassirostris*	USFS - S, AGFD SGCN 1B	X	–	–	Deciduous riparian woodlands in semi-arid canyons. Nest records in Arizona are from mixed groves of sycamores and cottonwoods, while adjoining slopes are covered by oak-pine woodland or mesquite-grassland. Elevation: 2,100 – 4,300 feet (AGFD 2010d).
Violet-crowned hummingbird	*Amazilia violiceps*	USFS - S, AGFD SGCN 1B	X	–	–	Breeds in southeastern Arizona along lower elevation canyons and creeks with riparian woodland vegetation, especially cottonwood, willow, and sycamores. Elevation: 2,800 – 5,800 feet (AGFD 2002k).
Western burrowing owl	*Athene cunicularia hypugaea*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	X	X	I	Grasslands, pastures, low desertscrub, edges of agricultural fields, canals, and vacant lots. Often associated with burrowing mammals. Elevation: 600 – 6,200 feet (AGFD 2001m).
Fish						
Desert sucker	*Catostomus clarkii*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	X	–	–	Found in rapids and flowing pools of streams and rivers primarily over bottoms of gravel-rubble with sandy silt in the interstices. Elevation: 450 – 8,900 feet (AGFD 2002e).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Gila longfin dace	*Agosia chrysogaster*	USFWS - SC, BLM - S, AGFD SGCN 1B, Pima	X	–	–	Habitat is wide-ranging, from intermittent hot low-desert streams to clear and cool brooks at higher elevations. Usually occupies small or medium size streams with sandy or gravely bottoms, eddies, and pools near overhanging banks or other cover. Elevation: <6,700 feet (AGFD 2013c).
Sonora sucker	*Catostomus insignis*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	X	–	–	Found in a variety of habitats from warm water rivers to trout streams. It has an affinity for gravelly or rocky pools, or at least for relatively deep, quiet waters. Elevation: 1,200 – 8,800 feet (AGFD 2002g).
Speckled dace	*Rhinichthys osculus*	USFWS - SC, BLM - S, AGFD SGCN 1B	X	–	–	Bottom-dweller in shallow rocky riffles, runs, and pools of headwaters, creeks, and small to medium rivers. Rarely in lakes. Adults breed in swift water. Elevation: 1,500 – 10,000 feet; however, most current records are from 6,500 – 9,900 feet (AGFD 2002i).
Invertebrates						
Las Guijas talussnail	*Sonorella sitiens*	Pima	X	–	–	Found in taluses or “slides” of coarse, broken rock. Generally in crevices one to several feet below the surface. Arizona range: Ko Vaya Hills and Baboquivari, Pajaritos, Patagonia, and Huachuca Mountains. Commonly collected from slides in northerly facing canyons Elevation: 5,300 feet (AGFD 2008a).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Maricopa tiger beetle	*Cicindela oregona maricopa*	USFWS - SC	I	I	X	Mostly along sandy stream banks. Less common on gravels and clays along stream banks and at seeps and along reservoir banks. Compact sand/silt important in larval stage. Elevation: 1,000 – 7,000 feet (AGFD 2001h).
Monarch butterfly	*Danaus plexippus*	BLM - S	X	I	I	This butterfly species is known from all elevations and habitat types in Arizona and typically utilizes major drainages with water for migration routes (Morris, Kline, and Morris 2015).
Papago/Black Mountain talussnail	*Sonorella papagorum*	Pima	X	–	–	Found on slopes with black basalt slides in crevices one to several feet below the surface. Nearby vegetation consists of ocotillo, mesquite, cat-claw, and palo verde. Only on Black Mountain near San Xavier Mission in Pima County. Elevation: 3,200 feet (AGFD 2004d).
Sabino canyon dancer	*Argia sabino*	USFWS - SC, USFS - S	X	–	–	Inhabits rocky streams in isolated canyons in arid areas. Santa Catalina mountains in Arizona and into Mexico. Elevation: 3,000 – 5,000 feet (AGFD 2001i).
Santa Catalina talussnail (tusconica subspecies)	*Sonorella sabinoensis tucsonica*	Pima	X	–	–	Found in taluses or “slides” of coarse, broken rock. Generally in crevices one to several feet below the surface. Species endemic to Arizona in the Santa Catalina, Tanque Verde and Tucson mountain Ranges in Pima County. Elevation: approximately 2,300 feet in Tucson Mountains (Tusconica subspecies) (AGFD 2008c).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Santa Rita talussnail	*Sonorella walkeri*	Pima	X	–	–	As other talussnails, found in crevices in taluses or "slides" of coarse, broken rock; however, also under logs, rocks, and rock outcrops. In Arizona from Santa Rita, Atascosa, and Whetstone Mountains and into Mexico. Elevation: 4,400 – 6,000 feet (AGFD 2008d).
Sonoran talussnail	*Sonorella magdalensis syn. tumamocensis*	USFWS - Petition, Pima	I	–	–	Found in taluses or "slides" of coarse, broken rock. Generally in crevices one to several feet below the surface. In Arizona from mountains and foothills in Pima County and Santa Cruz Counties into Mexico. Elevation: 2,700 – 6,000 feet (AGFD 2008e).
San Xavier talussnail	*Sonorella eremita*	USFWS - CCA, AGFD SGCN 1A, Pima	X	–	–	Talus slide on northwest slope of San Xavier Hill (=White Hill). Associated with mesquite, cat-claw acacia, foothills paloverde, wolfberry, creosote, and prickly pear. Elevation: 3,850 – 3,920 feet (AGFD 2003l).
Mammals						
Antelope jackrabbit	*Lepus alleni*	AGFD SGCN 1B	X	X	–	This species' preferred habitats occur in the drier areas of the Sonoran Desert including creosote bush flats, mesquite grasslands, and cactus plains. Elevation: varies (Arizona-Sonora Desert Museum 2017a).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Arizona myotis	*Myotis occultus*	USFWS - SC, BLM - S, AGFD SGCN 1B	X	–	–	In summer mostly found in ponderosa pine and pine-oak plant communities. Also in riparian habitat along permanent water in the desert, especially the Colorado and Verde Rivers. Elevation: most records from 3,200 – 8,700 feet; however, some records from 100 – 1,000 feet occur along the Colorado River (AGFD 2011a).
Brazilian free-tailed bat	*Tadarida brasiliensis*	AGFD SGCN 1B	X	–	X	This bat species roosts in caves, mine tunnels, and crevices in bridges, parking garages and buildings, and in attics. In spring, these bats move northward from southern Arizona and Mexico, to the Lower Sonoran and Upper Sonoran habitats. Elevation: less than 9,200 feet (AGFD 2004a).
California leaf-nosed bat	*Macrotus californicus*	USFWS - SC, BLM - S, AGFD SGCN 1B, Pima	X	I	X	Usually occupy Sonoran desertscrub but also found in Mohave and Great Basin desertscrub. Roost in mines, caves, and rock shelters. Elevation: <4,000 feet (AGFD 2014a).
Cave myotis	*Myotis velifer*	USFWS - SC, BLM - S, AGFD SGCN 1B	X	X	X	Desertscrub vegetation. Roost in caves, tunnels, mines, buildings, abandoned swallow nests, and under bridges. Elevation: 300 – 5,000 feet (AGFD 2002d).
Cockrum's desert shrew	*Notiosorex cockrumi*	AGFD SGCN 1B	I	–	–	This species' preferred habitat is desert shrub including plant communities dominated by mesquite, agave, cholla, and oak-brush in southern Arizona. Elevation: varies (IUCN Red List of Threatened Species 2017).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	USFWS –SC, AGFD SGCN 1A	X	–	–	Desertscrub and desert grassland habitat up to oak transition with agave and columnar cacti present as food plants. Roosts in caves, abandoned tunnels, and occasionally buildings. Elevation: 1,100 – 7,400 feet (AGFD 2011c).
Merriam's deer mouse	*Peromyscus merriami*	Pima	X	–	–	Dense brush, mesquite bosques in riparian or low desert. Southeast of Tucson taken in thick stands of mesquite, cholla, prickly pear, palo verde, and grasses. Elevation: 1,300 – 1,500 feet (AGFD 2011e).
Mexican long-tongued bat	*Choeronycteris mexicana*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1C, Pima	X	–	–	Mesic areas in canyons of mixed oak-conifer forests in mountains rising from the desert. May also use paloverde-saguaro vegetation associations. Caves and abandoned mines are favored daytime retreats but will use shallow caves and rock crevices. Elevation: 2,500 – 7,300 feet (AGFD 2006d).
Northern pygmy mouse	*Baiomys taylori*	USFS - S	X	–	–	Southeastern Arizona in desert grassland and grassy desertscrub vegetation with abundant water sources. Ungrazed, tall, thick grasses and weeds often along little-used roads with cotton rat runways. Elevation: unknown (Hoffmeister 1986).
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	X	–	–	Summer day roosts are found in caves and mines from desertscrub up to woodlands and coniferous forests. In winter, they hibernate in cold caves, lava tubes and mines mostly in uplands and mountains. Elevation: 500 – 8,500 feet (AGFD 2003j).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	AGFD SGCN 1B	X	I	X	This bat species roosts in crevices high on cliff faces in rugged canons in desertscrub and lowland habitats in southern Arizona and southern California. Elevation: 190 – 7,520 feet (AGFD 2011f).
Western red bat	*Lasiurus blossevillii*	USFS - S, AGFD SGCN 1B, Pima	I	–	X	Preferred habitat includes riparian and wooded areas. Primarily roosts in broad-leaf trees, mainly in cottonwoods. Elevation: 1,900 – 7,200 feet (AGFD 2011h).
Western yellow bat	*Lasiurus xanthinus*	USFS - S, AGFD SGCN 1B, Pima	X	X	X	Associated with palms and other broad-leafed trees such as sycamores, hackberries, and cottonwoods. Elevation: 500 – 6,000 feet (AGFD 2011i).
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	USFWS - SC, AGFD SGCN 1C	X	–	–	Grassy, dry, rocky slopes in or near the oak woodland belt, as well as montane meadows within ponderosa pine and Douglas fir forests. Elevation: 1,900 – 8,800 feet (AGFD 2003n).
Plants						
Arid throne fleabane	*Erigeron arisolius*	USFS - S	X	–	–	Grasslands and areas of oak woodlands, in grassy openings or on roadsides. Often occurs in moist areas. Elevation: 4,200 – 5,700 feet (AGFD 2001a).
Arizona crested coral-root	*Hexalectris arizonica*	USFS - S, NPL - SR	X	–	–	In organic mesic to dry soil over limestone or sandstone, in juniper, pine, and oak woodlands. Elevation: 5,250 – 6,560 feet (Flora of North America Editorial Committee [FNAEC] Volume 26 1993).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Arizona manihot	*Manihot davisiae*	USFS - S	X	–	–	Limestone slopes in the Baboquivari Mountains, canyons in the Santa Rita Mountains, and Santa Catalina Mountains. Elevation: 3,500 – 4,000 feet (Arizona Rare Plant Committee [ARPC] 2001).
Arizona passionflower	*Passiflora arizonica*	USFS - S	X	–	–	Rocky desert hillsides, limestone outcrops, canyon cliffs, and arroyos in the Lower Sonoran Zone, where it is primarily just beyond the typically defined boundaries of the Sonoran Desert. Elevation: typically, 3,281 – 5,906 feet (AGFD 2006a).
Ayenia	*Ayenia jaliscana*	USFS-S	X	–	–	This plant species is a woody perennial shrub found on rocky slopes, hillsides, and canyon bottoms, and in grassy plains in Pima and Santa Cruz counties in Arizona. Elevation: 3,900 – 3,970 feet (AGFD 2010b).
Bartram stonecrop	*Graptopetalum bartramii*	USFWS - SC, USFS - S, BLM - S, NPL - SR	X	–	–	Cracks in rocky outcrops in shrub live oak-grassland communities along meandering arroyos on sides of rugged canyons. Usually heavy litter cover and shade where moisture drips from rocks, often with Madrean evergreen woodland. Elevation: 3,600 – 6,700 feet (AGFD 2001d).
Beardless chinchweed	*Pectis imberbis*	USFWS - SC, USFS - S	X	–	–	Grassland and oak savannas on eroded granite substrate. Elevation: 3,600 – 6,500 feet (AGFD 2012b).
Broadleaf groundcherry	*Physalis latiphysa*	USFS - S	X	–	–	Washes, often in the shade of shrubs and boulders, in desertscrub or grasslands. Elevation: 3,000 – 4,700 feet (AGFD 2004b).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Cactus apple	*Opuntia engelmannii* var. *flavispina*	NPL - SR		–	X	Sandy bajadas, Sonoran Desert. Elevation: 1,640 – 2,625 feet (FNEAC Volume 4 1993).
Catalina beardtongue	*Penstemon discolor*	USFS - S, NPL - HS	X	–	–	This plant occurs in soil pockets of bare rock outcrops in chaparral or pine-oak communities. It is known from 14 populations scattered in southeastern Arizona. Elevation: 4,400 – 7,200 feet (ARPC 2001).
Chiltepin	*Capsicum annuum* var. *glabriusculum*	USFS - S	X	–	–	Canyons and slopes of desert riparian habitats in mesquite and oak woodlands. Elevation: 3,600 – 4,400 feet (AGFD 2003b).
Chiricahua mountain brookweed	*Samolus vagans*	USFS - S	X	–	–	Moist, sandy soil around springs, seeps, and in and along streams. This plant occurs in the Sky Island ranges of southeastern Arizona and is most abundant in the Huachuca Mountains. Elevation: 4,000 – 7,200 feet (AGFD 2015b).
Chiricahua rock cress	*Pennellia tricornuta*	USFS - S	X	–	–	Steep and rocky slopes in the understory with pine trees, and on road banks. Elevation: 6,000 – 9,000 feet (AGFD 2006e).
Cochise sedge	*Carex ultra*	USFS - S, BLM - S	X	–	–	Moist soil near perennially wet springs and streams; undulating rocky-gravelly terrain. Elevation: 2,040 – 6,000 feet (AGFD 2000a).
Desert barrel cactus	*Ferocactus cylindraceus*	NPL - SR	X	X	I	Gravelly or rocky hillsides, canyon walls, alluvial fans, and wash margins in the Mohave and Sonoran Deserts, on igneous and limestone substrates. Elevation: 200 – 2,900 feet (AGFD 2005a).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Desert night-blooming cereus	*Peniocereus greggii* var. *transmontanus*	NPL - SR	X	I	I	Sandy or gravelly loams, creosote bush-bursage flats, edges of washes and on slopes of small hills, Sonoran Desert. Elevation: 984 – 3,280 feet (FNAEC Volume 4 1993).
Emory's barrel-cactus	*Ferocactus emoryi*	NPL - SR	I	X	–	Hillsides, wash margins, alluvial fans, mesas, or flats, gravelly rocky or sandy soils, rocky slopes and adjacent bajadas, Sonoran desertscrub, igneous substrates. Elevation: below 3,937 feet (FNAEC Volume 4 1993).
Gentry's indigo bush	*Dalea tentaculoides*	USFWS - SC, USFS - S, BLM - S, NPL - HS	X	–	–	Along canyon bottoms or rocky slopes on primary terraces subject to occasional flooding. Elevation: 3,600 – 4,000 feet (AGFD 2001f).
Hohokam agave	*Agave murpheyi*	USFWS - SC, USFS - S, BLM - S, NPL - HS	–	–	X	Alluvial terraces within Sonoran desertscrub. Found in association with pre-Columbian settlements or present human cultivation south of Lake Pleasant. Elevation: 1,300 – 3,200 feet (AGFD 2003d).
Johnson's fishhook cactus	*Echinomastus johnsonii*	NPL - SR	–	–	X	Mojave desertscrub and upper edge of Sonoran desertscrub, rocky slopes, gravelly rolling hills, washes. Elevation: 1,500 – 5,160 feet (AGFD 2015c).
Kelvin cholla	*Cylindropuntia x kelvinensis*	NPL - SR	X	I	–	Sonoran desertscrub, edges of grasslands, rocky flats and slopes, rolling hills. Elevation: 1,640 – 3,280 feet (FNAEC Volume 4 1993).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Large-flowered blue star	*Amsonia grandiflora*	USFWS - SC, USFS - S	X	–	–	Canyon bottoms and sides in oak woodlands, typically dominated by Emory oak and Mexican blue oak, however, site-specific qualities are inconsistent. Adapted to rock fall disturbance. Elevation: 3,600 – 4,500 feet (AGFD 2003f).
Lemmon cloak fern	*Notholaena lemmonii*	USFWS - SC	X	–	–	Limestone cliff crevices, slopes and cliffs of igneous rocks. Base of cliffs, very dry, usually on granitic or volcanic substrates. Elevation: 2,840 – 6,000 feet (AGFD 2003g).
Magenta-flower hedgehog-cactus	*Echinocereus fasciculatus*	NPL - SR	X	–	–	Sand, gravel, and rocks of hillsides and hilltops. Flats to steep canyon-sides in desertscrub, semi-desert grasslands, and interior chaparral. Elevation: 1,800 – 5,600 feet (AGFD 2005b).
Metcalfe's tick-trefoil	*Desmodium metcalfei*	USFS - S	X	–	–	Rocky slopes, canyons, and ditches in grasslands, oak/pinyon woodlands, and riparian forests. Elevation: 4,000 – 6,500 feet (New Mexico Rare Plant Technical Council 1999).
Pima Indian mallow	*Abutilon parishii*	USFWS - SC, USFS - S, BLM - S, NPL - SR	X	–	–	Steep, rocky slopes and canyon bottoms in desertscrub, semi-desert grassland. Elevation: 1,720 – 4,900 feet (AGFD 2000b).
Saiya	*Amoreuxia gonzalezii*	USFWS - SC, USFS - S, NPL - HS	X	–	–	Open, rocky, limestone hillsides. Within the US, known from only two or three sites on the Coronado National Forest. Elevation: 4,200 – 4,600 feet (AGFD 2011g).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Santa Cruz beehive cactus	*Coryphantha recurvata*	USFS - S, NPL - HS	X	–	–	Alluvial soils of valleys and foothills in desert grassland and oak woodland. Plants are either on rocky hillsides with good grass cover, or in rock crevices where runoff accumulates. Elevation: 3,600 – 6,000 feet (AGFD 2001j).
Santa Cruz star leaf	*Choisya mollis*	USFWS - SC, USFS - S	X	–	–	Bottoms and slopes of canyons on sandy, gravelly, and cobbly loams in the shade of oaks, other trees, or rocks in the Madrean evergreen woodland. Elevation: 4,000 – 4,900 feet (ARPC 2001).
Santa Cruz striped agave	*Agave parviflora* ssp. *parviflora*	USFWS - SC, USFS - S, NPL - HS	X	–	–	Middle elevation mountains on open rocky or gravelly slopes and ridges. Prefers desert grassland and oak woodland habitats. Appears to prefer gravelly soils on rounded ridge-tops where grasses and shrubs are sparse and soil is bare or nearly so. Elevation: 3,500 – 7,900 feet (AGFD 2003m).
Santa Rita hedgehog cactus	*Echinocereus santaritensis*	NPL-SR	X	–	–	Sky islands in pine-oak forest, chaparral, and riparian woodland. Elevation: 4,265 – 8,891 feet (Porter 2013).
Sonoita noseburn	*Tragia laciniata*	USFS - S	X	–	–	Rocky soils in oak and mixed evergreen woodlands. Elevation: 3,500 – 5,700 feet (AGFD 2004e).
Sonoran bird's foot trefoil	*Lotus alamosanus*	USFS-S	X	–	–	Wet soil or sand in springs, seeps and streams of canyons or meadows. Elevation: 2,952 – 7,217 feet (NatureServe 2017).
Stag-horn cholla	*Opuntia versicolor*	NPL - SR	X	–	–	Sonoran Desert, desertscrub, flats, washes, rocky hillsides, canyons. Elevation: 1,968 – 4,265 feet (FNAEC Volume 4 1993).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Straw-top cholla	*Opuntia echinocarpa*	NPL - SR	–	I	I	This cacti species is found in arid deserts that contain rocky or sandy flats, hillsides, and include pinion-juniper woodlands. Elevation: 0 – 5,000 feet (American Southwest 2017).
Supine bean	*Macroptilium supinum*	USFWS - SC, USFS - S, NPL - SR	X	–	–	Ridge tops and gentle slopes of rolling hills in semi-desert grassland or grassy openings in oak-juniper woodland, growing in sandy loam. Elevation: 3,600 – 4,900 feet (ARPC 2001).
Sycamore Canyon muhly	*Muhlenbergia elongata*	USFS - S	X	–	–	In seeps or associated with water. Most often growing in crevices of cliffs, bedrock, and other rocks along canyon bottoms, but also known from rocky canyon slopes in oak, pine-oak, and riparian woodlands. Elevation: 3,500 – 6,000 feet (AGFD 2000c).
Thornber fishhook cactus	*Mammillaria thornberi*	NPL - SR	X	–	–	Sonoran desertscrub, valley floors, under shrubs, silty or sandy soils. Elevation: 1,392 – 1,968 feet (FNAEC Volume 4 1993).
Tumamoc globeberry	*Tumamoca macdougalii*	NPL - SR, Pima	X	I	–	Xeric situations in the shade of nurse plants along gullies and sandy washes of hills and valleys in Sonoran desertscrub and Sinaloan thornscrub communities. Substrate ranges from sandy soils of valley bottoms to rocky soils of upper bajada slopes. Elevation: below 3,000 feet (AGFD 2004f).
Wiggins milkweed vine	*Metastelma mexicanum*	USFWS - SC, USFS - S	X	–	–	Open slopes on granitic soils within oak woodland. Elevation: 3,500 – 5,600 feet (AGFD 2000d).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Reptiles						
Arizona striped whiptail	*Aspidoscelis arizonae*	BLM-S, AGFD SGCN 1B	X	–	–	A grassland species found in low valleys and sandy flats within semi-desert grassland. Elevation: 4,080 – 4,640 feet in Arizona (AGFD 2006b).
Banded rock rattlesnake	*Crotalus lepidus klauberi*	AGFD SGCN - 1A	X	–	–	Rocky areas of evergreen woodland, common in rockslides on south-facing slopes. Occurs from upper desert grassland to lower ponderosa pine forest. Often found in the vicinity of permanent or intermittent streams. Elevation: 4,000 – 8,200 feet (AGFD 2001c).
Brown vinesnake	*Oxybelis aeneus*	USFS - S, AGFD SGCN 1B	X	–	–	Brush-covered hillsides, canyons and stream bottoms with sycamore, oak, walnut and wild grape. Elevation: 3,000 – 5,800 feet (AGFD 2003a).
Common chuckwalla	*Sauromalus ater*	USFWS - SC	I	X	I	Predominantly found near cliffs, boulders, or rocky slopes where it uses rocks as basking sites and rock crevices for shelter. Found in rocky desert, lava flows, hillsides, and outcrops. Elevation: <6,000 feet (AGFD 2009a).
Ornate box turtle	*Terrapene ornata luteola*	BLM - S, AGFD SGCN 1A, Pima	X	–	–	Semi-desert grasslands sometimes found in Chihuahuan desertscrub. Southeast corner of Arizona. Elevation: 2,000 – 7,100 feet (AGFD 2008b).
Giant spotted whiptail	*Aspidoscelis stictogramma*	USFWS - SC, USFS - S, AGFD SGCN 1B, Pima	X	–	–	Riparian vegetation in mountain canyons, arroyos, and mesas in arid and semi-arid regions. Prefers dense, shrubby vegetation, often among rocks, near permanent and intermittent streams. Elevation: <4,500 feet (AGFD 2013b).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Groundsnake (valley form)	*Sonora semiannulata*	Pima	X	I	I	Found in a wide variety of communities ranging from lower Colorado River desertscrub up into woodland. Elevation: <6,000 feet (Brennan and Holycross 2006).
Hooded nightsnake	*Hypsiglena sp. nov.*	AGFD SGCN 1B	X	–	–	This snake species is found in Sonoran desertscrub, grasslands and woodlands within a wide variety of terrain ranging from flats to steep rocky and woodland slopes in extreme southeastern Arizona. Elevation: varies (Brennan 2012).
Mexican Rosy boa	*Lichanura trivirgata*	USFWS - SC, AGFD SGCN 1B	–	X	–	Rocky mountains and hillsides as well as rock-free flats in desertscrub and chaparral vegetation. Within Arizona, occurs in Maricopa County and Pima County. Elevation: 1,400 – 2,800 feet (AGFD 2003h).
Mountain skink	*Plestiodon callicephalus*	USFS - S	X	–	–	Madrean evergreen woodland encroaching into semi-desert grassland. Found in moist areas, often along canyon bottoms. Elevation: 3,500 – 6,500 feet (Brennan and Holycross 2006).
Northern green ratsnake	*Senticolis triaspis intermedia*	USFS - S, AGFD SGCN 1B	X	–	–	Occurs in or adjacent to Madrean oak woodlands on rocky slopes. Mostly encountered in ecotones between woodland and more open habitats or along riparian corridors. Elevation: 3,600 – 8,000 feet (Brennan and Holycross 2006).
Organ pipe shovel-nosed snake	*Chionactis palarostris organica*	AGFD SGCN 1B	–	X	–	Preferred habitat includes paloverde-saguaro habitats, and is fossorial in sandy and sandy-gravelly soils, prefers bajadas and hilly terrain in extreme south-central Arizona. Elevation: 0 – 2,500 feet (AGFD 2003i).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Reticulated gila monster	*Heloderma suspectum suspectum*	AGFD SGCN 1A	X	I	I	In Arizona, primarily in Sonoran Desert and extreme western edge of Mohave Desert, less frequent in desert-grassland and rare in oak woodland. Most common in undulating rocky foothills, bajadas and canyons. Less frequent or absent on open sandy plains. Elevation: <4,100 feet (AGFD 2013f).
Sonoran collared lizard	*Crotaphytus nebrius*	AGFD SGCN 1B	X	X	–	Preferred habitat includes rocky bajadas, hillsides, canyons, and mountain slopes, in areas with numerous large rocks and boulders in Maricopa, Pima, Pinal, and Yuma Counties, Arizona. Elevation: 0 – 4,680 feet (AGFD 2007).
Texas horned lizard	*Phrynosoma cornutum*	USFWS - SC	X	–	–	Chihuahuan desert and desert grassland; sandy to gravelly flat ground with or without rocky cover, usually with scattered shrubs or on mesquite flats. Elevation: 3,500 – 5,000 feet (AGFD 2002j).
Thornscrub hook-nosed snake	*Gyalopion quadrangulare*	USFS - S, AGFD SGCN 1B	X	–	–	In Arizona, oak-grass and mesquite-grass habitats, in loose soil of canyon bottoms and outwash plains. Rolling foothills of mesquite grasslands, including partly cultivated areas. Elevation: 3,400 – 4,400 feet (AGFD 1997).
Tucson shovel-nosed snake	*Chionactis occipitalis klauberi*	USFWS - SC, AGFD SGCN 1A, Pima	X	X	–	Sonoran desertscrub. Associated with soft, sandy soils having sparse gravel. Found in creosote bush-mesquite floodplain environments. Finds shelter under desert shrubs. Elevation: 790 – 1,700 feet (AGFD 2010e).

Common Name	Scientific Name	Status [a]	South	Central	North	Habitat Requirement
Yaqui black-headed snake	*Tantilla yaquia*	USFS - S, AGFD SGCN 1B	X	–	–	Evergreen and riparian woodland in the Chiricahua and Mule Mountains, Cochise County, and Pajarito Mountains, Santa Cruz County. Elevation: generally above 3,300 feet (AGFD 1991).

SOURCES: X = GIS point data from AGFD (2017b); Pima County (2013); and Morris, Kline, and Morris (2015); I = inferred species presence, corresponds to readily available information on species habitat preferences and range maps

[a] 1A = Tier of SGCN vulnerable species for which AGFD has entered into an agreement or has legal or contractual obligation, or warrants the protection of a closed season; 1B = Tier of SGCN species that are vulnerable but not Tier 1A species; AGFD = Arizona Game and Fish Department; BGEPA = Bald and Golden Eagle Protection Act; BLM = US Bureau of Land Management; CCA = Candidate Conservation Agreement under the ESA; HS = Highly Safeguarded under NPL; NPL = Arizona Native Plant Law; Petition = petitioned to be listed under the ESA; Pima = Listed by Pima County as Sensitive; S = Sensitive Species; SC = Species of Concern; SGCN = Species of Greatest Conservation Need; SR = Salvage Restricted under NPL; USFS = US Forest Service; USFWS = US Fish and Wildlife Service.

All elevations listed include Arizona range except where indicated. The potential presence of sensitive species listed by Pima County alone was only evaluated for the South Section.

AGFD data identify species with a known historical occurrence within the I-11 Project Study Area. Listing however does not mean that the species still exists within the I-11 Project Study Area or indicate where within the area the species was recorded. The AGFD data in this table only document presence, not absence, of a species.

Migratory Bird Treaty Act

Within the Sonoran Desert there are over 500 species of birds (Arizona-Sonora Desert Museum 2000). The majority of these species are migratory and protected under the MBTA. Nonnative species whose occurrences in the US are solely the result of intentional or unintentional human-assisted introduction are not covered by the MBTA. Migratory birds' requirements for habitat vary with different species with many of them utilizing Sonoran Desert habitats, agricultural and floodplain habitats, and/or open water habitats.

E14.3.3 Wildlife Connectivity

The ability for wildlife to disperse or move between habitats and across landscapes is a fundamental part of their life history. Connectivity in the landscape is maintained by comparable habitat patches being close together or linked by corridors of suitable habitat that wildlife can use or move through. All wildlife species require connectivity to complete essential aspects of their life history, including dispersal, colonization, and access to resources. For instance, many large mammal species can move tens or even hundreds of miles during seasonal migration or in search of food and other important resources. Conversely, some wildlife move short distances to obtain certain vital resources or to seek mating opportunities within habitat areas. In the long term, connectivity affects the size and genetic viability of sub-populations, which plays an important role in the survival and persistence of populations. Human development fragments and isolates naturally connected habitats across the landscape. In addition, the effects of urban expansion on species dispersal may vary substantially across taxa (Perkl et al. 2018). Research demonstrates that deleterious impacts can be minimized or mitigated by focusing on protecting and enhancing connections, corridors, or linkages between habitat areas (AGFD 2018c). The synthesis of information in the efforts and reports on wildlife connectivity in Arizona does not necessarily represent an exhaustive mapping of all important wildlife linkages and barriers in the Study Area. Rather, this information should be considered an initial assessment of wildlife movement patterns to be supplemented in the future by further analysis and refinement that includes additional expert input, research studies of wildlife movement patterns, and additional linkage delineation based on site-specific data (AGFD 2018c).

As part of AGFD's management of wildlife and fisheries, the Arizona SWAP (AGFD 2012a) presents an outline of a Species and Habitat Conservation Guide model, which identifies conservation potential for lands within the state. The AGFD decided to include five indicators of wildlife conservation value in the model. Each of those indicators, or sub models, was developed as a separate layer that can be used independently of the model. These five indicators are (AGFD 2012a):

- The importance of the landscape in maintaining biodiversity – represented by the SGCN.
- The economic importance of the landscape to the State of Arizona – represented by the Species of Economic and Recreational Importance.
- The economic importance of the waterbodies and aquatic systems to the State of Arizona – represented by sport fish.
- Large areas of relatively intact habitats – represented by unfragmented areas.
- The importance of riparian habitat to wildlife – represented by riparian habitat.

To help identify areas in the landscape that have very little to no development, AGFD created a landscape integrity dataset (Perkl 2013) by weighting and combining many factors that can

contribute to a human modification of the landscape (e.g., roads, railroads, airports, canals, housing). From this dataset, the most intact contiguous areas larger than 5,000 hectares were extracted to represent Large Intact Blocks. This size threshold was set by AGFD for a patch of habitat to be considered a Large Intact Block; if a road segment reduces the size of a Large Intact Block to be smaller than this threshold value, or if that block is isolated by barriers, the functionality of the entire block is compromised (AGFD 2018c).

Figure E14-10 depicts clusters of adjacent Large Intact Blocks within the Study Area, for which at least a portion of the blocks fall within the Study Area. Each number-letter combination corresponds to an individual Large Intact Block, where the number indicates the Large Intact Block Cluster it belongs to. Large Intact Block Cluster 7 corresponds to the other Large Intact Blocks that occur beyond the Study Area, and for which no calculations were made.

Both these blocks and the nearby blocks outside the Study Area could be influenced by one or more of the 20 proposed corridor options being considered, through habitat loss, fragmentation, and isolation. The Large Intact Block clusters were delineated in GIS data provided by AGFD (AGFD 2018c). The assignment of Large Intact Blocks into numbered clusters is part of the AGFD GIS data to aid in the discussion of the potential environmental consequences in **Section E14.4.3**. AGFD determined Large Intact Block cluster associations by identifying road segments for which annual average daily traffic is at least 5,000. Canals smaller than the Central Arizona Project (CAP) canal also were considered as potential breaks, but AGFD concluded that they currently do not represent as much of barrier to movement compared to road segments with high traffic volumes. Traffic density correlates with the barrier effect of roadways on wildlife. For instance, roads with 4,000 to 10,000 vehicles per day are considered a strong barrier, because noise and movement repel wildlife, and individuals trying to cross the road become casualties. Roads with traffic levels beyond 10,000 vehicles per day are considered impermeable to most species (Iuell et al. 2003).

In 2006, an interagency working group in Arizona published Arizona's Wildlife Linkages Assessment (AWLWG 2006a) that identified and mapped large areas of protected habitat and linkages between those that were threatened by fragmentation and isolation. These were prioritized for conservation and to preserve connectivity at a landscape level. The mapped areas included potential linkage zones, which are portions of habitat critical for wildlife movement between two or more habitat blocks. Both ADOT and AGFD maintain data and information relevant to wildlife movement within the State of Arizona.

Subsequently, AGFD and other state and local agencies have worked to refine both the habitat areas in need of conservation and the specific wildlife movement corridors that connect these areas. Between 2006 and 2008, AGFD contracted Paul Beier at Northern Arizona University to model the biologically corridors in the areas ranked by the AWLWG to be the highest priority at the time. These were produced using a group of focal species that need large intact landscapes to perpetuate local populations, habitat specialists, species reluctant or unable to cross barriers, rare and/or endangered species, and species that need connected landscapes for gene flow. Identifying the organisms that have the greatest requirements also may aid in maintaining the connectivity of habitats for non-target organisms with more common requirements. The wildlife linkages that were identified from the model and that occur within the I-11 Study Area include the Santa Rita-Tumacácori Linkage, the Patagonia-Santa Rita Linkage, the Tucson-Tortolita-Santa Catalina Linkage, the Ironwood-Picacho Linkage, the Gila Bend-Sierra Estrella Linkage, the Buckeye Hills East - Sonoran Desert National Monument Linkage, the Wickenburg-Hassayampa Linkage, and the White Tank-Belmont-Hieroglyphic Mountains Linkage.

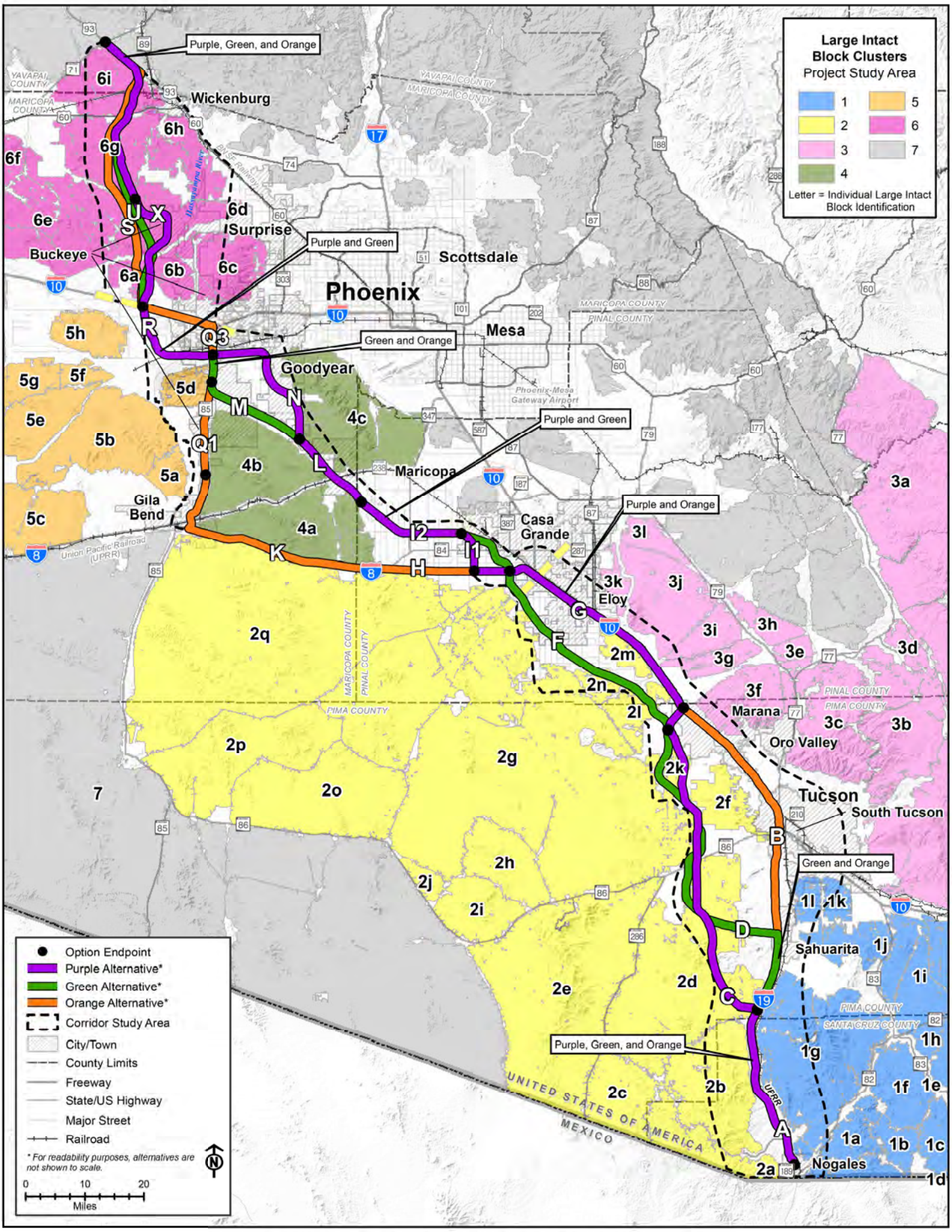

Figure E14-10. Large Intact Block Clusters

Further details are provided in a series of missing linkage reports that are available online. Prioritization was based on the importance of retaining wildlife movements through an area and on perceived potential for further fragmentation of the area. Therefore, modeling efforts should not be interpreted as an indication that wildlife linkages that were not modeled are any less critical to wildlife movement across Arizona. AGFD used similar methods to supplement the identified linkages in other priority areas between 2010 and 2013; in Pima County, these Detailed Linkages were identified through funding by the Pima County Regional Transportation Authority. The Detailed Linkages that occur within the I-11 Study Area include the Santa Rita-Sierrita Detailed Linkage and the Coyote-Ironwood-Tucson Detailed Linkage. **Figure E14-11** depicts the linkages based on this work for the South Section. **Figure E14-12** and **Figure E14-13** depict the same information for the Central and North Sections, respectively. These figures include the wildland blocks, which represent the core areas used for modeling connectivity for the wildlife linkages and Detailed Linkages; as well as other wildlife connectivity features, including the Tucson Mitigation Corridor (TMC) and the Gila/Salt River Corridor Granite Reef Dam Potential Linkage Zone. Given that multiple, often overlapping, wildlife connectivity features are mentioned in this section, only features that have little to no overlap with each other are represented in the figures.

During the scoping process, AGFD, BLM, and other pertinent agencies expressed concerns for the potential of I-11 to further fragment habitat, and the desire to preserve Large Intact Blocks and the corridors that connect them. Where infrastructure could fragment or obstruct a movement corridor, some level of permeability may be maintained or mitigated through installation of overpasses or underpasses that are properly located and designed to convey wildlife across the barrier.

Wildlife corridors are permeable contiguous habitats that help to maintain connections among larger areas of similar habitat and that cross areas surrounded by or are otherwise fragmented by human infrastructure (Turner, Gardner, and O'Neill 2001). In some cases, wildlife corridors have been identified through GIS models as previously described. In other cases, wildlife corridors are natural features in the landscape, such as strips of xero-riparian habitat that can span short or vast distances across the landscape. Although wildlife corridors represent a smaller proportion of land across a given landscape, these are critical features needed to maintain dispersal patterns, daily movements, and gene flow; to preserve migration routes; or to conserve satellite populations within a meta-population network.

The designated wildlife corridors crossing the Study Area identified through the Arizona Missing Linkages Project (Beier, Garding, and Majka 2006, 2008a, 2008b; Beier, Majka, and Bayless 2006a, 2006b, 2006c) are described by project section in **Table E14-14** and the text that follows. Other wildlife corridors within the Project Area that do not overlap or only partially overlap with these wildlife linkages are also listed; these correspond to the Detailed Linkages, BLM Wildlife Movement Corridors, the Pima County Buffer Overlay Zone, the Tucson Mitigation Corridor, and the Gila/Salt River Corridor Granite Reef Dam Potential Linkage Zone. These other wildlife corridors, as well as wildlife linkages identified within individual counties in the County Wildlife Connectivity Assessments, which provide detail beyond the scope of the Tier 1 analysis, will be examined in the Tier 2 analysis; these include the assessments for Maricopa County (AGFD 2011d), Pima County (AGFD 2012d, 2012e), Pinal County (AGFD 2013e), and Yavapai County (AGFD 2013i). The text also describes some of the major washes and established wildlife crossings that are important to wildlife movement in the Study Area. Additional features would need to be identified through on-the-ground studies.

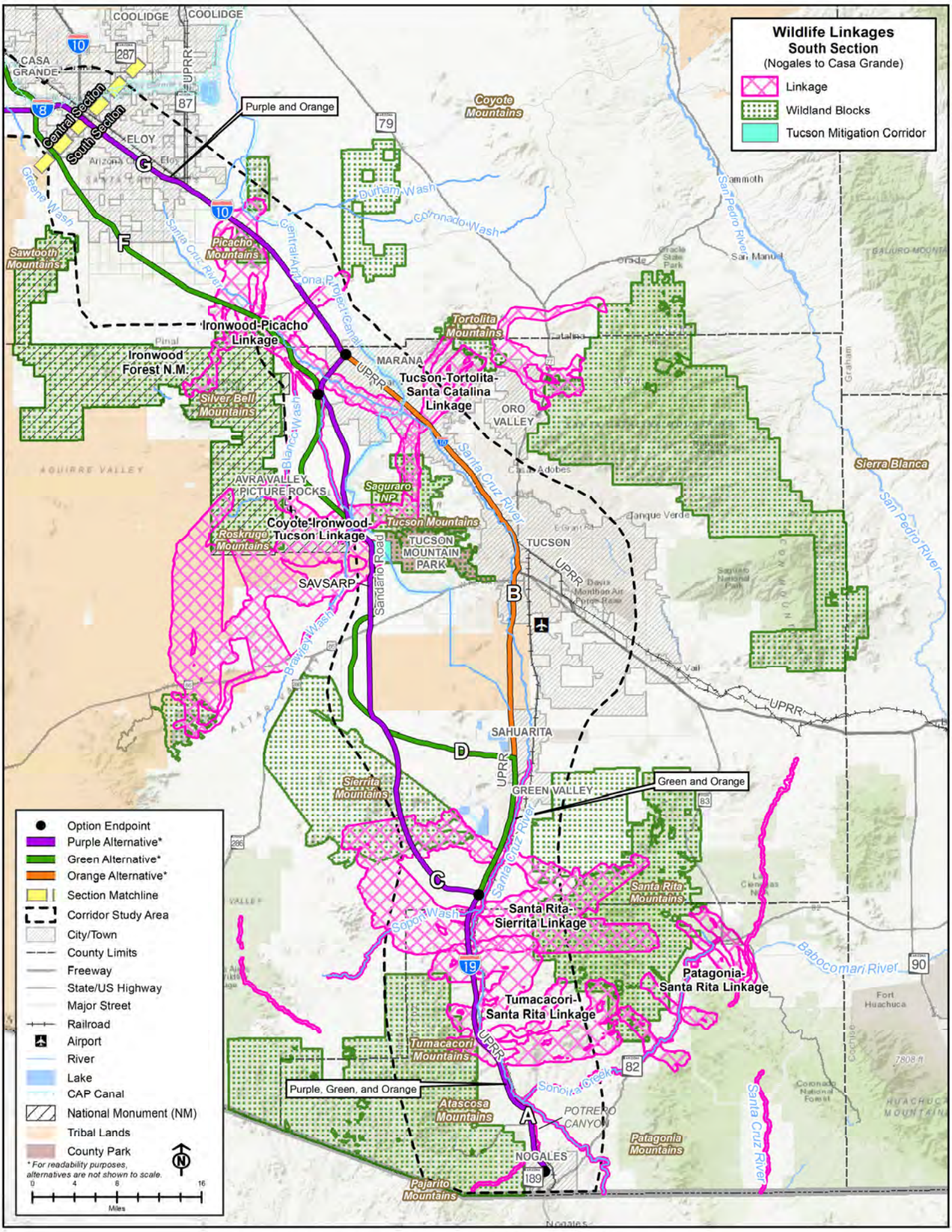

Figure E14-11. Wildlife Linkages - South Section

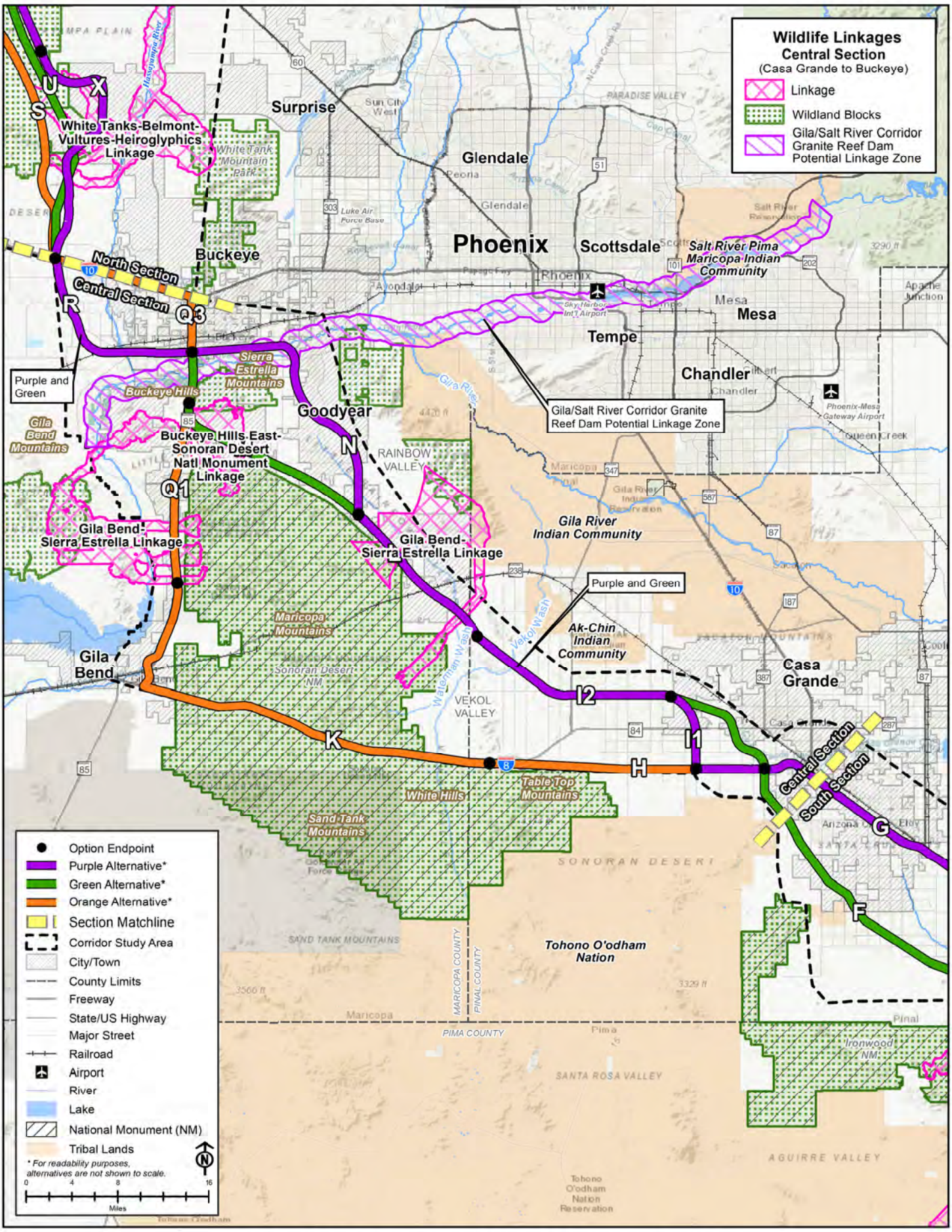

Figure E14-12. Wildlife Linkages - Central Section

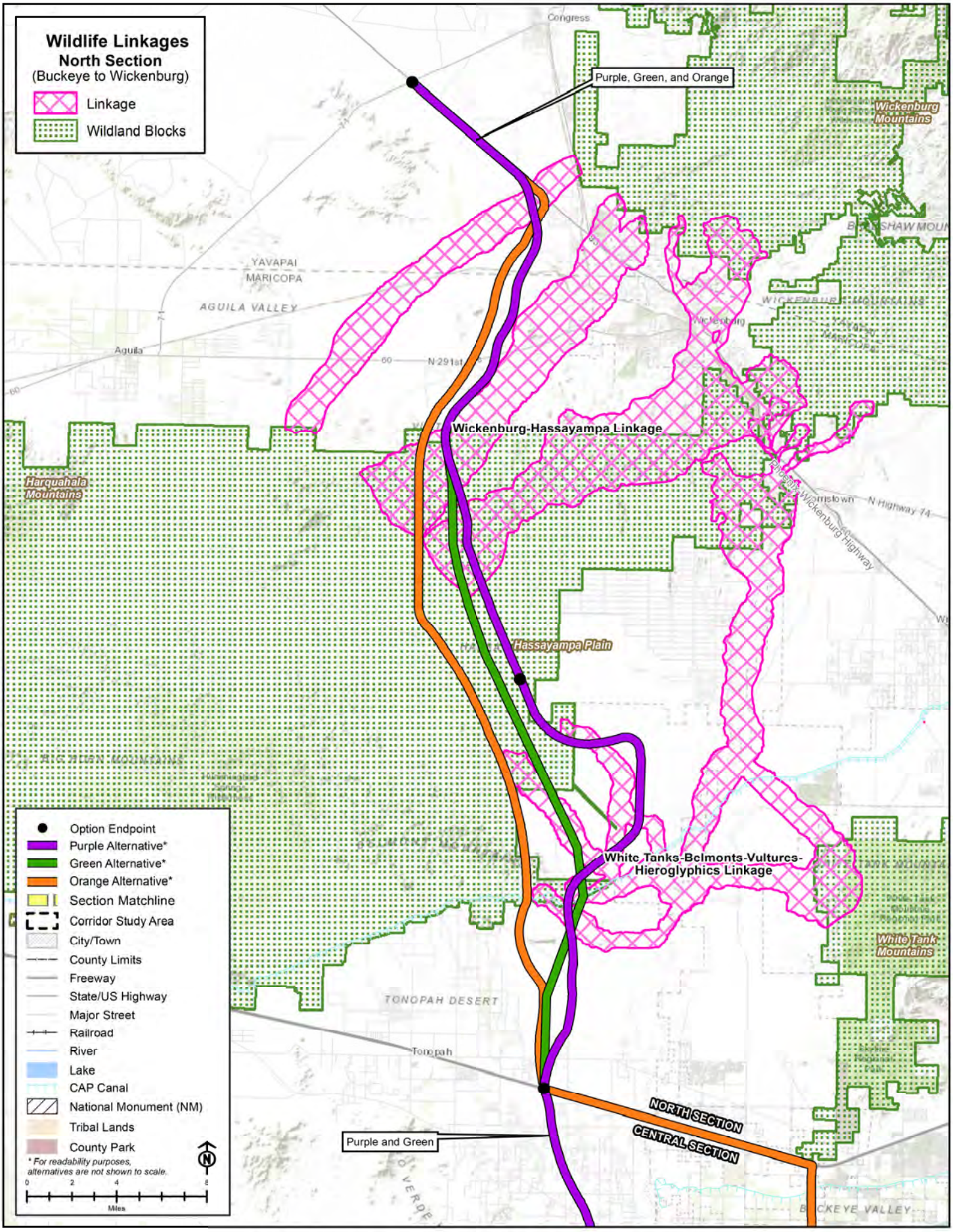

Figure E14-13. Wildlife Linkages - North Section

Table E14-14. Summary of Wildlife Linkages and Other Wildlife Corridors in the Study Area

Wildlife Movement Corridors	South Section	Central Section	North Section
Wildlife Linkages			
Santa Rita-Tumacácori Linkage	X	–	–
Patagonia-Santa Rita Linkage	X	–	–
Tucson-Tortolita-Santa Catalina Linkage	X	–	–
Ironwood-Picacho Linkage	X	–	–
Santa Rita-Sierrita Detailed Linkage	X	–	–
Coyote-Ironwood-Tucson Detailed Linkage	X	–	–
Gila Bend-Sierra Estrella Linkage	–	X	–
Buckeye Hills East – Sonoran Desert National Monument Linkage	–	X	–
Wickenburg-Hassayampa Linkage	–	–	X
White Tank-Belmont-Hieroglyphic Mountains Linkage	–	–	X
Other Wildlife Corridors			
BLM Wildlife Movement Corridors	–	X	X
Pima County Wildlife Corridors	X	–	–
Pina County Buffer Overlay Zone	X	–	–
Tucson Mitigation Corridor (TMC)	X	–	–
Gila/Salt River Corridor Granite Reef Dam Potential Linkage Zone	–	X	–

SOURCES: Wildlife linkages data obtained from AWLWG (2006b, 2006c, 2006d, 2006e, 2006f, 2008a, 2008b); Tucson Mitigation Corridor data obtained from Reclamation (2016).

South Section

Approximately 597,031 acres of Large Intact Blocks occur within the South Section, represented by three Large Intact Block clusters designated as Large Intact Block Clusters 1 through 3. Large Intact Block Cluster 1 and Large Intact Block Cluster 2, which are the southernmost blocks, occur respectively on the east and west sides of I-19 and the Santa Cruz River. The northern boundary of Large Intact Block Cluster 1 corresponds to I-10; that of Large Intact Block Cluster 2 corresponds to I-8. Large Intact Block Cluster 3 occurs north and east of the City of Tucson. Major barriers between the Large Intact Blocks in the South Section include I-19, I-10, State Route (SR) 86, SR 82, SR 83, the City of Tucson, and the City of Casa Grande (**Figure E14-10**).

The Tucson-Tortolita-Santa Catalina Linkage occurs in Pima and Pinal Counties and connects protected lands in three mountainous areas (Tortolita Mountains, Santa Catalina Mountains, and Tucson Mountains) that are connected across desert valleys by means of two corridors (Beier, Garding, and Majka 2006d). Major barriers to movement within this linkage include highways (I-10 and SR 77), the cities of Oro Valley and Marana, and a growing network of residential developments and roads (Beier, Garding, and Majka 2006d). Pima County has

begun to purchase land within this linkage to preserve connectivity between the Tortolita Mountains and the Tucson Mountains within this corridor. This includes approximately 5,161 acres described as the Avra Valley/I-10 parcel, most of which occurs within the Tucson-Tortolita-Santa Catalina Linkage.

The Santa Rita-Tumacácori Linkage includes a complex of upland and riparian corridors connecting the Santa Rita Mountain Complex and surrounding semidesert grasslands with the Tumacácori-Atascosa-Pajarito Mountain Complex (Beier, Majka, and Bayless 2006b). Riparian corridors in the linkage include parts of Sapori Wash, the Santa Cruz River, Sonoita Creek, and Potrero Canyon (Beier, Majka, and Bayless 2006b). Major potential barriers in the linkage include I-19, the Union Pacific Railroad, and urban development along I-19, which inhibit wildlife movement between the two wildland blocks (Beier, Majka, and Bayless 2006b). Traffic by undocumented migrants from Mexico, and border security efforts to control that traffic, also affect animal movement in the linkage (Beier, Majka, and Bayless 2006b).

The Patagonia-Santa Rita Linkage occurs on private land, national forest, and state trust land, and consists of four distinct corridors that are approximately 1 to 2 miles wide and linked by a narrower corridor that follows riparian habitat along Sonoita Creek. This linkage connects the Santa Rita Mountains and the Patagonia Mountains across Sonoita Creek (Beier, Garding, and Majka 2008b). Major potential barriers in the linkage include SR 82, SR 83, border security, and expanding urban development in and near Patagonia and Sonoita (Beier, Garding, and Majka 2008b).

The Ironwood-Picacho Linkage connects protected lands managed by BLM, located at the Ironwood Forest National Monument, the Picacho Mountains, and a block of Sonoran Desert surrounding Durham Wash and Coronado Wash (Beier, Majka, and Bayless 2006a). One corridor complex connects the Ironwood Forest National Monument with the Picacho Mountains; another corridor connects a block of Sonoran Desert with the Ironwood Forest National Monument (Beier, Majka, and Bayless 2006a). Major potential barriers to wildlife movement within the linkage include I-10, the Union Pacific Railroad, the CAP Tucson Canal and irrigation canals, and urban and agricultural development along the I-10 corridor (Beier, Majka, and Bayless 2006a).

The Santa Rita-Sierrita Detailed Linkage includes a large, divided wildlife corridor that connects wildland blocks associated with the Santa Rita and the Sierrita Mountains that are separated by the Santa Cruz Valley (AGFD 2012e). Substantial barriers that impede wildlife passage between the two areas include I-19, major roads, a number of mine features, the Union Pacific Railroad, and urban growth in Green Valley (AGFD 2012e).

The Coyote-Ironwood-Tucson Detailed Linkage includes a series of interconnected corridors joining protected native lands in the Coyote Mountains; the Ironwood Forest National Monument (including part of the Roskruge, Silver Bell, and Sawtooth Mountains); and the Tucson Mountains (including Saguaro National Park [SNP] and its designated wilderness area) (AGFD 2012f). The branches of the corridor pass through various features including steep foothills around the Roskruge Mountains and Avra Valley. Smaller portions of the corridor include Brawley Wash, Blanco Wash, and portions of the Santa Cruz River (AGFD 2012a). Potential impediments to wildlife movement through this linkage involve SR 86 and other major roads, and the communities in the local region (i.e., Avra Valley, Picture Rocks, Robles Junction/Three Points, and the Town of Marana) (AGFD 2012f).

Major xero-riparian features that facilitate movement in the South Section of the Study Area include Brawley Wash, Greene Wash, Robles Wash, and the Santa Cruz River. These features aid wildlife movement north-south through the Avra Valley, with 17 tributaries such as Sopori Wash and Sonoita Creek to the east and west aiding movement across the valleys. The larger tributaries to the Santa Cruz River include Cañada del Oro Wash and the Rillito River.

The Bureau of Reclamation established the 2,514-acre TMC in 1990 west of Tucson Mountain Park (Reclamation 2016). The western portion of the TMC occurs within the Coyote-Ironwood-Tucson Detailed Linkage. The purchase and protection of these lands was a commitment made by the Bureau of Reclamation with USFWS and AGFD as a conservation measure developed for the Tucson Aqueduct EIS (Reclamation 2016). The Master Management Plan agreed to by these agencies prohibits any future development within the area other than existing wildlife developments or habitat improvements (Reclamation 2016). This prohibition is intended to preserve habitat from urbanization while maintaining an open wildlife movement corridor (Reclamation 2016).

In order to maintain a functional wildlife movement corridor, the Bureau of Reclamation installed a series of seven CAP canal siphons, which are concrete pipe sections that travel underneath desert washes (Reclamation 2016). In March 2016, two desert bighorn sheep were observed using one of the siphon crossings within the TMC to move from the Ironwood Forest National Monument to the Tucson Mountain District of SNP (Reclamation 2016). AGFD biologists believe these sheep are dispersing from populations in the Silver Bell and Waterman Mountains, directly south of the Silver Bell Mountain Range (AGFD 2018c). Mule deer and javelina also have been observed using the siphon crossings (Popowski and Krausman 2002). Bobcat (*Lynx rufus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), American badger (*Taxidea taxus*), desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), and Harris' antelope squirrel (*Ammospermophilus harrisii*) activity has been documented at camera sites located in the designated wildlife crossings within or just outside the TMC (Haynes et al. 2010). In addition, a mountain lion was observed crossing Sandario Road, east of the Southern Avra Valley Storage and Recovery Project, which suggests the potential for lion movement in and out of the Tucson Mountains (Haynes et al. 2010). The western part of the TMC is bounded by North Sandario Road, which occurs within 0.6 and 1.6 miles of these crossing features.

Pima County has targeted for purchase an additional 1,896 acres adjacent to the southern boundary of the TMC parcel in the Brawley Wash/Black Wash area. If Pima County can obtain the funds to purchase this parcel, it will preserve in perpetuity additional land on either side of the CAP canal that remains free from development. The CAP canal is crossed by two roadway bridges in this area (West Manville Road, north of Mile Wide Road, and West Milky Way Drive, south of the TMC) that could facilitate wildlife movement between Ironwood Forest National Monument and the Tucson Mountain District of SNP. The land is suitable to install wildlife-specific crossings at a later date. In addition, the City of Tucson has designated an Avra Valley Habitat Conservation Plan Permit Area, setting aside 21,000 acres of city-owned land in the Avra Valley of Pima County for limited development, to support federally recognized species.

The Pima County Buffer Overlay Zone is a zoning overlay district within 1 mile of the public preserves in Pima County, including national, state, and county parks; wildernesses; and national forests and monuments. The purpose of this overlay is to preserve and protect the open space characteristics of lands that are in close proximity to public preserves, ensure the continued existence of adequate wildlife habitat, and foster unimpeded wildlife movement in the

vicinity of Pima County's public preserves, while also permitting reasonable economic use of the land.

Central Section

Approximately 335,802 acres of Large Intact Blocks occur within the Central Section, represented by two Large Intact Block clusters designated as Large Intact Block Clusters 4 and 5. Large Intact Block Cluster 5 is bound by I-10 to the north and I-8 to the south and includes habitat adjacent to the Gila River. Large Intact Block Cluster 4 is east of Large Intact Block Cluster 5 and east of Gila Bend. Major barriers between Large Intact Blocks in the Central Section include I-8; SR 238; and SR 85, which isolates Large Intact Block Cluster 4 from Large Intact Block Cluster 5 (**Figure E14-10**).

The Gila Bend-Sierra Estrella Linkage connects protected lands in four areas, the Gila Bend Mountains, the Sonoran Desert National Monument, the Sierra Estrella Mountains, and the Buckeye Hills (Beier, Garding, and Majka 2008a). The linkage is made of two separate corridor complexes. One corridor complex connects the Sonoran Desert National Monument to the Gila Bend Mountains across the Gila River lowlands and Buckeye Hills. The other connects the Sonoran Desert National Monument to the Sierra Estrella Mountains (Beier, Garding, and Majka 2008a). Major barriers in these corridors include SR 85, irrigation canals, and agricultural and urban development (Beier, Garding, and Majka 2008a). The Gila/Salt River Corridor Granite Reef Dam Potential Linkage Zone, which is located along the Gila River, is a critical resource for habitat connectivity and wildlife movement (AWLWG 2006a) that includes riparian vegetation that supports many wildlife species.

The Buckeye Hills East-Sonoran Desert National Monument Linkage is approximately 4.3 to 6.2 miles long and connects the Buckeye Hills and Gila River corridor to the north with the Maricopa Mountains in the Sonoran Desert National Monument to the south (AGFD 2018c). The linkage is relatively free of physical impairments but primarily includes unimproved roads, dispersed off-road vehicle recreation, and utility lines (AGFD 2018c).

The primary natural corridors in the Central Section include Waterman Wash, Vekol Wash, and the Gila River. Waterman Wash and Vekol Wash aid the north-south movement of wildlife through Rainbow Valley to the Gila River. The east-west oriented tributaries to these two washes aid movement of wildlife across Vekol Valley and Rainbow Valley. The Gila River aids movement east-west along the Buckeye Hills and north-south through the lowlands bounded by the Maricopa and Gila Bend Mountains.

The BLM *Lower Sonoran Planning Area Resource Management Plan* has designated Wildlife Movement Corridors on lands managed by BLM within the Central Section (BLM 2012) to assist wildlife in moving from one area to another safely. BLM developed mitigation measures to protect these Wildlife Movement Corridors. Some of these corridors have varying amounts of overlap with the Buckeye Hills East-Sonoran Desert National Monument Linkage, and the Gila Bend-Sierra Estrella Linkage. Other BLM corridors do not co-occur with other established wildlife corridors.

The greatest potential for wildlife mobility from the Maricopa Mountains to a neighboring mountain range is through Rainbow Valley to the Estrella Mountains.

North Section

Approximately 403,140 acres of Large Intact Blocks occur within the North Section, represented by one Large Intact Block cluster designated as Large Intact Block Cluster 6, which occurs west of Phoenix and north of I-10. To the north, Large Intact Block Cluster 6 is bound by US 60, US 93, and SR 71 at the northern end of the project corridor (**Figure E14-10**). The CAP canal, which occurs within Large Intact Block Cluster 6 and is a major barrier to wildlife movement in the North Section, includes mitigation for wildlife connectivity.

The Wickenburg-Hassayampa Linkage connects wildland blocks in the Wickenburg, Weaver, Hieroglyphic, Buckhorn, and Sheep mountains to wildland blocks in the Vulture, Harquahala, and Big Horn Mountains via three separate corridor areas (Beier, Majka, and Bayless 2006c). Major potential barriers within the wildlife corridors include US Route 60, the Phoenix-Wickenburg Highway, US 93, the Burlington Northern Santa Fe Railroad, the proposed Wickenburg bypass, and expanding urban development in and near Wickenburg (Beier, Majka, and Bayless 2006c).

The White Tank-Belmont-Hieroglyphic Mountains Linkage connects wildland blocks between the White Tank Mountains and surrounding core wildlife wildland blocks in the Belmont Mountains, Big Horn Mountains, Vulture Mountains, Hieroglyphic Mountains, and the Hassayampa River (AGFD 2018c). The purpose of these wildlife corridors is to conserve the current ecological integrity and long-term viability of wildlife populations in the White Tank Mountains by ensuring the habitat network can provide robust resistance to the pressures of development and climate change (AGFD 2018c). The primary barriers or impairments within the corridor arms include Sun Valley Parkway, North Wickenburg Road/135th Avenue, US 60, rural roadways, the CAP canal, livestock fencing along the CAP canal, rural housing units, and the potential for future urban development (AGFD 2018c).

The principal natural corridors in the North Section include the Hassayampa River, Jackrabbit Wash, Coyote Wash, Star Wash, and Daggs Wash. These aid the north-south movement of wildlife from highlands near Wickenburg to the lowlands near the Gila River. The Hassayampa River also functions as an important transition from a riparian to xero-riparian corridor in the vicinity of Wickenburg.

The Bureau of Reclamation maintains a number of wildlife crossings where the CAP would otherwise block the north-south movement of terrestrial wildlife across the Hassayampa Plain. There are eight crossing features along the CAP canal within the North Section. Two of the wildlife bridges were placed between the Belmont Mountains and the Hot Rock Mountains, and Belmont Mountains and the Flatiron Mountains, respectively, while a third was placed just north of the White Tank Mountain Regional Park to facilitate movement of terrestrial wildlife across the canal. Siphons under the Hassayampa River and Jackrabbit Wash also preserve movement opportunities for wildlife along these washes. Five concrete wash overchute structures designed for drainage purposes, although not optimal in design, also provide opportunity for wildlife to cross the CAP canal at Coyote Wash and Daggs Wash. Three of the concrete overchutes occur west of the Hassayampa River; the other two occur to the east. Recent and ongoing monitoring of CAP canal crossing structures by Bureau of Reclamation personnel have recognized that concrete overchutes are utilized for crossing purposes by wildlife, including mule deer, kit fox (*Vulpes macrotis*), American badger, skunks (Mephitidae family), mountain lion, and desert bighorn sheep (Reclamation 2018).

The BLM *Lower Sonoran Planning Area Resource Management Plan* has designated Wildlife Movement Corridors on lands managed by BLM within the North Section (BLM 2012) to assist wildlife in moving from one area to another safely. Some of these corridors have varying amounts of overlap with the White Tank-Belmont-Hieroglyphic Mountains Linkage and the Wickenburg-Hassayampa Linkage. Other BLM corridors do not co-occur with other established wildlife corridors.

E14.4 Environmental Consequences

This section includes an analysis and comparison of the three Build Corridor Alternatives: the Green, Purple, and Orange Alternatives, as well as the individual options that make up each Build Corridor Alternative (see **Chapter 2** [Alternatives Considered] for a full description). This section also analyzes a potential new route for Options C and D located near the CAP canal and the TMC. This CAP Design Option is within the South Section for the Purple and Green Alternatives and includes a deviation to the east from the Sandario Road alignment to parallel the CAP canal. This new option, which is described further in **Chapter 2** (Alternatives Considered) of the Draft Tier 1 EIS, would introduce negligible differences in impacts to most biological resources except for wildlife connectivity. Differences between the CAP Design Option and Options C and D are discussed in the following sections.

E14.4.1 Biotic Communities (Vegetation and Wildlife)

Build Corridor Alternatives

Biotic Communities

Table E14-14 summarizes the number of acres of each biotic community within each of the corridor options. **Table E14-15** and **Table E14-16** summarize the acres of potential impact within the three Build Corridor Alternatives and the No Build Alternative.

Based on the entire 2,000-foot-wide corridor, the Orange Alternative would encompass approximately 33 percent fewer acres within the Semidesert Grassland than either the Purple or Green Alternatives and approximately 25 percent fewer acres in the Lower Colorado River Desertscrub. Within the Arizona Upland Sonoran Desertscrub, the Orange Alternative would include approximately 63 percent more acres than the Purple Alternative and 58 percent more than the Green Alternative. Impacts to Mohave Desertscrub would be identical for all three Build Corridor Alternatives. Within the 2,000-foot-wide corridor, the acreage within the Orange Alternative is 2 percent less than the Green Alternative and 3 percent less than the Purple Alternative. Because the Orange Alternative would be co-located along existing transportation routes, the overall footprint of that alternative would be substantially reduced compared to the other Build Corridor Alternatives.

The estimated acreage for the No Build Alternative includes projects that are currently programmed. These projects include widening projects along existing routes (I-10 in Tucson and near the Town of Picacho and US 93 in Wickenburg). The estimated acres of impact for the No Build Alternative were developed using the length of each programmed project and multiplying that length by an assumed width of disturbance of 100 feet. Because these improvements would occur on existing facilities, the overall impact to biotic communities would be negligible.

Table E14-15. Acres for Biotic Communities within Corridor Options

Option	Semidesert Grassland	Arizona Upland Sonoran Desertscrub	Lower Colorado River Desertscrub	Mohave Desertscrub	Total Acres
South Section					
A	6,955	0	0	0	6,955
B	1,468	10,533	2,182	0	14,183
C [a]	6,142 (6,187)	2,154 (2,281)	5,840 (5,907)	0	14,136 (14,375)
D [a]	6,123 (6,123)	4,192 (4,293)	5,245 (5,304)	0	15,560 (15,720)
F	0	0	12,331	0	12,331
G	0	908	10,021	0	10,929
Central Section					
H	0	923	3,459	0	4,382
I1	0	0	1,768	0	1,768
I2	0	0	4,515	0	4,515
K	0	3,621	6,415	0	10,036
L	0	0	3,647	0	3,647
M	0	0	4,478	0	4,478
N	0	0	6,205	0	6,205
Q1	0	0	3,860	0	3,860
Q2	0	0	1,101	0	1,101
Q3	0	0	4,198	0	4,198
R	0	0	4,236	0	4,236
North Section					
S	1,065	6,341	4,252	567	12,225
U	946	5,220	5,335	570	12,071
X	946	5,123	6,588	570	13,227

[a] Acreage for the CAP Design Option is in parentheses under the acreage for the regular option.

Table E14-16. Acres of Biotic Communities within the Build Corridor Alternatives and Percent of Total Biotic Community Area within the Study Area

Build Corridor Alternative	Semidesert Grassland	Arizona Upland Sonoran Desertscrub	Lower Colorado River Desertscrub	Mohave Desertscrub
Purple Alternative (**Options A**, C[a], **G**, I, L, N, R, X)	14,043 3.2% (14,088) (3.2%)	8,185 0.9% (8,312) (0.9%)	42,820 3.4% (42,887) (3.4%)	570 24.8% (570) (24.8%)
Green Alternative (**Options A**, D[a], F, I2, L, M, **Q2**, R, U)	14,024 3.2% (14,024) (3.2%)	9,412 1.0% (9,513) (1.0%)	40,888 3.2% (40,947) (3.3%)	570 24.8% (570) (24.8%)
Orange Alternative (**Options A, B, G, H, K, Q, S**)	9,488 2.2%	22,326 2.4%	31,290 2.5%	570 24.6%
No Build Alternative	0 0%	105 <0.1%	64 <0.1	0 0%

NOTE: Bold letters under option indicate the options that are co-located with existing routes.
[a] Acreage for the Build Corridor Alternative using the CAP Design Option instead of the regular option (designated by an asterisk) is in parentheses.

Riparian and Important Bird Area Habitats

In addition to crossing major biotic communities, the corridor options also cross several unique habitat types, including several riparian areas: Lower Montane Riparian, Desert Riparian, Emergent Marsh, Desert Wash, and Invasive Riparian. Several Important Bird Areas coincide with riparian areas.

Table E14-17 summarizes the number of acres of riparian and Important Bird Area habitats within each of the 2,000-foot-wide corridor. **Table E14-18** summarizes the number of acres of riparian areas and Important Bird Areas for each of the three proposed Build Corridor Alternatives. Acreage values for the No Build Alternative were all equal to zero, and therefore are not included in the table.

Table E14-17. Acres of Riparian and Important Bird Area Habitat within the Corridor Options

Option	Desert Riparian Woodland	Emergent Marsh	Riparian Mesquite Bosque	Desert Wash	Invasive Riparian	Open Water	Total Acres of Riparian	Important Bird Areas
South Section								
A	11	8	218	0	0	3	240	59
B	36	0	11	0	0	11	58	0
C[a]	4 (4)	0 (0)	145 (125)	0 (0)	0 (0)	0 (0)	149 (129)	459 (459)

Option	Desert Riparian Woodland	Emergent Marsh	Riparian Mesquite Bosque	Desert Wash	Invasive Riparian	Open Water	Total Acres of Riparian	Important Bird Areas
D [a]	2 (1)	0 (0)	178 (107)	0 (0)	0 (0)	1 (1)	181 (109)	459 (459)
F	375	0	283	1	1	0	660	0
G	21	0	56	5	7	2	91	0
Central Section								
H	0	0	2	0	0	0	2	0
I1	5	0	0	0	0	0	5	0
I2	7	0	2	0	0	2	11	0
K	0	0	8	0	1	0	9	0
L	2	0	0	0	0	0	2	0
M	0	0	0	0	0	0	0	0
N	36	0	74	0	44	4	158	839
Q1	0	0	0	0	0	0	0	0
Q2	64	0	46	0	84	7	201	514
Q3	0	0	0	0	0	0	0	0
R	2	0	0	0	2	0	4	0
North Section								
S	0	0	7	0	1	2	10	0
U	0	0	1	0	0	2	3	0
X	0	0	1	0	0	2	3	0

[a] Acreage for the CAP Design Option is in parentheses under the acreage for the regular option.

Table E14-18. Acres of Riparian and Important Bird Area Habitats within the Build Corridor Alternatives and Percent of Total Riparian and Important Bird Area Habitat Area within the Study Area

Build Corridor Alternative	Desert Riparian Woodland	Emergent Marsh	Riparian Mesquite Bosque	Desert Wash	Invasive Riparian	Open Water	Important Bird Areas
Purple Alternative (Options A, C [a], G, I, L, N, R, X)	88 11.6% (88) (11.6%)	8 66.6% (8) (66.6%)	496 41.6% (476) (39.9%)	5 55.5% (5) (55.5%)	53 14.5% (53) (14.5%)	13 10.2% (13) (10.2%)	1,357 1.4% (1,457) (1.5%)
Green Alternative (Options A, D [a], F, I2, L, M, Q2, R, U	463 61.0% (462) (60.9%)	8 66.6% (8) (66.6%)	728 61.0% (657) (55.1%)	1 11.1% (1) (11.1%)	87 23.9% (87) (23.9%)	15 11.8% (15) (11.8%)	1,032 1.1% (1,128) (1.2%)

Build Corridor Alternative	Desert Riparian Woodland	Emergent Marsh	Riparian Mesquite Bosque	Desert Wash	Invasive Riparian	Open Water	Important Bird Areas
Orange Alternative (Options A, B, G, H, K, Q, S)	132 17.4%	8 66.6%	348 29.2%	5 55.5%	93 25.5%	25 19.6%	573 0.6%

[a] Acreage for the Build Corridor Alternative using the CAP Design Option instead of the regular option (designated by an asterisk) is in parentheses.

Riparian Areas

Riparian areas make up a small but important habitat type within Arizona. The majority of riparian areas within the Study Area are associated with drainages such as rivers and large washes. The two most common riparian types found within the alignment options are Desert Riparian Woodland (577 acres within all options) and Riparian Mesquite Bosque (1,027 acres within all options). These two riparian types make up 32.3 percent and 57.4 percent, respectively. The next largest riparian type is the invasive riparian, which comprises 7.8 percent.

Along Option A, which is common to all three Build Corridor Alternatives, the majority of the riparian acreage is associated with the Santa Cruz River. Since the Build Corridor Alternatives would utilize the existing I-19 alignment, the additional impact to riparian areas along this option would be relatively small.

Option B, which continues to follow I-19, would impact relatively few riparian areas and most of these are associated with the Santa Cruz River. Options C and D diverge from I-19 and turn west and then north. The largest concentrations of riparian areas are located toward the northern limits of these options and are associated with Brawley Wash (Options C and D), the Santa Cruz River (Option C), and Los Robles Wash (Option D).

The largest number of acres of riparian area potentially impacted by any of the options is along Option F. A large portion of Option F parallels and crosses the Santa Cruz River and several of its tributaries. The largest riparian type within this option is the Desert Riparian Woodland (375 acres) followed by the Riparian Mesquite Bosque (283 acres).

The number and concentration of riparian areas diminishes through the Central Section until the corridor crosses the Gila River. Two potential crossings of the Gila River include one along the existing SR 85 alignment (Option Q2) and a new crossing farther to the east in Goodyear (Option N). The Gila River Important Bird Area essentially corresponds to the main concentrations of riparian areas along the Gila River. However, unlike the Important Bird Area, there is a greater acreage of riparian area within Option Q2 than in Option N. This difference is opposite considering that Option Q2 follows an existing road, while Option N would be on a new alignment. The two options differ in the composition of the riparian areas. Option N is primarily Riparian Mesquite Bosque (74 acres) followed by Invasive Riparian (44 acres) and Desert Riparian Woodland (36 acres). Option Q2 is primarily Invasive Riparian (84 acres) followed by Desert Riparian Woodland (64 acres) and Riparian Mesquite Bosque (46 acres).

In the North Section the number of potentially impacted riparian areas is small with Option S having a total of 10 acres of riparian area. Options U and X each have 3 acres.

Important Bird Areas

The Build Corridor Alternatives, for the most part, would avoid major impacts to the Important Bird Areas. Option A, which is common to all three Build Corridor Alternatives, would parallel the Upper Santa Cruz River Important Bird Area. While the 2,000-foot-wide corridor overlaps this Important Bird Area in a couple of locations, the terrain and development along the existing I-19 right-of-way is such that it is likely these areas can be avoided. Options C and D would clip the edge of the Tucson Sky Island Important Bird Area but it may be possible to avoid or minimize impacts to this Important Bird Area.

In the South Section, both the Green and Purple Alternatives (Options C and D) would cross the far western portion of the Tucson Sky Island Important Bird Area, along Sandario Road, for approximately 2 miles. The Green and Orange Alternatives would cross the Gila River Important Bird Area at the current location of the SR 85 crossing, thus minimizing additional impacts to this Important Bird Area. The Purple Alternative, however, would cross the Gila River approximately 8.5 miles to the east and then turn to an east-west orientation paralleling the river. The 2,000-foot-wide corridor would cut across the northern portion of this Important Bird Area in several locations. The Purple Alternative would encompass almost 800 more acres of Important Bird Area habitat than the Orange or Green Alternatives, in addition to introducing a new crossing of the Gila River and the Important Bird Area.

Species of Economic and Recreational Importance

Direct impacts to Species of Economic and Recreational Importance and their habitat would be similar to those for other wildlife species within the Study Area. Each of the Build Corridor Alternatives would result in loss of potential habitat. There also would be the potential for increased mortality due to animal/vehicle collisions. Because the Orange Alternative would be co-located along existing transportation corridors, it would have the least potential direct impact on habitat loss for Species of Economic and Recreational Importance. The Purple Alternative would have the next smallest impact on habitat loss due to a greater amount of co-located alignment than the Green Alternative. Impacts to wildlife mortality are more difficult to predict, but it would be reasonable to assume that the Orange Alternative would have the smallest effect on wildlife mortality, including Species of Economic and Recreational Importance, due to its co-location along existing highways. Estimating the relative magnitude of wildlife mortality due to vehicle collisions and trying to compare the Purple and Green Alternatives within the Central and North Sections is more problematic. **Section 3.4** (Recreation) of the Administrative Final Tier 1 EIS discusses and evaluates the impacts of the project on recreation.

Wildlife/Motor Vehicle Collisions

Collisions between wildlife and motor vehicles are a nationwide problem. Data on the number of collisions are generally not well maintained. Arizona has some generalized data but nothing specific for roads within the Study Area. The majority of the data that are collected, both in Arizona and nationwide, relate to collisions with large animals, primarily large game species such as elk and deer. Collision numbers for smaller species are hard to come by because there is generally no property damage or human injuries and the carcasses are generally either obliterated by traffic or eaten by scavengers.

According to a 2007 National Cooperative Highway Research Program synthesis study, the number of annual deer/vehicle collisions nationwide was estimated at more than one million in the early 1990s. These collisions were estimated to cause between 155 and 211 human fatalities, 13,713 and 29,000 human injuries, and more than one billion dollars in property damage a year nationwide (Huijser et al. 2007). The number of collisions can be minimized

through a combination of preventing wildlife from getting onto the road and providing alternative means for crossing the road.

The Orange Alternative, which would mostly utilize existing roads, would likely have the least impact on vehicle collisions and wildlife mortality because the alignment would follow the most existing roads. The Green and Purple Alternatives would potentially have greater impacts associated with collisions between motor vehicles and wildlife, with the Green Alternative potentially having the greatest impact because the Purple Alternative would follow existing roads to a greater extent.

Invasive Species

During construction, the greatest potential direct impact would be the introduction of invasive species, particularly for options that are on currently undeveloped land. Surrounding lands also would be impacted as invasive species gradually disperse from the roadway. The spread of invasive species entails negative impacts to native species, including interspecific competition and altered fire regimes. In the South and Central Sections where there already is considerable urban development, many of the noxious and invasive species are well established in the Study Area and as such there would be a greater chance that they could begin colonizing new road right-of-way and surrounding habitats. The corridor options in the North Section and in the northeast part of the Central Section (Purple and Green Alternatives) are in relatively undisturbed areas where the presence of invasive species may not be as prolific; as a result, the establishment and spread of invasive species may take longer to occur, but have a greater impact on native species.

No Build Alternative

The No Build Alternative, as described in **Chapter 2** (Alternative Considered) of the Draft Tier 1 EIS, is used as a baseline for comparison with the Build Corridor Alternatives. The No Build Alternative would not implement any of the Build Corridor Alternatives for development of I-11. Impacts for the No Build Alternative were analyzed using currently programmed projects. These projects include widening projects along existing routes (I-10 in Tucson and near the Town of Picacho and US 93 in Wickenburg).

Biotic Communities

The No Build Alternative would have minimal direct impact to biotic communities. The only impacts would be associated with the identified projects within the Central and North Sections (as previously described above). The numbers of acres potentially affected are summarized in **Table E14-9**.

Riparian Areas

The No Build Alternative would have no impact on riparian areas.

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Table E14-19. Potential Occurrences of ESA-Protected Species per Corridor Option

Common Name	Scientific Name	Status (defined in table note)	Corridor Option																			
			South Section						Central Section											North Section		
			A	B	Cb	Db	F	G	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R	S	U	X
Amphibians																						
Chiricahua leopard frog with critical habitat	*Lithobates chiricahuensis*	USFWS - LT, AGFD SGCN 1A, Pima	I	–	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Birds																						
Mexican spotted owl with critical habitat	*Strix occidentalis lucida*	USFWS - LT, AGFD SGCN 1A	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Southwestern willow flycatcher with critical habitat	*Empidonax traillii extimus*	USFWS - LE, AGFD SGCN 1A, Pima	X	–	–	–	–	–	–	–	–	–	–	–	I	–	I	–	–	–	–	–
Yellow-billed cuckoo (Western Distinct Population Segment) with proposed critical habitat	*Coccyzus americanus*	USFWS - LT, USFS - S, AGFD SGCN 1A, Pima	X	X	–	–	X	–	–	–	–	–	–	–	X	–	X	X	X	–	–	–
Yuma Ridgway's rail	*Rallus obsoletus yumanensis*	USFWS - LE, AGFD SGCN 1A	–	–	–	–	–	–	–	–	–	–	–	–	X	–	X	–	–	–	–	–
Fish																						
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	USFWS - LE, AGFD SGCN 1A, Pima	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Sonora chub with critical habitat	*Gila ditaenia*	USFWS - LT, AGFD SGCN 1A	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mammals																						
Jaguar with critical habitat	*Panthera onca*	USFWS - LE, AGFD SGCN 1A	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ocelot	*Leopardus pardalis*	USFWS - LE, AGFD SGCN 1A	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Plants																						
Huachuca water-umbel	*Lilaeopsis schaffneriana* ssp. *recurva*	USFWS - LE, NPL - HS, Pima	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Pima pineapple cactus	*Coryphantha scheeri* var. *robustispina*	USFWS - LE, NPL - HS, Pima	X	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Reptiles																						
Northern Mexican gartersnake	*Thamnophis eques megalops*	USFWS - LT, USFS - S, AGFD SGCN 1A, Pima	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Sonoran desert tortoise	*Gopherus morafkai*	USFWS - CCA, USFS - S, BLM-S; AGFD SGCN 1A, Pima	X	X	X	X	I	X	X	I	I	X	X	I	I	X	I	I	I	X	X	X

SOURCE: X = GIS point data (AGFD 2017b).

NOTES: 1A = Tier of SGCN species for which AGFD has entered into an agreement or has legal or contractual obligation, or warrants the protection of a closed season; 1B = Tier of SGCN species that are not Tier 1A species; AGFD = Arizona Game and Fish Department; CCA = Candidate Conservation Agreement under the ESA; HS = Highly Safeguarded under Arizona Native Plant Law; LE = Listed as Endangered under ESA; LT = Listed as Threatened under ESA; NPL = Arizona Native Plant Law; Pima = Listed by Pima County as Sensitive; S = Sensitive Species; SGCN = Species of Greatest Conservation Need; USFS = US Forest Service; USFWS = US Fish and Wildlife Service; I = Inferred species presence. Corresponds to readily available information on species habitat preferences and range maps.

[a] Species records are the same for the regular option (designated by an asterisk) and the regular option

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Important Bird Areas
The No Build Alternative would have no impact on Important Bird Areas.

Species of Economic and Recreational Importance
The No Build Alternative would have no measurable increased impact on Species of Economic and Recreational Importance.

Wildlife/Motor Vehicle Collisions
The No Build Alternative would not result in any substantive change in wildlife/motor vehicle collisions. The number of collisions can vary from year-to-year, which is influenced by population levels, availability of food, weather conditions, and other factors.

Invasive Species
The No Build Alternative would not result in any substantive change in the overall trend in the spread of invasive and noxious plant species.

E14.4.2 Special Status Species

Build Corridor Alternatives

Potential environmental effects on ESA-listed species and other sensitive species are evaluated for each Build Corridor Alternative. Specified habitat requirements are evaluated by determining whether suitable habitat exists within the Study Area. The potential occurrences of ESA-listed species within each corridor option are presented in **Table E14-19** and **Table E14-20**. Critical habitat for several species is denoted in **Table E14-19** and **Table E14-20**. Effects on all ESA-listed species are based on the potential for each species' habitat to be physically disturbed or the quality of that habitat affected by the presence of the facility.

Endangered Species Act Species: Aquatic and Riparian Species
The biotic communities/riparian areas that fall under this habitat association consist of the North American Warm Desert Lower Montane Riparian Woodland and Shrubland, North American Warm Desert Riparian Woodland and Shrubland, North American Arid West Emergent Marsh, North American Warm Desert Riparian Mesquite Bosque, North American Warm Desert Wash, Invasive Southwest Riparian Woodland and Shrubland, and Open Water. Within the Study Area, aquatic and riparian habitat exists for 10 ESA-listed species: Chiricahua leopard frog, southwestern willow flycatcher, yellow-billed cuckoo, Yuma Ridgway's rail, Gila topminnow, Sonora chub, northern Mexican gartersnake, Huachuca water-umbel, and two highly mobile mammal species, jaguar and ocelot. Habitat associated with these 10 species is predominately located within Options A, B, C, N, and Q2 and includes the Santa Cruz and Gila Rivers, and other designated washes and associated floodplains.

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Table E14-20. Total Surface Area Covered by Critical or other Protected Habitat within the 2,000-foot-wide Corridor

Option	Critical/Protected Habitat (acres)									
	USFWS Designated or Proposed Critical Habitat			USFWS 10(j) Experimental Population/Reintroduction Areas				Sonoran Desert Tortoise Habitat		
	Southwestern willow flycatcher	Yellow-billed cuckoo (Western Distinct Population Segment)	Jaguar	Mexican wolf 10(j) Area Zone 2	Mexican wolf 10(j) Area Zone 3	Sonoran pronghorn 10(j) Area - overall	Sonoran pronghorn Reintroduction Area D	BLM Category I	BLM Category II	USFWS High Value Potential Habitat
South Section										
A	424.7	263.99	1.06	3,463.24	3,491.64	3,491.64	–	–	–	73.41
B	–	–	–	9,506.98	4,675.79	4,675.79	–	–	–	329.35
C[a]	–	–	–	28.43 (28.43)	14,107.14 (14,346.14)	14,107.14 (14,346.14)	–	–	–	637.68 (638.82)
D[a]	–	–	–	2,498.76 (2,498.76)	13,061.34 (13,221.34)	13,061.34 (13,221.34)	–	–	–	928.30 (927.75)
F	–	–	–	–	12,331.66	12,331.66	–	–	–	2.49
G	–	–	–	2,237.38	8,691.96	8,691.96	698.68	–	–	112.29
Central Section										
H	–	–	–	–	4,382.79	4,382.79	2,076.08	–	722.23	106.12
I1	–	–	–	–	1,768.38	1,768.38	2.02	–	–	–
I2	–	–	–	–	4,515.24	4,515.24	–	–	–	–
K	–	–	–	–	10,035.72	10,035.72	3,902.14	112.05	1,265.05	472.26
L	–	–	–	–	3,646.86	3,646.86	–	196.61	–	0.35
M	–	–	–	–	4,478.34	4,478.34	–	–	612.09	45.64
N	–	306.78	–	–	6,205.29	6,205.29	–	–	–	118.08
Q1	–	–	–	–	3,859.74	3,859.74	–	–	673.82	117.87
Q2	–	316.18	–	–	1,100.79	1,100.79	–	–	407.43	75.16
Q3	–	–	–	–	4,198.09	3,312.37	–	–	–	91.08
R	–	–	–	–	4,235.30	4,231.68	–	–	–	13.19
North Section										
S	–	–	–	1,008.87	11,217.24	10.29	–	–	5,072.60	1,217.62
U	–	–	–	865.40	11,205.18	7.87	–	–	4,142.37	1,038.75
V	–	–	–	865.40	12,361.68	7.43	–	–	3,845.54	845.18

SOURCES: Surface area values based on digital data of Sonoran desert tortoise habitat as designated by BLM (BLM 2009) and USFWS (USFWS 2015c), designated critical habitat assigned to species protected under the ESA (USFWS 2017a), and USFWS Sonoran pronghorn and Mexican wolf 10(j) Experimental Population/Reintroduction Areas (USFWS 2015f, 2011).

NOTES: 10(j) = section of the ESA authorizing the establishment of experimental populations outside a species' current range, but within its historical range; USFWS = US Fish and Wildlife Service

[a] Acreage for the CAP Design Option is in parentheses under the acreage for the regular option.

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Because all of the 2,000-foot-wide corridor in the South Section is located along the existing I-19 alignment (Options A and B), all Build Corridor Alternatives in the South Section have the potential to impact ESA-protected species and sensitive habitats associated with the Santa Cruz River. I-19 (Options A and B) is located west and adjacent to the floodplain of the river. In addition to direct impacts to the riparian habitat these species occupy, increased operations of co-locating I-19 and I-11 have the potential to impact ESA species by increasing air, noise, and light pollution, which further degrade habitat quality and add stress to species' biological lifecycles, which includes breeding, feeding, and resting. However, if I-19 requires widening in this area, every attempt will be made to avoid impacts to riparian habitat by widening the roadway to the west and away from the Santa Cruz River, if at all possible.

Within the Central Section all three Build Corridor Alternatives would span the perennial Gila River utilizing bridges (Options N and Q2). Some permanent floodplain tree habitat removal would be required; however, habitat modifications would be localized in nature, as small in size as feasible, and short in duration. Potential impacts from all three Build Corridor Alternatives would occur at two possible Gila River locations (approximately 7 miles apart) and are similar in design (bridged roadway over riparian floodplains). Two alternatives (Orange and Green) would be co-located along the existing SR 85 Bridge (Option Q2). The Purple Alternative would add an additional roadway crossing (Option N) upstream of the existing SR 85 bridged crossing. Adding a second bridged Gila River crossing would increase potential to impact ESA species and habitat quality by increasing noise, air, and light pollution in the vicinity of the Gila River. The addition of a roadway crossing over the Gila River with the Purple Alternative would also cause the loss of croplands, which in turn could reduce a source of irrigation water runoff into the Gila River. Runoff near the proposed crossing helps sustain marshes and Yuma Ridgway's rail habitat at that location, and may sustain marsh habitat further downstream. Loss of irrigation water resulting from replacement of croplands by I-11 would need to be evaluated in more detail during the Tier 2 analysis. The Orange and Green Alternatives would result in fewer potential impacts to ESA species and habitat quality.

Impacts to Chiricahua leopard frogs will be avoided, minimized, and mitigated by implementing measures to address impacts related to invasive species and habitat modifications and to address wildlife movements and landscape connectivity impacts. Impacts to Gila topminnow should be addressed by avoiding increases of sediment or delivering pollutants to the stream course, as well as avoiding reductions in surface flow to available aquatic habitats. Impacts to southwestern willow flycatcher, western yellow-billed cuckoo, and Yuma Ridgway's rail, and their respective designated and proposed critical habitat, should be avoided, minimized, or mitigated according to the mitigation strategies in **Table E14-24** and **Table E14-25**.

Within the North Section, all three Build Corridor Alternatives would avoid perennial waters and associated riparian habitats.

<u>Endangered Species Act Species: Sonoran Desert and Mountainous Area Species</u>
The biotic communities that fall under this habitat association consist of Lower Colorado River Desertscrub, Arizona Upland Sonoran Desertscrub, Semidesert Grassland, Mohave Desertscrub, and Madrean Evergreen Woodland. As shown in **Table E14-19** and **Figure E14-1**, **Figure E14-5**, and **Figure E14-6**; all three Build Corridor Alternatives would impact previously disturbed and undisturbed lands of the Sonoran Desert, which are considered habitat for plant and animal ESA-listed species. These species include Pima pineapple cactus, as well as ocelot and jaguar, which prefer large habitat blocks. Both the ocelot and jaguar utilize areas within more mountainous terrain and other areas with denser vegetation such as along larger

drainages. Mountainous terrain within the South Section of the Study Area would be avoided by all three Build Corridor Alternatives, while Option S in the North Section of the Study Area would go through the eastern portion of the Belmont Mountains. Specific project mitigation measures to minimize habitat fragmentation effects to the species will be developed during pre-Tier 2 analyses and include development of potential wildlife roadway crossings into interstate designs.

Tree and cactus removal and minor habitat modifications would occur to upland habitats and floodplain habitat during construction; however, habitat modifications would be localized in nature, as small in size as feasible, and short (less than 5 years) in duration. Impacts to Semidesert Grassland within the Sonoran Desert may require substantial compensatory mitigation due to the likely presence of Pima pineapple cactus and its habitat within this biotic community. Destruction of grassland habitat for construction of I-11 would represent a permanent impact to grassland plant species within the anticipated 400-foot roadway footprint, including Pima pineapple cactus. Dispersal of noxious and invasive weeds into Semidesert Grassland following construction of I-11 may negatively impact ESA-listed species such as Pima pineapple cactus, and Candidate Conservation Agreement species such as the Sonoran desert tortoise, due to competition and altered fire regimes.

Although all three Build Corridor Alternatives would bisect Pima pineapple cactus habitat, the Orange Alternative is likely to have less impacts to this species as it is co-located with I-19 through Pima pineapple cactus habitat. I-19 may or may not need to be widened in this area, and some impacts to this species have already occurred within the roadway prism. The Purple and Green Alternatives, on the other hand, would bisect high quality, densely occupied Pima pineapple cactus habitat, which is likely to impact hundreds of Pima pineapple individuals. In order to avoid a potential "Jeopardy" decision by USFWS for this species, substantial mitigation and compensation will need to occur within these two Build Corridor Alternatives. Impacts to Pima pineapple cactus and its habitat will be minimized by reduction of the construction footprint through quality Pima pineapple cactus habitat, detailed surveys of suitable habitat, and the implementation of long-term control of noxious and invasive weeds. ESA Section 7 consultations for Pima pineapple cactus will occur during Tier 2 analysis and will include studies to locate the new roadway facility to further reduce impacts to this species. Refer to **Table E14-24** and **Table E14-25** for detailed mitigation strategies for this species. Recent research suggests that translocation of this species is not very successful and, therefore, is not included as a mitigation strategy.

Habitat Conservation Plans

The *City of Tucson Habitat Conservation Plan*, Pima County's *Sonoran Desert Conservation Plan* (Pima County 2016b), and Pima County's Conservation Land System could be affected by any or all of the Build Corridor Alternatives. However, the Purple and Green Alternatives, which bisect Avra Valley, are likely to have the greatest impacts to parcels that have been set aside as conservation areas under the Avra Valley portion of the *City of Tucson Habitat Conservation Plan* (City of Tucson 2018). Similarly, the Purple and Green Alternatives would have the greatest impacts on various categories of Pima County Conservation Lands. The extent of any impact on Habitat Conservation Plans will be determined during Tier 2.

Critical Habitat of Endangered Species Act Species and other Protected Habitats

Critical habitat for several species occurs within all three Build Corridor Alternatives. As denoted in **Table E14-19** and **Table E14-20**, none of the Build Corridor Alternatives would cross

designated or proposed critical habitat for the Chiricahua leopard frog, Mexican spotted owl, or Sonora chub.

Within the South Section, I-19 is adjacent to the Santa Cruz River. All of the Build Corridor Alternatives, which share the designated Option A, have the potential to impact critical habitat and proposed critical habitat associated with the Santa Cruz River for the southwestern willow flycatcher and yellow-billed cuckoo, respectively. Options C and D have the potential to impact currently undeveloped grasslands, thereby posing a possibly significant threat to species such as Pima pineapple cactus via habitat loss and degradation, which includes impacts from noxious weed invasions and altered fire regimes. Proximity impacts associated with potential widening of I-19 (co-located I-11 facility) such as additional air, light, and noise pollution have the potential to impact habitat. The only critical habitat for the Chiricahua leopard frog occurring within the Study Area consists of two small stock ponds approximately 0.6 mile to the east of Option C.

Mexican spotted owl and jaguar habitat occur at higher elevations, predominately located in the mountainous and forested portions of the larger Study Area east and west of I-19 and north of I-10. All three of the Build Corridor Alternatives would avoid those types of habitats. Depending on the results of wildlife movement studies that will be conducted prior to the Tier 2 process, wildlife connectivity between these higher elevation areas (sky islands) utilized by the jaguar and ocelot may need to be enhanced with species-specific designed wildlife crossings for I-11. Refer to **Section E14.3.3** for more impact discussions that relate to mobility of both general wildlife and special status species.

Within the Central Section, all three Build Corridor Alternatives would cross the Gila River utilizing bridges in similar locations, as depicted on **Figure E14-5**. The Gila River contains proposed critical habitat for yellow-billed cuckoo, and habitat for southwestern willow flycatcher and Yuma Ridgway's rail. Some floodplain tree habitat would be permanently removed; however, it is assumed that habitat modifications would be localized in nature, as small in size as feasible, and short in duration. Option N would add an additional roadway crossing over the Gila River approximately 7 miles upstream of the existing SR 85 bridge. Proposed critical habitat for the yellow-billed cuckoo has the potential to be degraded between the two bridges and their associated roadways. Runoff of irrigation water into the Gila River near the proposed crossing is an important source of water that helps to sustain riparian habitat, thereby potentially benefitting the southwestern willow flycatcher and the yellow-billed cuckoo at that location. Loss of irrigation water resulting from replacement of croplands by the interstate would need to be evaluated in more detail during the Tier 2 analysis.

No critical habitat for ESA-protected species occurs in the North Section.

Mexican wolf and Sonoran pronghorn have USWFS 10(j) Experimental Populations/ Reintroduction Areas associated with Sonoran Desert habitats (**Table E14-19** and **Table E14-20**). Within the Study Area, over 2 million acres and 1.6 million acres of future reintroduction areas have been assigned for the Mexican wolf and the Sonoran pronghorn, respectively. Connectivity between these large swaths of land is paramount to the future success of reintroduced populations. See **Section E14.2.2** for more impact discussions that relate to mobility of both general wildlife and special status species.

The Sonoran desert tortoise, which has a USFWS Candidate Conservation Agreement under ESA and is a BLM sensitive species, has BLM designated Category I and II habitats within the

Study Area. In addition, USFWS provided GIS data depicting the modelled locations and extent of USFWS-defined predicted High Value Potential Habitat based on specific spatial criteria. BLM and USFWS tortoise habitat digital maps were both used in this analysis. Sonoran desert tortoise habitat acreages are discussed in **Table E14-19**. Potential impacts to the Sonoran desert tortoise include direct mortality, as well as impacts to suitable habitat due to habitat fragmentation, habitat conversion, and altered fire regimes. Loss of vegetation used as forage, cover, and sheltering sites removes the ability for the species to adequately fulfill natural history needs and results in delayed fatalities from starvation, exposure, or predation. Introduction of invasive plants also can alter ecosystem by increasing the frequency, duration, and magnitude of wildfires.

In the North Section all Build Corridor Alternatives would potentially impact Sonoran desert tortoise. In the Central and South Sections, selecting corridor options that follow existing roadways will minimize impacts to Sonoran desert tortoise. The overarching conservation goal of the Candidate Conservation Agreement for Sonoran desert tortoise is to work with the agencies involved to provide a clear conservation benefit to the species, and contribute to the preclusion to list (ESA) through reduction of threats in Arizona (USFWS 2015a). As such, prior to project design and Tier 2 National Environmental Policy Act (NEPA) review, detailed habitat assessments should occur for Sonoran desert tortoise within the Tier 1-identified 2,000-foot corridor to map suitable habitat and develop design recommendations that help avoid and minimize impacts to this species. See **Table E14-25** for detailed tortoise mitigation strategies.

Other Sensitive Species

As stated, other sensitive species include non-ESA-listed species deemed sensitive by BLM, USFS, USFWS, or counties; species protected under the BGEPA, AGFD SGCN; and plant species protected under the Arizona Native Plant Law. **Table E14-20** lists sensitive species recorded in each corridor option with GIS data or inferred by range and habitat.

In addition to being considered habitat for several ESA-protected species, the same habitat associations previously discussed (Riparian and Aquatic Areas/Sonoran Desert and Mountainous Areas) also are considered important habitat for other sensitive species of plants and animals. As listed in **Table E14-21**, other sensitive species analyzed include 3 amphibians, 20 birds (including bald and golden eagles), 3 fish, 2 invertebrates, 13 mammals (including 8 bats), 21 plants (including Tumamoc globeberry), and 12 reptiles. In habitats that are shared by ESA-listed species and other sensitive species, such as riparian areas, impacts to sensitive species would be similar to those experienced by ESA-listed species. However, sensitive species also occur in areas in which ESA-listed species are not present. Thus, all biotic communities impacted by Build Corridor Alternatives are habitat for different sensitive species and will require mitigation measures to be developed during Tier 2 studies. Construction of the I-11 transportation corridor would result in substantial negative effects to vegetation communities (see **Table E14-14**, **Table E14-15**, **Table E14-16**, and **E14-17**). These impacts would require a combination of avoidance, minimization, and/or other species-specific mitigation measures to mitigate any negative effects to sensitive species.

Impacts associated with construction of a freeway facility include the potential for mortality and injury from roadway/vehicle interactions, and directly removing potential habitats for amphibians, birds, fish, invertebrates, mammals, and reptiles. Additional impacts to animal species include increased habitat degradation due to increased noise, air, and light pollution associated with new or improved roadway facilities.

1

Table E14-21. Distribution of Other Sensitive Species within the 2,000-foot-wide Corridor

Common Name	Scientific Name	Status (defined in table note)	Corridor Options (1)																				
			South Section						Central Section												North Section		
			A	B	C a	D a	F	G	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R	S	U	X	
Amphibians																							
Lowland leopard frog	*Lithobates yavapaiensis*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1A, Pima	X	X	X	X	X	–	–	–	–	–	–	–	I	–	I	–	–	–	–	–	
Sonoran green toad	*Anaxyrus retiformis*	BLM - S, AGFD - SGCN 1B	–	–	–	–	–	–	–	–	–	I	I	I	–	–	–	–	–	–	–	–	
Western narrow-mouthed toad	*Gastrophryne olivacea*	BLM - S, AGFD - SGCN 1C	X	X	I	I	–	–	–	–	–	I	I	–	–	–	–	–	–	–	–	–	
Birds																							
Abert's towhee	*Melozone aberti*	Pima	X	X	X	X	X	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
American peregrine falcon	*Falco peregrinus anatum*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1A	–	I	–	I	I	I	–	–	–	–	–	–	I	–	I	I	I	–	–	–	
Arizona Bell's vireo	*Vireo bellii arizonea*	Pima	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Arizona grasshopper sparrow	*Ammodramus savannarum ammolegus*	USFS - S, BLM - S, AGFD SGCN 1B	I	I	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Azure bluebird	*Sialia sialis fulva*	AGFD SGCN 1B	I	I	–	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Bald eagle-winter population	*Haliaeetus leucocephalus*	USFWS - SC, BGEPA, USFS - S, BLM - S, AGFD SGCN 1A	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Bald eagle–Sonoran populations	*Haliaeetus leucocephalus*	USFWS - SC, BGEPA, USFS - S, BLM - S, AGFD SGCN 1A	I	I	–	–	I	–	–	–	I	–	–	–	X	–	I	I	I	–	–	–	
Black-capped gnatcatcher	*Polioptila nigriceps*	AGFD SGCN 1B	X	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	X	X	X	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Elegant trogon	*Trogon elegans*	USFS - S, AGFD SGCN 1B	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Golden eagle	*Aquila chrysaetos*	BGEPA, BLM - S, AGFD SGCN 1B	I	I	I	I	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Gray hawk	*Buteo plagiatus*	USFWS – SC	X	I	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Le Conte's thrasher	*Toxostoma lecontei*	AGFD SGCN 1B		–	–	–	–	–	–	–	–	–	–	–	I	–	I	I	I	I	I	I	
Northern beardless-tyrannulet	*Camptostoma imberbe*	USFS - S,	X	I	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Rose-throated becard	*Pachyramphus aglaiae*	USFS - S, AGFD SGCN 1B	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Rufous-winged sparrow	*Aimophila carpalis*	AGFD SGCN 1B, Pima	X	X	X	X	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Swainson's hawk	*Buteo swainsoni*	Pima	X	X	X	X	I	I	I	I	I	I	–	–	I	I	I	I	I	–	–	–	

Common Name	Scientific Name	Status (defined in table note)	Corridor Options (1)																				
			South Section						Central Section												North Section		
			A	B	C a	D a	F	G	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R	S	U	X	
Swainson's thrush	*Catharus ustulatus*	AGFD SGCN 1B	X	I	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Thick-billed kingbird	*Tyrannus crassirostris*	USFS - S, AGFD SGCN 1B	X	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Violet-crowned hummingbird	*Amazilia violiceps*	USFS - S, AGFD SGCN 1B	X	I	–	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Western burrowing owl	*Athene cunicularia hypugaea*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	–	I	I	–	I	I	–	I	I	–	–	–	I	–	I	I	I	–	–	–	
Fish																							
Desert sucker	*Catostomus clarkii*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Gila longfin dace	*Agosia chrysogaster chrysogaster*	USFWS - SC, BLM - S, AGFD SGCN 1B, Pima	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Sonora sucker	*Catostomus insignis*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Invertebrates																							
Maricopa tiger beetle	*Cicindela oregona maricopa*	USFWS – SC	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Monarch butterfly	*Danaus plexippus*	BLM – S	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Mammals																							
Antelope jackrabbit	*Lepus alleni*	AGFD SGCN 1B	I	I	I	I	X	X	I	I	–	–	–	–	–	–	–	–	–	–	–	–	
Brazilian free-tailed bat	*Tadarida brasiliensis*	AGFD SGCN 1B	I	X	I	X		X	–	–	–	–	–	–	–	–	–	–	–	I	I	I	
California leaf-nosed bat	*Macrotus californicus*	USFWS - SC, BLM - S, AGFD SGCN 1B, Pima	I	I	I	X	I	X	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Cave myotis	*Myotis velifer*	USFWS - SC, BLM - S, AGFD SGCN 1B	I	X	I	X	X	X	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Cockrum's desert shrew	*Notiosorex cockrumi*	AGFD SGCN 1B	I	I	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	USFWS - SC, AGFD SGCN 1A	X	I	I	I	I	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Merriam's mouse	*Peromyscus merriami*	Pima	X	X	X	X	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Mexican long-tongued bat	*Choeronycteris mexicana*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1C, Pima	X	X	X	X	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Northern pygmy mouse	*Baiomys taylori*	USFS - S	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	USFWS - SC, USFS - S, BLM - S, AGFD SGCN 1B, Pima	I	I	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	AGFD SGCN 1B	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	

Common Name	Scientific Name	Status (defined in table note)	Corridor Options (1)																				
			South Section						Central Section												North Section		
			A	B	C a	D a	F	G	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R	S	U	X
Western red bat	*Lasiurus blossevillii*	USFS - S, AGFD SGCN 1B, Pima	I	I	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Western yellow bat	*Lasiurus xanthinus*	USFS - S, AGFD SGCN 1B, Pima	X	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	USFWS - SC, AGFD SGCN 1C	X	X	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Plants																							
Arid throne fleabane	*Erigeron arisolius*	USFS - S	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Arizona passionflower	*Passiflora arizonica*	USFS - S	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Broadleaf groundcherry	*Physalis latiphysa*	USFS - S	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cactus apple	*Opuntia engelmannii* var. *flavispina*	NPL - SR	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	I	–	–
Catalina beardtongue	*Penstemon discolor*	USFS - S, NPL - HS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chiltepin	*Capsicum annuum* var. *glabriusculum*	USFS - S	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Desert barrel cactus	*Ferocactus cylindraceus*	NPL - SR	–	–	–	–	–	I	I	–	–	–	I	X	I	X	X	–	–	I	I	I
Desert night-blooming cereus	*Peniocereus greggii* var. *transmontanus*	NPL - SR	I	I	I	I	I	I	I	–	–	I	I	I	I	I	I	I	I	I	I	I
Emory's barrel-cactus	*Ferocactus emoryi*	NPL - SR	–	–	–	–	–	I	I	–	–	X	I	I	I	I	I	–	–	–	–	–
Johnson's fishhook cactus	*Echinomastus johnsonii*	NPL - SR	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	I	I	X
Kelvin cholla	*Cylindropuntia x kelvinensis*	NPL - SR	–	–	X	X	I	I	–	I	–	–	–	–	–	–	–	–	–	–	–	–
Large-flowered blue star	*Amsonia grandiflora*	USFWS - SC, USFS - S	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Pima Indian mallow	*Abutilon parishii*	USFWS - SC, USFS - S, BLM - S, NPL - SR	I	I	I	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Saiya	*Amoreuxia gonzalezii*	USFWS - SC, USFS - S, NPL - HS	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Santa Cruz beehive cactus	*Coryphantha recurvata*	USFS - S, NPL - HS	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Santa Cruz star leaf	*Choisya mollis*	USFWS - SC, USFS - S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Santa Cruz striped agave	*Agave parviflora* ssp. *parviflora*	USFWS - SC, USFS - S, NPL - HS	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stag-horn cholla	*Opuntia versicolor*	NPL - SR	X	X	I.	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Straw-top cholla	*Opuntia echinocarpa*	NPL-SR	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	I	I	I	I	I
Thornber fishhook cactus	*Mammillaria thornberi*	NPL - SR	–	I	X	X	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tumamoc globeberry	*Tumamoca macdougalii*	NPL - SR, Pima	–	I	X	X	–	–	I	–	–	I	–	–	–	–	–	–	–	–	–	–

Common Name	Scientific Name	Status (defined in table note)	Corridor Options (1)																				
			South Section						Central Section												North Section		
			A	B	C a	D a	F	G	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R	S	U	X
Reptiles																							
Common chuckwalla	*Sauromalus ater*	USFWS - SC	–	–	–	–	I	I	I	–	–	I	–	I	I	I	I	–	–	I	I	I
Desert box turtle	*Terrapene ornata luteola*	BLM - S, AGFD SGCN 1A, Pima	X	X	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Giant spotted whiptail	*Aspidoscelis stictogramma*	USFWS - SC, USFS - S, AGFD SGCN 1B, Pima	X	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Groundsnake (valley form)	*Sonora semiannulata*	Pima	–	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hooded nightsnake	*Hypsiglena sp. nov.*	AGFD SGCN 1B	X	X	I	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mountain skink	*Plestiodon callicephalus*	USFS – S	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Reticulate gila monster	*Heloderma suspectum suspectum*	AGFD SGCN 1A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Rosy boa	*Lichanura trivirgata*	USFWS - SC, AGFD SGCN 1B	–	–	–	–	–	–	–	–	–	I	–	–	–	–	–	–	–	–	–	–
Sonoran collared lizard	*Crotaphytus nebrius*	AGFD SGCN 1B	–	–	–	–	–	–	–	–	–	I	–	I	–	I	I	–	–	–	–	–
Texas horned lizard	*Phrynosoma cornutum*	USFWS - SC	–	–	I	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Thornscrub hook-nosed snake	*Gyalopion quadrangulare*	USFS - S, AGFD SGCN 1B	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tucson shovel-nosed snake	*Chionactis occipitalis klauberi*	USFWS - SC, AGFD SGCN 1A, Pima	–	–	X	X	X	X	I	–	–	X	I	–	–	–	–	–	–	–	–	–

SOURCES: X = GIS point data, AGFD (2017b); Pima County (2013). I = Inferred species presence. Corresponds to readily available information on species habitat preferences and range maps.

NOTES: 1A = Tier of SGCN species for which AGFD has entered into an agreement or has legal or contractual obligation, or warrants the protection of a closed season; 1B = Tier of SGCN species that are not Tier 1A species; AGFD = Arizona Game and Fish Department; BGEPA = Bald and Golden Eagle Protection Act; BLM = US Bureau of Land Management; CCA = Candidate Conservation Agreement under the ESA ; HS = Highly Safeguarded under NPL; NPL = Arizona Native Plant Law; Petition = petitioned to be listed under the ESA Pima = Listed by Pima County as Sensitive; S = Sensitive Species; SC = Species of Concern; SGCN = Species of Greatest Conservation Need; SR = Salvage Restricted under NPL; USFS = US Forest Service.; USFWS = US Fish and Wildlife Service; All elevations listed include Arizona range except where indicated. The potential presence of sensitive species listed by Pima County alone was only evaluated for the South Section. There is insufficient data available for cactus apple. Therefore, an absence of data does not reliably indicate species absence.

[a] Species records are the same for the regular option (designated by an asterisk) and the CAP Design Option.

Migratory Bird Treaty Act

Both the Green and Purple Alternatives would increase accessibility into adjacent lands in Pima, Pinal, and Maricopa Counties and may increase accessibility to wildlife refuges and Important Bird Areas utilized by migratory birds and other sensitive wildlife.

Habitat for migratory birds varies with different species, with many species utilizing Sonoran Desert habitats, agricultural and floodplain habitats, and/or open water habitats. The Green and Purple Alternatives would have the most potential to impact nesting birds as they include the greatest amount of ground disturbance compared to the Orange Alternative, which includes the most co-location with existing facilities. Impacts to migratory birds can be mitigated with standard construction techniques and species-specific mitigation measures developed during Tier 2 analysis. Where possible, the design of I-11 will minimize tree plantings (versus low growing shrubs) within the median of the new roadways to reduce the attractiveness of those facilities to migratory birds, and reduce bird mortality associated with highway operation. Minimizing highway lighting also can reduce potential impacts to nocturnal birds that prey on insects attracted to lights.

No Build Alternative

The No Build Alternative, as described in **Chapter 2** (Alternatives Considered) of the Draft Tier 1 EIS, is used as a baseline for comparison with the Build Corridor Alternatives. The No Build Alternative would not implement any of the Build Corridor Alternatives for development of I-11. Impacts for the No Build Alternative were analyzed assuming construction of currently programmed projects. These projects include widening projects along existing routes (I-10 in Tucson and near the Town of Picacho and US 93 in Wickenburg).

Endangered Species Act Species

Any potential impacts to ESA-protected species that might occur under the No Build Alternative will be assessed as part of the Tier 2 NEPA analysis for those projects.

Habitat Conservation Plans

Impacts to areas protected under Habitat Conservation Plans may occur with the No Build Alternative. Impacts associated with future projects (No Build Alternative) will be assessed during project-specific Tier 2 NEPA analysis and will require mitigation measures to be developed and implemented.

Critical and Protected Habitat

Impacts to critical habitat for ESA and other protected habitats may occur with the No Build Alternative. Impacts associated with future projects (No Build Alternative) will be assessed during project-specific Tier 2 NEPA analysis and will require species-specific ESA Section 7 Consultation.

Other Sensitive Species

Impacts to special status species may occur with the No Build Alternative. Impacts associated with future projects (No Build Alternative) will be assessed during project-specific Tier 2 NEPA analysis and will require species-specific mitigation measures to be developed and implemented during construction.

Migratory Bird Treaty Act

Impacts to species protected under the MBTA may occur with the No Build Alternative. Impacts associated with future projects (No Build Alternative) will be assessed during project-specific Tier 2 NEPA analysis and will require species-specific mitigation measures to be developed and implemented during construction.

Special Status Species End-to-End Considerations

Besides the No Build Alternative, the Orange Alternative would have the least impacts to sensitive species habitats (Options A, B, G, H, K, Q, and S). Habitat for numerous special status species occurs in all corridor options of the project. Impacts to ESA-listed species and their critical habitat will require ESA Section 7 consultation with USFWS during Tier 2 analysis.

In general, the Green Alternative is comprised mostly of new corridor options; the Orange Alternative is comprised mostly of existing interstate and highway Corridor Options, while the Purple Alternative is comprised of a mix of existing and new corridor options.

Both the Green and Purple Alternatives would increase accessibility into adjacent lands in Pima, Pinal, and Maricopa Counties and may increase accessibility to wildlife refuges and Important Bird Areas. Due to proximity, all of the Build Corridor Alternatives have the potential to impact habitats of ESA-listed species (including critical habitat) associated with the Santa Cruz River floodplain (Options A, B, and C) (**Table E14-19** and **Table E14-20**). Option C would cross the Santa Cruz River floodplain outside designated critical habitat areas.

All the Build Corridor Alternatives would have similar impacts to the Gila River aquatic and riparian habitats (Options Q2 and N), which is considered habitat (including proposed critical habitat) for the yellow-billed cuckoo, Yuma Ridgway's rail, and southwestern willow flycatcher (**Table E14-19** and **Table E14-20**). Option N would add an additional roadway crossing over the Gila River approximately 7 miles upstream of the existing SR 85 bridge. Proposed critical habitat for the yellow-billed cuckoo has potential to be degraded between these two transportation facilities.

Species found in the upland land classifications of the Sonoran Desert would be impacted the most by the Green Alternative (Options A, D, F, I2, L, M, Q2, R, and U) because this alternative utilizes the most new corridor options and would have the highest acreage of impacts converted from natural land uses to transportation facilities.

E14.4.3 Wildlife Connectivity

Build Corridor Alternatives

Habitat fragmentation is one of the impacts to wildlife associated with the construction of I-11, especially within new corridor options. As described in **Section E14.3.3**, page E14-E14-69, large undeveloped tracts of land are important habitat for wildlife movement and connectivity. **Figure E14-10** shows large areas of relatively intact and undeveloped habitat within the Study Area. Corridor options representing a new alignment would directly fragment Large Intact Blocks by introducing a new linear facility where a roadway does not currently exist. Large Intact Block portions that would be adjacent to I-11 rather than directly intersected by I-11 also are expected to experience increased isolation as a result of guardrails, steep shoulders, and traffic, which are physical barriers to wildlife movement. In addition to fragmentation, habitat degradation would occur within Large Intact Block portions adjacent to I-11 due to increased disturbances

such as noise and light pollution, and the spread of invasive species, all of which have effects that occur beyond the road itself and contribute to isolation.

Table E14-22 shows which Large Intact Blocks would be fragmented by the alternatives, and the number and size of the Large Intact Block fragments resulting from the construction of the Build Corridor Alternatives. Surface areas are provided in hectares to facilitate comparison with the AGFD 5,000-hectare threshold under which a habitat block is no longer considered functional to meet all of the habitat needs for many wildlife species (AGFD 2018a). **Table E14-23** indicates, for each Build Corridor Alternative, the total surface area represented by Large Intact Block fragments that no longer fulfill the required 5,000-hectare threshold following construction of the alternatives. Large Intact Blocks affected by the Build Corridor Alternatives that become smaller in surface area as a result of the direct fragmentation of currently undeveloped land comprise Large Intact Blocks within Large Intact Block Clusters 2, 4, and 6. Large Intact Blocks that would experience the isolating effects of adjacent new roadways include Large Intact Block 4a and Large Intact Block 4b, which would experience increased isolation from Large Intact 4c as a result of the Purple and Green Alternatives. While Large Intact Blocks beyond the I-11 corridor (Large Intact Block Cluster 7) and Large Intact Blocks within the corridor but beyond the footprint of the alternatives (Large Intact Block Clusters 1, 3, and 5) would not be physically divided by I-11, they are still expected to experience the effects of increased isolation, because of reduced dispersal opportunities of wildlife species with large ranges.

Table E14-22. Large Intact Block Fragmentation by Build Corridor Alternative

Large Intact Blocks Fragmented by Alternatives	Total Area (hectares)	Area of Resulting Large Intact Block Fragments (hectares)		
		Purple Alternative	Green Alternative	Orange Alternative
Large Intact Block Cluster 2 [a]				
2D	140,605	104,535 36,070	117,003 22,808 787 5 1	–
2F	21,159	21,073 86 (20,599) (560)	21,073 86 (20,599) (560)	–
2G	451,786	–	451,537 219 30	–
2K	5,414	**4,656** **728** **27** **3** **<1** **<1**	5,104 243 65 2	–

Large Intact Blocks Fragmented by Alternatives	Total Area (hectares)	Area of Resulting Large Intact Block Fragments (hectares)		
		Purple Alternative	Green Alternative	Orange Alternative
2L	15,699	–	12,373 3,237 49 23 14 3	–
2N	6,562	–	6,093 469	–
Large Intact Block Cluster 4				
4C	74,030	73,900 92 23 15	73,923 92 15	–
Large Intact Block Cluster 6				
6A	7,410	7,403 7	6,912 496 2	5,659 1,751
6B	13,709	13,609 100	13,645 64	–
6D	28,436	21,898 6,538	27,511 655 177 93	–
6E	86,421	–	–	83,948 2,415 49 9
6G	42,848	29,005 13,821 16 6 <1	27,333 15,515	21,708 21,123 17 <1
6I	34,479	29,712 4,757 4 4 2	29,712 4,757 4 4 2	28,719 5,760

NOTE: The surface areas of the resulting fragments of the single Large Intact Block that would be entirely lost as a result of fragmentation are indicated in bold.

[a] Surface areas for the CAP Design Option are in parentheses under the surface areas for the regular Build Corridor Alternative.

Table E14-23. Total Surface Area of Fragments Lost from Existing Large Intact Blocks by Build Corridor Alternative

Large Intact Block Clusters	Large Intact Blocks Fragmented by Alternatives	Total Surface Area of Fragments Lost from Existing Large Intact Blocks by Alternative (hectares)		
		Purple Alternative	Green Alternative	Orange Alternative
2 [a]	2D, 2F, 2G, 2K, 2L, 2N,	5,500 (5,974)	5,233 (5,706)	–
4	4C	130	107	–
6	6A, 6B, 6D, 6E, 6G, 6I	4,897	6,254	4,241
Total:		**10,527 (11,001)**	**11,594 (12,067)**	**4,241**

[a] Surface areas for the CAP Design Option are in parentheses under the surface areas for the regular Build Corridor Alternative.

Based on parameters such as traffic volume, footprint, truck use, and speed limit, and according to wildlife movement data collected by AGFD, already-existing roadways such as I-10, I-8, and I-19 represent near-total barriers to wildlife (AGFD 2018c). Therefore, when co-located with existing roadways where widening will be required, the I-11 corridor provides a potential opportunity to improve wildlife connectivity through the implementation of mitigation components such as wildlife overpasses and underpasses.

A highway can represent both a physical and psychological barrier for wildlife movement. Individuals that attempt to cross can be injured or killed by traffic or can be affected by turning back, delaying progress, or speeding their movement (van Langevelde, van Dooremalen, and Jaarsma 2009). Wider roads and higher traffic volumes increase the barrier effect and decrease connectivity within the landscape (van Langevelde, van Dooremalen, and Jaarsma 2009). Highways are a barrier for mammals, reptiles, amphibians, and many ground-dwelling insects (van Langevelde, van Dooremalen, and Jaarsma 2009). Deer, elk, and other large ungulates may pass through right-of-way fence to enter the right-of-way, but then often struggle to get back out due to traffic volume and limited space within the right-of-way. This increases the risk for vehicle/wildlife collisions, wildlife and human injury or fatality, and property damage.

Failure to adequately accommodate for safe wildlife passage of highways can lead to various deleterious impacts to wildlife. Migration patterns, dispersal movements, or daily or seasonal activities can be disrupted within the corridor itself. Increased mortality or decreased passage across a road could lead to local population decline, decreased genetic diversity within a population, an increased likelihood of a local population dying out (local extinction or extirpation), a reduced ability to adapt to ecological shifts associated with climate change, or a decrease in regional biodiversity in habitat patches that have become more isolated from each other. These problems can be of societal significance when protected natural areas such as national parks experience loss of species due to habitat fragmentation.

South Section

Option A in the South Section would run between two Large Intact Block Clusters designated as Large Intact Block Cluster 1 east of I-19 and Large Intact Block Cluster 2 west of I-19. Option B (Orange Alternative), which would follow I-10, is adjacent to the eastern edge of Large Intact Block Cluster 2 and west of Large Intact Block Cluster 3 (**Figure E14-10**).

Options C (Purple Alternative) and D (Green Alternative) fragment the northeastern corner of Large Intact Block Cluster 2, impacting Large Intact Blocks such as Large Intact Block 2d and Large Intact Block 2k (**Figure E14-10**). Within the South Section, the Orange Alternative generally avoids direct impacts to Large Intact Blocks because it is co-located with the existing I-19 and I-10. In several locations, the Orange Alternative, however, is located within urban or growing areas where continued development also could impact Large Intact Blocks. Impacts associated with the Purple and Green Alternatives also would occur along the eastern portion of Large Intact Block Cluster 2 and are located where there is increasing urban growth with large tracts of protected parkland.

The Tucson-Tortolita-Santa Catalina Linkage could be impacted by implementing Option B, which is co-located at I-10 and adds additional travel lanes. The existing I-10 infrastructure and railroad right-of-way paralleling the highway are about 525 feet wide combined, and span the full width of the wildlife corridor. In this area, this linkage is the most compromised of the linkages identified by Beier, Garding, and Majka (2006), because the combination of high traffic volumes on I-10 combined with the presence of canals, rail lines, and frontage roads currently render this interstate impermeable to wildlife movement. However, the inclusion of appropriate mitigation to provide a crossing or network of navigable crossings across these barriers would improve connectivity.

The Santa Rita-Tumacácori Linkage could be impacted by implementing Options A, B, C, and D. Option A, being co-located on I-19, would not add additional right-of-way, but increased traffic along the highway could lead to decreased successful crossings of I-19 within the linkage. Options B, C, and D lie next to an arm of the linkage that parallels I-19 along the Santa Cruz River. Development of a traffic interchange for Option C and increased traffic along the highway in Options C and D could decrease the numbers of wildlife moving along this part of the Santa Cruz River. Additional travel lanes in Options C and D that are within the existing right-of-way of I-19 would not impact the wildlife corridors within the linkage.

The Patagonia-Santa Rita Linkage does not intersect any of the Corridor Options and is far enough away to not be impacted by changes to I-19 in Option A. Wildlife movement would not be impacted within this corridor option.

The Ironwood-Picacho Linkage could be impacted by implementing Options F and G. Option G would be co-located with I-8 and I-10 with no additional travel lanes. These two interstate highways are mostly impermeable to wildlife movement, but the inclusion of appropriate mitigation to provide suitable wildlife crossings would improve connectivity through the two linkage arms. Option F would add a 400-foot-wide barrier to wildlife where none exists or where there are only rural unpaved farm roads. Establishing new travel lanes in Option F could potentially restrict wildlife movement within the linkage.

The Santa Rita-Sierrita Detailed Linkage could be impacted where I-19 is co-located along Options A, B, and D and by introducing a new transportation right-of-way in Option C that is 280 feet wide and within a roadless area. Increased travel along Options A, B, and D along I-19 could lead to decreased successful crossings of I-19 within the linkage. Option C could potentially restrict or result in a barrier to wildlife movement where none currently exists.

The Coyote-Ironwood-Tucson Detailed Linkage could be impacted where I-10 is co-located along Option B. Increased traffic volume along I-10 could lead to decreased successful crossings of I-10 within the linkage. Options C, F, and part of D would add a 400-foot-wide

barrier in the Avra Valley where none exists or where there are only rural unpaved farm roads. The new travel lanes in these corridor options could potentially restrict wildlife movement in those parts of the linkage.

Natural wildlife corridors along major xero-riparian features, including Brawley Wash, Greene Wash, the Santa Cruz River, and the tributaries to these resources, could be impacted by the corridor options in the region. The Santa Cruz River passes through Options A, B, C, D, E, and F. Brawley Wash passes through Options C, D, and F; and Greene Wash passes through Options E, F, G, H, and I. Corridor options could impede wildlife movement along the washes and their tributaries by introducing new transportation infrastructure where these are not co-located along existing interstate highways and by increasing traffic volumes in the region.

The TMC established by the Bureau of Reclamation could be impacted by locating Options C and D on its western edge, and by locating the CAP Design Option through the property. Options C and D and the CAP Design Option would create new highway construction within a right-of-way that is 400 feet wide. Currently there are no roads in the TMC, and the overlapping parts of Options C and D are within 0.6 to 1.6 miles of the wildlife crossing features in the TMC. Implementing Option C or D could decrease the number of successful passages through those crossing features. However, implementing the CAP Design Option would move I-11 parallel to the CAP, thereby allowing the design of I-11 to match the existing wildlife crossings in the TMC area, which would reduce the barrier effect of the I-11 infrastructure and avoid greater fragmentation of the Coyote-Ironwood-Tucson Detailed Linkage. However, the addition of artificial illumination resulting from road and vehicle lights on the west side of the TMC would have the potential to impair wildlife from accessing and leaving the TMC and Saguaro National Park via the existing wildlife crossings in the TMC area. Design options for this section of roadway are unknown at this time; however, additional land purchase for wildlife connectivity has been added to mitigate potential impacts for the TMC corridor.

Central Section

Within the Central Section, the Orange Alternative would follow I-8, which would separate Large Intact Block Cluster 2 from Large Intact Block Cluster 4 (**Figure E14-10**). Near the Town of Gila Bend, the Orange Alternative would turn north and be co-located along SR 85, which would separate Large Intact Block Cluster 4 from Large Intact Block Cluster 5. The Purple and Green Alternatives would directly impact Large Intact Block Cluster 4 by isolating Large Intact Block 4a and Large Intact Block 4b from Large Intact Block 4c, which corresponds to the Sierra Estrella Mountains. In contrast, the Orange Alternative would not fragment Large Intact Block Cluster 4.

The Gila Bend–Sierra Estrella Linkage could be impacted by Options Q1, K, and L. Options Q1 and K would be co-located along SR 85 and would not add additional travel lanes within the road right-of-way. Increased travel along SR 85 could lead to decreased successful crossings of the highway within the linkage. Option L would add new transportation infrastructure that is 400 feet wide where none exists or where there are only rural unpaved roads. The new travel lanes in Option L could potentially restrict wildlife movement within the linkage through Rainbow Valley.

The Buckeye Hills East–Sonoran Desert National Monument Linkage could be impacted by Option M, which would add new transportation infrastructure that is 400 feet wide where none exists currently or where there are only rural unpaved roads. The new travel lanes in Option M could potentially restrict wildlife movement within the linkage. Future urban development could surround the linkage to the east and west, which could increase dispersed recreation (Beier,

Garding, and Majka 2008a). The natural corridors along Waterman Wash and the Gila River could be impacted by Options L, M, and N, which could reduce wildlife movement along these xero-riparian corridors and their tributaries. Wildlife moving along the Gila River also could be impacted by nearby Options K, Q1, Q2, and R that could limit access to the Gila River where these parallel or cross the river. Vekol Wash in the Vekol Valley intersects I-8, and successful crossings of I-8 also could decrease due to increased traffic volume along the interstate. Options K and H would be co-located with I-8; Vekol Wash crosses Option I2.

North Section

In the North Section, all three Build Corridor Alternatives would cross Large Intact Block Cluster 6. The CAP canal occurs within Large Intact Block Cluster 6 and was designed with wildlife crossings connecting the southernmost Large Intact Blocks in this cluster to those to the north. As depicted on **Figure E14-10**, **Table E14-22**, and **Table 14-23**, the direct impacts related to fragmentation would be similar for all alignments crossing these Large Intact Block clusters.

The Wickenburg-Hassayampa Linkage and the White Tank-Belmont-Hieroglyphic Mountains Linkage would be similarly impacted by implementing Options S, U, and X. Each of the corridor options would add new transportation infrastructure that is 400 feet wide where none exists currently or where there are only rural unpaved roads. The new travel lanes in any of the three corridor options could potentially restrict wildlife movement within the linkage and along the natural movement corridors along the Hassayampa River, Jackrabbit Wash, and their tributaries. Also, the corridor options would occur at or near the eastern edges of these two linkages and could fragment both the linkage and the preserved lands they connect. Option S would pass through more preserved lands than Options S and X. Option X would have a more circuitous route that passes through more of the arms within the White Tank-Belmont-Hieroglyphic Mountains Linkage.

Bureau of Reclamation wildlife crossings across the CAP could be impacted by Options S, U, and X in the North Section. Although none of these corridor options would pass over a wildlife crossing, the traffic volume on a new nearby highway could decrease the number of successful crossings at these structures.

End-to-End Considerations

From end-to-end, corridor options co-located with an existing highway would add disturbance to an area that is already experiencing road-related impacts. However, co-locating options with an existing highway would have a lesser impact to wildlife corridors and linkages overall than constructing corridor options in native habitats where roads are unpaved or do not exist. In either situation, mitigation to preserve wildlife movements across the highway is possible by installing wildlife overpasses or underpasses. However, as suggested by AGFD in their ongoing cooperative correspondence on the project, these would require further studies to properly locate and design the structures so that they are effective at conveying wildlife across the highway barrier.

Proper siting and design of any crossing structures would require baseline investigations on wildlife movement and roadway mortality through the linkage arms that would be part of the Tier 2 environmental process. Other specific mitigation strategies would be identified during the Tier 2 environmental process, which could include baseline investigations to identify wildlife use of existing bridges, culverts, and other structures, improving existing crossing structures to increase permeability along co-located sections of the highway, and potential off-site mitigation established through cooperative efforts with local municipalities.

Purple Alternative

The Purple Alternative would intersect and therefore directly impact three of the six Large Intact Block clusters present within the Study Area: Large Intact Block Clusters 2, 4, and 6 (**Table E14-22** and **Table 14-23**). Nine Large Intact Blocks would be fragmented by the Purple Alternative. Of these Large Intact Blocks, Large Intact Block 2k would be reduced to six fragments, none of which fulfill the AGFD 5,000-hectare requirement (**Table E14-22**). Thus, Large Intact Block 2k would no longer qualify as a Large Intact Block. All other Large Intact Blocks that would be fragmented by the three Build Corridor Alternatives produce at least one fragment that fulfills the 5,000 hectare threshold, indicating that following fragmentation, all Large Intact Blocks other than Large Intact Block 2k would still qualify as Large Intact Blocks based on the surface area requirement. In terms of connectivity, under the Purple Alternative, the loss of functional land represented by the loss of Large Intact Block fragments that are at least 5,000 hectares in surface area would be intermediate between that under the Green Alternative and the Orange Alternative (**Table E14-23**).

The Purple Alternative would create new highway infrastructure that would create impediments to wildlife movement that currently do not exist within Pima County (including the Pima County Buffer Overlay Zone), the Santa Rita-Sierrita Detailed Linkage, the TMC, the Buckeye Hills East-Sonoran Desert National Monument Linkage, the Gila Bend-Sierra Estrella Linkage, the Wickenburg-Hassayampa Linkage, the White Tank-Belmont-Hieroglyphic Mountains Linkage, and several BLM Wildlife Movement Corridors. Unlike the Green and Orange Alternatives, the Purple Alternative would add an additional roadway crossing over the Gila River within the Gila/Salt River Corridor Granite Reef Dam Potential Linkage Zone, approximately 7 miles upstream of the existing SR 85 bridge. The Purple Alternative would contribute to the isolation of Large Intact Blocks where it is co-located with existing high-traffic highways (greater than 5,000 annual average daily traffic), and where widening would be needed. However, in these roadway segments, wildlife connectivity could be improved if wildlife crossing mitigation is implemented in the process of upgrading these highways to the proposed I-11. Thus, wildlife movement through the following linkages could potentially be improved: the Ironwood-Picacho Linkage, which crosses the I-10 at Option G, and the Santa Rita-Tumacácori Linkage, which crosses I-19 at Options A and B.

The Purple Alternative would introduce new highway infrastructure within the Avra Valley, Vekol Valley, Rainbow Valley, and Hassayampa Plain that would compromise the quality of wildlife corridors and linkages and habitat quality (e.g., Large Intact Block integrity) in these areas by increasing the cascade of effects described in the previous section. The Green Alternative also would introduce more new highway infrastructure compared to both the Purple and Orange Alternatives. The only new fracture zone included in the Orange Alternative would be through the Hassayampa Plain. Thus, of the three alternatives, the Orange Alternative would have the lowest expense and the lowest requirements for complex wildlife connectivity mitigations, because it relies the most on already existing roadways.

Impacts to individual wildlife species and populations would require baseline investigations on wildlife movement and roadway mortality through the linkage arms. ADOT will continue to work with the cooperating agencies and partners during the Tier 2 process to develop appropriate studies to evaluate these factors. Specific mitigation strategies will be identified during the Tier 2 environmental process.

Green Alternative

The Green Alternative would intersect and therefore impact four of the six Large Intact Block clusters present within the Study Area: Large Intact Block Clusters 2, 4, 5, and 6 (**Table E14-22** and **Table 14-23**). A total of 12 Large Intact Blocks would be fragmented by the Green Alternative, compared to 4 Large Intact Blocks and 9 Large Intact Blocks for the Orange and Purple Alternatives, respectively. Of these Large Intact Blocks, none would be completely reduced to fragments below the AGFD 5,000-hectare requirement (**Table E14-22**). In terms of connectivity, under the Green Alternative, the loss of functional land represented by the loss of Large Intact Block fragments that are at least 5,000 hectares in surface area would be the greatest compared to the Orange Alternative and the Purple Alternative (**Table E14-23**). Under the Green Alternative, this loss would be approximately 3.6 times and 1.4 times larger than that caused by the Orange Alternative and Purple Alternative, respectively. Thus, the Green Alternative would cause the most fragmentation of Large Intact Blocks.

The Green Alternative would create new highway infrastructure that would affect habitat quality (e.g., Large Intact Block integrity) and create impediments to wildlife movement that currently do not exist within the Pima County Buffer Overlay Zone, the Ironwood-Picacho Linkage, the Santa Rita-Sierrita Detailed Linkage, the Santa Rita-Tumacácori Linkage, the TMC, the Coyote-Ironwood-Tucson Detailed Linkage, the Buckeye Hills East-Sonoran Desert National Monument Linkage, the Gila Bend-Sierra Estrella Linkage, the Wickenburg-Hassayampa Linkage, the White Tank-Belmont-Hieroglyphic Mountains Linkage, and several BLM wildlife movement corridors. The Green Alternative would contribute to the isolation of Large Intact Blocks where it is co-located with existing high-traffic highways (greater than 5,000 annual average daily traffic), and where widening would be needed. However, in these roadway segments, wildlife connectivity could be improved if wildlife crossing mitigation is implemented in the process of upgrading these highways to the proposed I-11.

Overall, the corridor options in the Green Alternative would be primarily situated in areas without existing major highways, which would introduce additional new highway infrastructure, and therefore more fragmentation of wildlife habitat and wildlife corridors within wildlife linkages than either the Purple Alternative or Orange Alternative. The Green Alternative has the greatest potential to disrupt wildlife linkages and disrupt connectivity, followed by the Purple Alternative, and the Orange Alternative. Compared to the Purple Alternative, which has a potential for disruption that is slightly smaller than that generated by the Green Alternative, the Orange Alternative would be significantly less likely to disrupt wildlife linkages compared to the Green and Purple Alternatives For instance, in the North Section, while the Green Alternative would be shorter and less convoluted compared to the other alternatives, it would impact the Wickenburg-Hassayampa and the White Tank-Belmont-Hieroglyphic Mountains Wildlife Linkages to a greater extent. In contrast, the Orange Alternative would traverse the least linkage areas where roadways do not currently exist, and therefore would have the least impact on wildlife linkages. However, each of these alternatives could create a blockage at or near the interface of the wildlife linkages and the blocks of land these connect where high-traffic roadways do not currently exist, as well as impair wildlife movement across the CAP canal as a result of their proximity to existing CAP wildlife crossings. While the Green Alternative, followed by the Purple Alternative, would create more new barriers to wildlife movement, the Orange Alternative would create the least new barriers and provide a limited opportunity to reduce the barrier effect of existing roadways.

The Green Alternative would cause the most deleterious impacts to biotic communities, Important Bird Areas, invasive species, Species of Economic and Recreational Importance, and

special status species compared to the other alternatives, as a result of its greater negative impacts to riparian areas and to wildlife connectivity. Mitigation for wildlife corridors under this Build Corridor Alternative would require the most effort and the largest cost to conduct studies to locate crossing structures and to implement wildlife overpasses or underpasses that are effective at conveying wildlife past the highway barrier.

Orange Alternative

The Orange Alternative would intersect and therefore directly impact four of the six Large Intact Block clusters present within the Study Area: Large Intact Block Clusters 2, 4, 5, and 6 (**Table E14-22** and **Table 14-23**). Four Large Intact Blocks would be fragmented by the Orange Alternative. Of these Large Intact Blocks, none would be completely reduced to fragments below the AGFD 5,000-hectare requirement (**Table E14-22**). In terms of connectivity, under the Orange Alternative, the loss of functional land represented by the loss of Large Intact Block fragments that are at least 5,000 hectares in surface area would be the smallest compared to the Green Alternative and the Purple Alternative (**Table E14-23**). This loss would be approximately 2.4 times and 3.6 times smaller than that of the Purple Alternative and Green Alternative, respectively. Thus, the Orange Alternative would cause the least fragmentation of Large Intact Blocks.

The Orange Alternative would create new highway infrastructure that would affect habitat quality (e.g., Large Intact Block integrity) and create impediments to wildlife movement that currently do not exist within the Wickenburg-Hassayampa Linkage and the White Tank-Belmont-Hieroglyphic Mountains Linkage, and several BLM wildlife movement corridors. The Orange Alternative would contribute to the isolation of Large Intact Blocks where it is co-located with existing high-traffic highways (greater than 5,000 annual average daily traffic), and where widening would be needed. However, in these roadway segments, wildlife connectivity could be improved if wildlife crossing mitigation is implemented in the process of upgrading these highways to the proposed I-11. The Orange Alternative is the alternative that would rely the most on co-location with existing roadways. Thus, wildlife movement through the following linkages could potentially be improved: the Ironwood-Picacho Linkage, the Santa Rita-Sierrita Detailed Linkage, the Santa Rita-Tumacácori Linkage, the Tucson-Tortolita-Santa Catalina Linkage, the Coyote-Ironwood-Tucson Detailed Linkage, the Gila Bend-Sierra Estrella Linkage, and the BLM wildlife movement corridors.

Overall the corridor options would be co-located along existing major highways to a greater extent in the Orange Alternative than within the Purple or Green Alternatives. As a result, the Orange Alternative would create the fewest impediments to wildlife movement as a result of new roadway infrastructure. For instance, while the Purple Alternative and the Green Alternative would impact the Coyote-Ironwood-Tucson Detailed Linkage by creating new highway infrastructure that traverses the linkage, the Orange Alternative would only impact this linkage via potential expansion of the already-existing I-10, which occurs along a relatively small portion of the east edge of the linkage. In the North Section, where new highway infrastructure would be required, the overall environmental impact to wildlife corridors and linkages would be smaller under the Orange Alternative than under the Purple or Green Alternatives. However, each of these alternatives could create a blockage at or near the interface of the wildlife linkages and the wildland blocks that these connect where high-traffic roadways do not currently exist, as well as impair wildlife movement across the CAP canal as a result of their proximity to existing CAP wildlife crossings.

The Orange Alternative would have the least potential direct impacts on biological resources compared to the other two alternatives and could provide a limited opportunity to improve wildlife connectivity if wildlife crossing mitigation is implemented when new construction is needed to upgrade the co-located highways to the proposed I-11. In addition, mitigation under the Orange Alternative may be initially more effective because wildlife may have already acclimated to structures where they can cross the highway.

No Build Alternative

The No Build Alternative, as described in **Chapter 2** (Alternatives Considered) of the Draft Tier 1 EIS, is used as a baseline for comparison with the Build Corridor Alternatives. The No Build Alternative would not implement any of the Build Corridor Alternatives for development of I-11. Impacts for the No Build Alternative were analyzed using currently programmed projects. These projects include widening projects along existing routes (I-10 in Tucson and near the Town of Picacho and US 93 in Wickenburg). Therefore, the No Build Alternative is anticipated to have the least negative effect on wildlife connectivity and the modeled linkages and natural corridors in the region.