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

Appendix E14, Biological Resources Technical Memorandum

March 2019

U.S. Department of Transportation Federal Highway Administration

ADOT

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SUMMARY

Purpose

This technical memorandum describes the biological resources that could be affected by the proposed Interstate 11 from Nogales to Wickenburg, Arizona. This biological resources technical memorandum supports the Draft Tier 1 Environmental Impact Statement and Preliminary Section 4(f) Evaluation (Draft Tier 1 EIS) that evaluates the social, economic, and environmental impacts potentially resulting from the alternatives under evaluation, including the No Build Alternative.

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Acronyms

°F	degrees Fahrenheit
A	Aquatic (as used in Table E14-10)
AADT	annual average daily traffic
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
amsl	Above Mean Sea Level
ARPC	Arizona Rare Plant Committee
ARS	Arizona Revised Statute
AWLWG	Arizona Wildlife Linkages Working Group
AZDA	Arizona Department of Agriculture
AZIBA	Arizona Important Bird Area
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
CAP	Central Arizona Project
CCA	Candidate Conservation Agreement
CFR	Code of Federal Regulations
DPS	Distinct Population Segment
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
HCP	Habitat Conservation Plan
HDMS	Heritage Data Management System
HS	Highly Safeguarded
I	Interstate
IBA	Important Bird Area
LE	Listed Endangered
LIB	Large Intact Block
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 as used in Special Status Species tables)
PNW	State listed Prohibited Noxious Weed (as used in **Table E14-10**)
Reclamation	Bureau of Reclamation
RGNW	State Listed Regulated Noxious Weed
RNW	State Listed Restricted Noxious Weed
ROW	Right-of-Way
S	Sensitive (as used in Special Status Species tables)
SC	Species of Concern (as used in Special Status Species tables)
SDCP	Sonoran Desert Conservation Plan
SERI	Species of Economic and Recreational Importance
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
USC	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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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 a federal, state, or local governmental agencies; and the 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, 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 superceded 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 the following key federal and state statutes, executive orders (EOs), and agency and local government policies described below.

E14.1.1 Federal

E14.1.1.1 Endangered Species Act

The purpose of the ESA, as amended (16 United States Code [USC] § 1531 et seq.), is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the Department of the Interior 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). The 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 2015c).

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 the USFWS or NMFS under the ESA.

E14.1.1.2 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC § 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 the USFWS and with State fish and wildlife agencies is required.

E14.1.1.3 Migratory Bird Treaty Act

The MBTA, as amended (16 USC 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 starlings, and rock pigeons), and non-migratory upland game birds. The USFWS implements and enforces the MBTA and is the lead federal agency for managing and conserving migratory birds in the US. The USFWS regulates the take of migratory birds for educational, scientific, and recreational purposes. Special Purpose Permits of the MBTA are

required in the event that an action would take, possess, or involve the sale or transport of birds protected by the MBTA (50 CFR 2I.27) (USFWS 2015a). Currently there is no permitting mechanism for take related to lawfully executed construction projects.

E14.1.1.4 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 (BGEPA), and as amended (16 USC 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" (USFWS 2016a).

E14.1.1.5 Federal Noxious Weed Act

The Federal Noxious Weed Act (7 USC § 2801 et. seq.) established a federal program to control the spread of 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.

E14.1.1.6 The Wilderness Act of 1964

The Wilderness Act of 1964 (16 USC 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.

E14.1.1.7 The Organic Act of 1916

The Organic Act of 1916 (16 USC 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 (NPS 2018). An Executive Order in 1933 transferred 56 national monuments and military sites from the Forest Service and the War Department to the NPS.

E14.1.1.8 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 2012a).

E14.1.1.9 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. The order outlines specific requirements of the Memorandum of Understanding (USFWS 2015b).

E14.1.1.10 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).

E14.1.1.11 Bureau of Land Management Special Status Species Policy

Under the authorities of the Federal Land Policy Management Act of 1976 (43 USC 1701 et seq.), ESA, and other federal laws and regulations, the Bureau of Land Management (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. The 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

E14.1.2.1 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 the AGFD by and through the Arizona Game and Fish Commission to regulate wildlife Arizona Revised

Statutes (ARS) Section 17-102, which establishes that most wildlife in Arizona are the property of the state.

The 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 2017a). "Endangered wildlife," are those species listed by the Department as Tier 1a of Species of Greatest Conservation Need or by the USFWS as endangered, threatened or a candidate for such status.

Arizona's State Wildlife Action Plan (SWAP) (AGFD 2017b) 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 every 5 years by the USFWS (AGFD 2012c). The current revision was issued in 2012.

E14.1.2.2 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) propose 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 2017b).

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

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

E14.1.2.3 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 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 noxious weeds, crop pests, or diseases under these authorized or approved programs (Arizona State Legislature 2017).

E14.1.2.4 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.

E14.1.2.5 Local Ordinances

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

E14.1.2.6 Pima County Native Plant Ordinance

The Pima County Native Plant Ordinance (Pima County Zoning Code §§ 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.

E14.1.2.7 Pima County Multi-species Conservation Plan for Pima County, Arizona

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 (SDCP). The purpose of the SDCP was to develop a regional plan to address the long-term conservation and preservation of the County's natural and cultural resources (Pima County 2016).

The Multi-species Conservation Plan represents the culmination of many years of planning and studies in the development of the biological element of the SDCP. That work effort was guided by the SDCP 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 SDCP (Pima County 2000). Other milestones in the development of the SDCP include defining land-protection priorities, securing funds for land acquisitions, acquiring and managing new preserves, and revising and updating County regulations. Formalizing the County's conservation commitments for compliance with the ESA is the next milestone in advancing the vision of the SDCP.

E14.1.2.8 City of Tucson Habitat Conservation Plan

The City of Tucson Habitat Conservation Plan (HCP) 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 HCP 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*).

E14.1.2.9 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 farm lands 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 the USFWS began working on the Avra Valley HCP in 2004 and the final draft plan was submitted to the USFWS in 2014 (City of Tucson 2014). Species proposed for coverage by the Avra Valley HCP 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 (LIBs), and riparian areas were identified using available literature and digital spatial data, much of which was provided by the AGFD. Specific wildlife data also provided by the 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 HCPs 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. Coordination with AGFD, USFWS, BLM, and other pertinent agencies and stakeholders will continue throughout the development of the Draft and Final Tier 1 EIS.

E14.2.1 Biotic Communities (Vegetation and Wildlife)

Potential environmental consequences on biotic communities are evaluated for each alternative. Regional vegetation communities, LIBs, 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 of the spread of invasive 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 noxious and invasive species (ADOT 2010). Potential mitigation strategies or measures are provided as examples for further consideration in the Tier 2 analysis. These 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 (AGFD 2016a). 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 which 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, 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 if 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 through 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 are 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 also cross several local ecological communities and/or special conservation areas, such as riparian areas and designated Important Bird Areas (IBAs) (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 (Climatological Data for Representative Locations within or Adjacent to the Study Area) summarizes climatological data for representative cities or towns within each of the biotic communities.

E14.3.1.1 South Section

The South Section encompasses five different biotic communities:

1. Semidesert Grassland
2. Madrean Evergreen Woodland
3. Sonoran Desertscrub Lower Colorado River Valley Subdivision (Lower Colorado River Desertscrub)
4. Sonoran Desertscrub Arizona Upland Subdivision (Arizona Upland Desertscrub)
5. Interior Chaparral

Of the five biotic communities within the South Section of the Study Area, three are crossed by one or more of the Build Corridor Alternatives (**Figure E14-1** [Biotic Communities – South Section]).

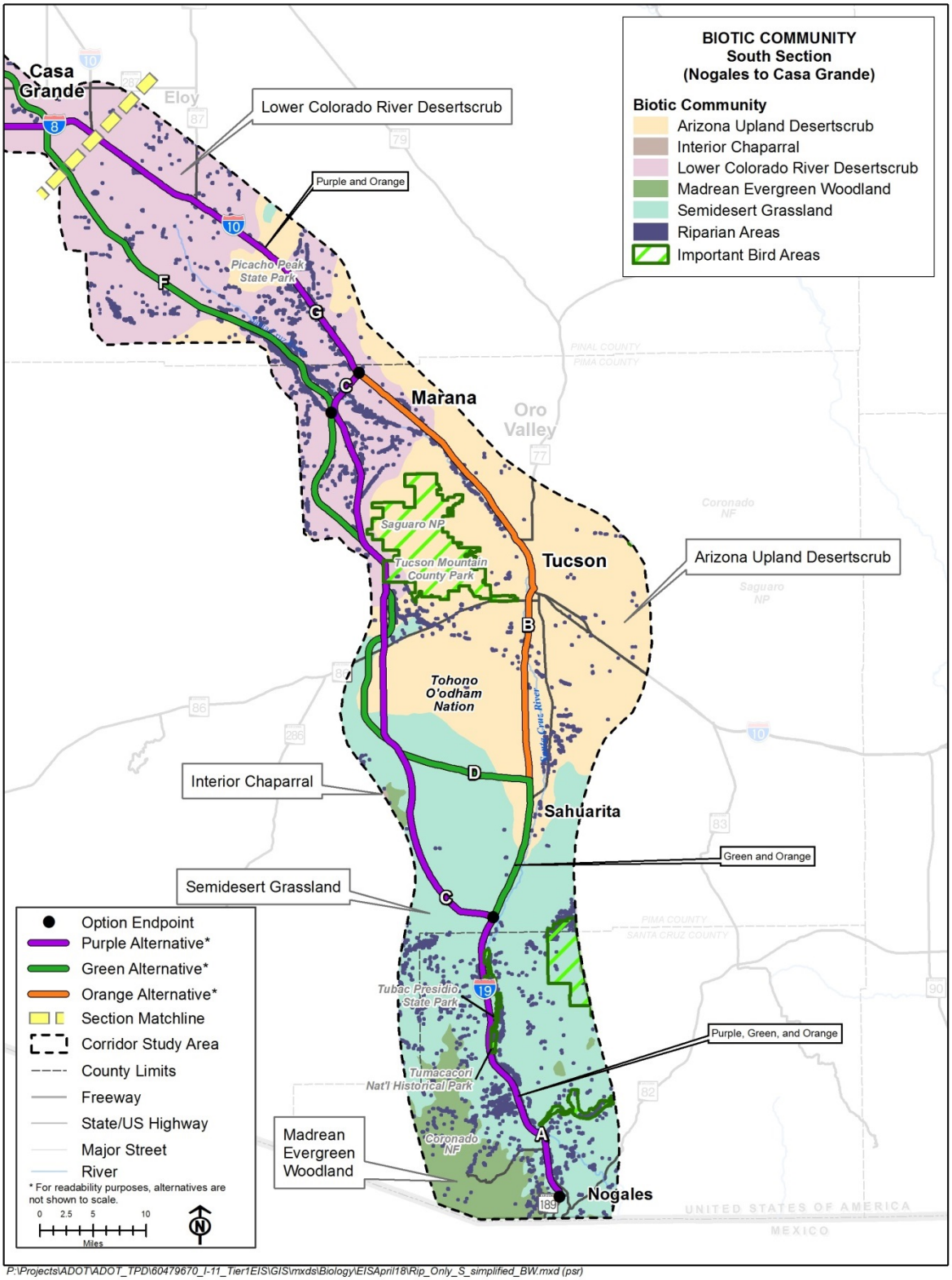
E14.3.1.1.1 Semidesert Grassland (South Section)

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

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 & 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 Desertscrub (on edge of Semidesert Grassland)	83.0	June & July/99	54.0	January & December/37	14.13	August/2.95	May/0.24
Tucson/Arizona Upland Desertscrub	83.7	July/101	58.1	January & December/42	11.92	August/2.24	May/0.20
Eloy/Lower Colorado River Desertscrub	87.7	July/106	53.6	January & 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 Desertscrub	83.8	July/102	57.3	January & December/42	15.05	August/2.36	June/0.12
Wickenburg/Arizona Upland Desertscrub	82.8	July/102	49.0	December/32	12.14	August/2.13	June/0.12

NOTE: Temperatures in ºF and precipitation in inches. Abbreviations in table: **Ave** = Average, **Temp** = Temperature.
SOURCES: Western Regional Climate Center 2016 (Santa Rita Experimental Range); YourWeatherService.com 2017.



SOURCE: Brown 1994.

Figure E14-1 Biotic Communities – South Section

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 2012c). 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** [Biotic Communities within the Study Area]).

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 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	**Acres**	**% Total Area**	**Acres**	**% Total Area**	**Acres**	**% Total Area**	**Acres**	**% Total Area**
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	13	<0.01	0	0.0	0	0.0	13	<0.01
North American Warm Desert Riparian Woodland and Shrubland	241	<0.01	458	0.02	45	<0.01	745	<0.03
North American Arid West Emergent Marsh	12	<0.01	0	0.0	0	0.0	12	<0.01
North American Warm Desert Riparian Mesquite Bosque	849	<0.03	256	0.01	87	<0.01	1,192	0.04
North American Warm Desert Wash	8	<0.01	0	0.0	0	0.0	9	<0.01
Invasive Southwest Riparian Woodland and Shrubland	10	<0.01	354	0.01	0	0.0	364	0.01
Open Water	61	<0.01	63	<0.01	2	<0.01	127	<0.01
Total Riparian	**1,195**	**0.04**	**1,131**	**0.04**	**135**	**<0.01**	**2,461**	**0.09**

SOURCES: Surface area values based on a digital map of the biotic communities of Arizona based on Brown and Lowe's (1979) descriptions (The 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 2012c).

Table E14-3 (Wildlife Species Commonly Associated with Semidesert Grasslands) 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.
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	*Mimus polyglottos*

Table E14-3 Wildlife Species Commonly Associated with Semidesert Grasslands (Continued)

Class	Common Name	Scientific Name
Birds (Con't)	Mourning dove	*Zenaida rnacroura*
	Prairie falcon Roadrunner	*Falco mexicanus*
	Say's phoebe	*Geococcyx californianus*
	Scaled quail	*Sayornis saya*
	Scott's oriole	*Callipepla squamata*
	Swainson's hawk	*Icterus parisorum*
	Verdin	*Buteo swainsoni*
	Western kingbird	*Auriparus flaviceps*
	Western meadowlark	*Tyrannus verticalis*
	Chihuahuan raven	*Sturnella neglecta*
		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*
Amphibians	Couch's spadefoot	*Scaphiopus couchii*
	Mexican spadefoot	*Spea multiplicata*
	Western green toad	*Anaxyrus debilis insidior*

SOURCES: Brennan and Holycross 2006; Brown 1994.

E14.3.1.1.2 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 amsl. 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** [Biotic Communities within the Study Area]).

In the mountainous regions of Arizona, such as the Santa Rita, Tumacacori, 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** [Climatological Data for Representative Locations within or Adjacent to the Study Area]). 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** (Wildlife Species Commonly Associated with Madrean Evergreen Woodlands) provides a more comprehensive list of the plant and animal species commonly associated with the Madrean Evergreen Woodland biotic community.

E14.3.1.1.3 Sonoran Desertscrub Arizona Upland Subdivision (South Section)

The Sonoran Desertscrub Arizona Upland Subdivision (Arizona Upland Desertscrub) (**Figure E14-3** [Arizona Upland Desertscrub on West Gates Pass Road at Tucson Estates Trail]) is located in south-central Arizona and northern Sonora, Mexico (**Table E14-3** [Wildlife Species Commonly Associated with Semidesert Grasslands]). 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 amsl, 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).

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.

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** [Climatological Data for Representative Locations within or Adjacent to the Study Area]). 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 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)*.

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

Areas of the Arizona Upland 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*).

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 (Wildlife Species Commonly Associated with the Arizona Upland Desertscrub) provides a more comprehensive list of the plant and animal species commonly associated with the Arizona Upland Desertscrub biotic community. The Arizona Upland 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 2012c). 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** [Biotic Communities within the Study Area]).

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

E14.3.1.1.4 Sonoran Desertscrub Lower Colorado River Valley Subdivision (South Section)

The Sonoran Desertscrub Lower Colorado River Valley Subdivision (Lower Colorado River Desertscrub) (**Figure E14-4** [Lower Colorado River Desertscrub, I-8 13.5 miles East of Exit 119]) 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 amsl (Brown 1994). Summer temperature highs may exceed 120°F, with surface temperatures approaching 180°F (Arizona-Sonora Desert Museum 2017a). Sandy substrates are common. A combination of low annual rainfall and high temperatures (**Table E14-1** [Climatological Data for Representative Locations within or Adjacent to the Study Area]) 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, 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 2012c). 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** [Biotic Communities within the Study Area]).

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 mountains ranges and mesas. Otherwise, large mammals, including the coyote and introduced burro, are rare (Brown 1994).

Table E14-6 (Wildlife Species Commonly Associated with the Lower Colorado River Desertscrub) 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*

Table E14-6 Wildlife Species Commonly Associated with the Lower Colorado River Desertscrub (Continued)

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.

E14.3.1.2 Central Section

The Central Section encompasses two different biotic communities, the Lower Sonoran Desertscrub and the Arizona Upland Desertscrub (**Figure E14-5** [Biotic Communities – Central Section]).

E14.3.1.2.1 Sonoran Desertscrub Arizona Upland Subdivision (Central Section)

The Arizona Upland 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 2012c). 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** [Biotic Communities within the Study Area]).

See page E14-17 for a description of the characteristics of the Arizona Upland Desertscrub.

E14.3.1.2.2 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** [Biotic Communities within the Study Area]). See page E14-21 for the characteristics of the Lower Colorado River Desertscrub.

E14.3.1.3 North Section

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

E14.3.1.3.1 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** [Biotic Communities within the Study Area]). See page E14-10 for the characteristics of the Semidesert Grassland biotic community.

E14.3.1.3.2 Sonoran Desertscrub Arizona Upland Subdivision (North Section)

The Arizona Upland 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** [Biotic Communities within the Study Area]). See page E14-17 for a description of the characteristics of the Arizona Upland Desertscrub.

E14.3.1.3.3 Sonoran Desertscrub Lower Colorado River Valley Subdivision (North Section)

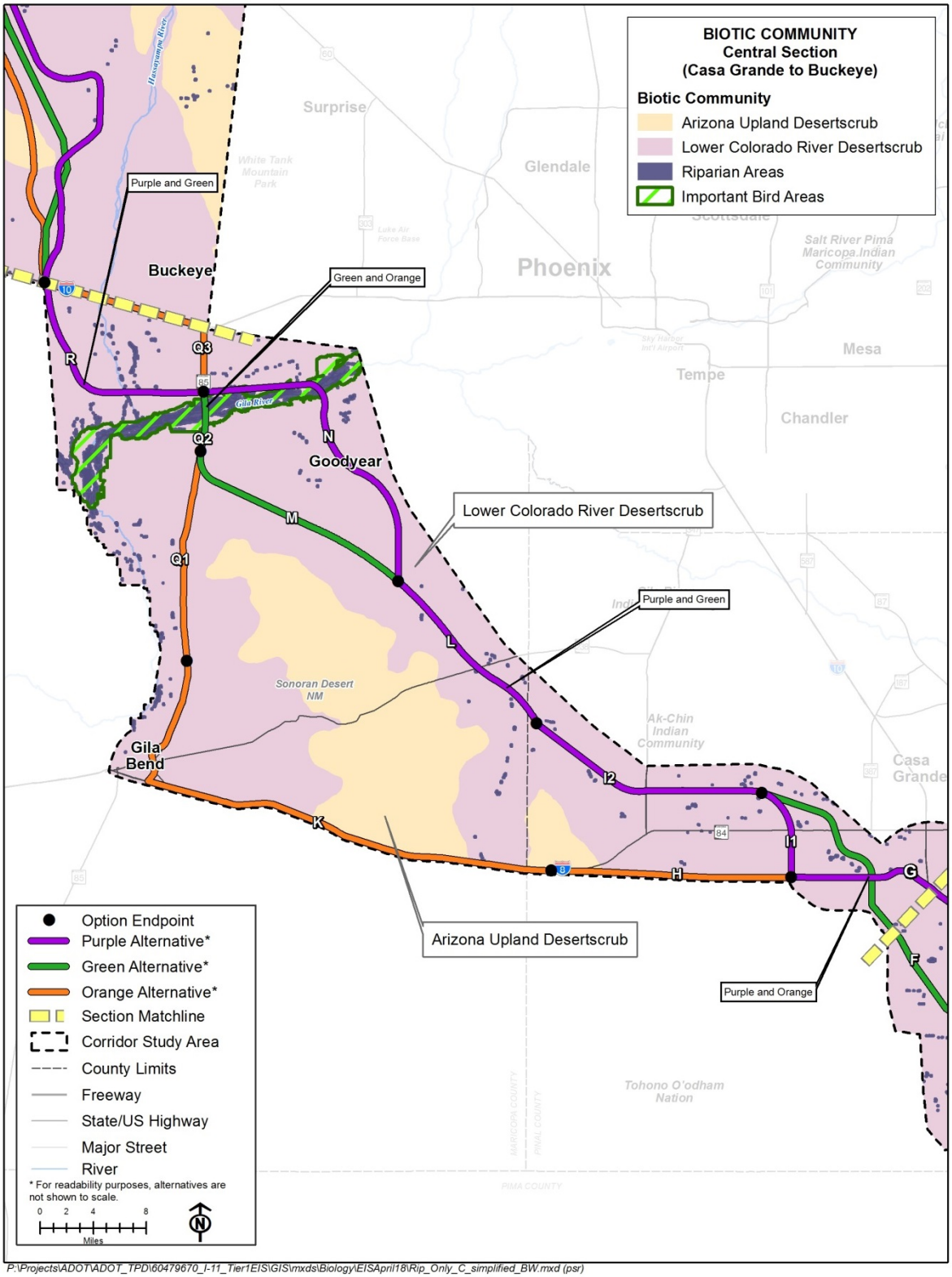
The Lower Colorado River Desertscrub biotic community encompasses approximately 42.8 percent of the North Section, or 230,621 acres, and approximately 46.6 percent (1,258,350 acres) of the entire Study Area (This community is unique in that it has become largely extirpated within the state with only severely degraded fragments remaining (AGFD 2012c). 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** [Biotic Communities within the Study Area]).

See page E14-21 for the characteristics of the Lower Colorado River Desertscrub.

E14.3.1.3.4 Mohave Desertscrub (North Section)

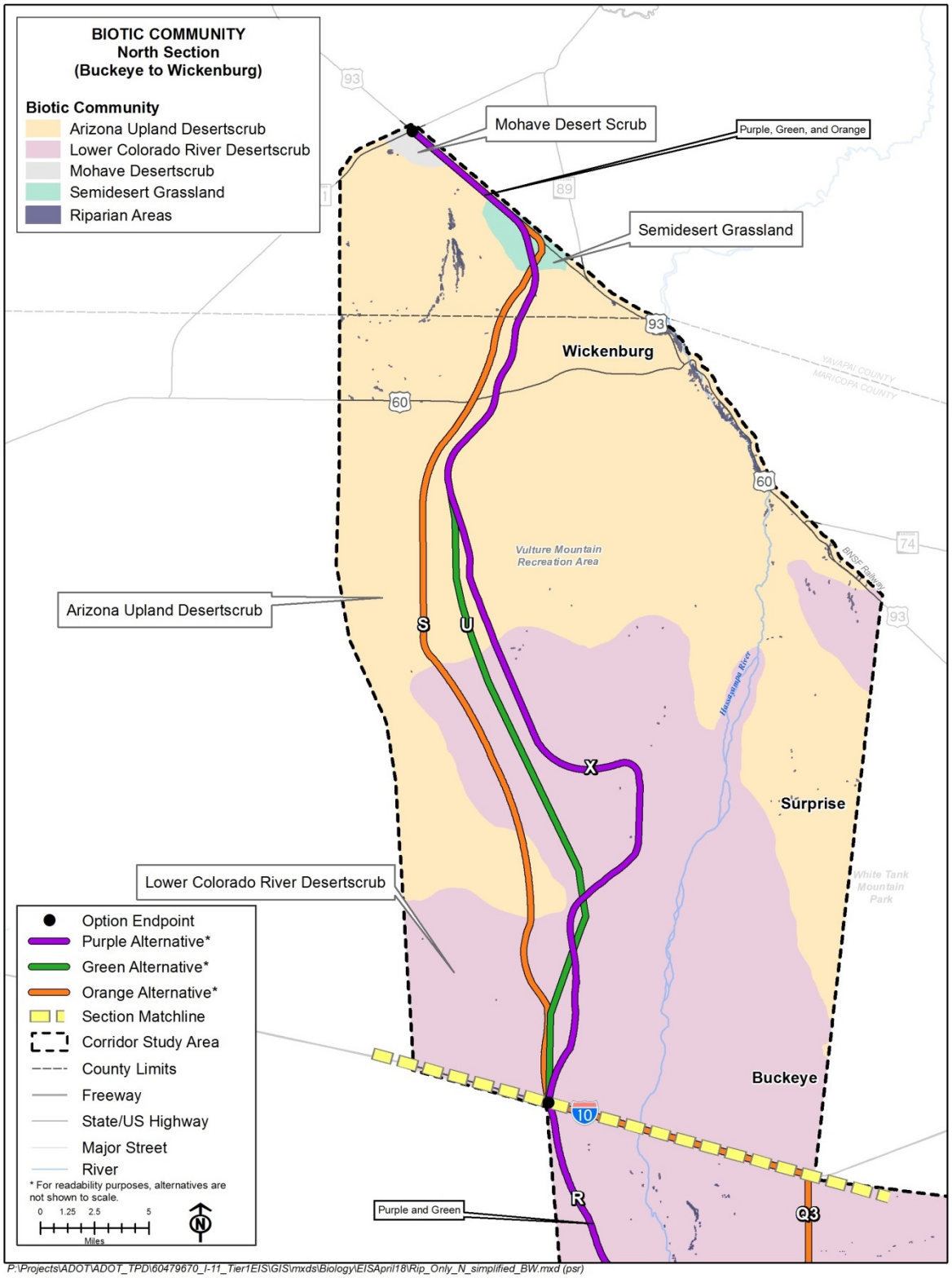
In Arizona, this community mainly occurs in the northwest portion of the state. Topography in this community includes flatlands, plains, low hills, and bajadas, at elevations ranging from 980 to 4,270 feet amsl. This elevational range is broader than that of other Desertscrub biomes. Annual rainfall 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** [Joshua Trees are One of the Characteristic Species of the Mohave Desertscrub]) 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** (Wildlife Species Commonly Associated with the Mohave Desertscrub).

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



SOURCE: Brown 1994.

Figure E14-5 Biotic Communities – Central Section



SOURCE: Brown 1994.

Figure E14-6 Biotic Communities – North Section

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*
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.

Figure E14-7 Joshua Trees are One of the Characteristic Species of the Mohave Desertscrub

E14.3.1.4 Riparian Habitats and Important Bird Areas

E14.3.1.4.1 Riparian Habitats

Seven different riparian habitats are described in the USGS's (2004) 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 IBAs. This community is unique in that it has become largely extirpated within the state with only severely degraded fragments remaining (AGFD 2012c). 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** [Biotic Communities within the Study Area]).

Table E14-2 (Biotic Communities within the Study Area) 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** [Hassayampa River]). 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 2017a).

North American Warm Desert Wash (Desert Wash) communities consist of intermittently flooded washes or arroyos which often dissect 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** (Gila River at SR 85 Dominated by Invasive Salt Cedar).

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 (Wildlife Species Commonly Associated with Riparian Areas) 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 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.

E14.3.1.4.2 Important Bird Areas

Several areas have been identified by the Arizona Important Bird Area (AZIBA) Program. The AZIBA is a program run by the Arizona Audubon and the Tucson Aububon Society in partnership with the AGFD (Audubon Arizona 2017). Objectives of the IBA 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; and
- Facilitation of long-term conservation of these most important avian habitats and their avian communities.

The IBA 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 IBAs (AZIBA Program 2011).

The IBA partner for the US is the National Audubon Society, which began to establish individual IBA programs state by state in 1995. The National Audubon Society oversees all of the state-level IBA Programs. The AZIBA are areas identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations.

Six AZIBA sites are located within the Study Area (AZIBA Program 2011) and are shown in **Figure E14-1** (Biotic Communities – South Section) and **Figure E14-5** (Biotic Communities – Central Section). These sites are:

South Section

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

Central Section

- Lower Salt and Gila Riparian Ecosystem IBA (Gila River IBA)

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

No IBA sites fall within the North Section of the Study Area. **Table E14-9** (Important Bird Areas within the Study Area) summarizes the acreages of IBAs 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 IBA	3,193	0.2	0	0.0	0	0.0	3,193	0.1
Upper Santa Cruz River IBA	2,184	0.2	0	0.0	0	0.0	2,184	<0.1
Santa Rita Mountains IBA	13,565	1.0	0	0.0	0	0.0	13,565	0.5
Tanque Verde Wash/Sabino Canyon IBA	26	<0.1	0	0.0	0	0.0	26	<0.1
Tucson Sky Islands IBA	47,183	3.5	0	0.0	0	0.0	47,183	1.7
Lower Salt and Gila Riparian Ecosystem IBA	0	0.0	27,125	3.4	0	0.0	27,125	1.0
Total IBA Area	66,151	4.9	27,125	3.4	0	0.0	93,275	3.5

E14.3.1.5 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 described above, Arizona's SWAP (AGFD 2012c) 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 (SERI).

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 2012c).

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 2016c) 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 2018a).

E14.3.1.6 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 species within road rights-of-way (ROWs) for which they have responsibility and attempts to eradicate or control the spread of these species. **Table E14-10** (Non-Native Invasive Plant Species Found in the Study Area) lists the non-native invasive 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

Table E14-10 Non-Native Invasive Plant Species Found in the Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	Habitat
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
Herb sophia	*Descurainia sophia*		T
Horehound	*Marrubium vulgare*		T
Johnsongrass	*Sorghum halepense*		T
Lehmann lovegrass	*Eragrostis lehmanniana*	ADOT	T
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 & 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

Table E14-10 Non-Native Invasive Plant Species Found in the Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	Habitat
Wild oat	*Avena fatua*	ADOT	T
Yellow nutsedge	*Cyperus esculentus*		T

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.

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

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.

E14.3.2.1 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 if any of these species could potentially occur in the vicinity of the Study Area. Within the Study Area, 12 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 (CCA) 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 CCA (USFWS 2015e) developed in cooperation with the 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 CCA. 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** (Distribution of ESA Protected Species within the Study Area), 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.

E14.3.2.2 Critical and Protected Habitat

Table E14-12 (Total Surface Area Covered by ESA Critical Habitat, 10(j) Experimental Population Areas, and Other Protected Habitats within the Study Area) provides information on critical habitat for ESA species that occurs 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 the USFWS as "High Value Potential Habitat" (USFWS 2015e) are included. Critical habitat for Sonora chub does not occur within the Corridor Options; therefore this species is not included in the table.

E14.3.2.3 Other Sensitive Species

In addition to species protected under the federal ESA (**Table E14-11** [Distribution of ESA Protected Species within the Study Area] and **Table E14-12** [Total Surface Area Covered by ESA Critical Habitat, 10(j) Experimental Population Areas, and Other Protected Habitats within the Study Area]), additional sensitive species analyzed include: species deemed sensitive by the 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 which are considered vulnerable by the AGFD and are either: 1) listed under the ESA as threatened, endangered, or as a candidate species; 2) protected under a CCA; 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 if they occur within the Study Area. **Table E14-13** (Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area) 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 the AGFD (AGFD 2016b) along with Pima County's list of sensitive species and Pima County Priority Conservation Area coverages (Pima County 2016, 2013) was 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 our 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 E14-11 Distribution of ESA Protected Species within the Study Area

Common Name	Scientific Name	Status (defined in table note)	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 which are mostly free from introduced fish, crayfish, and bullfrogs. Elevation: 3,300 – 8,900 feet amsl (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 amsl (AGFD 2005c; USFWS 2013a, 2012b).
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 require 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 amsl (AGFD 2002g; USFWS 2014a).
Yellow-billed cuckoo (Western Distinct Population Segment [DPS]) 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 amsl (AGFD 2017d; Halterman et al. 2015; USFWS unpublished data).

Table E14-11 Distribution of ESA Protected Species within the Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South Section	Central Section	North Section	Habitat Requirement
Yuma Ridgeway'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 amsl (AGFD 2006f; USFWS 2015f, 2010).
Fish						
Gila topminnow	*Poeciliopsis occidentalis 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 amsl (AGFD 2001f; USFWS 2015g, 2008).
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 amsl (AGFD 2001j; USFWS 2013b).

Table E14-11 Distribution of ESA Protected Species within the Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South Section	Central Section	North Section	Habitat Requirement
Mammals						
Jaguar with critical hábitat	*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 amsl (AGFD 2004b; Culver 2016; USFWS 2016b, 2014b).
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 mile from perennial water, had 23% tree cover, and were >3.5 miles from a major road. Elevation: on average 5,500 feet amsl (Avila-Villegas and Lamberton-Moreno 2013; Culver 2016; USFWS 2016b).
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 amsl (AGFD 2003d; USFWS 2017b, 2014c).

Table E14-11 Distribution of ESA Protected Species within the Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South Section	Central Section	North Section	Habitat Requirement
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 amsl (AGFD 2003i).
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 one mile from surface water. Adequate ground cover important, canopy cover less so. Elevation: 3,000 – 5,000 feet amsl, but up to 6,500 feet (rangewide up to 8,500 feet) (AGFD 2012b; Emmons and Nowak 2016; USFWS 2017c, 2014d).
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 amsl (AGFD 2015d).

NOTE: **1A** = Tier of SGCN species for which the 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; US**FWS** = US Fish and Wildlife Service.

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

Table E14-12 Total Surface Area Covered by ESA Critical Habitat, 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 DPS)	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

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; **DPS** = Distinct Population Segment; **HDMS** = Arizona Game and Fish Department (AGFD) Heritage Data Management System, **OERT** = AGFD Online Environmental Review Tool; **USFWS** = US Fish and Wildlife Service.

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 2015d, 2011), and based on digital data of Sonoran desert tortoise habitat as designated by the BLM (BLM 2009), and the USFWS (USFWS 2015h).

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

Common Name	Scientific Name	Status (defined in table note)	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 Mexcio and central Arizona. Elevation: below 8,000 feet amsl (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 amsl (AGFD 2006b).
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 amsl (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 amsl (AGFD 2006e).
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 amsl (AGFD 2009b).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl in Arizona. (AGFD 2013g).
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 amsl (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 amsl (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 amsl (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 amsl (AGFD 2010a).
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 amsl (AGFD 2001l).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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)				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 amsl (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 amsl (AGFD 2002k).
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 amsl (Corman and Wise-Gervais 2005).
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 amsl (AGFD 2001d; Corman and Wise-Gervais 2005).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (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 amsl (AGFD 2003n).
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 amsl (AGFD 2002e).
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 amsl (Corman and Wise-Gervais 2005; AGFD 2013d).
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 allaboutbirds.org (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 amsl (Corman and Wise-Gervais 2005).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (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 amsl (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 amsl (AGFD 2013f).
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 amsl (AGFD 2001m).
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 amsl (AGFD 2010c).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (AGFD 2002j).
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 amsl (AGFD 2001k).
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 amsl (AGFD 2002d).
Gila longfin dace	*Agosia chrysogaster 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 amsl (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 amsl (AGFD 2002f).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (AGFD 2002h).
Invertebrates						
Las Guijas talussnail	*Sonorella sitiens 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 amsl (AGFD 2008a).
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 amsl (AGFD 2001g).
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 et al. 2015).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (AGFD 2004c).
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 amsl (AGFD 2001h).
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: approx. 2,300 feet amsl in Tucson Mountains. (*Tusconica* subspecies) (AGFD 2008c).
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 amsl (AGFD 2008d).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (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 amsl (AGFD 2003j).
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 2017b).
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 amsl, however some records from 100 – 1,000 feet amsl occur along the Colorado River. (AGFD 2011a).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (AGFD 2004f).
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 amsl (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 amsl (AGFD 2002c).
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. (The IUCN Red List of Threatened Species 2017.)
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 amsl (AGFD 2011c).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (AGFD 2006c).
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 amsl (AGFD 2003h).
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 amsl (AGFD 2011g).
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 amsl (AGFD 2011e).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (AGFD 2011f).
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 amsl (AGFD 2003m).
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 amsl (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 amsl (Flora of North America Editorial Committee [FNAEC] Volume 26 1993).
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 amsl (Arizona Rare Plant Committee [ARPC] 2001).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (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 amsl (AGFD 2010e).
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 amsl (AGFD 2001c).
Beardless chinchweed	*Pectis imberbis*	USFWS - SC, USFS - S	X			Grassland and oak savannas on eroded granite substrate. Elevation: 3,600 – 6,500 feet amsl (AGFD 2012a).
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 amsl (AGFD 2004a).
Cactus apple	*Opuntia engelmannii* var. *flavispina*	NPL - SR			X	Sandy bajadas, Sonoran Desert. Elevation: 1,640 – 2,625 feet amsl (FNAEC Volume 4 1993).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (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 amsl (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 amsl (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 amsl (AGFD 2006d).
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 amsl (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 amsl (AGFD 2005a).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	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 amsl (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 amsl (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 amsl (AGFD 2001e).
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 amsl (AGFD 2003c).
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 amsl (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 amsl (FNAEC Volume 4 1993).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	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 amsl (AGFD 2003e).
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 amsl (AGFD 2003f).
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 amsl (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 amsl (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 amsl (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 amsl (AGFD 2011d).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	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 amsl (AGFD 2001i).
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 amsl (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 amsl (AGFD 2003k).
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 amsl (Porter 2013).
Sonoita noseburn	*Tragia laciniata*	USFS - S	X			Rocky soils in oak and mixed evergreen woodlands. Elevation: 3,500 – 5,700 feet amsl (AGFD 2004d).
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 amsl (Natureserve 2017b).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
Stag-horn cholla	*Opuntia versicolor*	NPL - SR	X			Sonoran Desert, desertscrub, flats, washes, rocky hillsides, canyons. Elevation: 1,968 – 4,265 feet amsl (FNAEC Volume 4 1993).
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 amsl (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 amsl (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 amsl (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 amsl (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 amsl (AGFD 2004e).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
Wiggins milkweed vine	*Metastelma mexicanum*	USFWS - SC, USFS - S	X			Open slopes on granitic soils within oak woodland. Elevation: 3,500 – 5,600 feet amsl (AGFD 2000d).
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 amsl in Arizona (AGFD 2006g).
Banded rock rattlesnake	*Crotalus lepidus klauberi*	AGFD SGCN - 1A	X			Rocky areas of evergreen woodland, common in rock slides 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 amsl (AGFD 2001b).
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 amsl (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 amsl (AGFD 2009a).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (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 amsl (AGFD 2013b).
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 amsl (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 amsl (AGFD 2003g).
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 amsl (Brennan and Holycross 2006).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (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 amsl (AGFD 2003l).
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 amsl (AGFD 2013e).
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 amsl (AGFD 2007).

Table E14-13 Additional Special Status Species Not Protected by ESA that Potentially Occur in Study Area (Continued)

Common Name	Scientific Name	Status (defined in table note)	South	Central	North	Habitat Requirement
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 amsl (AGFD 2002i).
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 amsl (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 creosotebush-mesquite floodplain environments. Finds shelter under desert shrubs. Elevation: 790 – 1,700 feet amsl (AGFD 2010d).
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 amsl (AGFD 1991).

NOTE: **1A** = Tier of SGCN vulnerable species for which the 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 identifies 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 documents presence, not absence of a species.

SOURCES: **X** = GIS point data from AGFD (2017c); Pima County (2013); and Morris et al. (2015);

I = inferred species presence, 2017 corresponds to readily available information on species habitat preferences and range maps

E14.3.2.4 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 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 2018a).It is important to note that the synthesis of information in the efforts and reports completed 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 2018a).

As part of AGFD's management of wildlife and fisheries, the Arizona SWAP (AGFD 2012c) 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 2012c):

1. The importance of the landscape in maintaining biodiversity – represented by the SGCN.
2. The economic importance of the landscape to the State of Arizona – represented by the SERI.
3. The economic importance of the waterbodies and aquatic systems to the State of Arizona – represented by sport fish.
4. Large areas of relatively intact habitats – represented by unfragmented areas.
5. 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, the 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, or LIBs. This size threshold was set by the AGFD for a patch of habitat to be considered a LIB; 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 2018a).

Figure E14-10 (Large Intact Block Clusters) depicts clusters of adjacent LIBs within the Study Area, for which at least a portion of the blocks falls within the Study Area. 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 LIB clusters were delineated in GIS data provided by the AGFD (AGFD 2018b). The assignment of LIBs 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, page E14-91. The AGFD determined LIB cluster associations by identifying road segments for which annual average daily traffic (AADT) is at least 5,000. Canals smaller than the Central Arizona Project (CAP) canal, also were considered as potential breaks, but the 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 indivudals 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. Both ADOT and AGFD maintain data and information relevant to wildlife movement within the State of Arizona.

Subsequenly, the 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, the AGFD contracted with Paul Beier at Northern Arizona University to model the biologically best 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.

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. The AGFD used similar methods to supplement the identified linkages in other priority areas between 2010 and 2013; the designs in Pima County

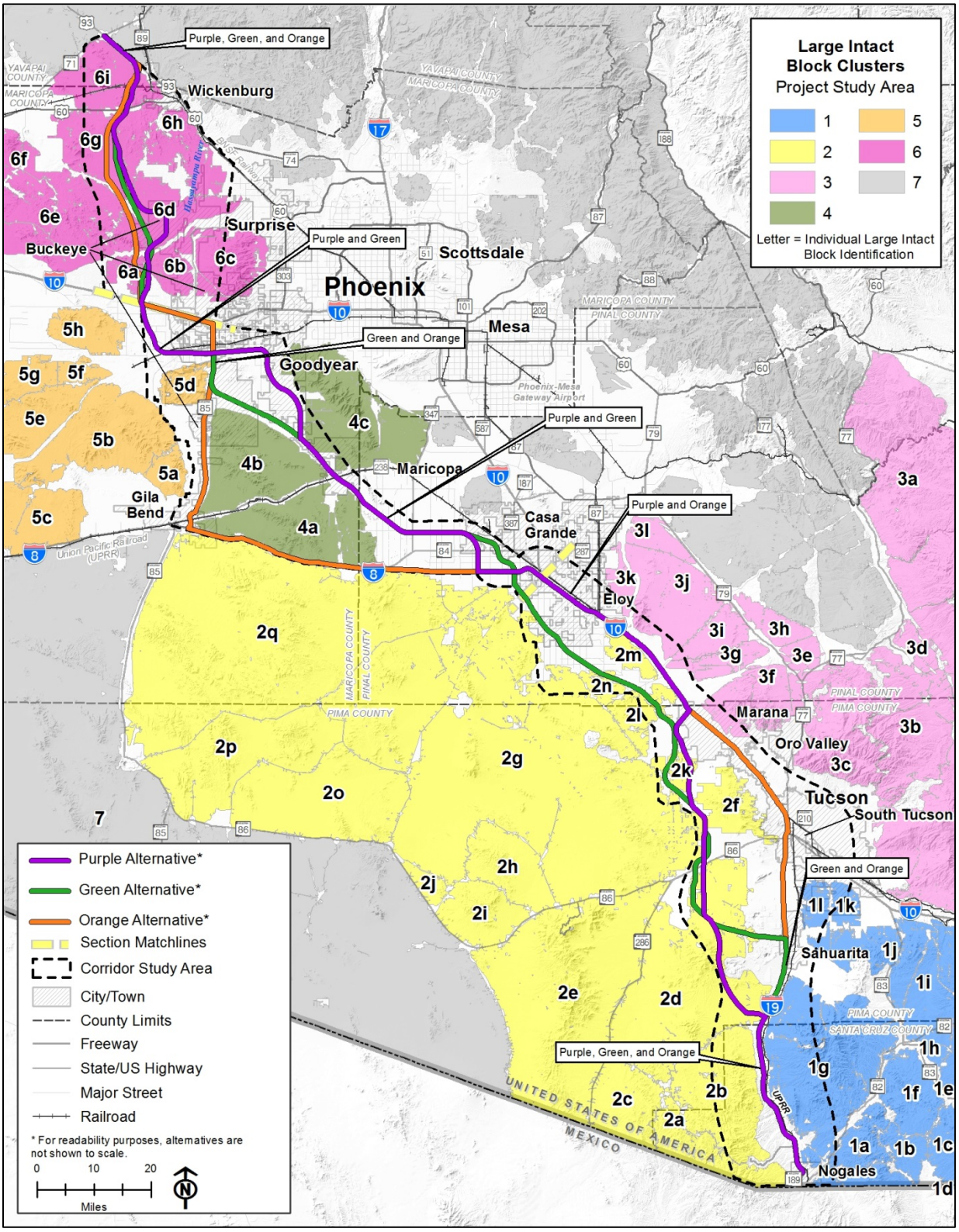


Figure E14-10 Large Intact Block Clusters

NOTE: Each number-letter combination corresponds to an individual LIB, where the number indicates the LIB Cluster it belongs to. LIB Cluster 7 corresponds to the other LIBs that occur beyond the Study Area, and for which no calculations were made.

were performed through funding by the Pima County Regional Transportation Authority. **Figure E14-11** (Detailed and Other Wildlife Linkage Designs - South Section) depicts the detailed linkage designs based on this work for the South Section. **Figure E14-12** (Detailed Linkage Designs - Central Section) and **Figure E14-13** (Detailed Linkage Designs - North Section) 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 in the Arizona Wildlife Linkages and AGFD Detailed Wildlife Connectivity Designs.

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 LIBs 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 et al. 2001). In some cases, wildlife corridors have been identified through GIS models as described above. 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[1] network.

The designated wildlife corridors crossing the Study Area identified through the Arizona Missing Linkages Project (Beier et al. 2008a,b, 2006a,b,c,d) are described by Project section in **Table E14-14** (Summary of Detailed Linkage Designs and Other Wildlife Corridors in the Study Area) and the text that follows. 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 2011h), Pima County (AGFD 2012d,e), Pinal County (AGFD 2013h), 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.

E14.3.3.1 South Section

A total of approximately 597,031 acres of LIBs occur within the South Section, represented by three LIB clusters designated as LIB Clusters 1 through 3. LIB Cluster 1 and LIB 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 LIB Cluster 1 corresponds to the I-10; that of LIB Cluster 2 corresponds to the I-8. LIB Cluster 3 occurs north and east of the City of Tucson. Major barriers between the LIBs 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** [Large Intact Block Clusters]).

[1] A meta-population is a group of populations of the same species that are separated from one another. These spatially separated populations can interact as individual members move from one population to another.

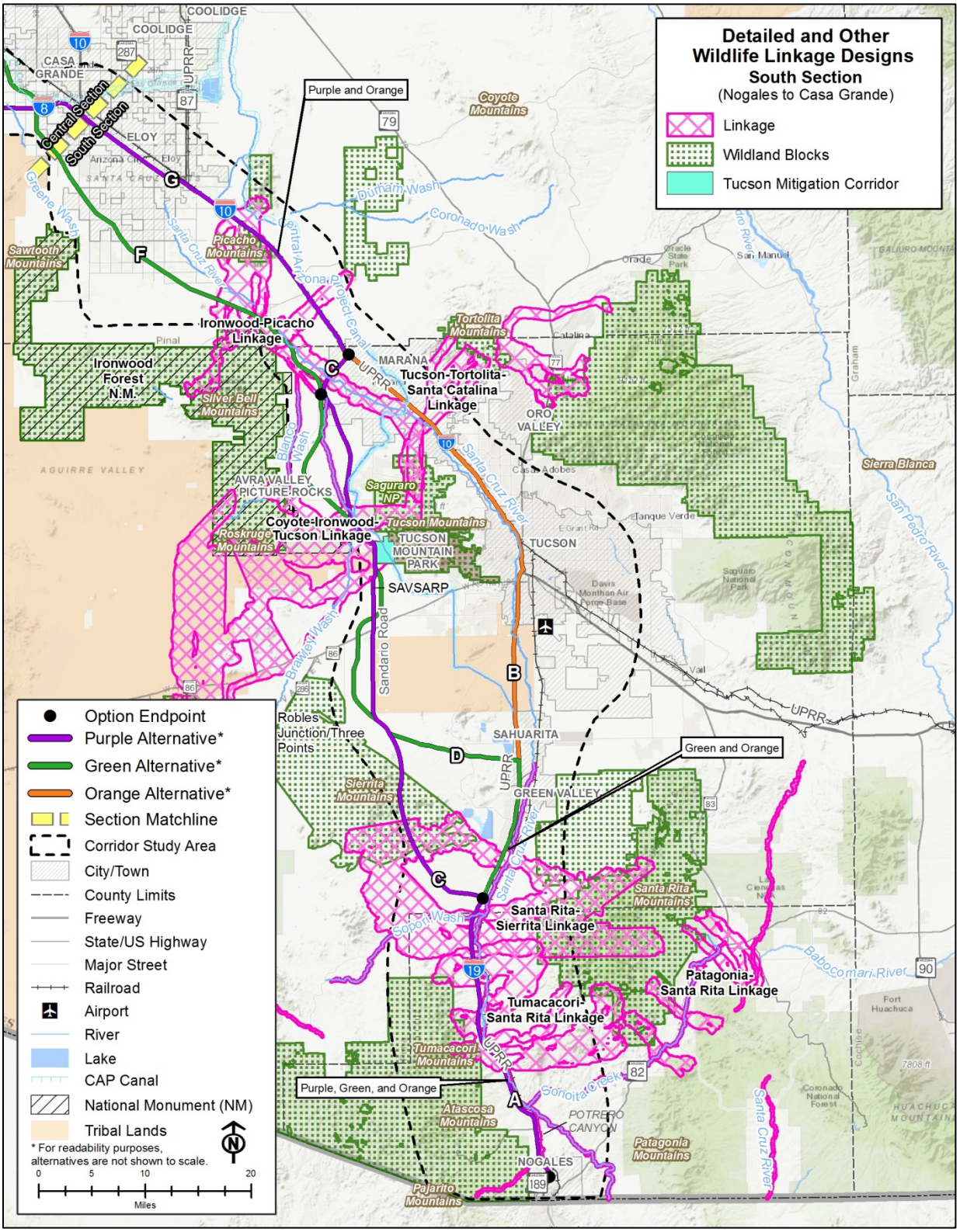


Figure E14-11 Detailed and Other Wildlife Linkage Designs - South Section

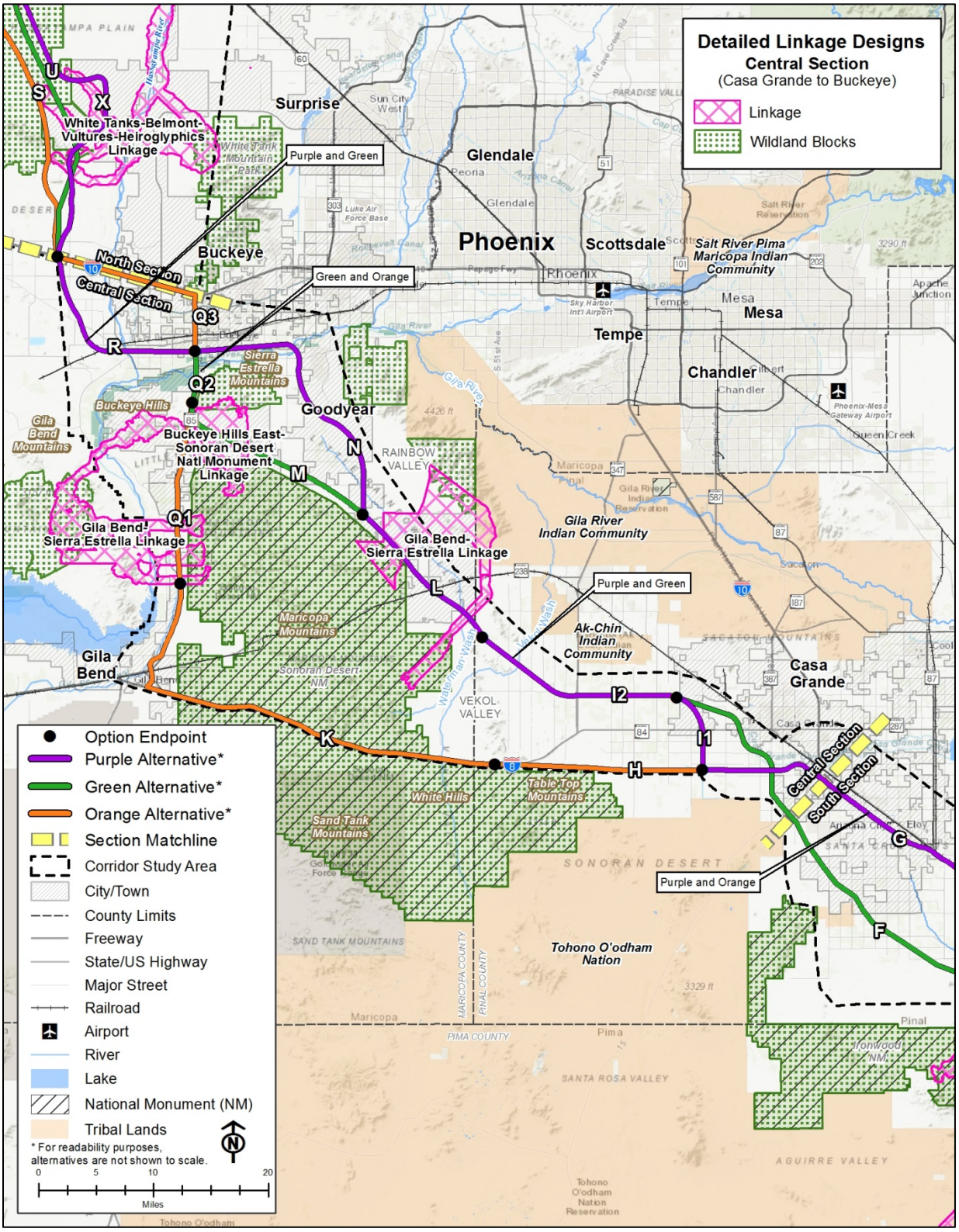


Figure E14-12 Detailed Linkage Designs - Central Section

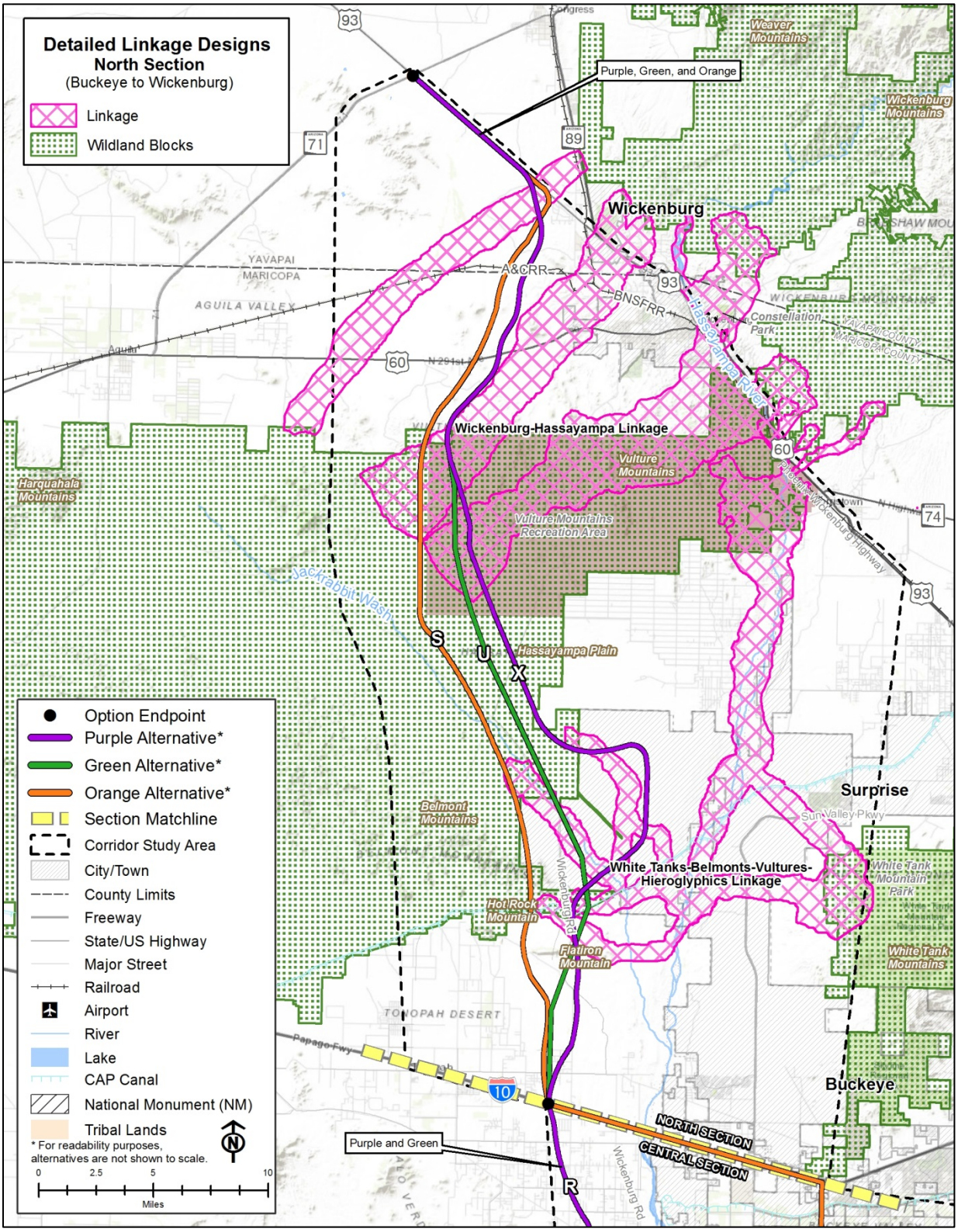


Figure E14-13 Detailed Linkage Designs - North Section

Table E14-14 Summary of Detailed Linkage Designs and Other Wildlife Corridors in the Study Area

Wildlife Movement Corridors	South Section	Central Section	North Section
Wildlife Linkages			
Santa Rita-Tumacacori	X		
Patagonia-Santa Rita	X		
Tucson-Tortolita-Santa Catalina	X		
Ironwood-Picacho	X		
Santa Rita-Sierrita	X		
Coyote-Ironwood-Tucson	X		
Gila Bend-Sierra Estrella		X	
Buckeye Hills East – Sonoran Desert National Monument		X	
Wickenburg-Hassayampa			X
WhiteTanks-Belmont-Hieroglyphic Mountains			X
Other Wildlife Corridors			
Tucson Mitigation Corridor (TMC)	X		

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

The Tucson-Tortolita-Santa Catalina Mountains 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 et al. 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 et al. 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 Mountains linkage.

The Santa Rita-Tumacacori linkage includes a complex of upland and riparian corridors connecting the Santa Rita Mountain Complex and surrounding semidesert grasslands with the Tumacacori-Atascosa-Pajarito Mountain Complex (Beier et al. 2006b). Riparian corridors in the linkage include parts of Sapori Wash, the Santa Cruz River, Sonoita Creek, and Potrero Canyon (Beier et al. 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 et al. 2006b). Traffic by undocumented migrants from Mexico, and border security efforts to control that traffic, also affect animal movement in the linkage (Beier et al. 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 et al. 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 et al. 2008b).

The Ironwood-Picacho linkage connects protected lands managed by the BLM, located at the Ironwood Forest National Monument, the Picacho Mountains, and a block of Sonoran Desert surrounding Durham Wash and Coronado Wash (Beier et al. 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 et al. 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 et al. 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 2012d). 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 2012d).

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 2012e). 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 2012c). 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 2012e).

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 (Reclamation) established the 2,514-acre TMC in 1990 west of Tucson Mountain Park (Reclamation 2016a). The western portion of the TMC occurs within the Coyote-Ironwood-Tucson linkage. The purchase and protection of these lands was a commitment made by Reclamation with USFWS and AGFD as a conservation measure developed for the Tucson Aqueduct EIS (Reclamation 2016a). 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 2016a). This prohibition is intended to preserve habitat from urbanization while maintaining an open wildlife movement corridor (Reclamation 2016a).

In order to maintain a functional wildlife movement corridor, Reclamation installed a series of seven CAP canal siphons, which are concrete pipe sections that travel underneath desert washes (Reclamation 2016a). 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 2016a). 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 2018a). 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 have 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 HCP 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.

E14.3.3.2 Central Section

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

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 et al. 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 et al. 2008a). Major barriers in these corridors include SR 85, irrigation canals, and agricultural and urban development (Beier et al. 2008a).

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 2018a). The linkage is relatively free of physical impairments but primarily includes unimproved roads, dispersed off-road vehicle recreation, and utility lines (AGFD 2018a).

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.

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

E14.3.3.3 North Section

A total of approximately 403,140 acres of LIBs occur within the North Section, represented by one LIB cluster designated as LIB Cluster 6, which occurs west of Phoenix and north of I-10. To the north, LIB Cluster 6 is bound by US 60, US 93, and SR 71 at the northern end of the project corridor (**Figure E14-10** [Large Intact Block Clusters]). The CAP canal, which occurs within LIB 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 et al. 2006c). Major potential barriers within the wildlife corridors include US Route 60, the Phoenix-Wickenburg Highway, US Route 93, the Burlington Northern Santa Fe Railroad, the proposed Wickenburg bypass, and expanding urban development in and near Wickenburg (Beier et al. 2006c).

The White Tanks-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 Hassayampa River (AGFD 2018a). 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 2018a). The primary barriers or impairments within the corridor arms include Sun Valley Parkway, North Wickenburg Road/135th Ave, US 60, rural roadways, the CAP canal, livestock fencing along the CAP canal, rural housing units, and the potential for future urban development (AGFD 2018a).

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.

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 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 (Bureau of Reclamation 2018).

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 which make up each Build Corridor Alternative (see **Chapter 2** 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**, 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 below.

E14.4.1 Biotic Communities (Vegetation and Wildlife)

E14.4.1.1 Build Corridor Alternatives

E14.4.1.1.1 Biotic Communities

Table E14-14 (Summary of Detailed Linkage Designs and Other Wildlife Corridors in the Study Area) summarizes the number of acres of each biotic community within each of the Corridor Options. **Table E14-15** (Acres for Biotic Communities within Corridor Options) and **Table E14-16** (Acres of Biotic Communities within the Build Corridor Alternatives and Percent of Total Biotic Community Area within the Study Area) summarize the acres of potential impact within the three Build Corridor Alternatives and the No Build Alternative.

Calculated using 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 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 corridor, the acreage within the Orange Alternative is 2 percent less than the Green Alternative and 3 percent less than the Purple Alternative. It should be noted that because the Orange Alternative would be co-located along existing transportation routes the overall footprint of that alternative would be substantially reduced as 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 Route 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 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*	6,142 (6,187)	2,154 (2,281)	5,840 (5,907)	0	14,136 (14,375)
D*	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

* 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 Desertscrub	Lower Colorado River Desertscrub	Mohave Desertscrub
Purple Alternative (Options A, C*, **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*, 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.

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

E14.4.1.1.2 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 IBAs coincide with riparian areas.

Table E14-17 (Acres of Riparian and IBA Habitats within the Corridor Options) summarizes the number of acres of riparian and IBA habitats within each of the 2,000-foot-wide corridor. **Table E14-18** (Acres of Riparian and IBA Habitats within the Build Corridor Alternatives and Percent of Total Riparian and IBA Habitat Area within the Study Area) summarizes the total number of acres of riparian areas and IBAs 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 IBA Habitats 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*	4 (4)	0 (0)	145 (125)	0 (0)	0 (0)	0 (0)	149 (129)	459 (459)
D*	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

* Acreage for the CAP Design Option is in parentheses under the acreage for the regular option.

Table E14-18 Acres of Riparian and IBA Habitats within the Build Corridor Alternatives and Percent of Total Riparian and IBA 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*, 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*, 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%)
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%

* 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 towards 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. There are two potential crossings of the Gila River, one along the existing SR 85 alignment (Option Q2) and a new crossing further to the east in Goodyear (Option N). The Gila River IBA essentially corresponds to the main concentrations of riparian areas along the Gila River. However, unlike the IBA, 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. There also is a difference between the two Options 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 a total of 3 acres.

Important Bird Areas

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

In the Central Section, both the Green and Purple Alternatives (Options C and D) cross the far eastern portion of the Tucson Sky Island IBA, along Sandario Road, for approximately 2 miles. The Green and Orange Alternatives would cross the Gila River IBA at the current location of the SR 85 crossing, thus minimizing additional impacts to this IBA. 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 IBA in several locations. The Purple Alternative encompasses almost 800 more acres of IBA habitat than the Orange or Green Alternatives, in addition to introducing a new crossing of the Gila River and the IBA.

E14.4.1.1.3 Species of Economic and Recreational Importance

Direct impacts to SERI and their habitat would be similar to 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, itwould have the least potential direct impact on habitat loss for SERI. 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 SERI, due to its co-ocation 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 of the Draft Tier 1 EIS discusses and evaluates the impacts of the project on recreation.

E14.4.1.1.4 Wildlife/Motor Vehicle Collisions

Collisions between wildlife and motor vehicles are a nationwide problem. Data on the number of collisions is 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 total 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 due to the fact that the Purple Alternative follows existing roads to a greater extent.

E14.4.1.1.5 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 ROW 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.

E14.4.1.2 No Build Alternative

The No Build Alternative, as described in **Chapter 2** 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 Route 93 in Wickenburg).

E14.4.1.2.1 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 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.

Important Bird Areas

The No Build Alternative would have no impact on IBAs.

E14.4.1.2.2 Species of Economic and Recreational Importance

The No Build Alternative would have no measurable increased impact on SERI.

E14.4.1.2.3 Wildlife/Motor Vehicle Collisions

The No Build Alternative would not result in any substantive change in wildlife/motor vehicle collisions. It should be noted that the number of collisions can vary from year-to-year, which is influenced by population levels, availability of food, weather conditions, and other factors.

E14.4.1.2.4 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

E14.4.2.1 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 if suitable habitat exists within the Study Area. The potential occurrences of ESA-listed species within each Corridor Option are presented in **Table E14-19** (Potential Occurrences of ESA Protected Species per Corridor Option) and **Table E14-20** (Total Surface Area Covered by Critical or other Protected Habitat within the 2,000-foot-wide Corridor). Critical habitat for several species is denoted within **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 presence of the facility.

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	C*	D*	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 DPS) with proposed critical habitat	*Coccyzus americanus*	USFWS - LT, USFS - S, AGFD SGCN 1A, Pima	X	X			X								X		X	X	X					
Yuma Ridgeway'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		

NOTES: **1A** = Tier of SGCN species for which the 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.

* Species records are the same for the regular option (designated by an asterisk) and the regular option

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

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

Section	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 DPS)	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	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*				28.43	14,107.14	14,107.14				637.68
					(28.43)	(14,346.14)	(14,346.14)				(638.82)
	D*				2,498.76	13,061.34	13,061.34				928.30
					(2,498.76)	(13,221.34)	(13,221.34)				(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	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	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

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

* Acreage for the CAP Design Option is in parentheses under the acreage for the regular option.

SOURCES: Surface area values based on digital data of Sonoran desert tortoise habitat as designated by the BLM (BLM 2009) and USFWS (USFWS 2015h), 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 2015d, 2011).

E14.4.2.1.1 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 Ridgeway'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.

Because all of the 2,000-foot-wide corridor in the South Section is located along 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 the I-19 does require 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 Orange and Green Alternatives would result in fewer potential impacts to ESA species and habitat quality.

Impacts to Chiricahua leopard frogs should 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 Ridgeway'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** (General Mitigation Strategies Applicable to all Corridor Options) and **Table E14-25** (Specific Mitigation Strategies for each Corridor Option).

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

E14.4.2.1.2 Endangered Species Act Species: Sonoran Desert and Mountainous Area Species

The biotic communities that fall under this habitat association consist of Lower Colorado River Desertscrub, Arizona Upland Desertscrub, Semidesert Grassland, Mohave Desertscrub, and Madrean Evergreen Woodland. As shown in **Table E14-19** (Potential Occurrences of ESA Protected Species per Corridor Option) and **Figure E14-1** (Biotic Communities – South Section), **Figure E14-5** (Biotic Communities – Central Section), and **Figure E14-6** (Biotic Communities – North Section); 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 is avoided by all three Build Corridor Alternatives, while Option S in the North Section of the Study Area goes through the eastern portion of the Belmont Mountains. Specific project mitigation measures to minimize habitat fragmentation effects to the species would be developed during pre-Tier 2 analyses and would 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 than5 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 CCA species such as the Sonoran desert tortoise, due to competition and altered fire regimes.

Although all three Build Corridor Alternatives dissect Pima pineapple cactus habitat, the Orange Alternative is likely to have less impacts to this species as it is co-located with the I-19 through Pima pineapple cactus habitat. The 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, dissect 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 can 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 need to occur during Tier 2 analysis and will include studies to locate the new roadway facility to further reduce impacts to this species (see **Table E14-24** [General Mitigation Strategies Applicable to all Corridor Options] and **Table E14-25** [Specific Mitigation Strategies for each Corridor Option] 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.

E14.4.2.1.3 Habitat Conservation Plans

Several HCPs cover areas within the Study Area. HCPs are formal agreements between a local jurisdiction (e.g., Pima County or City of Tucson) which provide specific conservation measures for the protection of one or more ESA-listed species, but also allow for specific types of development with the area covered by the Conservation Plan. One or more plans being developed by the City of Tucson as well as Pima County's Multi-species Conservation Plan could be affected by any or all of the Build Corridor Alternatives; however, the Purple and Green Alternatives which dissect Avra Valley are likely to have the greatest impacts to parcels which have been set aside as conservation areas under the Avra Valley portion of the City of Tucson HCP. The extent of any impact on HCPs would be determined during Tier 2.

E14.4.2.1.4 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 within **Table E14-19** (Potential Occurrences of ESA Protected Species per Corridor Option) and **Table E14-20** (Total Surface Area Covered by Critical or other Protected Habitat within the 2,000-foot-wide Corridor), none of the Build Corridor Alternatives will 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, respecitively. 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 avoid those types of habitats. Depending of 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. See the Wildlife Connectivity section 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 will cross the Gila River utilizing bridges in similar locations, as depicted in **Figure E14-5** (Biotic Communities – Central Section). The Gila River contains proposed critical habitat for yellow-billed cuckoo, and habitat for southwestern willow flycatcher and Yuma Ridgeway's rail. Some floodplain tree habitat will 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 seven 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 at the proposed crossing is an important source of water that helps to sustain the marshes and Yuma Ridgeway's rail habitat at that location. Irrigation runoff also may supply marsh habitat downstream of the crossing. 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 (**Tables E14-19** [Potential Occurrences of ESA Protected Species per Corridor Option] and **E14-20** [Total Surface Area Covered by Critical or other Protected Habitat within the 2,000-foot-wide Corridor]). 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, Wildlife Connectivity, for more impact discussions that relate to mobility of both general wildlife and special status species.

The Sonoran desert tortoise, which has a USFWS CCA under ESA and is a BLM sensitive species, has BLM designated Category I and II habitats within the Study Area. In addition, the USFWS provided GIS data depicting the modelled locations and extent of USFWS-defined predicted High Value Potential Habitat based on specific spatial critera. The 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 Occurrences of ESA Protected Species per Corridor Option). 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 either 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 CCA 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. As such, prior to project design and Tier 2 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** [Specific Mitigation Strategies for each Corridor Option] for detailed tortoise mitigation strategies).

E14.4.2.1.5 Other Sensitive Species

As stated, Other Sensitive Species include non-ESA listed species deemed sensitive by the BLM, USFS, USFWS, or counties; species protected under the Bald and Golden Eagle Protection Act, AGFD SGCN; and plant species protected under the Arizona Native Plant Law. **Table E14-20** (Total Surface Area Covered by Critical or other Protected Habitat within the

2,000-foot-wide Corridor) lists sensitive species recorded in each I-11 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 discussed above (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** (Distribution of Other Sensitive Species within the 2,000-foot-wide Corridor), 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 **Tables E14-14** [Summary of Detailed Linkage Designs and Other Wildlife Corridors in the Study Area], **E14-15** [Acres for Biotic Communities within Corridor Options], **E14-16** [Acres of Biotic Communities within the Build Corridor Alternatives and Percent of Total Biotic Community Area within the Study Area], and **E14-17** [Acres of Riparian and IBA Habitats within the Corridor Options]). 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.

E14.4.2.1.6 Migratory Bird Treaty Act

Both the Green and Purple Alternatives increase accessibility into adjacent lands in Pima, Pinal, and Maricopa counties and may increase accessibility to wildlife refuges and IBAs 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 should 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 reducing bird mortality associated with highway operation. Minimizing highway lighting also can reduce potential impacts to nocturnal birds that prey on insects attracted to lights.

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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*	D*	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	I	I			I				I				X		I	I	I				
Bald eagle–Sonoran populations															X				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				
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																	

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

Common Name	Scientific Name	Status (defined in table note)	Corridor Options [1]																				
			South Section						Central Section												North Section		
			A	B	C*	D*	F	G	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R	S	U	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
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										
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										

Table E14-21 Distribution of Other Sensitive Species within the 2,000-foot Corridor (Continued)

Common Name	Scientific Name	Status (defined in table note)	Corridor Options [1]																				
			South Section						Central Section												North Section		
			A	B	C*	D*	F	G	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R	S	U	X
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									

NOTES: **1A** = Tier of SGCN species for which the 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.

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

SOURCES: **X** = GIS point data, AGFD (2017c); Pima County (2013).

I = Inferred species presence. Corresponds to readily available information on species habitat preferences and range maps.

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E14.4.2.2 No Build Alternative

The No Build Alternative, as described in **Chapter 2**, 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 Route 93 in Wickenburg).

E14.4.2.2.1 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 National Environmental Policy Act (NEPA) analysis for those projects.

E14.4.2.2.2 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 NEPA analysis and will require species-specific ESA Section 7 Consultation.

E14.4.2.2.3 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 NEPA analysis and will require species-specific mitigation measures to be developed and implemented during construction.

E14.4.2.2.4 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 NEPA analysis and will require species-specific mitigation measures to be developed and implemented during construction.

E14.4.2.2.5 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 the 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 increase accessibility into adjacent lands in Pima, Pinal, and Maricopa counties and may increase accessibility to wildlife refuges and IBAs. 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** [Potential Occurrences of ESA Protected Species per Corridor Option] and **Table E14-20** [Total Surface Area Covered by Critical or other Protected Habitat within the 2,000-foot-wide Corridor]). Option C crosses 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 Ridgeway's rail, and southwestern willow flycatcher (**Table E14-19** [Potential Occurrences of ESA Protected Species per Corridor Option] and **Table E14-20** [Total Surface Area Covered by Critical or other Protected Habitat within the 2,000-foot-wide Corridor]). 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

E14.4.3.1 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 E14-64, large undeveloped tracts of land are important habitat for wildlife movement and connectivity. **Figure E14-10** (Large Intact Block Clusters) shows large areas of relatively intact and undeveloped habitat within the Study Area. Corridor Options representing a new alignment would directly fragment LIBs by introducing a new linear facility where a roadway does not currently exist. LIB 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 will occur within LIB 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 (LIB Fragmentation by Build Corridor Alternative) shows which LIBs are fragmented by the alternatives, and the number and size of the LIB 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 in terms of wildlife connectivity (AGFD 2018a).**Table E14-23** (Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative) indicates, for each Build Corridor Alternative, the total surface area represented by LIB fragments that no longer fulfill the required 5,000 hectare threshold following construction of the alternatives. LIBs affected by the Build Corridor Alternatives that become smaller in surface area as a result of the

Table E14-22 LIB Fragmentation by Build Corridor Alternative

			Area of Resulting LIB Fragments (Hectares)		
Large Intact Block Cluster	**LIBs Fragmented by Alternatives**	**Total Area (Hectares)**	**Purple Alternative**	**Green Alternative**	**Orange Alternative**
2*	2D	858,548	638,301 220,247	714,434 139,270 4,807 33 4	
	2F	21,159	21,073 86 (20,599) (560)	21,073 86 (20,599) (560)	
	2G	451,786		451,537 219 30	
	2K	5,415	**4,656** **728** **27** **3** **<1** **<1**	5,104 243 65 3	
	2L	15,699		12,373 3,237 49 23 14 3	
	2N	6,563		6,093 470	
4	4C	74,030	73,900 92 23 15	73,923 92 15	
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	42,849	29,005 13,821 17 6 <1	27,334 15,515	21,709 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

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

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

Table E14-23 Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative

		Total Surface Area of Fragments Lost from Existing LIBsby Alternative (Hectares)		
Large Intact Block Clusters	LIBs Fragmented by Alternatives	Purple Alternative	Green Alternative	Orange Alternative
2*	2D, 2F, 2G, 2K, 2L, 2N,	5,500 (5,974)	9,286 (9,760)	
4	4C	130	107	
6	6A, 6B, 6D, 6E, 6G, 6I	4,897	6,254	4,241
	Total:	**10,527 (11,001)**	**15,647 (16,121)**	**4,241**

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

direct fragmentation of currently undeveloped land comprise LIBs within LIB Clusters 2, 4, and 6. LIBs that would experience the isolating effects of adjacent new roadways include LIB 4a and LIB 4b which would experience increased isolation from LIB 4c as a result of the Purple and Green alternatives. While LIBs beyond the I-11 corridor (LIB Cluster 7) and LIBs within the corridor but beyond the footprint of the alternatives (LIB Clusters 1, 3, and 5) will 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.

Based on parameters such as traffic volume, footprint, truck use, and speed limit, and according to wildlife movement data collected by the AGFD, already-existing roadways such as I-10, I-8, and I-19, represent near-total barriers to wildlife (AGFD 2018a). Therefore, when co-located with existing roadways where widening will be required, the I-11 corridor provide 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 et al. 2009). Wider roads and higher traffic volumes increase the barrier effect and decrease connectivity within the landscape (van Langevelde et al. 2009). Highways are a barrier for mammals, reptiles, amphibians, and many ground-dwelling insects (van Langevelde et al. 2009). Deer, elk, and other large ungulates may pass through ROW fence to enter the ROW, but then often struggle to get back out due to traffic volume and limited space within the ROW. 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.

E14.4.3.1.1 South Section

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

Options C (Purple Alternative) and D (Green Alternative) fragment the northeastern corner of LIB Cluster 2, impacting LIBs such as LIB 2d and LIB 2k (**Figure E14-10** [Large Intact Block Clusters]). Within the South Section, the Orange Alternative generally avoids direct impacts to LIBs 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 LIBs. Impacts associated with the Purple and Green alternatives also occur along the eastern portion of LIB Cluster 2 and are located where there is increasing urban growth with large tracts of protected parkland.

The Tucson-Tortolita-Santa Catalina Mountains 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 ROW 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 et al. (2006d), 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-Tumacacori linkage could be impacted by implementing Options A, B, C, and D. Option A, being co-located on I-19, would not add additional ROW, 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 travelling along this part of the Santa Cruz River. Additional travel lanes in Options C and D that are within the existing ROW 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. There would be no impact to wildlife movement 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 ROW 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-19 is co-located along Options A, B, and part of D. Increased traffic volume along I-19 could lead to decreased successful crossings of I-19 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 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 ROW 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 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. 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.

E14.4.3.1.2 Central Section

Within the Central Section, the Orange Alternative follows I-8, which separates LIB Cluster 2 from LIB Cluster 4 (**Figure E14-10** [Large Intact Block Clusters]). Near the Town of Gila Bend, the Orange Alternative turns north and is co-located along SR 85, which separates LIB Cluster 4 from LIB Cluster 5. The Purple and Green alternatives directly impact LIB Cluster 4 by isolating LIB 4a and LIB 4b from LIB 4c, which corresponds to the Sierra Estrella Mountains. In contrast, the Orange Alternative does not fragment LIB 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 ROW. 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, whichcould increase dispersed recreation (Beier et al. 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 are co-located with I-8; Vekol Wash crosses Option I2.

E14.4.3.1.3 North Section

In the North Section, all three Build Corridor Alternatives cross LIB Cluster 6. The CAP canal occurs within LIB Cluster 6 and was designed with wildlife crossings connecting the southernmost LIBs in this cluster to those to the north. As depicted on **Figure E14-10** (Large Intact Block Clusters), **Table E14-22** (LIB Fragmentation by Build Corridor Alternative), and **Table 14-23** (Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative), the direct impacts related to fragmentation are similar for all alignments crossing these LIB clusters.

The Wickenburg-Hassayampa linkage and the WhiteTanks-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 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 passes through more preserved lands than Option S and X. Option X has a more circuitous route that passes through more of the arms within the WhiteTanks-Belmont-Hieroglyphic Mountains linkage.

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 passes over a wildlife crossing, the traffic volume on a new nearby highway could decrease the number of successful crossings at these structures.

E14.4.3.1.4 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 the 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.

E14.4.3.1.5 Purple Alternative

The Purple Alternative would intersect and therefore directly impact three of the six LIB clusters present within the Study Area: LIB clusters 2, 4, and 6 (**Table E14-22** [LIB Fragmentation by Build Corridor Alternative] and **Table 14-23** [Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative]). A total of 9 LIBs would be fragmented by the Purple Alternative. Of these LIBs, LIB 2k would be reduced to six fragments, none of which fulfill the AGFD 5,000 hectare requirement (**Table E14-22** [LIB Fragmentation by Build Corridor Alternative]). Thus, LIB 2k would no longer qualify as a LIB. All other LIBs that are fragmented by the three Build Corridor Alternatives produce at least one fragment that fulfills the 5,000 hectare threshold, indicating that following fragmentation, all LIBs other than LIB 2k would still qualify as LIBs based on the surface area requirement. In terms of connectivity, under the Purple Alternative, the loss of functional land represented by the loss of LIB 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** [Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative]).

The Purple Alternative would create new highway infrastructure that would create impediments to wildlife movement that currently do not exist within 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, and the WhiteTanks-Belmont-Hieroglyphic Mountains linkage. The Purple Alternative would contribute to the isolation of LIBs where it is co-located with existing high-traffic highways (>5,000 AADT), and where widening would be needed. However, in these roadway segments, there is potential to improve wildlife connectivity 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; the Santa Rita-Tumacacori linkage; and the Coyote-Ironwood-Tucson Detailed Linkage.

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., LIB 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 is 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 would be identified during the Tier 2 environmental process.

E14.4.3.1.6 Green Alternative

The Green Alternative would intersect and therefore directly impact four of the six LIB clusters present within the Study Area: LIB Clusters 2, 4, 5, and 6 (**Table E14-22** [LIB Fragmentation by Build Corridor Alternative] and **Table 14-23** [Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative]). A total of 12 LIBs would be fragmented by the Green Alternative, compared to 4 LIBs and 9 LIBs for the Orange and Purple Alternatives, respectively. Of these LIBs, none would be completely reduced to fragments below the AGFD 5,000 hectare requirement (**Table E14-22** [LIB Fragmentation by Build Corridor Alternative]). In terms of connectivity, under the Green Alternative, the loss of functional land represented by the loss of LIB 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** [Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative]). 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 LIBs.

The Green Alternative would create new highway infrastructure that would affect habitat quality (e.g., LIB integrity) and create impediments to wildlife movement that currently do not exist within the Ironwood-Picacho linkage; the Santa Rita-Sierrita Detailed Linkage; the Santa Rita-Tumacacori 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 and the WhiteTanks-Belmont- Hieroglyphic Mountains linkage. The Green Alternative would contribute to the isolation of LIBs where it is co-located with existing high-traffic highways (>5,000 AADT), and where widening would be needed. However, in these roadway segments, there is potential to improve wildlife connectivity 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 are 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 in comparison to either the Purple or Orange Alternatives. For instance, in the North Section, while the Green Alternative is shorter and less convoluted compared to the other alternatives, it impacts the Wickenburg-Hassayampa and the White Tanks-Belmont-Hieroglyphic Mountains wildlife linkages to a greater extent. In contrast, the Orange Alternative traverses 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, creates more new barriers to wildlife movement, the Orange Alternative creates the least new barriers and provides a limited opportunity to reduce the barrier effect of existing roadways.

The Green Alternative would cause the most deleterious impacts to biotic communities, IBAs, invasive species, SERI, and special status species compared to the other alternatives, as a

result of its greater 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.

E14.4.3.1.7 Orange Alternative

The Orange Alternative would intersect and therefore directly impact four of the six LIB clusters present within the Study Area: LIB Clusters 2, 4, 5, and 6 (**Table E14-22** [LIB Fragmentation by Build Corridor Alternative] and **Table 14-23** [Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative]). A total of four LIBs would be fragmented by the Orange Alternative. Of these LIBs, none would be completely reduced to fragments below the AGFD 5,000 hectare requirement (**Table E14-22** [LIB Fragmentation by Build Corridor Alternative]). In terms of connectivity, under the Orange Alternative, the loss of functional land represented by the loss of LIB 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** [Total Surface Area of Fragments Lost from Existing LIBs by Build Corridor Alternative]). 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 LIBs.

The Orange Alternative would create new highway infrastructure that would affect habitat quality (e.g., LIB integrity) and create impediments to wildlife movement that currently do not exist within the Wickenburg-Hassayampa linkage and the WhiteTanks-Belmont-Hieroglyphic Mountains linkage. The Orange Alternative would contribute to the isolation of LIBs where it is co-located with existing high-traffic highways (>5,000 AADT), and where widening would be needed. However, in these roadway segments, there is potential to improve wildlife connectivity 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 relies 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-Tumacacori linkage; the Tucson-Tortolita-Santa Catalina linkage; the Coyote-Ironwood-Tucson Detailed Linkage; and the Gila Bend-Sierra Estrella linkage.

Overall the Corridor Options are co-located along existing major highways to a greater extent in the Orange Build Corridor Alternative than within the Purple or Green Alternatives. As a result, the Orange Alternative is the alternative that creates the fewest impediments to wildlife movement as a result of new roadway infrastructure. For instance, while the Purple Alternative and the Green Alternative impact the Coyote-Ironwood-Tucson 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 has 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 might be initially more effective because wildlife may have already acclimated to structures where they can cross the highway.

E14.4.3.2 No Build Alternative

The No Build Alternative, as described in **Chapter 2**, 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 Route 93 in Wickenburg). Therefore, the No Build Alternative is anticipated to have the least effect on wildlife connectivity and the modeled linkages and natural corridors in the region.

E14.5 POTENTIAL MITIGATION STRATEGIES

This Tier 1 analysis provides an overview of potential impacts from the construction and operation of a new I-11 transportation facility within one of the Build Corridor Alternatives. Specific project design, construction methods, and facility alignment within a 2,000-foot Build Corridor Alternative have not been determined; therefore, specific methods to avoid, minimize, or mitigate project-related impacts cannot be developed. However, **Table E14-24** (General Mitigation Strategies Applicable to all Corridor Options) outlines the general mitigation strategies by type of resource which would be implemented for all the Corridor Options. **Table E14-25** (Specific Mitigation Strategies for each Corridor Option) identifies more specific mitigation strategies for each Corridor Option in addition to the general strategies. These strategies would be refined during the Tier 2 process.

Table E14-24 General Mitigation Strategies Applicable to all Corridor Options

General Mitigation Strategies Applicable to all Options	
Noxious and Invasive Species	ADOT will participate, support and commit to long-term noxious weed management efforts in the I-11 corridor. To effectively combat noxious and invasive weeds, a coordinated effort across federal, state and local levels is required. Noxious and invasive weed control on BLM or USFS lands would occur in accordance with previously approved Environmental Assessments. Long-term management of noxious and invasive weeds would be necessary to minimize indirect and cumulative effects to the Pima pineapple cactus and its habitat.
	To avoid the introduction of noxious and invasive species seeds, and to avoid noxious and invasive species seeds from entering/leaving the sites, all construction equipment shall be washed and free of all attached plant/vegetation and soil/mud debris prior to entering/leaving the construction sites.
	All disturbed soils not paved that will not be landscaped or otherwise permanently stabilized by construction will be seeded using species native to the project vicinity.
Native Plants	Protected native plants within the project limits will be impacted by this project; therefore, it will be determined if Arizona Department of Agriculture notification is needed for compensation purposes. If notification is needed, ADOT will send the notification prior to the start of construction.

Table E14-24 General Mitigation Strategies Applicable to all Corridor Options (Continued)

General Mitigation Strategies Applicable to all Options	
Wildlife Connectivity	ADOT will coordinate with AGFD, BLM, and other stakeholders to determine wildlife connectivity data needs and study design. ADOT will then fund and facilitate implementation of identified studies prior to the initiation of the Tier 2 process, due to the timeline required (likely 2-4 years) to collect and analyze sufficient data before draft design plans begin to limit the mitigations possible. ADOT and the stakeholders will identify crossing structures, design features, and supporting mitigation or conservation necessary to facilitate the movement of wildlife through the roadway barrier, and will incorporate the solutions into subsequent I-11 projects.
	Partnering opportunities with key land owners (e.g., BLM, Reclamation, Maricopa County, Pinal County, and Pima County) and appropriate municipal, county, state, and federal agencies would be established prior to and during the Tier 2 process by ADOT for long-term planning strategies.
	Prior to the Tier 2 analysis, ADOT will evaluate the Pima, Pinal, Maricopa and Yavapai county Wildlife Connectivity Assessment reports to identify and, if possible, avoid project impacts on the Diffuse, Landscape, and Riparian wildlife movement areas identified in each report.
	Structures designed to enhance wildlife connectivity, such as wildlife overpasses and underpasses, and fencing to funnel wildlife to these structures, would be evaluated by ADOT in association with AGFD, designed and constructed taking species-specific needs into consideration.
ESA-listed Species	ADOT will avoid or minimize impacts to designated or proposed critical habitat. If impacts to critical habitat cannot be avoided, consultation with the USFWS will occur during the Tier 2 analysis.
	Prior to the Tier 2 process, ADOT will conduct a thorough habitat assessment in all areas which have potential habitat for ESA-listed species. If suitable habitat occurs within the construction footprint, ADOT will avoid or minimize impacts. Additionally, pre-construction surveys will be completed for all ESA-listed species or it will be assumed that the species occurs on-site. For the southwestern willow flycatcher, yellow-billed cuckoo and Yuma Ridgeway's rail, two breeding seasons of surveys will be conducted prior to the Tier 2 process. During the Tier 2 process ADOT will conduct consultation with the USFWS.
	Potential mitigation measures to avoid or minimize impacts to ESA-listed species will be determined though consultation with the USFWS during the Tier 2 process, but could include breeding season restrictions, translocation of individuals, minimizing vegetation removal, minimizing the project footprint, etc.
	During the Tier 2 process, if impacts to ESA-listed species or habitat are determined likely to occur, compensatory mitigation will be negotiated with the USFWS.
Sonoran Desert Tortoise	ADOT will continue to honor its commitments within the Candidate Conservation Agreement for the Sonoran Desert Tortoise in Arizona (USFWS 2015e).
	Prior to the Tier 2 process, ADOT will conduct habitat suitability surveys within agency-mapped tortoise habitat that may be impacted I-11.
	ADOT will partner with state and federal agencies during the Tier 2 and design process and use data obtained from habitat suitability studies to inform design features to minimize impacts to the Sonoran desert tortoise and its habitat.
	Any future 1-11 segments selected for construction that are located within Sonoran desert tortoise habitat, will follow ADOT's existing mitigation strategies. ADOT has developed comprehensive Sonoran desert tortoise mitigation which includes, but is not limited to, education of contractors and ADOT staff on tortoise awareness, pre-construction surveys, relocation of tortoises, on-site monitoring of construction activities, and best management practices designed to reduce potential tortoise mortalities during construction.

Table E14-25 Specific Mitigation Strategies for each Corridor Option

Option	Resources*	Mitigation Strategy
A	Southwestern willow flycatcher, yellow-billed cuckoo and their critical habitat; Gila topminnow; and Northern Mexican garter snake	Avoid widening I-19 to the east along the Santa Cruz River and impacting habitat; conduct pre-construction surveys where appropriate; and consult with the USFWS, as needed.
	Jaguar, and its critical habitat; ocelot	Minimize the construction footprint to the extent possible and improve or construct wildlife crossings which jaguar and ocelots will use.
	Pima pineapple cactus	Minimize construction footprint through quality Pima pineapple cactus habitat, survey suitable habitat one year prior to the Tier 2 process to inform design, implement long-term control of noxious weeds; and negotiate compensatory mitigation with USFWS, as needed.
	Santa Cruz River	Avoid or minimize impacts to this major riparian corridor. The need for potential additional wildlife crossings would be assessed and implemented where warranted to preserve wildlife movement. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
	Tumacacori-Santa Rita linkage	Avoid or minimize impacts to linkages. Assess whether recommendations provided in the specific or county linkage reports can be used to improve or construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
	Santa Rita-Sierrita linkage	
B	Pima pineapple cactus	Minimize construction footprint through quality Pima pineapple cactus habitat, survey suitable habitat one year prior to the Tier 2 process to inform design, implement long-term control of noxious and invasive weeds; and negotiate compensatory mitigation with USFWS, as needed.
	Yellow-billed cuckoo	Avoid widening the I-19 or I-10 into the Santa Cruz River floodplain; conduct two breeding seasons of pre-construction surveys in suitable habitat; implement seasonal restrictions, and consult with USFWS, as needed.
	Santa Cruz River	Avoid or minimize impacts to this major riparian corridor. The need for potential additional wildlife crossings would be assessed and implemented where warranted to preserve wildlife movement. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
	Santa Rita-Sierrita linkage	Avoid or minimize impacts to linkages. Assess whether recommendations provided in the specific or county linkage reports can be used to improve and construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
	Tucson-Tortolita-Santa Catalina linkage	
	Coyote-Ironwood-Tucson linkage	

Table E14-25 Specific Mitigation Strategies for each Corridor Option (Continued)

Option	Resources*	Mitigation Strategy
C, D, CAP Option, I-10 Connector	Pima pineapple cactus	Minimize construction footprint through quality Pima pineapple cactus habitat, survey suitable habitat one year prior to the Tier 2 process to inform design, implement long-term control of noxious weeds; and negotiate compensatory mitigation with USFWS, as needed.
	Chiricahua leopard frog	Avoid critical and occupied habitat which occurs adjacent to the southern end of this option.
	Santa Rita-Sierrita linkage	Avoid or minimize impacts to linkages. Assess whether recommendations provided in the specific or county linkage reports can be used to improve and construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
	Coyote-Ironwood-Tucson linkage	
	TMC	Avoid, minimize or mitigate impacts to the TMC. Coordinate with Reclamation, AGFD, and other relevant agencies to improve and design wildlife crossings in and near the TMC. Specific mitigation related to the TMC includes: 1) relocating and reclaiming Sandario Road; 2) conducting wildlife studies prior to the Tier 2 process; 3) aligning I-11 wildlife crossing structures to match the existing CAP canal siphons (7 crossings total); 4) creating additional wildlife crossing near TMC depending on the results of wildlife studies; 5) acquiring property (at a 1:1 ratio) to support additional wildlife connectivity corridors within Avra Valley for the number of acres of the TMC which will be impacted by the project; and 6) implementing design restrictions, such as no interchanges in the TMC or immediate area and minimizing the width of I-11, to limit the I-11 footprint in the TMC area (see **Chapter 4**: Section 4(f) for more detail on these mitigation strategies).
F	Yellow-billed cuckoo	Avoid or minimize impacts to the Santa Cruz River along this Option; conduct two breeding seasons of pre-construction surveys; implement seasonal restrictions, and consult with USFWS, as needed.
	Coyote-Ironwood-Tucson linkage	Avoid or minimize impacts to linkages. Assess whether recommendations provided in the specific or county linkage reports can be used to improve and construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
	Ironwood-Picacho linkage	
G	Ironwood-Picacho linkage	Avoid or minimize impacts to linkages. Assess whether recommendations provided In the specific or county linkage reports can be used to improve and construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
H, I1, and I2		No specific mitigation strategies needed for these Options.
K, L	Gila Bend-Sierra Estrella linkage	Avoid or minimize impacts to linkages. Assess whether recommendations provided in the specific or county linkage reports can be used to improve and construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.

Table E14-25 Specific Mitigation Strategies for each Corridor Option (Continued)

Option	Resources*	Mitigation Strategy
M	Buckeye Hills East-Sonoran Desert National Monument	Avoid or minimize impacts to linkages. Assess whether recommendations provided in the specific or county linkage reports can be used to improve and construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
N	Yellow-billed cuckoo and its proposed critical habitat; southwestern willow flycatcher; and Yuma Ridgeway's rail	Minimize the footprint of the bridge crossing the Gila River to the extent possible; conduct two breeding seasons of pre-construction surveys in suitable habitat; implement seasonal restrictions and consult with the USFWS, as needed.
	Gila River	Avoid or minimize impacts to this major riparian corridor. The need for potential additional wildlife crossings would be assessed to preserve wildlife movement, Coordination with relevant agencies would occur to implement modifications that will enhance wildlife movement.
Q1	Gila Bend-Sierra Estrella linkage	Avoid or minimize impacts to linkages. Assess whether recommendations provided in the specific or county linkage reports can be used to improve and construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
Q2	Yellow-billed cuckoo and its proposed critical habitat; southwestern willow flycatcher; and Yuma Ridgeway's rail	Minimize the footprint of bridge widening or new bridge construction on the SR 85 crossing the Gila River to the extent possible; conduct two breeding seasons of pre-construction surveys in suitable habitat; implement seasonal restrictions and consult with the USFWS, if species present, as needed.
	Gila River	Avoid or minimize impacts to this major riparian corridor. The need for potential additional wildlife crossings would be assessed to preserve wildlife movement. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.
Q3, R	Yellow-billed cuckoo	Minimize construction in the Gila River floodplain to the extent possible; conduct two breeding seasons of pre-construction surveys in suitable habitat; implement seasonal restrictions and consult with the USFWS, if species present, as needed.
S, U, X	White Tanks-Belmonts-Vultures-Hieroglyphics linkage Wickenburg-Hassayampa linkage	Avoid or minimize impacts to linkages. Assess whether recommendations provided in the specific or county linkage reports can be used to improve and construct wildlife crossings in these linkages. Coordinate with relevant agencies to implement modifications that will enhance wildlife movement.

* Resources that share the same mitigation strategies are grouped together.

E14.6 FUTURE TIER 2 ANALYSIS

ADOT will continue to work with agencies prior to and during the Tier 2 process to conduct surveys needed to identify occupied habitat for ESA-listed species at the time of the Tier 2 project and to develop specific conservation measures to avoid, minimize, or mitigate impacts to listed species. It is acknowledged that ESA-listed species could change over time. ADOT will continue to work with federal and state agencies as well as affected municipalities during the Tier 2 process to evaluate potential impacts to other sensitive species listed by these entities. ADOT will work with Tribal agencies during the Tier 2 process to avoid or minimize effects to Tribally sensitive species.

ADOT will continue to work with stakeholders and partners such as AGFD and BLM prior to and during the Tier 2 process to develop and fund appropriate studies to evaluate wildlife movement and roadway mortality. Sufficient time (at least 2 to 4 years) will be given to ensure studies are able to acquire adequate data for guiding the development of mitigation measures. Future studies in support of Tier 2 impact analysis will focus on refining information relating specific impact areas within known wildlife linkages and corridors identified now and in the future. Tracking studies using camera traps, satellite telemetry, track plates, or other methods will identify spatial and temporal use patterns of target species within the Analysis Area. Collision studies will be utilized along co-located sections of I-11 to identify sites where overpasses or underpasses will be installed. ADOT will implement on-the-ground mitigation based on recommendations generated by these studies, such as constructing wildlife crossings where previous wildlife crossing has been documented, and constructing culverts of a specific size and design for wildlife occurring in specific locations in the Study Area. Also existing culverts, bridges, and other roadway features that are in place along co-located highways should be monitored to identify the species that use these and the degree to which these are effective at maintaining movement across the highway barriers.

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