ENVIRONMENTAL STEWARDSHIP PLAN
FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF VEHICLE FENCE AND RELATED TACTICAL INFRASTRUCTURE
U.S. Border Patrol Yuma Sector, Wellton Station, Arizona

U.S. Department of Homeland Security
U.S. Customs and Border Protection
U.S. Border Patrol

December 2008

COVER SHEET

ENVIRONMENTAL STEWARDSHIP PLAN
FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE
OF TACTICAL INFRASTRUCTURE
U.S. BORDER PATROL YUMA SECTOR, ARIZONA

Responsible Agencies: U.S. Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP), U.S. Border Patrol (USBP).

Coordinating Agencies: U.S. Army Corps of Engineers (USACE)-Los Angeles District; U.S. Fish and Wildlife Service (USFWS); and the United States Section, International Boundary and Water Commission (USIBWC).

Affected Location: U.S./Mexico international border in Yuma County, Arizona.

Project Description: The Project includes the construction, operation, and maintenance of tactical infrastructure to include vehicle fence, and associated access construction roads along approximately 8.82 miles of the U.S./Mexico international border within the USBP Yuma Sector, Arizona. The Project will be implemented in four discrete sections. Individual sections will range from approximately 0.17 to 6.70 miles in length.

Report Designation: Environmental Stewardship Plan (ESP).

Abstract: CBP plans to construct, operate, and maintain approximately 8.82 miles of tactical infrastructure, including four discrete sections of vehicle fence and access construction roads along the U.S./Mexico international border in the USBP Yuma Sector, Arizona. Individual sections will range from approximately 0.17 to 6.70 miles in length. The tactical infrastructure will encroach on public lands managed by the U.S. Bureau of Land Management (BLM) and USFWS.

This ESP analyzes and documents potential environmental consequences associated with the Project.

On April 1, 2008, the Secretary of the U.S. Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) of 1996 as amended, exercised his authority to waive certain environmental and other laws in order to ensure the expeditious construction of tactical infrastructure along the U.S./Mexico international border. The tactical infrastructure described in this ESP is covered by the Secretary's April 1, 2008, waiver (see **Appendix A**). Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary has committed DHS to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports the Secretary's commitment to

responsible environmental stewardship. To that end, CBP has prepared this ESP, which analyzes the potential environmental impacts associated with construction of tactical infrastructure in the USBP's Yuma Sector. The ESP also discusses CBP's plans as to how it can mitigate potential environmental impacts. The ESP will guide CBP's efforts going forward.

ENVIRONMENTAL STEWARDSHIP PLAN

FOR THE

CONSTRUCTION, OPERATION, AND MAINTENANCE OF VEHICLE FENCE AND RELATED TACTICAL INFRASTRUCTURE U.S. BORDER PATROL YUMA SECTOR, WELLTON STATION, ARIZONA

U.S. Department of Homeland Security
U.S. Customs and Border Protection
U.S. Border Patrol

DECEMBER 2008

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EXECUTIVE SUMMARY

Background

On April 1, 2008, the Secretary of the U.S. Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) of 1996 as amended, exercised his authority to waive certain environmental and other laws in order to ensure the expeditious construction of tactical infrastructure along the U.S./Mexico international border. The tactical infrastructure described in this Environmental Stewardship Plan (ESP) is covered by the Secretary's April 1, 2008, waiver (see **Appendix A**). Although the Secretary's waiver means that U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary has committed DHS to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports the Secretary's commitment to responsible environmental stewardship. To that end, CBP has prepared this ESP, which analyzes the potential environmental impacts associated with construction of tactical infrastructure in the USBP's Yuma Sector. The ESP also discusses CBP's plans as to how it can mitigate potential environmental impacts. The ESP will guide CBP's efforts going forward.

As it moves forward with the Project described in this ESP, CBP will continue to work in a collaborative manner with local governments, state and Federal land managers, and the interested public to identify environmentally sensitive resources and develop appropriate best management practices (BMPs) to avoid, identify, and minimize any adverse impacts on environmentally sensitive resources.

Goals and Objectives of the Project

The Project will provide U.S. Border Patrol (USBP) agents with the tools necessary to strengthen their control of the U.S. border between ports-of-entry (POEs) in the USBP Yuma Sector. The Project will help to deter illegal entries within the USBP Yuma Sector by improving enforcement efficiency, thus preventing terrorists and terrorist weapons, illegal aliens (IA), drugs, and other cross-border violators and contraband from entering the United States, while providing a safer work environment for USBP agents. The USBP Yuma Sector has identified four discrete areas along the border that experience high levels of illegal entry. Illegal entry activity typically occurs in areas that are remote and not easily accessed by USBP agents, near POEs where concentrated populations might live on either side of the border, or in locations that have quick access to U.S. transportation routes.

The Project is being carried out pursuant to Section 102 of IIRIRA, 8 United States Code (U.S.C.) § 1103 note. In Section 102(b) of IIRIRA, Congress called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border. This total includes certain priority miles of fencing that are to be completed by December 2008. Section 102(b) further specifies that these priority miles are to be constructed in areas where they will be practical and effective in deterring smugglers and aliens attempting to gain illegal entry into the United States.

Public Outreach and Agency Coordination

CBP notified relevant Federal, state, local, and Tribal agencies of the Project and requested input on environmental concerns that such parties might have regarding the Project. CBP has coordinated with the U.S. Environmental Protection Agency (USEPA); U.S. Fish and Wildlife Service (USFWS); Bureau of Land Management (BLM); State Historic Preservation Office (SHPO); and other Federal, state, and local agencies.

Although the Secretary issued the waiver, CBP has continued to work in a collaborative manner with agencies and has considered and incorporated agency and public comments into this ESP. Comments received during public and agency coordination efforts were considered and have been incorporated into the ESP analysis, as appropriate.

Description of the Project

CBP plans to construct, operate, and maintain tactical infrastructure consisting of four discrete sections of vehicle fence, and access and construction roads along the U.S./Mexico international border in the USBP Yuma Sector, Arizona. Tactical infrastructure includes the installation of vehicle fence sections in areas of the border that are not currently fenced. Locations are based on the USBP Yuma Sector's assessment of local operational requirements where such infrastructure will assist USBP agents in stopping illegal cross-border activities. Congress appropriated funds for this Project in CBP's Fiscal Year (FY) 2007 and 2008 Border Security Fencing, Infrastructure, and Technology Appropriations (Public Law [P.L.] 109-295; P.L. 110-161).

The vehicle fence will be constructed in four distinct sections along the U.S./Mexico international border within the USBP Yuma Sector in Yuma County, Arizona. These four sections of vehicle fence range from approximately 0.17 miles to 6.70 miles in length and are collectively designated as Project CV-2.

The vehicle fence is located within Yuma County, Arizona, and all four sections are wholly contained within the Roosevelt Easement adjacent to Cabeza Prieta National Wildlife Refuge (CPNWR). Access to the construction area will require the improvement or construction of access roads on CPNWR lands designated as Wilderness. Additional access will be provided from the adjacent Barry M. Goldwater Range (BMGR). Consistent with Federal mandates, USBP has identified these areas of the border locations where vehicle fence will contribute significantly to its priority homeland security mission.

Environmental Impacts, Mitigation, and Best Management Practices

Table ES-1 provides an overview of potential environmental impacts by specific resource area. **Chapter 3** of this ESP evaluates these impacts.

CBP followed specially developed design criteria to reduce potential adverse environmental impacts and will implement mitigation measures to further reduce or offset adverse environmental impacts without compromising operational requirements. Design criteria to reduce adverse environmental impacts include selecting a location for tactical infrastructure that will avoid or minimize impacts on environmental and cultural resources, consulting with Federal and state agencies and other stakeholders to avoid or minimize adverse environmental impacts and develop appropriate BMPs, and avoiding physical disturbance and construction of solid barriers in wetlands/riparian areas and streambeds, where practicable. BMPs required from the construction contractor will include implementation of a Construction Mitigation and Restoration Plan, Spill Prevention Control and Countermeasure Plan, Storm Water Pollution Prevention Plan, Environmental Protection Plans, Dust Control Plan, Fire Prevention and Suppression Plan, and Unanticipated Discovery Plan. **Appendix F**, the Biological Resources Plan, outlines BMPs.

CBP will enter into a programmatic mitigation agreement with the Department of the Interior (DOI) and fund a mitigation pool for adverse impacts that cannot be avoided.

Table ES-1. Summary of Environmental Impacts, Mitigation, and BMPs

Resource Area	Impacts of the Project	BMPs/Mitigation
Air Quality	Fugitive dust emissions will not exceed the *de minimis* threshold limits. Air emissions from maintenance activities are not expected to exceed thresholds above *de minimis* levels for criteria pollutants and will have a negligible contribution to the overall air quality in the Air Quality Control Region.	BMPs to reduce dust and control PM_{10} emissions. Construction equipment will be kept in good operating condition to minimize exhaust. Construction speed limits will not exceed 35 miles per hour. Implementation of a Fire Prevention and Suppression Plan will occur.
Noise	Impacts on nesting, feeding, and migration could occur on various species due to construction noise.	Mufflers and properly working construction equipment will be used to reduce noise. Generators will have baffle boxes, mufflers, or other noise-abatement capabilities. Equipment will be operated on an as-needed basis. A majority of the activities will occur away from population centers.
Land Use and Recreation	Pedestrian traffic within the CPNWR is expected to increase. A reduction in litter and in illegal cross-border vehicular traffic are expected, the latter contributing to an increase in visitor safety. There are no expected impacts on the BMGR from access roads with the exception of impacts related on increased vehicular traffic.	BMPs and mitigation are not expected to be necessary.

Resource Area	Impacts of the Project	BMPs/Mitigation
Aesthetics	Construction of tactical infrastructure will result in the introduction of new temporary and permanent visual elements into existing viewsheds. Clearing and grading of the landscape in the Project corridor during construction will result in changes in some visual elements.	Design techniques and construction practices will be used to reduce the visual impacts of the Project. Such practices as using irregular clearing shapes, bending slopes to match existing landforms and retaining existing rock formations, vegetation, and drainage whenever possible will be used to the maximum extent practicable.
Geology and Soils	Minor alterations of the existing microtopography are expected. Impacts on geologic resources could occur at locations where bedrock is at the surface and blasting will be necessary. Soil disturbance, compaction, and erosion are expected.	Construction-related vehicles will remain on established roads and areas with highly erodible soils will be avoided when possible. Gravel or topsoil will be obtained from developed or previously used sources. Project design and engineering practices will be implemented to mitigate geologic limitations to site development. Implementation of Dust Control Plan and an SWPPP will occur.
Water Use and Quality (Hydrology and Groundwater)	Increased erosion could lead to increased flood potential. Groundwater drawdown could occur during construction.	Revegetation of temporary staging areas will decrease flood potential. Potential aquifer recharge could occur from watering of surfaces during construction. Erosion-control measures are identified in the SWPPP. Any applicable conservation methods as outlined by ADWR will be implemented.

Resource Area	Impacts of the Project	BMPs/Mitigation
Water Use and Quality (Surface Waters and Waters of the United States)	Development of staging areas and the placement of permanent vehicle fence across wash channels will result in impacts associated with land disturbance and potential erosion and sedimentation.	Construction activities will stop during heavy rains. All fuels, oils, and solvents will be collected and stored. Wash crossings will not be located at bends to protect channel stability. Equipment maintenance, staging, laydown, or fuel dispensing will occur upland to prevent runoff. Fence types will allow conveyance of water, and culverted crossings at washes will be developed. Implementation of an SWPPP, sediment- and erosion-control plans, and wetlands mitigation and a restoration plan will occur.
Water Use and Quality (Floodplains)	Floodplains for major rivers are distant and not anticipated to be effected.	Crossings of washes within the Project corridor will be designed to ensure proper conveyance of flows during flow events.
Biological Resources (Vegetation Resources)	Blading, scraping, drilling, trenching, berming, and crushing of vegetation will occur. A total of 264 acres of vegetation is expected to be impacted by the Project. Indirect impacts include dust generation, nonnative species introductions, and rutting and compaction which in turn can cause redirection of flow.	Construction equipment will be cleaned to minimize the spread of nonnative species. Removal of brush in federally protected areas will be limited to smallest amount possible. Invasive plants that appear on the Project site will be removed. Temporarily impacted areas, such as staging areas, will be revegetated with native species. See BMP Number 45 under **Chapter 1.3.1** in **Appendix F**. Implementation of SWPPP, SPCC and CM&R plans, and a Dust Control Plan will occur.

Resource Area	Impacts of the Project	BMPs/Mitigation
Biological Resources (Wildlife and Aquatic Resources)	Potential adverse impacts on wildlife include habitat loss, noise and physical disturbance associated with construction, construction lighting, and subsequent maintenance activities. Potential beneficial impacts on wildlife are anticipated due to reduced cross-border violator traffic. No aquatic resources exist in the Project area.	An environmental monitor will be onsite during construction to account for occurrences of wildlife. If wildlife are encountered, the monitor will notify the construction manager of any activities that could harm or harass an individual and the construction manager will temporarily suspend activities in the vicinity of the individual. Ground disturbance during migratory bird nesting season will necessitate a migratory bird nest survey and possible removal and relocation. Vehicle fence design allows for the passage of small animals. To prevent entrapment of wildlife all excavated holes or trenches will either be covered or provided with wildlife escape ramps. All bollards will be covered to prevent entrapment and discourage roosting.
Biological Resources (Special Status Species)	There are no known occurrences of the lesser long-nosed bat within or immediately adjacent to the Project corridor. The AGFD documented an individual radiotagged Sonoran pronghorn within the project corridor. This is possibly an extralimital occurrence. Potential impacts on listed species include habitat loss and noise and physical disturbance associated with construction and subsequent maintenance activities, and beneficial impacts due to reduced cross-border violator traffic.	If federally protected species are encountered, the monitor will notify the construction manager of any activities that could harm or harass an individual of a federally listed species and the construction manager will temporarily suspend activities in the vicinity of the federally listed species. A qualified biologist can safely remove the individual or it can move away on its own. Fence types will allow transboundary migration of small animals. See **Chapter 3.8.3** and **Appendix F** for impacts on endangered species.

Resource Area	Impacts of the Project	BMPs/Mitigation
Cultural Resources	No significant cultural properties or contributing elements of larger NRHP-eligible sites or districts are within the impact corridors.	Cultural Monitor on site to ensure all BMPs are followed.
Socioeconomics and Environmental Justice	Residents of nearby towns will benefit from increased security, a reduction in illegal drug-smuggling activities and the number of violent crimes, less damage to and loss of personal property, and less financial burden for entitlement programs.	Beneficial impacts on socioeconomics and environmental justice are anticipated. BMPs and mitigation are not expected to be necessary.
Hazardous Wastes and Hazardous Materials	Products containing hazardous materials (e.g., fuels, oils, lubricants, pesticides, and herbicides) will be procured and used during construction.	Contractors will be required to develop SPCC and CM&R plans, and keep materials at the construction site to contain any spill or leak. All hazardous materials and wastes will be managed in accordance with applicable Federal, state, and local regulations.

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ENVIRONMENTAL STEWARDSHIP PLAN FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE U.S. BORDER PATROL YUMA SECTOR, ARIZONA

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1.1 BACKGROUND

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To that end, CBP has prepared this ESP, which analyzes the potential environmental impacts associated with construction of tactical infrastructure in the USBP's Yuma Sector. The ESP also discusses CBP plans to mitigate potential environmental impacts. The ESP further details the BMPs associated with the tactical infrastructure that CBP will implement during and after construction.

1.2 GOALS AND OBJECTIVES OF THE PROJECT

The mission of CBP is to prevent terrorists and terrorist weapons from entering the United States, while also facilitating the flow of legitimate trade and travel. In supporting CBP's mission, the U.S. Border Patrol (USBP) is charged with establishing and maintaining effective control of the border of the United States. USBP's mission strategy consists of five main objectives:

- Establish substantial probability of apprehending terrorists and their weapons as they attempt to enter illegally between the Ports of Entry (POEs)
- Deter illegal entries through improved enforcement
- Detect, apprehend, and deter smugglers of humans, drugs, and other contraband

- Leverage "smart border" technology to multiply the effect of enforcement personnel
- Reduce crime in border communities and consequently improve quality of life and economic vitality of targeted areas.

USBP has nine administrative sectors along the U.S./Mexico international border. Each sector is responsible for implementing an optimal combination of personnel, technology, and infrastructure appropriate to its operational requirements. The USBP Yuma Sector is responsible for the extreme western Arizona counties of Yuma, La Paz, and Mojave. The Yuma Sector also includes the eastern California portion of Imperial, Riverside, and San Bernardino counties, as well as the four southern Nevada counties of Lincoln, Nye, Clark, and White Pine. The area affected by the Project is in the southwestern portion of Yuma County, Arizona. Within the USBP Yuma Sector, areas for tactical infrastructure improvements have been identified that will help the Sector gain more effective control of the border and significantly contribute to USBP's priority mission of homeland security.

The Project will provide USBP agents with the tools necessary to strengthen their control of the U.S. border between POEs in the USBP Yuma Sector. The Project will help to deter illegal entries within the USBP Yuma Sector by improving enforcement efficiency, thus preventing terrorists and terrorist weapons, illegal aliens, drugs, and other cross-border violators and contraband from entering the United States, while providing a safer work environment for USBP agents. The USBP Yuma Sector has identified four discrete areas along the border that experience high levels of illegal entry. Illegal entry activity typically occurs in areas that are remote and not easily accessed by USBP agents, near POEs where concentrated populations might live on either side of the border, or in locations that have quick access to U.S. transportation routes.

The Project is being carried out pursuant to Section 102 of IIRIRA, 8 United States Code (U.S.C.) § 1103. In Section 102(b) of IIRIRA, Congress called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border. This total includes certain priority miles of fencing that are to be completed by December 2008. Section 102(b) further specifies that these priority miles are to be constructed in areas where it will be practical and effective in deterring smugglers and aliens attempting to gain illegal entry into the United States. Congress appropriated funds for this Project in CBP's fiscal year (FY) 2007 and 2008 Border Security Fencing, Infrastructure, and Technology Appropriations (Public Law [P.L.] 109–295; P.L. 110-161).

1.3 INTRODUCTION TO THE ENVIRONMENTAL STEWARDSHIP PLAN

This ESP is divided in to 6 chapters plus appendices. The **Chapter 1** presents a detailed overview. **Chapter 2** presents a detailed description of the Project.

Subsequent chapters present information on the resources present, and evaluate the direct, indirect, and cumulative effects of the Project. The ESP also describes measures CBP has identified—in consultation with Federal, state, and local agencies—to avoid, minimize, or mitigate impacts on the environment, whenever practical. The following resource areas are presented in this ESP: air quality, noise, land use and recreation, aesthetics, geological resources and soils, water use and quality, biological resources (i.e., vegetation, wildlife and aquatic species, special status species), cultural resources, socioeconomics and environmental justice, and hazardous materials and wastes. Some environmental resources were not included in this ESP because they were not relevant to the analysis. These potential resource areas include utilities and infrastructure (omitted because the Project will not impact any utilities or similar infrastructure), sustainability (omitted because the Project will use minimal amounts of resources during construction and maintenance), and human health and safety (omitted because construction workers will be subject to Occupational Safety and Health Administration (OSHA) standards and the Project will not introduce new or unusual safety risks).

CBP will follow specially developed design criteria to reduce adverse environmental impacts and will implement mitigation measures to further reduce or offset adverse environmental impacts on the extent practical. Design criteria to reduce adverse environmental impacts include construction of solid barriers in wetlands/riparian areas and streambeds. In addition, physical disturbance in wetlands/riparian areas and streambeds will be avoided to the extent practicable. Engineers are directed to design vehicle fence to convey pre-development stormwater flows after construction of tactical infrastructure. The same volume and velocity of stormwater flow will be expected. Accumulated debris will be removed during regular maintenance. Consultation with Federal and state agencies and other stakeholders will augment efforts to avoid or minimize adverse environmental impacts. Development of appropriate BMPs to protect natural and cultural resources will be utilized to the extent practical. BMPs will include implementation of a Construction Mitigation and Restoration (CM&R) Plan, Spill Prevention Control and Countermeasures (SPCC) Plan, Dust Control Plan, Fire Prevention Plan, Environmental Protection Plan (EPP), Stormwater Pollution Prevention Plan (SWPPP), and Unanticipated Discovery Plan for Cultural Resources.

1.4 PUBLIC OUTREACH AND AGENCY COORDINATION

CBP notified relevant Federal, state, local, and Tribal agencies of the Project and requested input on potential environmental concerns such parties might have regarding the Project. CBP has coordinated with the U.S. Environmental Protection Agency (USEPA); U.S. Fish and Wildlife Service (USFWS); State Historic Preservation Office (SHPO); and other Federal, state, and local agencies. Documents concerning public outreach and agency coordination can be found in **Appendix C**.

A public open house to provide information to the public was advertised and held at the Shilo Inn in Yuma, Arizona, on May 15, 2008. The open house was attended by 10 people. Agency and public comments have been considered and incorporated into the analysis of potential environmental impacts.

In addition, CBP conducted coordination meetings with Federal and state resource agencies on 22 May and 22 July to present and discuss environmental aspects of the Project and obtain feedback and any information regarding sensitive resources in the Project area.

1.5 SUMMARY OF ENVIRONMENTAL IMPACTS, BMPS, AND MITIGATION

CBP applied various design criteria to reduce potential environmental impacts associated with the Project, including selecting fence alignment and access road routes that will avoid or minimize effects on environmental and cultural resources. Nonetheless, CBP has determined that construction, operation, and maintenance of tactical infrastructure in the USBP Yuma Sector will result in positive as well as adverse environmental impacts. The adverse impacts will be greatest during construction. Mitigation resources that are available during construction of the Project include the following:

- BMPs will be used to avoid, minimize, or mitigate impacts on biological resources.
- CBP will require construction contractors to develop and implement a Construction Mitigation and Restoration (CM&R) Plan, Spill Prevention Control and Countermeasure (SPCC) Plan, Blasting Specifications, Dust Control Plan, Fire Prevention and Suppression Plan, and Unanticipated Discovery Plan for Cultural Resources to protect natural and cultural resources and residential areas during construction and operation of the Project.
- CBP will coordinate with the USFWS, the Arizona Department of Fish and Game (ADFG), Arizona SHPO, Native American tribes, and others to identify appropriate mitigation measures.
- Environmental monitors will be present during construction to ensure that avoidance and minimization BMPs are properly implemented.

2. DESCRIPTION OF THE PROJECT

CBP will construct and maintain vehicle fence, and construct, maintain, and operate access roads and patrol roads along the U.S./Mexico international border in the USBP Yuma Sector, Wellton Station, Arizona. Congress has appropriated funds for the construction of the tactical infrastructure. Construction of additional tactical infrastructure might be required in the future as mission and operational requirements are continually reassessed.

Vehicle fence will be a post-on-rail style fence for the majority of the fence alignment corridor, with Normandy style fencing used in areas of washes and steeper grades. Typical fence designs that are used are included in **Appendix B**. **Figures 2-1** and **2-2** show photographs of post-on-rail and Normandy-style fencing.

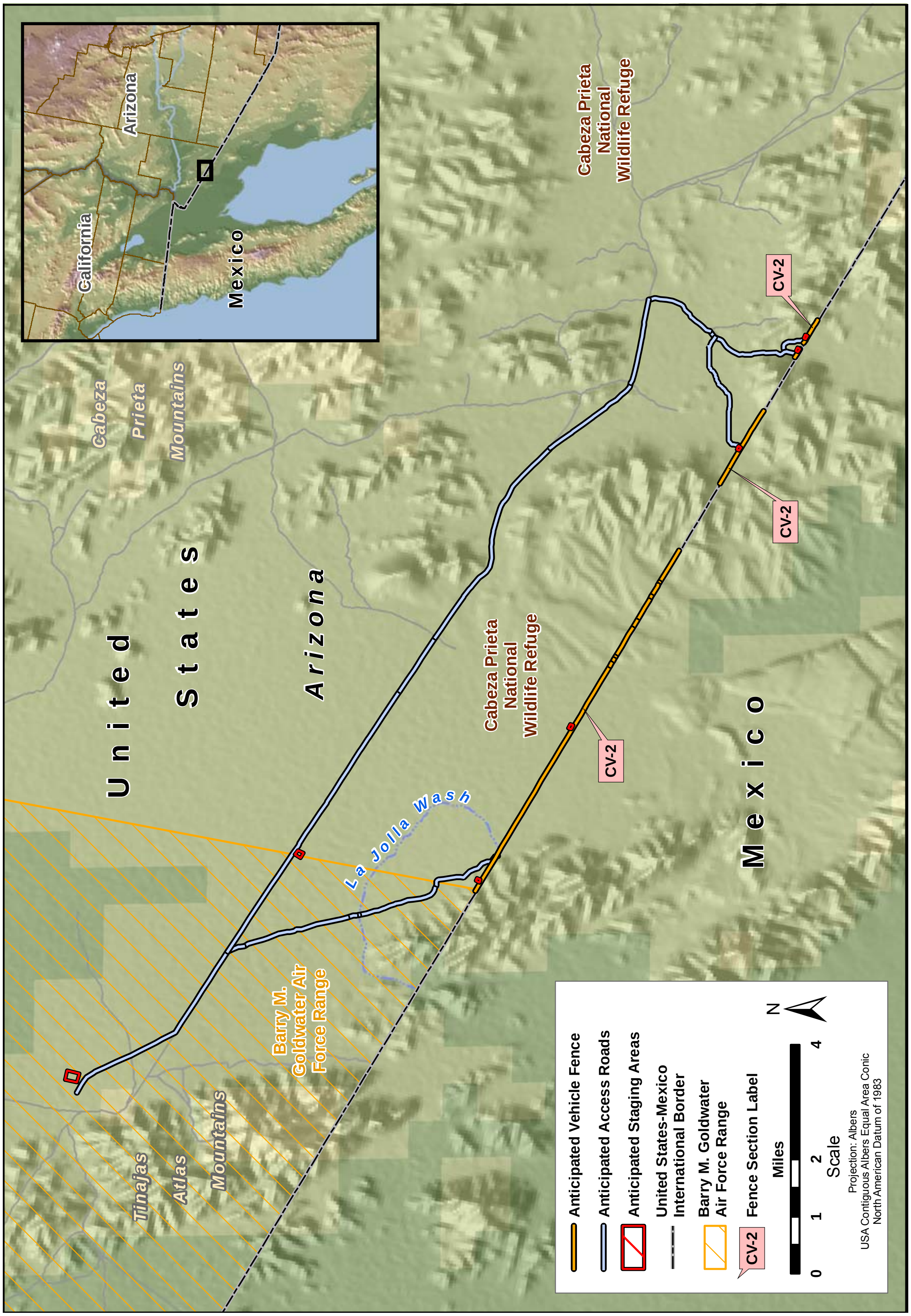
The vehicle fence will be constructed in four distinct sections along the U.S./Mexico international border within the USBP Yuma Sector in Yuma County, Arizona. These four sections of vehicle fence range from approximately 0.17 miles to 6.70 miles in length and are collectively designated as Project CV-2 in **Figure 2-3**. The sections are further described in **Table 2-1**.

Figure 2-1. Photograph of Post-on-Rail Fence

Figure 2-2. Photograph of Normandy-style Fence

Table 2-1. Tactical Infrastructure for USBP Yuma Sector

Section Number	Associated USBP Station	General Location	Land Ownership	Type of Tactical Infrastructure	Length of New Fence Section
CV-2	Wellton	Cabeza Prieta National Wildlife Refuge (CPNWR)	USFWS	Primary vehicle fence, access construction roads	6.70
CV-2	Wellton	CPNWR	USFWS	Primary vehicle fence, access construction roads	1.48
CV-2	Wellton	CPNWR	USFWS	Primary vehicle fence, access construction roads	0.47
CV-2	Wellton	CPNWR	USFWS	Primary vehicle fence, access roads	0.17
Total					**8.82 miles**



Source: ESRI StreetMap USA 2005

Figure 2-3. Location Map for CV-2

The vehicle fence is within Yuma County, Arizona, and all four sections are wholly contained within the Roosevelt Easement adjacent to Cabeza Prieta National Wildlife Refuge (CPNWR)[1]. The Roosevelt Easement is discussed in detail in **Chapter 3.4.2**. Access to the construction area will require the improvement and or construction of access roads on CPNWR lands designated as Wilderness. Additional access will be provided from the adjacent Barry M. Goldwater Range (BMGR). Consistent with Federal mandates, USBP has identified these four locations as areas where vehicle fence will contribute significantly to its priority homeland security mission. **Appendix D** contains detailed maps of the Project area.

The final design will be developed by a design/build contractor overseen by the U.S. Army Corps of Engineers (USACE). However, design criteria that have been established based on CBP operational needs require that, at a minimum, any fencing must be as follows:

- Capable of withstanding a crash of a 10,000-pound (gross weight) vehicle traveling at 40 miles per hour
- Capable of withstanding vandalism, cutting, or various types of penetration
- Designed to survive extreme climate changes
- Designed to reduce or minimize impacts on small animal movements
- Not impede the natural flow of surface water
- Aesthetically pleasing to the extent possible.

The alignment of the vehicle fence and roads project was identified by the USBP Yuma Sector as meeting its operational requirements and developed through coordination with Federal and state agencies. The alignment continues to meet current operational requirements and will be constructed with the objective of achieving the least environmental impacts on the extent possible.

The vehicle fence will impact an approximately 60-foot-wide corridor along each fence segment. This corridor will include vehicle fences and portions of access roads for construction. Access roads to the fence construction corridor will be narrow to minimize impacts on designated Wilderness and construction staging areas will be placed in previously disturbed areas to the extent possible. It is anticipated that approximately 28.7 miles of access road will be used to gain

[1] In 1907, President Roosevelt reserved from entry and set apart as a public reservation all public lands within 60 feet of the international boundary between the United States and Mexico within the State of California and the Territories of Arizona and New Mexico. Known as the “Roosevelt Reservation,” this land withdrawal was found “necessary for the public welfare ... as a protection against the smuggling of goods.” The proclamation excepted from the reservation all lands, which, as of its date, were (1) embraced in any legal entry; (2) covered by any lawful filing, selection, or rights of way duly recorded in the proper U.S. Land Office; (3) validly settled pursuant to law; or (4) within any withdrawal or reservation for any use or purpose inconsistent with its purposes (CRS 2006).

access to the border construction corridor, where an additional 8.82 miles of road will be constructed to support fence installation.

The primary access road will be an old historic route named the Camino del Diablo. This route runs west to east approximately 3.5 miles from, and parallel to, the U.S./Mexico international border. At both the west and east ends of the general Project area, ancillary access roads will branch from the Camino del Diablo south to the border. The western north-south access road will service the 6.70-mile section of fence and will for the most part be located on BMGR property, crossing into the Cabeza Prieta National Wildlife Refuge (CPNWR) just north of the border. The eastern north south road is entirely within the CPNWR, and will branch at two locations to service all three of the smaller fence sections. In all instances, where access roads currently exist, improvements will be required to support construction equipment. Any necessary aggregate or fill material will be clean material obtained by construction contractors from commercially available sources that will not pose an adverse impact on biological or cultural resources.

At some locations the access roads do not exist at all or are very poorly defined other than faint tracks from past incidental off-road vehicular use.

Due to the remote nature of the area and travel time requirements, a campsite will be developed on CPNWR lands in Coordination with CPNWR personnel. Vegetation will be cleared and grading will occur where needed. The area permanently impacted during construction of tactical infrastructure within the four sections will total approximately 275 acres. Wherever possible, existing roads will be used for construction access. **Figure 2-4** shows a typical schematic of temporary and permanent impact areas for vehicle fence and roads.

Construction of the vehicle fence and roads will require minor adjustments in USBP operations in the USBP Yuma Sector.

The fences will be made from non-reflective steel. No painting will be required. Fence maintenance will include removing any accumulated debris on the fence after a rain event to avoid potential future flooding. Post-on-rail or Normandy-style vehicle fence is not expected to have a significant effect on stormwater flow. As depicted in **Figure 2-1** and **2-2**, the vehicle fence design will not impede stormwater flow. Fence design provides space sufficient for the passage of stormwater. Regular fence maintenance will remove accumulated debris. Sand that builds up against the fence and brush will also be removed as needed. Brush removal could include mowing, removal of small trees, and application of herbicide, if needed. As part of maintenance activity, CBP personnel will observe the condition of the fence. Any destruction or breaches of the fence will be repaired, as needed.

Construction of other tactical infrastructure might be required in the future as mission and operational requirements are continually reassessed. To the extent that other current and future actions are known, they are discussed in **Chapter 5**, "Related Projects and Potential Effects."

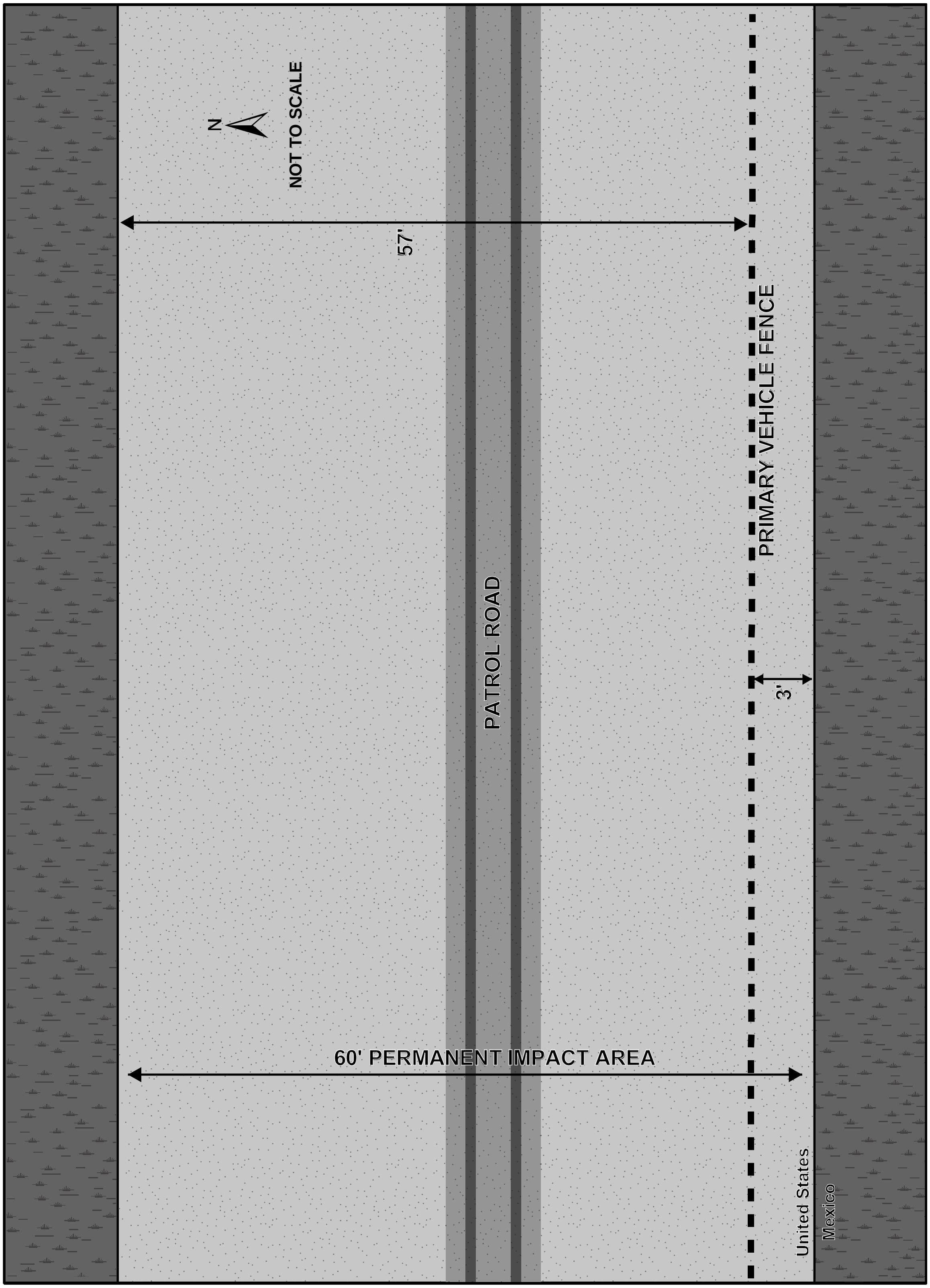


Figure 2-4. Schematic of Project Impact Areas

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3. ENVIRONMENTAL BASELINE AND EVALUATION

3.1 INTRODUCTION

CBP has compiled extensive information about the environmental resources that might be affected by the construction, operation, and maintenance of tactical infrastructure along the U.S./Mexico international border. CBP used this information to establish the baseline against which it evaluated the impacts of the construction, maintenance, and operation of the vehicle fence and supporting infrastructure. CBP obtained baseline environmental information from many sources, including site visits, field work, personal communications, and data from reputable sources such as Federal and state agencies.

The following resource areas are presented in this ESP: air quality, noise, land use and recreation, aesthetics, geology and soils, water use and quality, biological resources (i.e., vegetation resources, wildlife and aquatic species, special status species), cultural resources, socioeconomics and environmental justice, and hazardous materials and wastes. Some environmental resources were not included in this ESP because they were not relevant to the analysis. These potential resource areas include utilities and infrastructure (omitted because the Project will not impact any utilities or similar infrastructure), roadways and traffic (omitted because the Project will not be accessible from heavily traveled public roadways), sustainability (omitted because the Project will use minimal amounts of resources during construction and maintenance), and human health and safety (omitted because construction workers will be subject to OSHA standards and the Project will not introduce new or unusual safety risks).

3.2 AIR QUALITY

3.2.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the Clean Air Act (CAA) for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the CAA as the basis for evaluating potential environmental impacts and appropriate mitigations.

The air quality in a given region or area is measured by the concentration of various pollutants in the atmosphere. The measurements of these "criteria pollutants" in ambient air are expressed in units of parts per million (ppm), micrograms per cubic meter ($\mu g/m^3$), or milligrams per cubic meter (mg/m^3).

The CAA directed USEPA to develop National Ambient Air Quality Standards (NAAQS) for pollutants that have been determined to affect human health and the environment. NAAQS are currently established for six criteria air pollutants: ozone (O_3) (measured as either volatile organic compounds [VOCs] or nitrogen oxides [NO_x]), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulates equal to or less than 10 microns in diameter [PM_{10}] and particulates equal to or less than 2.5 microns in diameter [$PM_{2.5}$]), and lead (Pb). The primary NAAQS are ambient air quality standards to protect the public health; secondary NAAQS specify levels of air quality and are to protect the public welfare, such as effects on vegetation, crops, wildlife, economic values, and visibility.

States designate any area that does not meet the national primary or secondary ambient air quality standard for a criteria pollutant as a nonattainment area. For O_3, each designated nonattainment area is classified as marginal, moderate, serious, severe, or extreme, based on ambient O_3 concentrations. The Arizona Department of Environmental Quality (ADEQ) is responsible for implementing the Federal CAA.

The State of Arizona adopted the NAAQS for criteria pollutants. No additional State Ambient Air Quality Standards have been promulgated by the State of Arizona. **Table 3-1** presents the primary and secondary USEPA NAAQS.

These programs are detailed in State Implementation Plans (SIPs), which are required to be developed by each state or local regulatory agency and approved by USEPA. A SIP is a compilation of regulations, strategies, schedules, and enforcement actions designed to move the state into compliance with all NAAQS. Any changes to the compliance schedule or plan (e.g., new regulations, emissions budgets, controls) must be incorporated into the SIP and approved by USEPA. USEPA has delegated the authority for ensuring compliance with the NAAQS to ADEQ.

USEPA classifies the air quality in an air quality control region (AQCR), or in subareas of an AQCR, according to whether the concentrations of criteria pollutants in ambient air exceed the NAAQS. All areas within each AQCR are therefore designated as either “attainment,” “nonattainment,” “maintenance,” or “unclassified” for each of the six criteria pollutants. Attainment means that the air quality within an AQCR is better than the NAAQS, nonattainment indicates that criteria pollutant levels exceed NAAQS, maintenance indicates that an area was previously designated nonattainment but is now attainment, and unclassified means that there is not enough information to appropriately classify an AQCR, so the area is considered attainment.

Many chemical compounds found in the Earth’s atmosphere act as “greenhouse gases.” These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth’s surface, some of it is reflected back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere. Over time, barring other influences, the trapped heat results in the phenomenon of global warming. In April 2007, the

Table 3-1. National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standard	
		Primary	Secondary
O_3	1 Hour [c]	0.12 ppm	Same as Primary Standard
	8 Hours [b]	0.08 ppm (157 μg/m^3)	
	8 Hours	0.075 ppm[g]	
PM_{10}	24 Hours [a]	150 μg/m^3	Same as Primary Standard
$PM_{2.5}$	24 Hours [f]	35 μg/m^3	Same as Primary Standard
	Annual Arithmetic Mean [e]	15 μg/m^3	
CO	8 Hours [a]	9.0 ppm (10 mg/m^3)	None
	1 Hour [a]	35 ppm (40 mg/m^3)	
NO_2	Annual Arithmetic Mean	0.053 ppm (100 μg/m^3)	Same as Primary Standard
SO_2	Annual Arithmetic Mean	0.030 ppm (80 μg/m^3)	----
	24 Hours [a]	0.14 ppm (365 μg/m^3)	----
	3 Hours [a]	----	0.5 ppm (1,300 μg/m^3)
Pb	Quarterly Average	1.5 μg/m^3	Same as Primary Standard

Pollutant	Averaging Time	National Standard	
		Primary	Secondary

Sources: USEPA 2008a

Notes: Parenthetical values are approximate equivalent concentrations.

[a] Not to be exceeded more than once per year.

[b] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

[c] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1. (b) As of June 15, 2005, USEPA revoked the 1-hour ozone standard in all areas except the 14 8-hour ozone nonattainment Early Action Compact Areas.

[d] To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50 μg/m^3.

[e] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 μg/m^3.

[f] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m^3.

[g] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

U.S. Supreme Court declared that carbon dioxide (CO_2) and other greenhouse gases are air pollutants under the CAA. The Court declared that the USEPA has the authority to regulate emissions from new cars and trucks under the CAA.

Many gases exhibit these “greenhouse” properties. The sources of the majority of greenhouse gases come mostly from natural sources but are also contributed to by human activity.

3.2.2 Environmental Setting

The Project is within Yuma County, Arizona. Yuma County is within the Mohave-Yuma Intrastate Air Quality Control Region (MYAQCR). The MYAQCR encompasses Yuma and Mohave counties, Arizona. Yuma County has been designated as a Federal moderate nonattainment area for PM_{10}, and attainment/unclassified for all other criteria pollutants. Air quality in this region is monitored by the ADEQ.

3.2.3 Effects of the Project

The Federal *de minimis* threshold emissions rates were established by USEPA in the General Conformity Rule to focus analysis requirements on those Federal actions with the potential to substantially affect air quality. **Table 3-2** presents these thresholds, by regulated pollutant. As shown in **Table 3-2**, *de minimis* thresholds vary depending on the severity of the nonattainment area classification.

According to 40 CFR 93.153, a conformity determination is required for each pollutant where the total of direct and indirect emissions in a nonattainment or maintenance area caused by a Federal action would equal or exceed any of the limits shown in **Table 3-2**. Since Yuma County has been designated as a Federal moderate nonattainment area for PM_{10}, direct or indirect PM_{10} emissions above 100 tpy would require a conformity determination.

The USEPA has not promulgated an ambient standard or *de minimis* level for CO_2 emissions for Federal actions, so there is no standard value to compare an action against in terms of meeting or violating the standard.

Construction Activities

The construction activities, anticipated to occur for 60 days, will generate total suspended particulate and PM_{10} emissions as fugitive dust from ground-disturbing activities (e.g., minor grading and trenching, removal of spoils and berm) and from combustion of fuels in construction equipment. Fugitive dust emissions will be greatest during the initial site-preparation activities and will vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions. The quantity of uncontrolled fugitive dust

Table 3-2. Conformity *de minimis* Emissions Thresholds

Pollutant	Status	Classification	***de minimis*** **Limit (tpy)**
O_3 (measured as NO_x or VOCs)	Nonattainment	Extreme	10
		Severe	25
		Serious	50
		Moderate/marginal (inside ozone transport region)	50 (VOCs)/100 (NO_x)
		All others	100
	Maintenance	Inside ozone transport region	50 (VOCs)/100 (NO_x)
		Outside ozone transport region	100
CO	Nonattainment/ maintenance	All	100
PM_{10}	Nonattainment/ maintenance	Serious	70
		Moderate	100
		Not Applicable	100
$PM_{2.5}$ (measured directly, as SO_2, or as NO_x)	Nonattainment/ maintenance	All	100

SO_2	Nonattainment/ maintenance	All	100
NO_x	Nonattainment/ maintenance	All	100

Source: 40 Code of Federal Regulations (CFR) 93.153

emissions from a construction site is proportional to the area of land being worked and the level of construction activity. Estimated ground disturbance associated with the Project will total approximately 275 acres and will occur in stages as sections are constructed. CBP will develop a Dust Control Plan and implement best available control measures for PM_{10} during construction and earthmoving activities.

Regulated pollutant emissions associated with the Project will not contribute to or affect local or regional attainment status with the NAAQS. The Project will generate minor air pollutant emissions from the construction activities, the operation of an emergency generator, and a slight increase in maintenance activities.

Construction operations will also result in emissions of criteria pollutants as combustion products from construction equipment. These emissions will be of a temporary nature. For purposes of this analysis, the Project duration and affected Project site area that will be disturbed was used to estimate fugitive dust and all other criteria pollutant emissions. The construction emissions presented in **Table 3-3** include the estimated annual construction PM_{10} emissions associated with the Project. **Appendix G** contains the detailed spreadsheets for calculation of air emissions. These emissions will produce elevated short-term PM_{10} ambient air concentrations. However, the effects will be temporary, and will fall off rapidly with distance from the construction sites. Uncontrolled fugitive dust emissions (PM_{10} and $PM_{2.5}$) from the Project might exceed *de minimis* threshold levels (100 tpy) for Yuma County. However, CBP will develop a Dust Control Plan and implement best available control measures for PM_{10} and $PM_{2.5}$ during construction and earthmoving activities such as frequent watering and covering exposed dust piles to reduce fugitive dust emissions by 50 percent. With the implementation of the Dust Control Plan and best available control measures, construction fugitive dust emissions will not exceed the *de minimis* threshold limits and will not exceed 10 percent of the regional air emissions values.

Table 3-3. Total Construction Emissions Estimates

Description	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Construction Combustion Emissions	3.37	0.21	1.27	0.07	0.21	0.20
Construction Fugitive Dust Emissions	--	--	--	--	83.19	8.32

Construction Generator Emissions	6.03	0.49	1.30	0.40	0.42	0.40
Maintenance Emissions	0.31	0.04	0.29	0.0003	0.01	0.01
Total Project Emissions	**9.71**	**0.74**	**2.86**	**0.46**	**83.86**	**8.93**
Federal *de minimis* Threshold	NA	NA	NA	NA	100	NA
MYAQCR Regional Emissions	22,973	21,200	143,134	1,214	20,173	5,876
Percent of MYAQCR Regional Emissions	**0.042%**	**0.004%**	**0.002%**	**0.037%**	**0.42%**	**0.15%**

Source: USEPA 2007

Note: Total $PM_{10/2.5}$ fugitive dust emissions assume a 50 percent control efficiency (USEPA 2006).

Specific information describing the types of construction equipment required for a specific task, the hours the equipment is operated, and the operating conditions vary widely from project to project. For purposes of analysis, these parameters were estimated using established methodologies for construction and experience with similar types of construction activities. Combustion by-product emissions from construction equipment exhausts were estimated using USEPA's NONROAD Model emissions factors for construction equipment. As with fugitive dust emissions, combustion emissions will produce slightly elevated air pollutant concentrations. Early phases of construction projects involve heavier diesel equipment and earthmoving, resulting in higher NO_x and PM_{10} emissions. However, the effects will be temporary, fall off rapidly with distance from the construction site, and will not result in any long-term effects.

The Project is projected to require six diesel-powered generators to power construction equipment. These generators are estimated to be approximately 75 horsepower each and operated approximately 8 hours per day for 60 working days. Operational emissions associated with the Project are shown in **Table 3-3**. The emissions factors and estimates were generated based on guidance provided in USEPA AP-42, Volume I, *Stationary Internal Combustion Sources*.

The Project is projected to require six diesel-powered generators to power construction equipment. These generators are estimated to be approximately 75 horsepower each and operated approximately 8 hours per day for 60 working days. In addition, approximately 30 portable light units are projected to be required for construction activities. The construction lighting is powered by 8 horsepower diesel generators and operate approximately 12 hours per day for 60 working days. Operational emissions of construction generators associated with the Project are shown in **Table 3-3**. The emissions factors and estimates were generated based on guidance provided in USEPA AP-42, Volume I, *Stationary Internal Combustion Sources*.

Operations and Maintenance Activities. Minor long-term adverse impacts on air quality will be expected from operations and maintenance activities. The

Project will generate air pollutant emissions from the continuation of operations and increased maintenance activities along the Project corridor. Minor, long-term adverse effects will be expected from increased maintenance. The estimated annual air emissions from long-term vehicle operations and maintenance activities are shown in **Table 3-4**.

Table 3-4. Total Operations and Maintenance Vehicle Emissions Estimates

NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO_2 (tpy)
0.31	0.039	0.29	0.0003	0.011	0.010	35.35

The Project could result in an overall decrease in ground disturbance in undisturbed areas during operations. The Project will not be expected to increase off-road operations; therefore, operations will be expected to have a negligible contribution to criteria pollutant emissions from border-patrol operations.

The construction of new tactical infrastructure will increase infrastructure maintenance activities within the USBP Yuma Sector. It is anticipated that future maintenance of tactical infrastructure will be conducted by contractors, and will primarily consist of welding and fence section replacements, as needed. In addition some maintenance activities will require the use of a fork lift to clear sand as needed from fencing. Air emissions from maintenance activities are not expected to exceed thresholds above *de minimis* levels for criteria pollutants and will have a negligible contribution to the overall air quality in the MYAQCR, as shown in **Table 3-3** (USEPA 2007).

Greenhouse Gases. The Project will result in short-term CO_2 emissions from the operation of construction vehicles and generators. Operation of construction vehicles will result in an estimated 504 tons of CO_2, and operation of generators will result in an estimated 400 tons of CO_2. Therefore, short-term greenhouse gas emissions associated with construction activities will total approximately 624 tons of CO_2.

USBP Yuma Sector currently patrols along the border. The vehicles used for surveillance and patrol of the existing border areas are currently generating CO_2; therefore, no net increase of CO_2 emissions will be expected. Maintenance of tactical infrastructure will increase under the Project, which could result in CO_2 emissions of approximately 35 tons per year (tpy).

The USEPA has estimated that the total greenhouse emissions for Arizona were 89 million metric tons of carbon equivalent (MMTCE) in 1990 (Eredux.com 2008). The short-term CO_2 emissions associated with construction (624 tons) represent approximately 0.001 percent of the estimated Arizona CO_2 inventory. Long-term increases in CO_2 emissions will result from maintenance activities (35 tpy) representing negligible fractions of the estimated Arizona CO_2 inventory. The Project will be expected to have a negligible contribution to CO_2 and greenhouse gases.

Summary. As shown in **Tables 3-3** and **3-4**, emissions from the Project will not exceed the *de minimis* thresholds for the MYAQCR and will be less than 10 percent of the emissions inventory for MYAQCR (USEPA 2008a). Minor adverse impacts on local air quality will be anticipated from implementation of the Project.

A conformity determination in accordance with 40 CFR 93-153(1) is not required, as the total of direct and indirect emissions from the Project will not be regionally significant (e.g., the emissions are not greater than 10 percent of the MYAQCR emissions inventory). Emissions factors, calculations, and estimates of emissions for the Project are shown in detail in **Appendix G**.

3.3 NOISE

3.3.1 Definition of the Resource

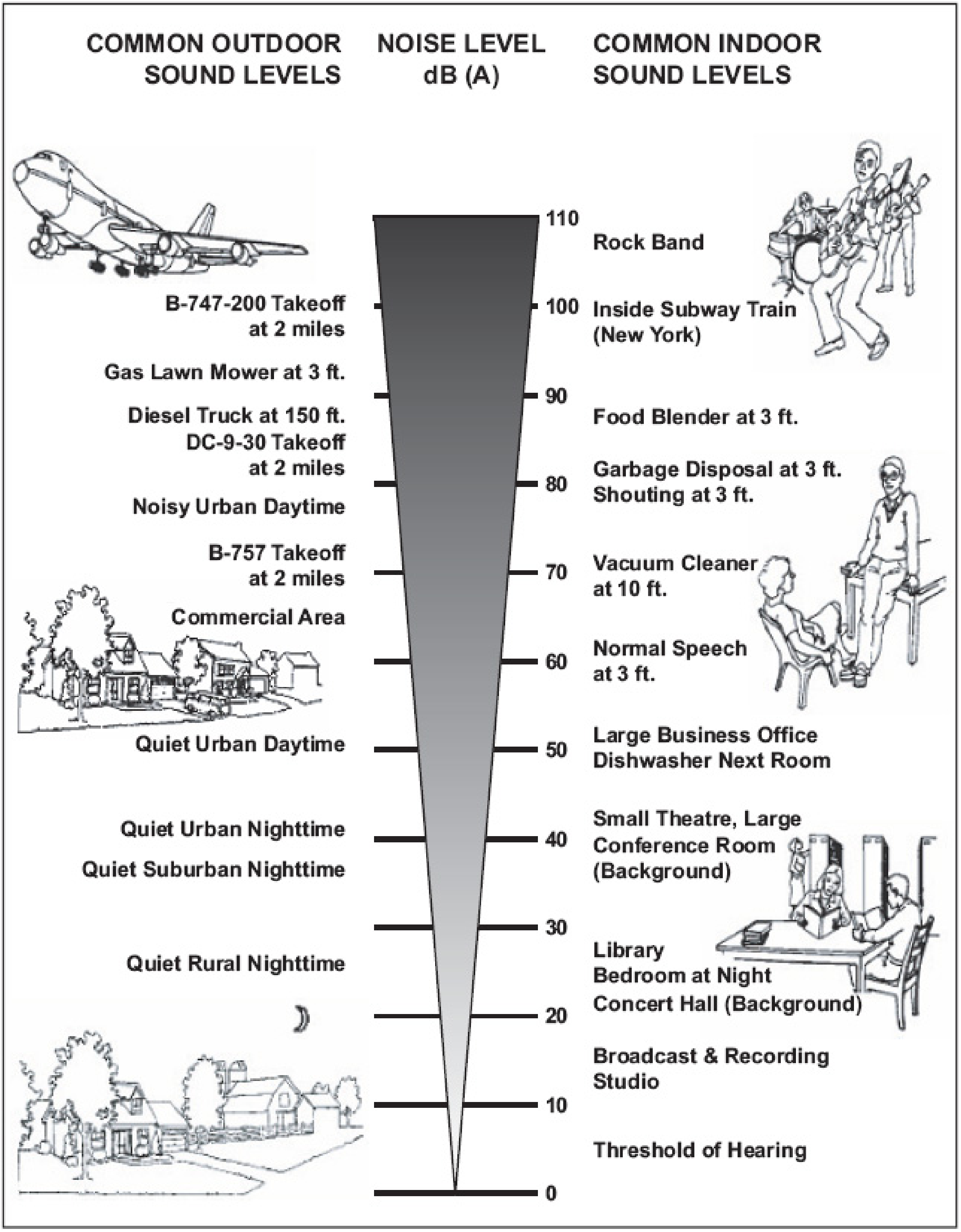
Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws included in the waiver,, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations with respect to noise.

Noise and sound share the same physical aspects, but noise is considered a disturbance while sound is defined as an auditory effect. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Noise can be intermittent or continuous, steady or impulsive, and can involve any number of sources and frequencies. It can be readily identifiable or generally nondescript. Human response to increased sound levels varies according to the source type, characteristics of the sound source, distance between source and receptor, receptor sensitivity, and time of day. How an individual responds to the sound source will determine if the sound is viewed as music to one's ears or as annoying noise. Affected receptors are specific (i.e., schools, churches, or hospitals) or broad (e.g., nature preserves or designated districts) areas in which occasional or persistent sensitivity to noise above ambient levels exists. Predictors of wildlife response to noise include noise type (i.e., continuous or intermittent), prior experience with noise, proximity to a noise source, stage in the breeding cycle, activity, and age. Potential impacts of noise on wildlife are discussed in **Chapter 3.8**.

Sound is defined as a particular auditory effect produced by a given source, for example the sound of rain on a rooftop. Sound is measured with instruments that record instantaneous sound levels in decibels. A-weighted sound level measurement is used to characterize sound levels that can be sensed by the human ear. “A-weighted” denotes the adjustment of the frequency range for what the average human ear can sense when experiencing an audible event. Noise levels associated with construction equipment, vehicle operations, and aircraft operations are analyzed using dBA. C-weighted sound level measurement correlates well with physical vibration response of buildings and other structures to airborne sound. Impulsive noise resulting from demolition activities and the discharge of weapons are assessed in terms of C-weighted decibels (dBC).

Most people are exposed to sound levels of 50 to 55 A-weighted decibels (dBA) or higher on a daily basis. Studies specifically conducted to determine noise impacts on various human activities show that about 90 percent of the population is not significantly bothered by outdoor sound levels below 65 dBA (USEPA 1974).

Ambient Sound Levels. Noise levels in residential areas vary depending on the housing density and location. As shown in **Figure 3-1**, a suburban residential area is about 55 dBA, which increases to 60 dBA for an urban residential area, and 80 dBA in the downtown section of a city.



Source: Landrum & Brown 2002

Figure 3-1. Common Noise Levels

Construction Sound Levels. Building construction, modification, and demolition work can cause an increase in sound that is well above the ambient level. A variety of sounds come from graders, pavers, trucks, welders, and other work processes. **Table 3-5** lists noise levels associated with common types of construction equipment that are likely to be used during the construction of the Project. Construction equipment usually exceeds the ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban area.

Table 3-5. Predicted Noise Levels for Construction Equipment

Construction Category and Equipment	Predicted Noise Level at 50 feet (dBA)
Clearing and Grading	
Bulldozer	80
Grader	80–93
Truck	83–94
Roller	73–75
Excavation	
Backhoe	72–93
Jackhammer	81–98
Building Construction	
Concrete mixer	74–88
Welding generator	71–82
Pile driver	91–105
Crane	75–87
Paver	86–88

Source: USEPA 1971

3.3.2 Environmental Setting

The fence segments will be constructed within the Roosevelt Easement adjacent to the CPNWR. The ambient acoustical environment in the CPNWR is low since natural noise sources, such as birds, and light vehicular and aircraft traffic.

Tacna, Arizona, is the closest community north of the U.S./Mexico international border in the vicinity of the Project. Noise from this community is unlikely to contribute to the ambient acoustical environment at the Project site since it is approximately 30 miles north.

The primary access road that will be used by construction vehicles under the Project will be Camino del Diablo, approximately 3.5 miles north of the U.S./Mexico international border. This route is currently used by privately owned vehicles and occasionally by four-wheel-drive vehicles for recreational purposes. Consequently only a small number of vehicles normally use this route. Mexican Route 2 is on the southern side of the border, approximately 3 to 4 miles south of the Project site.

3.3.3 Effects of the Project

Short-term minor adverse impacts are expected from the Project. Sources of noise from the implementation of the Project include operation of construction equipment, including limited use of pile drivers, and noise from construction vehicles. Noise from construction activities and vehicle traffic can impact wildlife as well as humans. Impacts on nesting, feeding, and migration could occur on various species due to construction noise. For specific information regarding impacts on wildlife from noise, see **Chapter 3.8**.

Blast Noise. Blasting could potentially occur during vehicle fence construction. Blast noise was modeled with the Blast Noise Prediction computer program, BNoise 2.0, using an application that estimates single event noise levels. The noise from blasting activities varies depending on the type of explosive, the amount, and the type of material that will be subject to the explosion. To estimate the noise from blasting under the Proposed Action, several different amounts of TNT were used, ranging from 2.2 pounds to 8.8 pounds. Noise from blasting generates an average noise level of approximately 117 to 126 dBC at 100 feet. Blasting activities will only occur during the construction period.

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The Cabeza Prieta National Wildlife Refuge is adjacent to the Project area. Consequently, animals could experience short-term impacts from noise if they were in the vicinity of vehicle fence during blasting activities. The closest municipality is approximately 39 miles north; consequently, populations will not likely be impacted by noise from blasting activities.

Construction Noise. The construction of the tactical infrastructure will result in noise impacts on populations in the vicinity of the sites. Construction of the fence sections and the patrol roads adjacent to the fence will result in noise from grading and building activities. Populations that could be impacted by construction noise include adjacent residents and personnel or visitors to CPNWR. Noise from construction activities was estimated using several different pieces of construction equipment operating simultaneously (see **Table 3-5**). Because noise attenuates over distance, a gradual decrease in the noise level occurs the farther a receptor is away from the source of noise. Consequently, noise levels from construction equipment will decrease as the distance increases from the source. At 50 feet the noise level will be approximately 85 dBA, at 300 feet the noise level will be approximately 70 dBA, and at 5,280 feet (i.e., 1 mile) the noise level will be approximately 45 dBA. The closest permanent residence that could be identified in aerial photographs is almost 25 miles from the Project Corridor. At this distance, noise from grading is expected to be approximately 23 dBA and noise from construction activities is expected to be approximately 17 dBA, which is very low.

Residents of the planned Project campsite that will coincide with fence construction activities will be approximately 3 miles from the construction areas. At this distance, off-duty workers at the campsites will experience noise levels of approximately 42 and 35 dBA from grading and construction activities, respectively. It is unlikely that visitors to CPNWR will chose to camp adjacent to a construction site which would be contrary to their desire for a wilderness experience. Campers will more likely chose locations at sufficient distance from the worksite so as to minimize their impacts from noise.

Implementation of the Project is expected to have temporary impacts on the noise environment from the use of heavy equipment during construction activities. However, the closest resident is approximately 25 miles from the Project Corridor, and therefore, it is anticipated that implementation of the Project will have negligible short-term adverse impacts as a result of the construction activities.

Vehicular Noise. Noise impacts from increased construction traffic will be temporary. Although the access roads do not pass by many residential areas, construction vehicles from Yuma will traverse on major highways and roads that pass by residential areas. Therefore, it is anticipated that the Project will have short-term minor adverse noise impacts as a result of the increase in traffic, most notably in the towns east of Yuma such as Tacna and Wellton.

3.4 LAND USE AND RECREATION

3.4.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws included in the waiver, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with land use.

The term “land use” refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws. There is, however, no nationally recognized convention or uniform terminology for describing land use categories. As a result, the meanings of various land use descriptions, “labels,” and definitions vary among jurisdictions. The Yuma County, Arizona Zoning Ordinance serves as the jurisdictional source of zoning for the Project corridor (Yuma County Department of Development Services 2006).

Two main objectives of land use planning are to ensure orderly growth and compatible uses among adjacent property parcels or areas. Tools supporting land use planning include master plans/management plans and zoning regulations.

3.4.2 Environmental Setting

All four sections of vehicle fence will be wholly contained within the Roosevelt Reservation and CPNWR. Access to the construction area will require the improvement or construction of access roads on CPNWR land designated as Wilderness. Additional access will also be provided from the western north-south access road on the adjacent BMGR property to the west. Staging areas will be placed within the BMGR and CPNWR properties. **Figure 2-3** shows the location of the CPNWR and BMGR in relation to the Project area. The following is a description of the specific land uses that occur in the vicinity of the Project:

Cabeza Prieta National Wildlife Refuge

According to the Yuma County, Arizona Zoning Ordinance, the CPNWR is zoned as an Open Space, Recreation and Resources Zoning District (OS/RR). The OS/RR provides for recreational opportunities and space for public and private recreational parks, resorts, and similar facilities apart from significant urban development densities. This district also provides, preserves, and protects open space or natural areas from incompatible development (Yuma County Department of Development Services 2006).

National Wildlife Refuges (NWRs) are a designation for certain protected areas of the United States managed by the USFWS. The NWR system is a national network of lands and waters managed for the conservation, management, and restoration of wildlife and plant resources and their habitats within the United States. The system consists of more than 500 refuges across the nation. The CPNWR plays a critical role in the recovery and protection of rare and sensitive species such as the federally endangered Sonoran pronghorn and the desert bighorn sheep, as well as the conservation of a diversity of desert wildlife representative of the Sonoran Desert. CPNWR is relatively accessible to visitors due to the non-wilderness road corridors along Camino del Diablo and Christmas Pass Road, and a network of administrative trails throughout (USFWS 2006).

Title III of the Arizona Desert Wilderness Act of 1990 designated approximately 93 percent (803,418 acres) of the CPNWR as a Wilderness in accordance with the Wilderness Act of 1964. This designation requires additional restrictions such as the prohibition of permanent or temporary roads, use of motorized vehicles or equipment, landing of aircraft, and structures and installations, except as minimally required to manage the area as wilderness. The Arizona Desert Wilderness Act of 1990 specifically states that designation of wilderness lands within the CPNWR will not preclude or otherwise affect continued low-level overflights by military aircraft over the NWR or the maintenance of existing associated ground instrumentation; nor will it preclude or otherwise affect continued border operations by DHS and its bureaus or the Drug Enforcement Administration (USFWS 2006).

The goals of the CPNWR are as follows:

1. *Wildlife and Habitat Management:* protect, maintain, enhance, or restore the diversity and abundance of wildlife species and ecological communities of the Sonoran Desert represented at CPNWR
2. *Wilderness Stewardship:* protect and conserve refuge wilderness employing strategies of wildlife and plant conservation that will conserve, maintain, and, where possible, restore the wilderness character of CPNWR
3. *Visitor Services Management:* provide visitors with compatible, high-quality wildlife-dependent recreational and educational experiences designed to foster better appreciation, understanding, and protection of the plant, animal, and wilderness resources
4. *Cultural Resources Management:* protect, maintain, and interpret cultural and historic resources on CPNWR, in cooperation with Tribal governments and the State of Arizona to benefit present and future generations (USFWS 2006).

Roosevelt Reservation

This is an area of land President Theodore Roosevelt reserved from entry in 1907 and set apart as a public reservation all public lands within 60 feet of the boundary between the United States and Mexico within the State of California and the Territories of Arizona and New Mexico. Known as the "Roosevelt Reservation," this land withdrawal was found "necessary for the public welfare ... as a protection against the smuggling of goods." The proclamation excepted from the reservation all lands, which, as of its date, were (1) embraced in any legal entry; (2) covered by any lawful filing, selection, or rights-of-way duly recorded in the proper U.S. Land Office; (3) validly settled pursuant to law; or (4) within any withdrawal or reservation for any use or purpose inconsistent with its purposes (CRS 2006).

Barry M. Goldwater Range

The BMGR, consisting of approximately 1.9 million acres, is operated by the 56th Fighter Wing Range Management Office, Airspace and Range Operations Office. It serves the U.S. Air Force and the U.S. Marine Corps as an armament and high-hazard testing area, a training area for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support, and a place to develop equipment and tactics (GlobalSecurity.org 2008). The BMGR contains 57,000 cubic miles of airspace for pilot training activities and simulations. The Luke Air Force Base Range Management Office manages the eastern range activities and Marine Corps Air Station Yuma oversees operations on the western portion. Approximately 6 percent of the land is intensively used for roads, targets, and support areas and the remaining 94 percent is relatively undisturbed Sonoran Desert. Military users drop live ordnance on five pinpoint targets; however 98 percent of the weapons dropped in the complex are inert practice bombs. Most of the land is a safety buffer for low-flying fighter aircraft, providing refuge-like conditions for wildlife, including a number of protected and endangered species (USAF 2008).

In 1939, President Roosevelt set aside approximately one-third of the BMGR (822,000 acres) as part of the 861,000-acre CPNWR. Although more than 95 percent of the CBNWR is within the BGMR, military activities in the CPNWR portion are limited to four remotely located radio transmitters and flight training operations in the overlying airspace. Jurisdiction for all lands within the CPNWR belongs to the USFWS (Town of Gila Bend 2008).

3.4.3 Effects of the Project

The installation of the vehicle fence, staging areas, and access roads will result in short-term and long-term minor to moderate adverse and beneficial impacts on land use. The severity of the impact will vary depending on the amount of changed land use, degree of incompatibility of the tactical infrastructure with existing land use, or the degree to which access to various land use types is restricted or limited by the Project. The expected effects of the Project for each land use are discussed below.

Cabeza Prieta National Wildlife Refuge

1. *Wildlife and Habitat Management:* Short-term minor adverse impacts on wildlife are expected due to disturbance from construction activities. Vegetation removal and grading activities will occur where necessary, thereby removing or altering wildlife habitat. This will result in minor adverse short-term impacts due to a temporary loss of habitat and long-term adverse impacts due to loss of vegetation species that take years to mature (e.g., saguaro cactus); however, impacts from construction activities are expected to be localized. Short-term and long-term minor adverse impacts on wildlife and habitat are expected from the construction

and utilization of access roads and staging areas. Access roads to the fence construction corridor will be narrow to minimize impacts on designated Wilderness areas. Wherever possible, existing roads will be used as access roads. Construction staging areas will be placed in previously disturbed areas to the maximum extent possible.

Long-term moderate beneficial impacts on wildlife species and habitat are expected due to a reduction of disturbance to the CPNWR from cross-border violator vehicular traffic. Construction and operation of tactical infrastructure will increase border security in the UBSP Yuma Sector and could result in a change to illegal traffic patterns. However, changes to illegal alien traffic patterns result from a myriad of factors; and therefore, are considered unpredictable and beyond the scope of this ESP.

Long-term adverse impacts will occur due to an increase in pedestrian traffic within the CPNWR. Restriction of vehicular access across the U.S./Mexico international border in the Project corridor could increase illegal cross-border violator attempts to cross on foot. The disturbance or destruction of habitat related to pedestrian traffic is expected to be less than vehicular traffic.

2. *Wilderness Stewardship:* Construction activities are expected to have a moderate short-term adverse impact on the wilderness character of the CPNWR due to a presence and use of heavy construction equipment and noise during the construction process. Impacts are not considered to be major due to the localized nature of the activity and relatively small affected land area in comparison to the entire refuge. Short-term minor adverse impacts are also expected due to the use of motorized vehicles and equipment on access roads, staging areas, and along the fence construction sites, which is normally prohibited within wilderness areas. A long-term moderate beneficial impact is expected due to a reduction in illegal cross-border vehicular traffic, which has created a vast system of illegal vehicle roads within the CPNWR, a reduction of litter left by IAs within the CPNWR; a reduction in habitat degradation from illegal activity; and a reduction in new invasive plant introductions (USFWS 2006).

3. *Visitor Services Management:* Minor short-term adverse impacts on visitor services will be expected due to construction activities. A relatively minimal amount of area within CPNWR will be off limits due to construction activities. The wilderness experience for visitors will be adversely affected from construction activity and related noise. Long-term indirect beneficial impacts are expected to occur as a result of decreased cross-border violators coming into the CPNWR and an increase in visitor safety. Additionally, long-term beneficial impacts will be expected due to a reduction in roads created by illegal vehicular traffic, vandalism, and litter.

4. *Cultural Resources Management:* Cultural resources surveys will be conducted within the Project corridor; therefore, impacts on cultural resources are expected to be minor. Short-term, minor adverse impacts

on Camino del Diablo, a four-wheel-drive road listed on the National Register of Historic Places (NRHP), are expected due to the use of a portion of this road as an access road. Camino del Diablo is open to permitted four-wheel-drive traffic; therefore, the effect of construction crew traffic on this cultural resources management goal is expected to be minor.

Roosevelt Reservation

Long-term beneficial impacts are expected for the land use purposes of the Roosevelt Reservation. Since the Reservation was created to prevent the smuggling of goods, the presence of the vehicle fence will assist in this land use purpose.

Barry M. Goldwater Range

The access road that will cross the BMGR is pre-existing; therefore, there are no expected impacts on the BMGR from this access road with the exception of minor short-term impacts related to increased vehicular traffic. The staging area within the BMGR will be placed within an undeveloped and unused portion of the range. Impacts, if any, from this staging area on land use of the BMGR will be short-term and minor. The construction and use of the access road and staging area within the BMGR are not anticipated to interfere with military operations.

3.5 AESTHETICS

3.5.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws included in the waiver, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with visual resources.

Visual resources include both natural and man-made features that influence the visual appeal of an area for residents and visitors. Visual resources can be defined as the visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features).

Various Federal agencies have developed Visual Management programs to assist in the analysis and mitigation of impacts on visual resources resulting from their various activities. Within the Department of the Interior which has overarching responsibility for several Land Management Agencies, including the Bureau of Land Management (BLM), National Park Service, and the USFWS, CBP has determined that the most appropriate Visual Management system to analyze impacts from the Project has been developed by BLM, In order to meet its responsibility to maintain the scenic values of public lands, BLM has developed a Visual Resources Management (VRM) system based on human perceptions and expectations in the context of the existing landscape. Different levels of scenic values require different levels of management. Determining how an area should be managed first requires an assessment of the area's scenic values. For management purposes, BLM has developed Visual Resource Classes.

1. *Class I Objective.* The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes but also allows very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
2. *Class II Objective.* The objective of this class is to preserve the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities are allowed, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. New projects can be approved if they blend in with the existing surroundings and don't attract attention.
3. *Class III Objective.* The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities might attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. New projects can be approved that are not large-scale, dominating features.
4. *Class IV Objective.* The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities can dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements of predominant natural features (BLM 2003a).

3.5.2 Environmental Setting

As discussed in **Chapter 3.4**, the majority of the Project will be adjacent to Federal lands managed by the USFWS and the Department of Defense (DOD). The area surrounding Section CV-2 falls into two classes. The CPNWR is classified as a Class I Visual Resource and the DOD-managed lands to the west of CPNWR and the Roosevelt Reservation to the south are designated as a Class III Visual Resource.

The Project region and site are characterized by deep, northwest-trending, alluvium-filled basins separated by linear mountain ranges (Sonoran Region of the Basin and Range Province of North America). The Sonoran Desert is young having developed over the past 8,000–9,000 years; therefore it lacks a distinctive faunal species component evolved to the extant conditions (USFWS 2006). Relatively recent volcanic activity is evident with some slopes covered by gravel and cobble of volcanic origin. The Project area physiography includes the footslopes of the Tinajas Altas Mountains on the BMGR on its western end and the footslopes of the Cabeza Prieta and Tule mountains on its eastern terminus. The Lechuguilla Desert, a relatively flat alluvial plain dissected by many desert washes, occurs between these rugged desert mountain ranges

3.5.3 Effects of the Project

To properly assess the contrasts between the existing conditions and the Project, it is necessary to break each down into the basic features (i.e., landform/water, vegetation, and structures) and basic elements (i.e., form, line, color, and texture) so that the specific features and elements that cause contrast can be accurately identified.

General criteria and factors used when rating the degree of contrast are as follows:

- *None.* The element contrast is not visible or perceived.
- *Weak.* The element contrast can be seen but does not attract attention.
- *Moderate.* The element contrast begins to attract attention and dominate the characteristic landscape.
- *Strong.* The element contrast demands attention, cannot be overlooked, and is dominant in the landscape.

When applying the contrast criteria, the following factors are considered:

1. *Distance*. The contrast created by a Project usually is less as viewing distance increases.
2. *Angle of Observation*. The apparent size of a Project is directly related to the angle between the viewer's line-of-sight and the slope upon which the Project is to take place. As this angle nears 90 degrees (vertical and horizontal), the maximum area is viewable.
3. *Length of Time the Project Is In View*. If the viewer can only view the Project for a short period of time, the contrast might not be of great concern. If the Project can be viewed for a long period of time, the contrast could be very significant.
4. *Relative Size or Scale*. The contrast created by the Project is directly related to its size and scale as compared to the immediate surroundings.

5. *Season of Use.* Contrast ratings should consider the physical conditions that exist during the heaviest or most critical visitor-use season, such as snow cover and tree defoliation during the winter, leaf color in the fall, and lush vegetation and flowering in the spring.
6. *Light Conditions*. The amount of contrast could be substantially affected by the light conditions. The direction and angle of light can affect color intensity, reflection, shadow, form, texture, and many other visual aspects of the landscape. Light conditions during heavy periods must be a consideration in contrast ratings.
7. *Recovery Time*. The amount of time required for successful revegetation should be considered. Few projects meet the VRM management objectives during construction activities. Recovery usually takes several years and goes through several phases (e.g., bare ground to grasses, to shrubs, to trees).
8. *Spatial Relationships*. The spatial relationship within a landscape is a major factor in determining the degree of contrast.
9. *Atmospheric Conditions.* The visibility of a Project due to atmospheric conditions such as air pollution or natural haze should be considered.
10. *Motion.* Movements such as waterfalls, vehicles, or plumes draw attention to a Project (BLM 2003b).

The Project will adversely impact visual resources both directly and indirectly. Construction of tactical infrastructure will result in the introduction of new temporary (e.g., heavy equipment, supplies) and permanent (e.g., fencing and patrol roads) visual elements into existing viewsheds. Clearing and grading of the landscape in the Project corridor during construction will result in changes in some visual elements.

The construction activity associated with the Project will result in both temporary and permanent moderate contrasts to Classes I and III Visual Resources.

Impacts on aesthetic and visual resources will include short-term impacts associated with the construction phase of the Project and use of staging areas, recurring impacts associated with monitoring and maintenance, and long-term impacts associated with the completed Project. Impacts can range from weak, such as the impacts on visual resources adjacent to the Project corridor when seen from a distance or when views of fences are obstructed by the terrain, to strong, such as the intrusion of fence sections into high-quality views of the CPNWR. **Figures 3-2**, **3-3,** and **3-4** display the degree to which the tactical infrastructure is visible from various distances in areas of uninterrupted vistas.

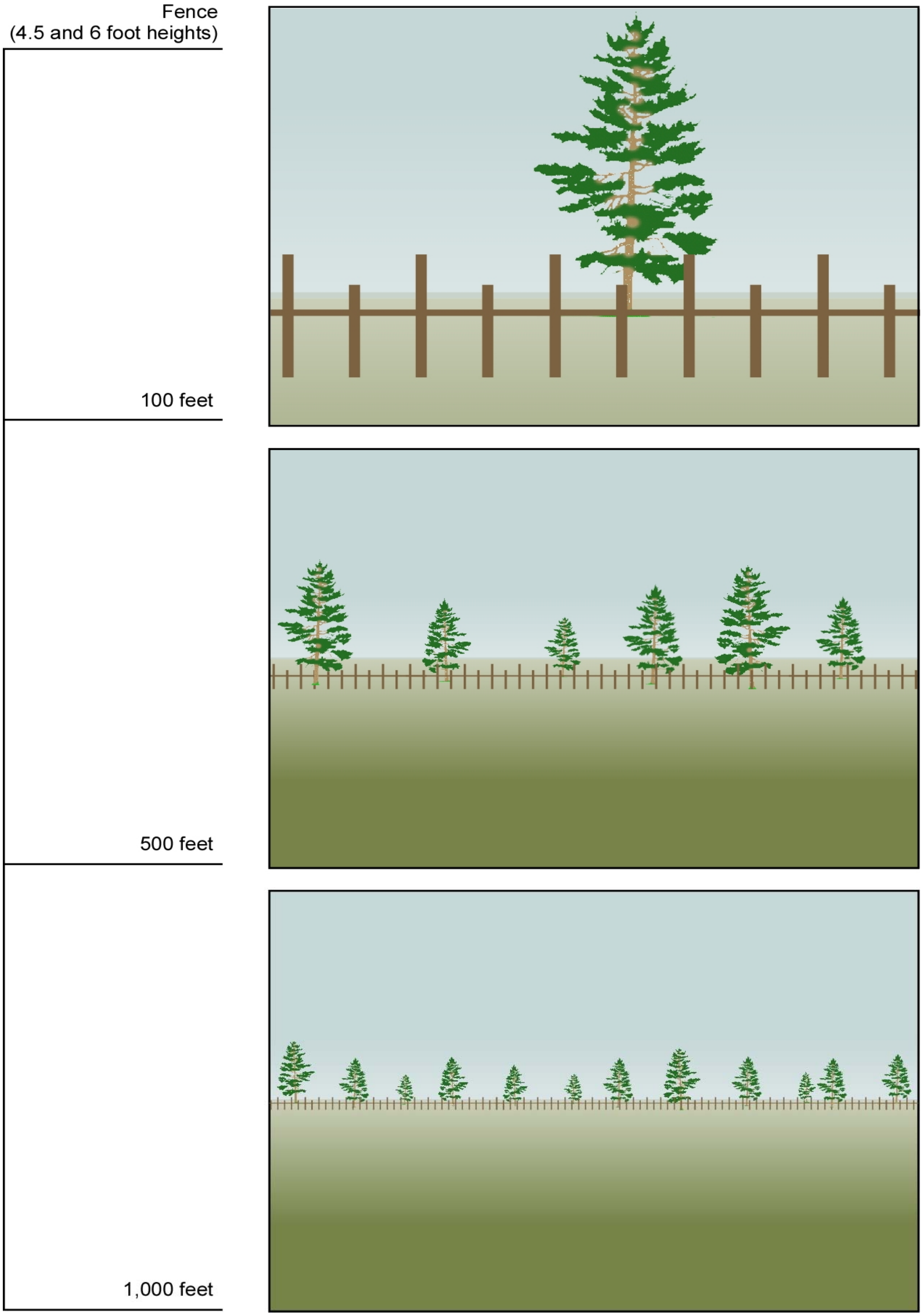

Figure 3-2. Schematic Showing Visibility of Fencing at Various Distances

Figure 3-3. Photograph of Landscape Showing Fencing

Figure 3-4. Photograph of Fencing and Cabeza Prieta Mountains

The construction of access roads and vehicle fences in and adjacent to a Class I Visual Resource area is a strong contrast to the CPNWR and also represents a moderate to strong contrast in areas of lesser class designation. The following paragraphs discuss factors that might offset the strong contrasts.

In some areas of the Project, the fence will be screened from view by elevation and undulating terrain. Public viewing is also limited in this area of CPNWR because of low visitation frequency, due to the general lack of access and hostile conditions.

Beneficial impacts are also possible through viewers positively associating the fence with a feeling of greater security. This increased security also lends itself to a potential reduction in visual impacts elsewhere in the CPNWR through the limitation of unwanted off-road activity and the accompanying reduction on scarring and contrast to the natural landscape. Additionally, limiting human activity to those that have an appreciation for wilderness areas will likely result in less unsightly litter and trash.

Over time, the changes to the landscape caused by construction and maintenance of access roads will dissipate substantially, therefore reducing the contrast of viewable sections of all fence segments.

There are numerous design techniques and construction practices that can be used to reduce the visual impacts from surface-disturbing projects. These methods will be used to the extent practicable, in conjunction with BLM's visual resource contrast rating process wherein both the existing landscape and the Project are analyzed for their basic elements of form, line, color, and texture. Some design techniques and construction practices that might be applicable to CPNWR include the following:

- Using irregular clearing shapes
- Hauling in or hauling out excessive earth cut or fill in sensitive viewing areas
- Rounding or warping slopes (shaping cuts and fills to appear as natural forms)
- Bending slopes to match existing landforms
- Retaining existing rock formations, vegetation, and drainage whenever possible
- Avoiding soil types that will generate strong contrasts with the surrounding landscape when they are disturbed
- Striping, saving, and replacing topsoil (6-inch surface layer) on disturbed earth surfaces
- Choosing native plant species

- Replacing soil, brush, rocks, and other construction-generated natural debris over disturbed earth surfaces when appropriate, thus allowing for natural regeneration rather than introducing an unnatural-looking cover.

3.6 GEOLOGY AND SOILS

3.6.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws included in the waiver, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with geology and soils resources.

Geology and soils resources include the surface and subsurface materials of the earth. Within a given physiographic province, these resources typically are described in terms of topography, soils, geology, minerals, and paleontology, where applicable.

Topography is defined as the relative positions and elevations of the natural or human-made features of an area that describe the configuration of its surface. Regional topography is influenced by many factors, including human activity, seismic activity of the underlying geological material, climatic conditions, and erosion. Information describing topography typically encompasses surface elevations, slope, and physiographic features (i.e., mountains, ravines, or depressions).

Site-specific geological resources typically consist of surface and subsurface materials and their inherent properties. Principal factors influencing the ability of geological resources to support structural development are seismic properties (i.e., potential for subsurface shifting, faulting, or crustal disturbance), topography, and soil stability. Soils are the unconsolidated materials overlying bedrock or other parent material. They develop from weathering processes on mineral and organic materials and are typically described in terms of their landscape position, slope, and physical and chemical characteristics. Soil types differ in structure, elasticity, strength, shrink-swell potential, drainage characteristics, and erosion potential, which can affect their ability to support certain applications or uses. In appropriate cases, soil properties must be examined for compatibility with particular construction activities or types of land use.

Prime and unique farmland is protected under the Farmland Protection Policy Act (FPPA) of 1981. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. Unique farmland is defined as land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of a specific crop when treated and managed according to acceptable farming methods. Soil qualities, growing season, and moisture supply are needed for well-managed soil to produce a sustained high yield of crops in an economic manner. The land could be cropland, pasture, rangeland, or other land, but not urban built-up land or water. The intent of the FPPA is to minimize the extent that Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. The FPPA also ensures that Federal programs are administered in a manner that, to the extent practicable, will be compatible with private, state, and local government programs and policies to protect farmland.

The provisions of the FPPA administered by the Natural Resources Conservation Service (NRCS) pertain to activities on prime and unique farmland, as well as farmland of statewide and local importance (see 7 Code of Federal Regulations [CFR] Part 658, 5 July 1984). Determination of whether an area is considered prime or unique farmland and potential impacts associated with a project are based on preparation of the Farmland Conversion Impact Rating Form AD-1006 for areas where prime farmland soils occur and by applying criteria established at Section 658.5 of the FPPA (7 CFR 658).

3.6.2 Environmental Setting

Physiography and Topography. The physiography of this setting is classified as basin and range, with multiple northwest-to-southeast trending mountain ranges. The basin and range is expansive, extending from west Texas through southern New Mexico and the southwestern half of Arizona and into the Mojave Desert. From the east to the west, the southeast-trending mountain ranges include Cabeza Prieta, Tule, Sierra Pinta, Mohawk, Bryan, Granite, Aqua Dulce, Growler, and Childs Mountain. The highest elevation is found in the northeast of the CPNWR in the Growler Mountains, with Temporal Peak reaching 3,300 feet above mean sea level (amsl) (USGS undated). The Cabeza Prieta National Wildlife Refuge encompasses 860,000 acres and is adjacent to the Project Corridor to the east.

Valleys, canyons, and washes compose the basins running parallel to the mountain ranges. Washes are shallow to deep, flat-floored channels or gullies of an intermittent stream. No permanent streams exist, and heavy rains flow through washes, retaining water for as little as a few hours or as long as several weeks (Cabeza Prieta Natural History Association undated). The two primary washes found within the Project area include the La Jolla Wash and Coyote Wash. In addition, numerous smaller unnamed washes drain the Project area. Please see **Chapter 3.7** for a discussion on hydrology.

Geology. The regional surface geology is varied, ranging from volcanic, such as basalts and intrusive granites to sedimentary rocks found in alluvial structures and drainage corridors. Normal and thrust faulting has occurred throughout the Project area but is no longer active (USFWS 2006). The geologic history of the region is characterized by multiple episodes of tectonic activity and marine transgressions and regressions (USFWS 2006). During the Mesozoic, subduction of the Pacific tectonic plate underneath of the North American plate, resulted in mountain building processes and volcanic activity known as the Laramide Orogeny (NPS undated). Within the Project area, Mesozoic-aged rocks (180 million years to 100 million years before present) are composed of volcanic, locally metamorphosed, and granitic rocks. The geology is indicative of crustal uplift and volcanic activity present during this time. The extinct cinder cones responsible for volcanic eruptions during the Mesozoic are located to the east in Monument Bluff (USGS 2000). Sediments of this age include sandstone, shale, conglomerates, and limestone, which are derived from shallow seas. The sedimentary rocks, composing basin fill range from 450 to more than 1,130 feet thick (USGS undated). During the Cenozoic Era (20 million years before present to Recent), crustal uplift and volcanic activity continued and was augmented by thrust and normal faulting and igneous intrusions. Regional and contact metamorphic rocks caused by the Laramide Orogeny exist far to the east, beyond the Project site. Cenozoic-aged rocks include basalts and unconsolidated to moderately consolidated sand, silt, clay, and minor gravel. Aside from basalts, other volcanic material includes andesitic and rhyolitic flows with volcanic tuff. Tertiary-aged deposits within the Cenozoic Era include the Helmet, Pantano, Whitetail, and Locomotive Formations (USFWS 2006).

Land subsidence is becoming an issue of concern in south-central Arizona, and is likely caused by compaction of aquifers due to groundwater depletion (University of Arizona 1992). Differential compaction of an aquifer can cause the creation of fissures, or cracks in the earth's surface, resulting in land subsidence. Two fissure springs exist within the watershed of the Project site, and are discussed further in **Chapter 3.7.1**.

Soils. Soils in the Project area have formed on valley slopes and within the alluvial fans. Valley slope soils are well-drained, deep, and exist on slopes with up to a 10 percent grade. These soils have been mapped as the Sonoita-Anthony soil association. These soils have moderate permeability, slight erosion hazards, and a low limitation to construction due to shrink-swell characteristics. Alluvial fan soils have been mapped as Coolidge-Wellton-Anthony and Rillito-Gunsight-Pinal. The Coolidge-Wellton-Anthony association exhibits moderately rapid permeability, and slight hazards from flooding and erosion. The Rillito-Gunsight-Pinal association has moderate permeability, and slight to moderate flood and erosion hazards. Both soil associations have low limitations to construction due to shrink-swell characteristics (USFWS 2006). Soils that formed on alluvial fans are relatively level and deep, with variable composition dependent upon parent material. Comprehensive soil surveys for the Cabeza Prieta area have not been conducted but are anticipated to be completed in 2009 (NRCS 2008). Therefore site-specific soil surveys will need to be conducted to determine the exact location and soil series affected by the Project and potential uses and limitations associated with the soils.

3.6.3 Effects of the Project

Physiography and Topography. The tactical infrastructure will be constructed at the base of the Tinajas Atlas Mountains to the west and extend into the Cabeza Prieta Mountains to the east, transecting the Lechuguilla Desert. In addition, access roads will be constructed and will cross several branches of the La Jolla Wash in the CPNWR. Therefore, short- and long-term minor adverse impacts on the natural topography are expected. Grading, contouring, filling, and trenching associated with the installation of the tactical infrastructure will result in minor alterations of the existing microtopography. The impact corridor will be regraded, contoured, and revegetated following tactical infrastructure installation. This will minimize modifications to existing flood-flow characteristics. The effects of the Project on hydrology, including the La Jolla Wash, are discussed in **Chapter 3.7**.

An SWPPP will be developed consistent with USEPA National Pollutant Discharge Elimination System (NPDES), Arizona Pollutant Discharge Elimination System, and ADEQ guidelines. SWPPPs will be developed and implemented as part of Project development. The plans will include site maps that show the construction site perimeter, existing and new buildings, lots, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the impact corridor. The SWPPPs will list BMPs that the discharger will use to protect stormwater runoff along with the locations of those BMPs. Additionally, the SWPPPs will contain a visual monitoring program, a chemical monitoring program for nonvisible pollutants to be implemented if there is a failure of BMPs, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Minor adverse impacts due to potential increased sheet flow as a result of grading, contouring, and trenching will be expected to be temporary and mitigated by the implementation of the BMPs developed during preparation of the SWPPP.

Geology. The 60-foot impact corridor lies on granitic mountains and relatively flat sediments and volcanic rocks. The soils are composed of sediments that include unconsolidated mixed gravel, sand, silt, and clay. The tactical infrastructure will be erected at the base of the Tinajas Atlas Mountains, which are composed of Mesozoic granite and quartz diorite (USGS 2000). Upon entering the Lechuguilla Desert, rocks are primarily sedimentary alluvial deposits. Sediments are composed of gravel, sand, and silt. Towards the eastern end of the tactical infrastructure the geology changes to volcanic basalts, agglomerates, and tuffs (USGS 2000). The landforms reflect the different rock types with the competent igneous rocks forming mountains and sedimentary deposits forming valleys.

Short- and long-term negligible to minor adverse impacts on geologic resources could occur at locations where bedrock is at the surface and blasting will be necessary to grade for fence placement or patrol road development. Geologic resources could affect the placement of the primary pedestrian fence or patrol roads due to the occurrence of bedrock at the surface, or as a result of structural instability. Site-specific geotechnical surveys will be conducted prior to construction to determine depth to bedrock. In most cases, it is expected that Project design and engineering practices will be implemented to mitigate geologic limitations to site development, such as fence design changing from post-on-rail to Normandy-style and roads being re-routed to avoid blasting.

Soils. The tactical infrastructure will be primarily underlain by moderately consolidated sediments from the Coolidge-Wellton-Anthony and Rillito-Gunsight-Pinal soil associations. These associations have a slight risk of hazard due to erosion. A slight flooding risk is also a hazard in areas where the access roads are proximal to La Jolla Wash. However, site-specific soil surveys will be necessary to determine the exact locations and soil types associated with the tactical infrastructure alignment and potential uses and limitations associated with those soils.

Short-term minor direct adverse impacts on soils are expected from soil disturbance and compaction due to grading, contouring, and trenching associated with the installation of the tactical infrastructure. Displaced soil will be properly stockpiled to prevent erosion and sedimentation and excess soils will be disposed of properly if not utilized during regrading and recontouring activities following installation of the fence. In areas where soils have not been previously disturbed by development and other land uses prior to this Project, minor adverse effects on natural soil structure and soil organisms will be expected.

Increased soil erosion as a result of the construction activities will be minimized with the implementation of BMPs established during the development of the SWPPP. Implementing these BMPs will minimize adverse effects associated with sediments that will potentially be transported from construction sites. Construction activities expected to directly impact the existing soils as a result of grading, excavating, placement of fill, compaction, and mixing or augmentation necessary to prepare the sites for development of the fence sections and patrol roads and associated utility lines will also be avoided by the proper implementation of the BMPs. Due to the semi arid climate of the region, and a prevalence of fine silt loams at locations along the alignment and access roads, wind erosion will potentially impact disturbed soils in areas where vegetation has been removed. However, following construction activities, the areas disturbed will be revegetated with native species to the maximum extent practicable to reestablish native plant communities and help stabilize soils.

No impacts on Prime Farmland will occur as a result of Project implementation. There are no prime farmland soils mapped within the Project corridor.

Soils in open areas between the tactical infrastructure sections could be adversely impacted by IAs in the areas where there will be no fence. However, changes to cross-border violator traffic patterns result from a myriad of factors and therefore are considered unpredictable and beyond the scope of this ESP.

Long-term, minor to moderate direct beneficial impacts on soils are expected as a result of an expected decrease in illegal vehicle off road traffic and the associated soil erosion and compaction within the Project area. In addition, the increased security of the vehicle fence will likely reduce the need for current USBP operational traffic within the Project area, as illegal traffic across the border will be reduced.

3.7 WATER USE AND QUALITY

3.7.1 Hydrology and Groundwater

3.7.1.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Clean Water Act (CWA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the CWA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for hydrology and groundwater.

Hydrology addresses the redistribution of water through the processes of evapotranspiration, surface runoff, and subsurface flow. Hydrology results primarily from temperature and total precipitation that determine evapotranspiration rates, topography which determines the rate and direction of surface flow, and soil properties that determine rate of subsurface flow and recharge to the groundwater reservoir. Groundwater consists of subsurface hydrologic resources. It is an essential resource that functions to recharge surface water and is used for drinking, irrigation, and industrial processes. Groundwater typically can be described in terms of depth from the surface, aquifer or well capacity, water quality, recharge rate, and surrounding geologic formations.

3.7.1.2 Environmental Setting

***Hydrology*.** The Project corridor crosses the Lower Gila basin and the Western Mexican basin, which compose the Rio Sonoyta watershed. Within the Lower Gila basin, two ephemeral streams, the La Jolla Wash and the Coyote Wash, occur in the region of the Project. In addition, numerous unnamed washes drain the Project area. The Project is primarily contained within the Western Mexican Drainage Basin, and the Agualita Wash is the largest tributary to the Rio Sonoyta. The drainage of the Project corridor in general flows from north-to-southwest, emptying into the Gulf of California. Overall, the Project corridor is located on an extensive plain of arid desert valleys and small, barren mountain ranges. The climate is continental desert, is of extreme aridity, and results in high air and soil temperatures. The average annual precipitation in the area ranges from 4 to 10 inches, with 44 percent of this precipitation occurring from July through September (ADWR undated). The evaporation rate has not been determined, but is potentially very high during the summer season due to high temperatures (ADWR undated).

The biotic community in the area is classified as Lower Colorado River Valley Sonoran Desert Scrub. Plants in the area are widely dispersed and provide negligible groundcover. Reduced groundcover along with steep slopes due to local topography can lead to heavy runoff and high erosion potential during precipitation events.

Groundwater. The USBP Yuma Sector is in the Lower Gila Basin and the Western Mexican Drainage Basin. The Western Mexican Drainage Basin has a total surface area of 610 square miles and lies in southern Arizona along the U.S./Mexico international border (USFWS 2006). The Lower Gila Basin covers approximately 7,310 square miles and is northwest of the Western Mexican Drainage Basin. The tactical infrastructure will cross the Lower Gila basin to the west. Groundwater within the Lower Gila Basin is found in stream alluvium and basin fill, consisting of sand, gravel, and boulders. Stream alluvium can range from 10 to 110 feet in thickness, while basin fill can range from 450 to more than 1,130 feet in thickness (ADWR undated). Please see **Chapter 3.6** for a discussion on geology and soils. Within the floodplain of the Gila River approximately 55 miles from the site of the Project, well yields exceed 2,000 gallons per minute (gpm) (ADWR undated). Groundwater recharge is accomplished by runoff infiltration from washes and the Gila River floodplain. Groundwater flows to the southwest and has elevated concentrations of fluoride in the east of the basin and elevated concentrations of total dissolved solids, arsenic, and fluoride in the west of the basin, rendering this groundwater unsuitable for most purposes (ADWR undated).

The Western Mexican Basin has one major and two minor aquifers, located to the east of the Project site. The main water bearing unit is composed of unconsolidated sediments, with water levels varying from 27 to 237 feet below ground level (USFWS 2006). No perennial or intermittent streams exist in the basin, although several springs are present. The most notable spring is the Quitobaquito spring, in Organ Pipe National Monument, almost 50 miles west of the site of the Project. Two minor springs, the Aguajita and an unnamed spring, yield 4 gpm and 1 gpm, respectively (ADWR undated). The springs flow from a highly fractured granitic source, which provides a conduit from along the Aguajita Wash to springs in the southwest of the Quitobaquito Hills. These springs are classified as fissure springs and maintain a temperature of about 74 degrees Fahrenheit (°F) (Carruth 1996). The Quitobaquito spring is slightly brackish, and has been capped and diverted to preserve habitat for the endangered

Quitobaquito pupfish (see **Chapter 3.8** for a discussion on biological resources). The Aguajita Wash is the largest ephemeral tributary in the La Abra Plain, which lies to the east and is not in the Project corridor. In addition, a thin alluvial aquifer might overlie shallow Mesozoic to early Tertiary crystalline rocks along Aguajita Wash, providing a hydrologic connection to groundwater pumped in Mexico for agricultural purposes (Carruth 1996). The physical groundwater basin extends across the U.S./Mexico international border.

No known barriers to groundwater flow exist, but the altitude and low permeability of granite bedrock near the U.S./Mexico international border can slow groundwater flow towards the border (ADWR undated). Groundwater recharge for the Western Mexican Drainage Basin is minor from mountain front recharge and stream infiltration, as well as underflow from groundwater basins that are hydraulically up gradient (CBP 2008). Estimated recharge is approximately 1,000 acre-feet per year (USFWS 2006). Groundwater storage is estimated to be approximately 3.5 million acre-feet, with a depth of 1,200 feet (USFWS 2006). The Western Mexican Groundwater Basin contains 16 registered wells with pumping capacity of less than or equal to 35 gpm, and 5 wells with more than 35 gpm (ADWR undated). Groundwater sampled along the border west of the City of Lukeville found concentrations of fluoride, arsenic, and lead equal to or exceeding drinking water standards (CBP 2008).

3.7.1.3 Effects of the Project

Hydrology. Minor adverse impacts on the hydrology of the Colorado River will be expected to occur as a result of grading and contouring in the Project corridor. Grading and contouring will be expected to alter the topography and result in removal of vegetation on a small scale, which could in turn increase erosion potential and runoff during heavy precipitation events. Revegetating the area with native vegetation following construction along with other BMPs to abate runoff and wind erosion will reduce the impacts of erosion and runoff. Additionally, the small increase in impervious surface within the floodplain will result in negligible increases in the quantity and velocity of stormwater flows to the washes in the area. BMPs will be developed as part of the SWPPPs to manage stormwater both during and after construction. Therefore, effects will be expected to be negligible.

Groundwater. Short-term, minor, direct, adverse construction-related impacts on groundwater resources will also be expected. During construction, water will be required for pouring concrete, watering of road and ground surfaces for dust suppression during construction, and for washing construction vehicles. Water use for construction will be temporary, and the volume of water used for construction will be minor when compared to the amount used annually in the area for municipal, agricultural, and industrial purposes. Water not lost to evaporation from watering of surfaces during construction will potentially contribute to aquifer recharge through downward seepage.

The potential for short-term negligible adverse effects on groundwater related to an increase in stormwater runoff will also occur. Implementation of stormwater and spill prevention BMPs developed consistent with the SWPPPs and other applicable plans and regulations will minimize potential runoff or spill-related impacts on groundwater quality during construction.

Long-term, negligible to minor, adverse impacts will be expected associated with groundwater drawdown resulting from increased personnel related Border Patrol activities. Impacts will be expected to be negligible to minor because agents will be expected to bring water needed for patrol activities with them. Groundwater in proximity to the Project corridor will not be expected to be used as a source of water needed to conduct patrol activities. Site-specific analysis will be necessary to determine the effect of Border Patrol operations on regional water supplies. Arizona Department of Water Resources (ADWR) has several conservation methods for the commercial and industrial sectors to conserve water, including water-efficient technologies, limitations on water intensive landscaping, and facility audits to determine potential areas for increased water conservation practices (ADWR 2008). If necessary, CBP will incorporate any applicable conservation methods as outlined by ADWR.

3.7.2 Surface Waters and Waters of the United States

3.7.2.1 Definition of the Resource

Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale.

Waters of the United States are defined within the CWA, as amended, and jurisdiction is addressed by the USEPA and the USACE. These agencies assert jurisdiction over (1) traditional navigable waters, (2) wetlands adjacent to navigable waters, (3) nonnavigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-around or have continuous flow at least seasonally (e.g., typically 3 months), and (4) wetlands that directly abut such tributaries (USDOJ 2007).

Wetlands and riparian habitats represent some of the most ecologically important and rare vegetation communities on desert landscapes. They provide keystone habitat for a wide array of plant and animal species including resident and migrating birds, amphibian and fish species, mammals, and insects. Vegetation production and diversity are usually very high in and around these mesic to aquatic sites, with many plant species adapted only to these unique environments. In addition, wetlands and riparian zones provide a variety of hydrologic functions vital to ecosystem integrity. These include water filtration of sediment, groundwater recharge, and nutrient/chemical capture (USFS 1995). Development and conversion of wetlands and riparian zones affects wildlife diversity, carrying capacity, and hydrologic regime. Changes to and removal of wetlands can cause effects that are proportionally greater than elsewhere in an ecosystem (Graber 1996).

Wetlands have been defined by agencies responsible for their management. The term "wetland" used herein, is defined using USACE conventions. The USACE has jurisdiction to protect wetlands under Section 404 of the CWA using the following definition:

> . . . areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands have three diagnostic characteristics that include: (1) over 50 percent of the dominant species present must be classified as obligate, facultative wetland, or facultative, (2) the soils must be classified as hydric, and (3) the area is either permanently or seasonally inundated, or saturated to the surface at some time during the growing season of the prevalent vegetation (USACE 1987).

Wetlands are protected as a subset of the waters of the United States under Section 404 of the CWA. The term "waters of the United States" has a broad meaning under the CWA and incorporates deepwater aquatic habitats and special aquatic habitats (including wetlands).

3.7.2.2 Environmental Setting

Surface Water

The Project is located in the Rio Sonoyta watershed, which encompasses the Western Mexican Drainage Basin and the south-central portion of the Lower Gila Basin. Surface water features within the region include the Gila River, the Rio Sonoyta, the La Jolla Wash, Coyote Wash, and the Aguajita Wash. In addition, numerous unnamed washes drain the Project area. A wash is characterized as a dry gravelly bed of an ephemeral or intermittent stream which temporarily fills with water during periods of significant rainfall. In essence, these washes act as conduits for floodwaters. The largest ephemeral tributary to the Rio Sonoyta is the Aguajita Wash. Headwaters for the Rio Sonoyta watershed begin in Sonora, Mexico, and flow northwest where they are joined in the United States by the San Simon Wash and Chukut Kuk Wash, both of which are far to the east of the Project site. The Rio Sonoyta is bound by the La Lesna Mountains on the east; a surface and groundwater divide on the south and north, and the Cerros Manteca, San Juan de Ulua, and Sierra de la Nariz mountains on the west (USGS 1985).

The Gila River, a tributary of the Colorado River, flows to the north approximately 50 miles from the Project site. The Gila River is primarily dry, filling when water is released from Painted Rock Dam for flood control purposes and also during significant rainfall events. The Gila River has elevated concentrations of metals, total dissolved solids, and turbidity (ADWR undated). The Coyote Wash and La Jolla Wash are in the Lower Gila Basin, and act as conduits for Gila River floodwaters. Coyote Wash has elevated levels of boron and selenium (ADWR undated).

The La Jolla Wash, which crosses the Project site, drains into Mexico towards the southwest. No Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) have been developed for La Jolla Wash, Coyote Wash, or Aguajita Wash. La Jolla Wash is normally dry and is subject to flash flooding when torrential rainstorms occur in the drainage area.

Jurisdictional Wetlands and Other Waters of the United States

Field surveys were conducted for the Project corridor on July 7 through 9, 2008, to delineate jurisdictional wetlands and other waters of the United States within the Project areas. Delineations were also conducted along access roads and staging areas associated with the fence alignments. Formal delineations were conducted within a 150-foot corridor associated with the fence alignments, 60 feet to either side of the center line of access roads, and within staging areas.

Determination of the occurrence and extent of jurisdictional wetlands and other waters of the United States was based on the application of procedures established in the USACE *Wetlands Delineation Manual*, Technical Report Y-87-1 (USACE 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region,* Technical Report ERDC/EL TR-06-16 (USACE 2006). Determination of the occurrence of jurisdictional wetlands was based on the presence or absence of hydrophytic (wetland) vegetation, hydric (wetland) soils, and wetland hydrology. The presence of all three of the criteria is necessary for an area to be designated as a jurisdictional wetland under normal conditions.

Determination of the extent of jurisdictional washes and other waters of the United States in the Project areas was based on characterization of the landward extent of the ordinary high water mark (OHM). Indicators used to determine the occurrence and extent of jurisdictional washes included the presence of developed channels, typically 2 feet or greater in width; the occurrence of an OHM; the absence of fine sediments along flow paths; distinct changes in the vegetative assemblage or larger or more dense vegetation than surrounding areas; the presence of cut banks; the presence of litter, debris, or wrack lines; occurrence of desiccation cracks or other indicators of hydrology; and other indicators of the occurrence of intermittent water flow regimes.

All washes and other waters of the United States within the Project areas were delineated. Based on field surveys, there were no vegetated wetlands identified within the 150-foot corridor associated with the fence alignments, 60 feet to either side of the center line of access roads, or within proposed staging areas. A total of 83 waters of the United States, composed of 83 ephemeral wash channels (61.91 acres), were delineated in the Project corridor and designated as W1 through W83.

Waters of the United States types and locations (Universal Transverse Mercator (UTM) coordinates, (NAD83, zone 12N); general channel characteristics and general vegetation on the banks of each wash; delineated acreages within a 150-foot corridor associated with the fence alignments, 60 feet to either side of the center line of access roads, or within proposed staging areas; and potential impact acreages in Section CV-2 are described in **Section 4.4** of the Biological Survey Report, attached in **Appendix E**. A 60-foot impact corridor to the north of the fence alignment or adjacent to access roads is considered the maximum width of potential impact associated with implementing the Project. All waters of the United States acreages within proposed staging areas are included as potential impact areas. Maps showing the locations and boundaries of delineated waters of the United States in the Project assessment areas are provided in **Appendix D**.

3.7.2.3 Effects of the Project

***Surface Waters, Wetlands, and Other Waters of the United States*.** Minor short- and long-term impacts on washes in the impact corridor will be expected. The tactical infrastructure will consist of a primary vehicle fence, access roads, and staging areas. Development of staging areas and the placement of permanent primary vehicle fence across wash channels will result in short-term adverse impacts associated with land disturbance and potential erosion and sedimentation. CBP will require the construction contractor to prepare an SWPPP, sediment- and erosion-control plans, and other environmental protection plans for the Project which will minimize potential for adverse effects on washes. Minor, long-term, beneficial effects on washes will be expected as a result of a reduction in cross-border traffic in washes. Development of culverted crossing at washes will be expected to reduce damage to wash channels and their banks associated with traffic along access roads. Implementation of the Project will be expected to have minor short-term, adverse effects on surface water quality as a result of potential erosion and associated transport of sediments into adjacent surface waters. Implementation of BMPs, as discussed above will reduce potential for these adverse effects.

Adverse effects on jurisdictional wetlands, washes, and other waters of the United States will be avoided or minimized to the maximum extent practicable. Based on the delineations of washes and other waters of the United States within the areas surveyed conducted on July 7 through 9, 2008, there are 61.91 total delineated acres of waters of the United States, including 17.95 acres within the potential impact areas. A wetlands mitigation and restoration plan will be developed to compensate for unavoidable impacts on washes within the Project areas.

3.7.3 Floodplains

3.7.3.1 Definition of the Resource

Floodplains are areas of low-level ground present along rivers, stream channels, or coastal waters. The living and nonliving parts of natural floodplains interact with each other to create dynamic systems in which each component helps to maintain the characteristics of the environment that supports it. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, nutrient cycling, water quality maintenance, and a diversity of plants and animals. Floodplains provide a broad area to spread out and temporarily store floodwaters. This reduces flood peaks and velocities and the potential for erosion. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body (FEMA 1986).

Floodplains are subject to periodic or infrequent inundation due to rain or melting snow. Risk of flooding typically hinges on local topography, the frequency of precipitation events, and the size of the watershed above the floodplain. Flood potential is evaluated by FEMA, which defines the 100-year floodplain. The 100-year floodplain is the area that has a 1 percent chance of inundation by a flood event in a given year. Certain facilities inherently pose too great a risk to be in either the 100- or 500-year floodplain, such as hospitals, schools, or storage buildings for irreplaceable records. Federal, state, and local regulations often limit floodplain development to passive uses, such as recreational and preservation activities, to reduce the risks to human health and safety.

3.7.3.2 Environmental Setting

The Project corridor exists in an arid environment with little rainfall. Major rivers, such as the Rio Sonoyta, are more than 30 miles from the Project site. No FIRM has been mapped for the Project corridor.

3.7.3.3 Effects of the Project

No adverse impacts on floodplain resources will occur as a result of the Project. Floodplains for major rivers are distant and not anticipated to be effected by installation of the tactical infrastructure. Crossings of washes within the Project corridor will be designed to ensure proper conveyance of flows during flow events. CBP will mitigate unavoidable impacts associated with unmapped floodplains in the Project corridor using planning guidance developed by the USACE. Erosion and sediment control and stormwater management practices will also be implemented during and after construction to minimize potential for adverse effects on any floodplains associated with washes in the Project corridor.

3.8 BIOLOGICAL RESOURCES

3.8.1 Vegetation Resources

3.8.1.1 Definition of the Resource

Although the Secretary's waiver means CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with vegetation resources.

Vegetation distribution and character within the Project area is strongly defined by the environmental drivers including physiography, climate, geology, soils, and topography. This section of the ESP identifies and briefly describes the important environmental drivers, the floristic classification and vegetation types that occur throughout the Project area, and the effects related to use/widening of existing access roads and staging areas and the construction of new access roads, staging areas, and the vehicle barrier. More detailed and extensive biological information and characteristic ground photographs are presented in the Biological Survey Report (see **Appendix E**).

3.8.1.2 Environmental Setting

Physiography: The Project region and site are characterized by deep, northwest-trending, alluvium-filled basins separated by linear mountain ranges (Sonoran Region of the Basin and Range Province of North America). The Sonoran Desert is young, having developed over the past 8,000 to 9,000 years. Therefore it lacks a distinctive faunal species component evolved to the extant conditions (USFWS 2006). Relatively recent volcanic activity is evident with some slopes covered by gravel and cobble of volcanic origin. The Project area physiography includes the footslopes of the Tinajas Altas Mountains on the BMGR on its western end and the footslopes of the Cabeza Prieta and Tule mountains on its eastern terminus. The Lechuguilla Desert, a relatively flat alluvial plain dissected by many desert washes, occurs between these rugged desert mountain ranges.

Climate: The Project area climate is typical of the Sonoran Desert (e.g., semiarid within the Xeric Climatic Region as described in Robinson et al. 2006). Low rainfall and high temperatures are characteristic of the basin and range lowlands (e.g., summers are long and hot and winters are short, dry, and cold and might include brief periods when temperatures are below freezing) (Robinson et al. 2006, Bailey 1995). The precipitation pattern is generally biseasonal, much of the precipitation occurs from July to September in the form of intense thunderstorms driven by moisture from the Gulf of California (monsoons), however gentle rains from Pacific Ocean moisture occur from

December through February (USFWS 2006). The desert washes of the Project area are intermittent or ephemeral (i.e., years with more than 250 days of no flow) but can have high flow in response to intense thunderstorms.

The general climatic summary records for Yuma, Arizona (Station 029660) have been prepared from 1948 to 2007 data (WRCC 2008). Average minimum temperatures in Yuma range from a low of 44 degrees Fahrenheit (°F) in December and January to 80 °F in July, and average high temperatures range from 69 °F in December and January to 107 °F in July (WRCC 2008). The lowest temperature recorded was 5 °F on February 18, 1995, and the highest temperature recorded was 124 °F on July 28, 1995. The average annual precipitation is 3.0 inches, which is relatively evenly distributed throughout the year. The range of precipitation is 0.3 inches (1956) to 6.8 inches (1989). A long growing season is experienced for the Project region (there are approximately 320 frost-free days annually), the prevailing wind varies from 6.5 to 9.1 miles per hour in a southerly direction, and the pan evaporation rate is high at 99 inches annually (WRCC 2008).

Plant Community Classification and Description

General Vegetation Classification: The vegetation of the basin and range lowlands of southwestern Arizona has generally been classified under the Dry Domain (Map Unit 300), Tropical/Subtropical Desert Division (Map Unit 320) of Bailey (1995). The Project area is more finely classified by Bailey (1995) as the American Semidesert and Desert Province (Map Unit 322), Sonoran Desert Section (Map Unit 322b).

Wellton Station Site Vegetation Classification: The USGS Arizona Gap Project (Bennett et al. 2004) provided discussion and described plant geography of the Project area to vegetation series using topographic features, climate, vegetation types, and terrestrial vertebrates. This system recognized two Nearctic Upland vegetation mapping units in the Tinajas Altas, Cabeza Prieta, and Tule mountains vicinity using a combination of plant species dominance, wildlife use, topography, hydrology, and geology. The vegetation series that are associated with the Project area include (1) Tropical-Subtropical Desertland, Sonoran Desertscrub, Creosotebush-Bursage Series; and (2) Tropical-Subtropical Desertland, Tropical-Subtropical Sonoran Desert Scrub, Paloverde-Mixed Cacti Series. The entire corridor was predominantly characterized by the USFWS (2006) as the Sonoran Desertscrub vegetation series of the Lower Colorado Valley subdivision of the Sonoran Desert.

NatureServe (2008) has defined ecological systems to represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes such as drought, fire, or flooding. Ecological systems represent classification units that are readily identifiable by conservation and resource managers in the field. The ensuing plant community/vegetation description for the Project area was prepared in the framework of ecological systems that include (1) Sonoran Granite Outcrop Desert Scrub (CES302.760), (2) North American Warm Desert Bedrock Cliff and Outcrop (CES302.745), (3) North American Warm Desert Volcanic Rockland (CES302.754), (4) Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761), (5) Sonora-Mojave Creosotebush-White Bursage Desert Scrub (CES302.756), (6) Sonoran Brittlebush-Ironwood Desert Scrub (CES302.758), (7) North American Warm Desert Wash (CES 302.755), and (8) North American Warm Desert Riparian Mesquite Bosque (CES302.752). The two classification systems discussed above are cross-walked in a relational table (see **Table 3-6**) presented in the Biological Survey Report (see **Appendix E**).

Field Methods: Classification and description of existing vegetation within this corridor was achieved by conducting walking surveys of the Project corridor, access roads, and staging areas as planned, sampling observation points, and relating them to the NatureServe (2008) classification database directly or as provisional types. At the coarsest level, the eight above-named ecological systems were determined and local vegetation types described using the national system. A finer level of classification equaling or approximating the vegetation alliance level of the National Vegetation Classification System (NatureServe 2008) was used to prepare the plant community discussions under each ecological system.

Vegetation Overview, Site-Specific Description, and Project Impacts: Much of the vegetation cover along the vehicle barrier fence section consists of native shrublands characterized by creosotebush, white bursage, brittlebush, pencil cholla, saguaro, and ocotillo; sparse to low vegetation cover occupies approximately 75 percent of the corridor. Approximately 0.5 percent was of the corridor was tall shrubland; approximately 10 percent of the corridor was composed of grassland; 12 percent was wooded shrubland. Development (including existing roads and trails) accounts for approximately 3 percent of the corridor; unvegetated desert wash bottoms occupied approximately 0.5 percent of the corridor.

A brief description of each plant community observed within fence section (CV-2) is provided herein; they are distinguished using the NatureServe Vegetation Alliance level of classification or an approximation. Each of these communities is illustrated and supported by representative ground photographs within the attached Biological Survey Report. Following each description is a statement of the measured impact of Project construction to the individual vegetation type.

Sonoran Granite Outcrop Desert Scrub Ecological System (CES302.760)

Paloverde–Ocotillo–Creosotebush Mountain Slope Wooded Shrubland. The moderately steep lower slopes (up to 25 percent slope) of the Tinajas Altas and Tule mountains supported this sparse wooded shrubland type along the border at the western and eastern termini of the Project corridor. Sparse stands had become established in bedrock cracks, in thin materials trapped in small

Table 3-6. Project Impacts on Vegetation by Plant Community

Plant Community Impacted	Direct Impact Type and Acreage	Indirect Impact Type	Location and Comments
Paloverde–Ocotillo–Creosotebush Mountain Slope Wooded Shrubland	Acreage: 6.12 acres A-1, A-2, A-3, C-1, C-2, C-3	a, b, c, d, e, f, g, h	Located on lower slopes of Cabeza Prieta, Tule, and Tinajas Altas mountains
Rock Outcrop Sparse Shrubland	Acreage: 3.41 acres C-1, C-2, C-3	a, b, c, e	Located on lower slopes of Cabeza Prieta, Tule, and Tinajas Altas mountains
Creosotebush–Limberbush–White Bursage Shrubland	Acreage: 18.45 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located on upper alluvial fans off Cabeza Prieta, Tule, and Tinajas Altas mountains
Creosotebush–White Bursage Volcanic Cobble Shrubland	Acreage: 7.04 acres A-1, A-2, A-3	a, b, c, d, e, f, g, h	Located on flats, bajadas, slopes, and ridges along access roads and the international border near the Tule Mountains
Creosotebush–Ocotillo Volcanic Cobble Shrubland	Acreage: 13.91 acres A-1, A-2, A-3	a, b, c, d, e, f, g, h	Located on bajadas, slopes, and ridges along access roads and the international border near the Tule Mountains
Creosotebush–Brittlebush–Teddy Bear Cholla Volcanic Cobble Shrubland	Acreage: 7.04 acres A-1, A-2, A-3	a, b, c, d, e, f, g, h	Located on slopes on the international border near the Tule Mountains
Brittlebush–Creosotebush Volcanic Cobble Shrubland	Acreage: 0.5 acres A-1, A-2, A-3	a, b, c, d, e, f, g, h	Located on ridge shoulder slopes on the international border near the Tule Mountains
Saguaro/Creosotebush–White Bursage Wooded Shrubland	Acreage: 8.7 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located on alluvial fans at the footslopes of the Cabeza Prieta Mountains
Creosotebush–White Bursage Shrubland	Acreage: 106.6 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located on alluvial plains, alluvial fans, and footslopes of the mountains
Creosotebush–Brittlebush–White Bursage Shrubland	Acreage: 61.2 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located in small to large desert washes on alluvial plains, alluvial fans, and footslopes of the mountains

Plant Community Impacted	**Direct Impact Type and Acreage**	**Indirect Impact Type**	**Location and Comments**
Creosotebush/Annual Herbaceous Vegetation Shrubland	Acreage: 11.1 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located on alluvial plains particularly where silt beds predominate, areas with shallow eolian deposits, and areas of sparse growth on alluvial plains
Creosotebush–White Bursage–Four-winged Saltbush Shrubland	Acreage: 5.4 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located on alluvial plains particularly where silt beds predominate adjacent to moderate-sized desert washes along access roads
Annual Herbaceous Vegetation–Barrens	Acreage: 31.2 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located on alluvial plains and alluvial fans on flats between desert washes including limestone-derived sand and gravel and silt beds along access roads, in staging areas, and on the international border
Ironwood–Brittlebush Desert Wash Wooded Shrubland	Acreage: 6.6 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located along access roads, on staging areas, and on the international border in small to moderately large desert washes of alluvial plains and alluvial fans
Four-wing Saltbush–Catclaw Acacia Desert Wash Shrubland	Acreage: 3.4 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located in small to moderate desert washes on alluvial plains along access roads
Smoketree–Catclaw Acacia Desert Wash Shrubland	Acreage: 1.8 acres A-1, A-2, B-1, B-2	a, b, c, d, e, f, g, h	Located in a large desert wash crossed by the easternmost access road and in two desert washes on the international border
Paloverde–Ironwood–Mixed Shrub Desert Wash Wooded Shrubland	Acreage: 10.9 acres A-1, A-2, A-3, B-1, B-2, B-3	a, b, c, d, e, f, g, h	Located along access roads, on staging areas, and on the international border where Cabeza Prieta, Tule, and Tinajas Altas mountain footslopes and upper alluvial fans occur
Honey Mesquite/Mixed Shrubs Riparian Wooded Shrubland	Acreage: 6.1 acres A-1, A-2, B-1, B-2	a, b, c, d, e, f, g, h	Located along Camino del Diablo at its widest segment and a single desert wash on the international border.

Plant Community Impacted	Direct Impact Type and Acreage	Indirect Impact Type	Location and Comments
Total Long-term Vegetation Impact/Total Temporary Vegetation Impact (likely will have long-term implications in terms of restoration)	275 acres/ 41 acres	a, b, c, d, e, f, g, h	Project corridor

depressions, and on gravelly fans along the toeslopes. Seventy-five percent or more of the substrate was exposed bedrock with the remainder predominantly composed of large and small rocks. Scattered littleleaf paloverde and ironwood trees characterized the woodland layer. The tall, short, and dwarf-shrub layers included low cover of ocotillo, saguaro, creosotebush, limberbush, teddy bear cholla, elephant tree, and white bursage. Annual forbs and grasses were sparse and included species of buckwheat, Indian plantain, and six weeks fescue.

Rock Outcrop Sparse Shrubland. Rock outcrops occurred along the Camino del Diablo where the road/trail crossed the footslopes of the Cabeza Prieta Mountains. The outcrops were steep, up to 35 percent slope, and were composed of approximately 95 percent granite bedrock, with vegetation growing from cracks and between boulders that had fallen from the steep slopes. Total vegetation cover was sparse provided by the short and dwarf-shrubs desert lavender, brittlebush, California snakeweed, barrel cactus, buckwheat, and white bursage. Annual forbs contributed sparse cover and were characterized by wild buckwheat and six weeks fescue.

North American Warm Desert Bedrock Cliff and Outcrop Ecological System (CES302.745)

Creosotebush–Limberbush–White Bursage Shrubland. A relatively diverse shrub community had become established on the alluvial fans associated with the footslopes of the Tinajas Altas and Tule mountains along the Project corridor on the border. The substrate consisted of shallow to moderately deep alluvium of fans and low bajadas cut by narrow desert washes, typically from 1.0 meter (m) to 5.0 m wide and up to 2.5 m deep. The short and dwarf-shrubs creosotebush, limberbush, and white bursage contributed low cover. Where the alluvial fans were broad, creosotebush and white bursage were present with higher cover. Where more desert washes occurred and dissected the fans, limberbush became the dominant short shrub. Littleleaf paloverde, ocotillo, and saguaro were typically present as small trees or tall shrubs contributing sparse cover. Additional short and dwarf-shrubs included teddy bear cholla, wolfberry, elephant tree, brittlebush, ratany, and cholla. The herbaceous layer contributed sparse cover and included Indian-wheat, buckwheat, spineflower, and scorpion-weed. Cryptobiotic crust was rarely present at low cover.

North American Warm Desert Volcanic Rockland Ecological System (CES302.754)

Creosotebush–White Bursage Volcanic Cobble Shrubland. Small exposures of volcanic cobble rarely occurred within large expanses of alluvium formed from granitic rocks of the nearby Cabeza Prieta Mountains. Volcanic cobble-covered ridges and slopes of the Tule Mountains were extensive along the border. The volcanic cobbles and gravel typically provided up to 60 percent cover and attained diameters up to 2 feet. These sites were characterized in the short and dwarf-shrub layers by creosotebush and white bursage. The tall shrub layer contributed sparse cover and included ocotillo, blue paloverde, and saguaro.

Additional short and dwarf-shrubs that may occur with sparse cover included teddy bear cholla and dagger cholla. Annual forbs provided sparse cover in the herbaceous layer, which was characterized by fleabane, Indian wheat, and spineflower.

Creosotebush–Ocotillo Volcanic Cobble Shrubland. Surface deposits of volcanic cobble, rocks, and gravel occurred on the Tule and Cabeza Prieta mountain footslopes, capping bajadas, ridges, and slopes. The sites were gently sloped (3 to 6 percent slopes) and consistently supported low cover of creosotebush short shrubs and ocotillo tall shrubs. The dwarf-shrubs multiple-headed barrel cactus and range ratany contributed sparse cover. The herbaceous layer was composed of sparse cover by annual forbs of which Indian wheat was most common.

Creosotebush–Brittlebush–Teddy Bear Cholla Volcanic Cobble Shrubland. The volcanic rock fields of the Tule Mountains footslopes and a small bajada near the Cabeza Prieta Mountains supported a consistent sparse cover of short shrubs on volcanic rocks, gravel, and cobble up to 18 inches in diameter. This community was characterized by creosotebush, brittlebush, teddy bear cholla, and white bursage that together provided low cover. The tall shrub ocotillo was scattered throughout the stands and provided sparse cover and blue paloverde was present at the bajada site. An herbaceous layer contributed sparse cover characterized by fluffgrass and annual wild buckwheat.

Brittlebush–Creosotebush Volcanic Cobble Shrubland. Extensive volcanic rock-covered ridges occurred on the footslopes of the Tule Mountains on the international border near the center of the Project corridor. The upper slopes or shoulders of the ridges were armored by large volcanic rocks and supported nearly pure stands of the short shrub brittlebush, which provided low to moderate cover. Additional sparse cover of the short shrubs creosotebush and buckhorn cholla and the tall shrub ocotillo occurred. The herbaceous layer provided sparse cover by annual forbs, wild buckwheat was the most common species sampled.

Sonoran Paloverde-Mixed Cacti Desert Scrub Ecological System (CES302.761)

Saguaro / Creosotebush–White Bursage Wooded Shrubland. This unique vegetation type occurred on the alluvial fans and plains adjacent to the footslopes of the Cabeza Prieta Mountains where stands were traversed by the Camino del Diablo. They became established where small braided shallow washes emerged in the gently sloped alluvial deposits below the footslopes. The stands were characterized by sparse canopy cover of saguaro, ironwood, and littleleaf paloverde trees. The tall, short, and dwarf-shrub layers provided low to moderate cover and were characterized by ocotillo, creosotebush, wolfberry, teddy bear cholla, buckhorn cholla, four-wing saltbush, brittlebush, white burrobush, and rush bebbia. Big galleta, a perennial grass, can occur with sparse cover in the herbaceous layer and annual forbs provided sparse cover.

Cryptobiotic crust had become established on the terraces above the active drainage channels and provided low to moderate cover.

During field surveys a database of all saguaro cacti growing within the survey corridor was constructed, this database includes the individual plant coordinates acquired with a survey-grade global positioning system (GPS) receiver, an estimate of height, a photograph of each saguaro cactus, and pertinent notes of individual plant health (see **Appendix E**). Approximately 360 saguaros were encountered during the field surveys, with approximately 260 saguaros occurring within the impact corridor. Of these, approximately 121 saguaros were 2 m tall or less.

Sonora-Mojave Creosotebush-White Bursage Desert Scrub Ecological System (CES302.756)

Creosotebush–White Bursage Shrubland. This common vegetation type occurred extensively in the Lechuguilla Desert across the Project area. Occupied habitats included alluvial fans, alluvial plains, and footslopes including sites with small drainages and with substrates ranging from silt to small gravel. Stands were characterized by the short shrub creosotebush and the dwarf-shrub white bursage that provided sparse to low cover. The tall shrub layer and remaining short shrub layer contributed sparse to low cover and were characterized by ocotillo, saguaro, littleleaf paloverde, ironwood, honey mesquite, blue paloverde, wolfberry, brittlebush, four-wing saltbush, limberbush, range ratany, desert agave, teddy bear cholla, pencil cholla, dagger cholla, and multiple-headed barrel cactus. The herbaceous layer was composed mostly of annual grasses and forbs which provided sparse cover and included the perennial bunchgrass big galleta, annual grasses six weeks fescue and Mediterranean grass, and the annual forbs Indian wheat and chaenactis. Cryptobiotic crust nearly always occurred in low to moderate cover, one site adjacent to the Camino del Diablo supported biotic crust of approximately 60 percent cover.

Creosotebush–Brittlebush–White Bursage Shrubland. This type became established on the extensive alluvial flats or plains crossed by the Camino del Diablo and within the large staging area on the western terminus of the Project as planned. The soils of these stands were well-armored by small gravel and very small drainages regularly crossed the flats. The short and dwarf-shrubs creosotebush, brittlebush, and white bursage characterized the type and together provided up to 15 percent cover (see **Figure 3-5**). Cover by creosotebush short shrubs ranged from 5 percent to 12 percent. The tall shrubs or short trees ocotillo, saguaro, ironwood, and littleleaf paloverde could provide sparse cover, up to 3 percent. Pencil cholla was a common component of the dwarf-shrub layer and typically provided about 1 percent cover. In the herbaceous layer, annual forbs contributed sparse cover and were characterized by Indian wheat. Cryptobiotic crust was common and typically contributed 10 percent cover within this vegetation type.

Figure 3-5. Characteristic Vegetative Cover of Creosote Bush, Saguaro Cactus, Brittlebush, and White Bursage

Creosotebush–Annual Herbaceous Vegetation Shrubland. Alluvial plains near the middle of the Project corridor occurred on flat to gently sloping sites and were composed of fine sediments including thick silt beds known locally as talc. Where the westernmost access roads crossed these plains, nearly monotypic stands of creosotebush short shrubs had become established. Creosotebush provided sparse to low cover and sparse cover can be contributed by small saguaro, multiple-headed barrel cactus, and buckhorn cholla. The understory was characterized by sparse to low cover of annual herbaceous vegetation that had become established on eolian deposits captured under the shrub canopies. The annual grass six weeks fescue provided sparse to low cover and the annual forbs Indian wheat, peppergrass, spineflower, wild buckwheat, and others contributed sparse to low cover. On flat sites between shrubs, cryptobiotic crust had become established and can provide low to moderate cover.

Creosotebush–White Bursage–Four-wing Saltbush Shrubland. Stands of this uncommon vegetation type had become established in the eastern Project corridor and were bisected by the Camino del Diablo and the eastern most access road. The stands occupied alluvial plains between relatively large desert washes; these plains collected small eolian deposits from adjacent beds of fine silt (talc beds) that formed small mounds beneath shrub canopies. The short and dwarf-shrub layers were characterized by creosotebush, four-wing saltbush, white bursage, and pencil cholla which together provided low cover. Saguaros can provide sparse cover. Eolian deposits supported sparse cover of annual forbs in the herbaceous layer, characterized by Indian wheat. Exposed alluvium supported low cover of cryptobiotic crust.

Annual Herbaceous Vegetation–Barrens. Alluvial plains of the western and middle portions of the Project corridor in the Lechuguilla Desert occurred on flat to gently sloping sites and were composed of fine sediments including thick silt beds known locally as talc or on coarse sand and small gravel eroded from the adjacent granitic mountains. Where the westernmost access roads crossed these plains, nearly barren areas occurred between small desert washes and stands of creosotebush–white bursage short shrublands.

These sites were devoid of vegetation or supported sparse cover of annual herbaceous grasses and forbs including six weeks fescue, Mediterranean grass, Indian wheat, peppergrass, spineflower, wild buckwheat, chaenactis, and others. Cryptobiotic crust had often become established and provided low cover.

Sonoran Brittlebush-Ironwood Desert Scrub Ecological System (CES302.758)

Ironwood–Brittlebush Desert Wash Wooded Shrubland. Small- to medium-sized desert washes (3 m to 15 m wide) supported this vegetation type on the western end of the Camino del Diablo and in the large adjacent staging area; the type was uncommon elsewhere in the Project corridor. Stands were characterized by 2 m to 5 m tall ironwood trees in the canopy layer and brittlebush in the short shrub layer, which each contributed sparse to low cover.

The remaining tall, short, and dwarf-shrub layers contributed sparse to low cover and included saguaro, ocotillo, honey mesquite, creosotebush, wolfberry, four-wing saltbush, buckhorn cholla, teddy bear cholla, white bursage, range ratany, and pencil cholla. The herbaceous layer provided sparse cover and was composed of mostly annual grasses and forbs, including big galleta, six weeks fescue, wild buckwheat, pepperweed, and catseye. The parasite California mistletoe had become established in many ironwood trees. Cryptobiotic crust can occur with sparse cover.

North American Warm Desert Wash Ecological System (CES302.755)

Creosotebush–Triangle-leaf Bursage Desert Wash Shrubland. The eastern access road crosses this shallow wash and flat area composed of silt or talc that is characterized by a unique short shrub stand of creosotebush and triangle-leaf bursage which together provide moderate cover. In the herbaceous layer, annual forbs provided sparse cover and were characterized by pepperweed. Intershrub areas not affected by recent flows supported low cover of biotic crust.

Four-wing Saltbush–Catclaw Acacia Desert Wash Shrubland. Desert washes bisected by access roads in the eastern Project corridor uncommonly supported four-wing saltbush dominated stands. The washes were large, up to 80 m wide, were often braided, and occurred within silty soils. The short shrub four-wing saltbush contributed low cover and the tall shrub catclaw acacia provided sparse cover. Ironwood trees occasionally occurred and provided sparse cover.

Additional short shrubs included creosotebush, brittlebush, and cheeseweed that provided sparse cover. The herbaceous layer provided sparse cover and was characterized by annual forbs including pepperweed.

Smoketree–Catclaw Acacia Desert Wash Shrubland. This vegetation type occurred at two locations on the eastern end of the Project corridor both occurrences were in large desert washes up to 60 m wide. Vegetation cover was dense on the desert wash banks and scattered within the otherwise barren channel bottoms. The canopy layer was characterized by 3 m to 5 m tall smoke trees which provided low cover and the tall shrub layer was characterized by catclaw acacia which provided low to moderate cover. Additional sparse canopy and shrub cover was contributed by littleleaf paloverde, honey mesquite, four-wing saltbush, rush bebbia, cheeseweed, and wolfberry. The herbaceous layer contributed sparse cover and was characterized by annual forbs including pepperweed.

Paloverde–Ironwood / Mixed Shrub Desert Wash Wooded Shrubland. This vegetation type represented the common community established on small to large desert washes that dissected alluvial fans near the footslopes of the Tinajas Altas, Cabeza Prieta, and Tule mountains. The desert wash bottoms were typically armored by granite cobbles and gravel or had downcut to bedrock or caliche layers. The stands occurred on the wash banks and terraces and were characterized by the 2- to 5- m tall canopy trees littleleaf paloverde and ironwood that together provided sparse to low cover. The dominant trees often harbored desert mistletoe and some were stressed or had recently succumbed due to this parasite. Saguaro up to 10 m tall often provided sparse cover in the canopy layer. The tall, short, and dwarf-shrub layers contributed sparse to low cover and included catclaw acacia, desert lavender, limberbush, wolfberry, elephant tree, creosotebush, brittlebush, teddy bear cholla, and triangle-leaf bursage. The herbaceous layer often included sparse cover of the perennial bunchgrass, big galleta, and sparse to low cover of annual grasses and forbs including six weeks fescue, pepperweed, chaenactis, wild buckwheat, and fleabane.

North American Warm Desert Riparian Mesquite Bosque Ecological System (CES302.752)

Honey Mesquite–Mixed Shrubs Riparian Wooded Shrubland. Mesic desert washes and one small playa supported wooded shrublands dominated by honey mesquite, including a long reach of the Camino del Diablo where water flowed down the roadbed (following heavy precipitation events) between roadside banks dominated by honey mesquite trees. This community was characterized by 2 to 5 m tall honey mesquite trees or tall shrubs that provided low to dense cover. Additional trees and tall shrubs that occurred with sparse cover in the canopy layer included ironwood, littleleaf paloverde, and catclaw acacia. The short and dwarf-shrub layers were characterized by sparse to low cover of creosotebush, four-wing saltbush, rush bebbia, cheeseweed, California brickelbush, and white bursage. The herbaceous layer was characterized by sparse to moderate cover of annual forbs including the annual mustard London rocket. Cryptobiotic crust could be present on terraces above active channels and can provide low cover.

Nonative Plant Species: The Project corridor does not support Federal- or state-listed (USDA 2006) noxious weeds. Eight nonnative plant species were observed on site (see **Table 5-2** of the Biological Survey Report, **Appendix E**); all were annuals. Nonnative plant species occurred on desert plains and flats, eolian deposits, disturbed existing staging areas, roadsides, excavated areas, and sandy desert wash bottoms.

3.8.1.3 Effects of the Project

Vegetation impacts related to vehicle barrier fence construction will be direct and indirect and are summarized in **Table 3-6**. Direct impacts include blading, scraping, drilling, trenching, berming, and crushing vegetation and are calculated from the vegetation map created for this Project versus the designed corridors of construction. Indirect impacts include dust generation, nonnative species introductions, and diversion of flows and incidental or random vehicle and equipment turning and parking that destroys cryptobiotic crusts, causes rutting, and compacts soils, but might not kill the vascular flora. The range of impact types summarized in **Table 3-6** are listed below:

Direct Impact Types

A. Vegetation removal by blading, scraping, dozing, drilling, trenching, crushing
   - A-1. Vehicle Barrier Fence, Construction Road, Maintenance Road, Patrol Road
   - A-2. Construction Access Road
   - A-3. Staging Area

B. Vegetation covering by fill material during site leveling and berming procedures
   - B-1. Vehicle Barrier Fence, Construction Road, Maintenance Road, Patrol Road
   - B-2. Construction Access Road
   - B-3. Staging Area

C. Vegetation removal by blasting
   - C-1. Vehicle Barrier Fence, Construction Road, Maintenance Road, Patrol Road
   - C-2. Construction Access Road
   - C-3. Staging Area

Indirect Impact Types

a. Dust generation covering leaves and flowers of downwind plants
b. Broken branches from vehicle/equipment passage
c. Hydrocarbon/other liquid spill potential
d. Soil compaction to rooting zone
e. Siltation during runoff events
f. Erosion resulting from rutting and destruction of soil profile
g. Random vehicle/equipment tracks outside construction and access corridors and staging area boundaries
h. Potential introduction of nonnative plant species or spread of nonnatives already introduced elsewhere in the Project area.

Portions of the Project area subject to construction and future maintenance and enforcement activities will result in permanent impacts on vegetation; this area totals 264 acres. Some areas will receive indirect impacts that range from short-term to long-term in duration. For example, dust deposition during construction will be considered short-term and will largely be removed from vegetation during an adequate rainfall event. Temporary staging areas and vehicle or equipment tracks outside the construction and access zones will result in long-term impacts due to destruction of cryptobiotic crust, vegetation crushing, nonnative species invasion, and increased erosion potential. Temporarily impacted areas, such as staging areas, will be revegetated with native species (see Number 45 in Section 1.3.1 in **Appendix F**). Restoration of these sites will likely require several decades in this arid environment. Effects on sparse Sonoran Desert vegetation communities due to elimination of most illegal vehicle access and possibly some human foot traffic following construction of the vehicle barrier as planned will be beneficial and will allow restoration of the landscape to proceed in the short and long term.

Mitigation used to lessen the impacts of the Project include avoiding all columnar cacti and agave and when it's not possible, replace the impacted plants as appropriate. Locations and photographs of potentially transplantable saguaros have been recorded in the table and database attached to the Biological Survey Report (see Appendix E). Examples of saguaros observed during field surveys are provided in **Figure 3-6**. Implementation of an SWPPP, SPCC and CM&R plans, and Dust Control Plan will occur to reduce siltation, pollutant runoff, and dust covering of plants, respectively.

3.8.2 Wildlife and Aquatic Resources

3.8.2.1 Definition of the Resources

Although the Secretary's waiver means CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with wildlife and aquatic resources.

Wildlife and aquatic resources include native or naturalized animals and the habitats in which they exist. Identification of the species potentially occurring in the Project area was accomplished through literature reviews, coordination with appropriate Federal and state resource managers, other knowledgeable experts, and late spring site review and field surveys. Available habitats included desert mountain ridges and slopes, rock outcrops, volcanic cobble-covered ridges and slopes, alluvial fans, desert washes, and desert plains that were barren or supported annual herbaceous vegetation, short shrublands, tall shrublands, wooded shrublands, and woodlands.

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703–712), as amended, implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit. Under EO 13186, [Responsibilities of Federal Agencies to Protect Migratory Birds], the USFWS administers, oversees, and enforces the

Figure 3-6. Representative Saguaro Cactus Documented in and Adjacent to the Project Corridor

conservation provisions of the MBTA, including population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement. The MBTA defines a migratory bird as any avian species listed in 50 CFR 10.13, which includes most native birds occurring in North America.

The MBTA and EO 13186 require Federal agencies to minimize or avoid impacts on migratory birds listed in 50 CFR 10.13. If design and implementation of a Federal action cannot avoid measurable negative impact on migratory birds, EO 13186 requires the responsible agency to consult with the USFWS and obtain a Migratory Bird Depredation permit.

The Secretary's waiver (2008) states that CBP no longer has any specific legal obligations under the MBTA for the CV-2 sections addressed in this ESP, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the MBTA as the basis for evaluating potential environmental impacts and appropriate mitigations.

3.8.2.2 Environmental Setting

Wildlife. This section of the vehicle fence is within Yuma County, Arizona, and the four segments are designed within the Roosevelt Reservation. However access roads leading to the construction area require improvements or construction on refuge lands designated as Wilderness on the CPNWR. Additional access and staging areas will be located on the BMGR. Surveys were conducted in the Project corridor in April (site review) and June/July (general biotic and wetlands/waters of the United States) of 2008, detailed results are provided in the Biological Survey Report (see **Appendix E**). The vegetation/wildlife habitat of the Project corridor is composed of predominately sparse Sonoran Desert communities characterized by creosotebush, white bursage, brittlebush, and pencil cholla flats; honey mesquite; paloverde; ironwood; smoketree; catclaw acacia; limberbush, and saguaro washes; and volcanic cobble and alluvium supporting ocotillo, teddy bear cholla, saguaro, creosotebush, and brittlebush.

The CPNWR, BMGR, and the associated Project areas are ideally suited for reptiles including species of lizards, tortoise, and snakes. The hot and dry climate of the region results in air temperatures that exceed 100 ºF from June to October (USFWS 2002b, USFWS 2006). Rainfall typically occurs during July, August, and September and can vary in areas anywhere between 7.5 centimeters (cm) annually to 20 cm annually on the far eastern portion of the CPNWR (USFWS 2002b). During the Project-specific wildlife surveys, whiptail

(*Cnemidophorus sp*.), Mojave rattlesnake (*Crotalus scutulatus*), collared lizard (*Crotaphytus collaris*), and horned lizard (*Phrynosoma sp. – scat only*) species were observed. Other reptile species that might occur in the Project area include Gila monster (*Heloderma suspectum*), desert tortoise (*Gopherus agassizii*), long-nosed leopard lizard (Gambelia wislizenii), desert banded gecko (*Coleonyx variegatus*), desert iguana (*Dipsosaurus dorsalis*), and the desert spiny lizard (*Sceloporus magister*) (USFWS 2002b, USFWS 2006).

CPNWR also provides habitat for five toad and at least one frog species which occur in the Sonoran Desert (USFWS 2002b, USFWS 2006). Most amphibians occur in or near artificial water catchments or natural basins that fill with water during summer storms or are artificially filled to support other wildlife species including desert bighorn sheep. Other individuals respond to summer thunderstorms and are active throughout the CPNWR in appropriate wash, flat, and tinaja habitats. No amphibians were observed during the diurnal wildlife surveys conducted in April and June/July 2008; however, species documented in the region include Couch's spadefoot toad (*Scaphiopus couchi*), Great Plains toad (*Bufo cognatus*), Sonoran green toad (*Bufo retiformis*), Colorado River toad (*Bufo alvarius*), red-spotted toad (*Bufo punctatus*), and canyon tree frog (*Hyla arenicolor*) (USFWS 2002b, USFWS 2006).

There are more than 40 species of mammals that reside within the Project corridor; among them are the federally endangered Sonoran pronghorn and lesser long-nosed bat and the desert bighorn sheep a species of special concern (USFWS 2002b, USFWS 2006). During wildlife surveys conducted in April and June/July 2008, Project biologists observed the Yuma antelope squirrel (*Ammospermophilus harrisii*), coyote (*Canis latrans*), black-tail jackrabbit (*Lepus californicus*), desert bighorn sheep (*Ovis canadensis mexicana*), desert cottontail (*Sylvilagus audubonii*), and the kit fox (*Vulpes macrotis macrotis*). Other mammal species common to or rarely occurring within the Project corridor include the desert kangaroo rat (*Dipodomys deserti arizonae*), Merriam's kangaroo rat (*Dipodomys merriami merriami*), cactus mouse (*Peromyscus eremicus eremicus*), California myotis (*Myotis californicus stephensi*), Arizona, Bailey and desert pocket mouse (*Perognathus amplus taylori, P. baileyi baileyi*, and *P. penicillatus pricei*), round-tailed ground squirrel (*Spermophilus tereticaudus neglectus*), American badger (*Taxidea taxus berlandieri*), mountain lion (*Puma concolor*), gray fox (*Urocyon cineroargenteus*), mule deer (*Odocoileus hemionus crooki*), Sonoran pronghorn (*Antilocapra americana sonoriensis*), and the western spotted skunk (*Spilogale gracilis leucoparia*).

Most of the avian species occurring in CPNWR and BMGR are migratory, passing through in spring and fall (USFWS 2006, USGS 2006). More than 200 avian species have been reported in and around the CPNWR and BMGR; however the number of species using the available habitats is highly variable due to extreme dry spells that reduce food sources and limit suitable habitat values (USGS 2006). During wildlife surveys conducted in April and June/July 2008 of the Project area, the American kestrel (*Falco sparverius*), common raven

(*Corvus corax*), greater roadrunner (*Geococyx californianus*), white-winged dove (*Zenaida asiatica*), mourning dove (*Zenadia macroura*), red-tailed hawk (*Buteo jamaicensis*), northern mockingbird (*Mimus polyglottos*), elf owl (*Micrathene whitneyi*), Gambel's quail (*Callipepla gambelii*), western kingbird (*Tyrannus verticalis*), turkey vulture (*Cathartes aura*), and Gila woodpecker (*Melanerpes uropygialis*) were observed. Abundant and common avian species (USFWS 2006) include the turkey vulture, red-tailed hawk, American kestrel, Gambel's quail, mourning dove, white-winged dove, elf owl, Gila woodpecker, Say's phoebe (*Sayornis saya*), loggerhead shrike (*Lanius ludovicianus*), common raven, verdin (*Auriparus flaviceps*), cactus wren (*Campylorhynchus brunneicapillus*), ruby-crowned kinglet (*Regulus calendula*), black-tailed gnatcatcher (*Polioptila meanura*), curve-billed thrasher (*Toxostoma curvirostre*), and house finch (*Carpodacus mexicanus*).

Aquatic Resources. There are no aquatic resources in the Project area.

3.8.2.3 Effects of the Project

The Project will potentially have permanent impacts on wildlife on approximately 264 acres of vegetation. The fence will be constructed in four sections along the U.S./Mexico international border. These four sections range in length from 0.17 miles to 7.2 miles, the total fence length is 8.82 miles and is designed for construction within the Roosevelt Reservation. In addition there will be construction and improvements to 28.65 miles of access roads. It is anticipated that the post-on-rail vehicle fence will be constructed for the majority of the segment, with Normandy-style barrier used for desert wash crossings and steeper grades. As part of the design criteria, the fence was designed to reduce or minimize impacts on small animal movements and not to impede the natural flow of surface water. However, it is anticipated the wildlife resources could be impacted.

Wildlife. Permanent impacts on wildlife from habitat loss will occur from the installation of the vehicle fence, construction of new access roads, and improvement of existing access roads. Temporary impacts on wildlife could result from increased human activity, noise, security lighting, and physical disturbances associated with construction and maintenance.

Small mammal burrows that also support reptiles, amphibians, and ground-dwelling insects are common within the Project area and these species and habitat will be eliminated in the long term in the immediate vicinity of new construction access roads due to grading, compaction, and surfacing. Impacts on migratory birds include direct loss of habitat (e.g., escape cover, foraging, roosting, and nesting) and are also dependent upon timing of fence construction. For example, any nesting birds found within the Project footprint will be avoided or relocated by specialist qualified biologist. There could also be a benefit to migratory birds by the reduction of vehicular traffic through the habitats. More mobile wildlife species will generally avoid the Project area during construction however predators and scavengers could be attracted to the area to consume displaced or dead wildlife.

Lighting along the border fence will behaviorally impact nocturnal wildlife both by attracting them or displacing them around the illuminated zones. The Project proposes minimizing impacts by only using security lighting around the staging areas. If construction or maintenance activities require continuing into the night in areas occupied by listed animal species, all lights will be shielded to direct light only onto the work site and the area necessary to ensure the safety of the workers. The minimum foot-candles necessary will be used and the number of lights will be minimized.

Aquatic Resources. There are no aquatic resources in the Project area.

3.8.3 Special Status Species

3.8.3.1 Definition of the Resource

Although the Secretary's waiver means CBP no longer has any specific legal obligations under the Endangered Species Act (ESA) for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the ESA as the basis for evaluating potential environmental impacts and appropriate mitigations associated with special status species.

Two groups of special status species are addressed in this ESP: Federal threatened and endangered species and state threatened and endangered species. Each group has its own definitions, and legislative and regulatory drivers for consideration; these are briefly described below.

The ESA, as amended (16 U.S.C. 1531–1544 et seq.) provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the United States or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. Under the ESA, a Federal endangered species is defined as any species that is in danger of extinction throughout all or a significant portion of its range. The ESA defines a Federal threatened species as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The Arizona Game and Fish Department (AGFD) Natural Heritage Program maintains a list of Wildlife of Special Concern (WSC) in Arizona. This list includes fauna whose occurrence in Arizona is or might be in jeopardy, or with known or perceived threats or population declines (AGFD 2008). These species are not necessarily the same as those protected by the Federal government under the ESA.

The Arizona Department of Agriculture (ADA) maintains a list of protected plant species within Arizona. The 1999 Arizona Native Plant Law defined five categories of protection within the state. These include Highly Safeguarded (HS), no collection allowed; Salvage Restricted (SR), collection only with permit; Export Restricted, transport out of state prohibited; Salvage Assessed, permit required to remove live trees; and Harvest Restricted, permit required to remove plant by-products (ADA 2007).

3.8.3.2 Environmental Setting

All federally and state-listed species in Yuma County, Arizona, are presented in **Table 3-7**.

Within the Section CV-2 Project corridor the broad habitat types available to resident and migrating wildlife species include sparse herbaceous vegetation, shrubland, and woodland. Most of the available wildlife habitat consists of arid desert shrubland communities that have become established on ridges, slopes, alluvial fans, and plains, and along arroyos, gullies, and desert washes (e²M 2008).

Federal Species

Two federally listed species, lesser long-nosed bat (*Leptonycteris curasoae)* and Sonora pronghorn (*Antilocapra americana sonoriensis),* have the potential to occur in or near Section CV-2 in Yuma County, Arizona (see **Table 3-7**) (USFWS 2008).

The following federally listed, candidate, and conservation agreement species are not anticipated to be impacted by the construction, maintenance, and operation of the tactical infrastructure in Section CV-2:

- Razorback sucker (*Xyrauchen texanus*)
- Bald eagle (*Haliaeetus leucocephalus*)
- Southwestern willow flycatcher (*Empidonax traillii extimus*)
- Yellow-billed cuckoo (*Coccyzus americanus*)
- Yuma clapper rail (*Rallus longirostris yumanensis*)
- Flat-tailed horned lizard (*Phrynosoma mcallii).*

While the historic ranges of the species include this region of Arizona, available data indicate no known records of these species within or proximal to the impact corridor. Additionally, neither these species nor their habitat were observed during the June 2008 survey (e²M 2008). Therefore, these species will not be discussed in this section.

No Federal threatened or endangered species were observed during the June 2008 surveys (see the Biological Survey Report in **Appendix E**). The following sections provide brief descriptions of habitat preferences of the federally listed species considered further in this ESP. Additional details on the known distribution and threats to these species are provided in the Biological Resources Plan in **Appendix F.**

Table 3-7. State- and Federally Listed Species with the Potential to Occur in or near the Project Corridor

Common Name	Scientific Name	Potential to Occur	Federal Status	State Status
FISH				
Razorback sucker	*Xyrauchen texanus*	N	E	WSC
REPTILES				
Desert rosy boa	*Charina trivirgata gracia*	N	SC	—
Sonoran Desert tortoise	*Gopherus agassizii* (Sonoran Population)	Y	SC	WSC
Banded gila monster	*Heloderma suspectum cinctum*	N	SC	—
Flat-tailed horned lizard	*Phrynosoma mcallii*	N	CA	WSC
Arizona chuckwalla	*Sauromalus ater* (Arizona Population)	N	SC	—
Yuman Desert fringe-toed lizard	*Uma rufopunctata*	N	SC	WSC
BIRDS				
Great egret	*Ardea alba*	N	—	WSC
Western burrowing owl	*Athene cunicularia hypugaea*	N	SC	—
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	N	C	WSC
Snowy egret	*Egretta thula*	N	—	WSC
Southwestern willow flycatcher	*Empidonax traillii extimus*	N	E	WSC
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	Y	SC	WSC
Bald eagle (wintering population)	*Haliaeetus leucocephalus*	N	T, PDL	WSC

Common Name	Scientific Name	Potential to Occur	Federal Status	State Status
Least bittern	*Ixobrychus exilis*	N	—	WSC
Loggerhead shrike	*Lanius ludovicianus*	N	SC	—
California black rail	*Laterallus jamaicensis coturniculus*	N	SC	WSC
BIRDS (continued)				
Yuma clapper rail	*Rallus longirostris yumanensis*	N	E	WSC
MAMMALS				
Sonoran pronghorn	*Antilocapra americana sonoriensis*	Y	E	WSC
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	N	SC	—
Spotted bat	*Euderma maculatum*	N	SC	WSC
Greater western bonneted bat	*Eumops perotis californicus*	N	SC	—
Western yellow bat	*Lasiurus xanthinus*	N	—	WSC
Lesser long-nosed bat	*Leptonycteris curasoae*	Y	E	WSC
California leaf-nosed bat	*Macrotus californicus*	N	SC	WSC
Yuma myotis	*Myotis yumanensis*	N	SC	—
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	N	—	—
Yuma hispid cotton rat	*Sigmodon hispidus eremicus*	N	SC	—
PLANTS				
Parish onion	*Allium parishii*	N	S	SR
Kofa barberry	*Berberis harrisoniana*	N	S	—
Gander's cryptantha	*Cryptantha ganderi*	N	S	—
Clustered barrel cactus	*Echinocactus polycephalus* var. *polycephalus*	Y	—	SR
Dune spurge	*Euphorbia platysperma*	N	SC	—

Common Name	Scientific Name	Potential to Occur	Federal Status	State Status
California barrel cactus	*Ferocactus cylindriceus* var. *cylindraceus*	Y	PR	SR
Dune sunflower	*Helianthus niveus* ssp. *tephrodes*	N	SC	—
Senita	*Lophocereus schottii*	Y	—	SR
PLANTS (continued)				
Straw-top cholla	*Opuntia echinocarpa*	Y	—	SR
Sand food	*Pholisma sonorae*	N	SC	HS
Kearney sumac	*Rhus kearneyi*	Y	S	SR
Schott wire lettuce	*Stephanomeria schottii*	N	S	—
Blue sand lily	*Triteleiopsis palmeri*	N	S	SR
California fan palm	*Washingtonia filifera*	N	—	SR

Source: Arizona Game and Fish Department (AGFD) 2008; USFWS 2008

Notes: E = Listed Endangered; T = Listed Threatened; C = Candidate; CA = Conservation Agreement; PDL = Proposed for Delisting; PR = Protected; S= Sensitive; SC = Species of Concern; WSC = Wildlife of Special Concern in Arizona; HS = Highly Safeguarded Protected Native Plants (no collection allowed); SR = Salvage Restricted Protected Native Plants

Sonoran pronghorn. The Sonoran pronghorn inhabits broad intermountain alluvial valleys with creosote-bursage and palo verde-mixed cacti associations (USFWS 2008). Sonoran pronghorns most frequently use the valleys and hills of Pinta Sands, Mohawk Valley, San Cristobal Valley, and Growler Valley east of the Project area. Sonoran pronghorns are known to occur within CPNWR, with the CPNWR being central to its distributional range (USFWS 2006). Although Section CV-2 will occupy part of the historical range for Sonoran pronghorn, the Project is outside the current range of the species. Additionally, because of the lack of water resources in the Project area, it is considered marginal, seasonal habitat for Sonoran pronghorn (e²M 2008). Threats to Sonoran pronghorn include barriers to movement caused by roads, canals, train tracks, and fences (USFWS 2002a). However, research indicates that Sonoran pronghorn can cross under fences with a clearance of 22 inches, with a low aversion rate. The clearance under a post-on-rail fence is 36 inches and the clearance under a Normandy style fence is 32.5 inches (e²M 2008).

Lesser long-nosed bat. The lesser long-nosed bat inhabits desert scrub habitat with agave and columnar cacti present as food plants (USFWS 2008). After breeding in the desert, lesser long-nosed bats move east into the mountains and valleys of southeastern Arizona, which are a combination of forested lands, grasslands, and desert scrub. Lesser long-nosed bats use roost sites within CPNWR, including one of three maternity roosts in the United States (USFWS

2006). Forage habitat for the species is also present within the Project corridor (e²M 2008).

State Species

State-listed plant species observed within the Section CV-2 Project corridor during June 2008 surveys included the clustered barrel cactus (*Echinocactus polycephalus* var. *polycephalus*). Potential habitats for the California barrel cactus (*Ferocactus cylindriceus* var. *cylindraceus*), senita (*Lophocereus schottii*), straw-top cholla (*Opuntia echinocarpa*), and Kearney sumac (*Rhus kearneyi*) were observed in Sections CV-2.

Suitable habitat for the following state-listed plant species is uncommon to absent in the Project corridor: Parish onion, Kofa barberry, Gander's cryptantha, dune spurge, dune sunflower, sand food, Schott wire lettuce, blue sand lily, and California fan palm. There were no highly safeguarded protected native plants observed within Section CV-2. Typical saguaro cacti occur within the Project corridor but the fan-top or crested form that is listed under the highly safeguarded protected native plants does not occur.

Two state-listed animal species, in addition to lesser long-nosed bat and Sonora pronghorn, are likely to occur in or near the Project corridor (see **Table 3-7**). The state-listed species with potential habitat within the Project corridor include the Sonoran desert tortoise (*Gopherus agassizii*) and the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*).

The following paragraphs provide brief descriptions of the regional distribution and habitat of state-listed species for which individuals or suitable habitat were observed during the June 2008 surveys (see **Appendix E**) (e²M 2008).

Clustered barrel cactus. The clustered barrel cactus inhabits alluvial plains and flats in sand and silt substrate. The species occurred uncommonly within the Project corridor during June 2008 surveys (e²M 2008).

California barrel cactus. The California barrel cactus inhabits gravelly or rocky hillsides, canyon walls, alluvial fans, and desert wash margins on igneous and limestone substrates. Potential habitat within the corridor for this species includes the gravelly, rocky, or sandy soils; however, this species was not observed during inventories of the corridor (e²M 2008).

Senita. Senita inhabits desert soils that are heavy or sandy and form valleys and plains. Suitable habitat for senita composed most of the Project area, but this species was not observed during inventories of the corridor (e²M 2008).

Straw-top cholla. Straw-top cholla inhabits desert mountain and desert floor habitats. Potential habitat within the corridor for this species includes the bajadas and alluvial valley soils; however, this species was not observed during surveys (e²M 2008).

Kearney sumac. Kearney sumac inhabits canyons and drainages of the Tinajas Altas, Cabeza Prieta, and Gila mountains. Potential habitat for this species includes the rocky slopes of the Tinajas Altas and Tule mountains; however, this species was not observed during surveys (e²M 2008).

Cactus ferruginous pygmy-owl. The cactus ferruginous pygmy-owl inhabits Sonoran desert scrub habitat in the northwestern portion of CPNWR. The cactus ferruginous pygmy-owl was delisted as federally endangered in 2006 but remains a species of conservation concern. Two occurrences within CPNWR have been documented; one in the Cabeza Prieta Mountains and one further east in the Agua Dulce Mountains (e²M 2008). Neither of these is recorded within the Project area.

Sonoran Desert tortoise. Potential habitat for the Sonoran Desert tortoise within the corridor includes paloverde-mixed cacti associations where boulders, outcrops, and natural cavities with deep enough soil to support excavations as shelters (e²M 2008).

3.8.3.3 Effects of the Project

Federal Species

Approximately 258 acres of vegetation that serve as habitat for threatened and endangered will be permanently impacted along the Project corridor. Additional loss of habitat resulting from clearing of laydown areas for construction materials and maintenance and storage areas for heavy equipment will be minimal as previously disturbed areas will be selected for these functions to the extent practicable. Potential impacts on listed species include habitat loss, noise, and physical disturbance associated with construction and subsequent maintenance activities, and beneficial impacts due to reduced cross-border violator traffic.

Lesser long-nosed bat. Short-term and long-term, negligible effects on the lesser long-nosed bat will occur in Section CV-2. However, there are no known occurrences of this species within or immediately adjacent to the Project corridor (NatureServe 2008). Effects will occur through the direct loss of forage habitat. Based on the known forage distances of up to 40 miles for lesser long-nosed bats, it is likely that this species forages throughout portions of the CPNWR, where flowers and fruit of saguaro, organ pipe, prickly pear, and agave are available (USFWS 2006, USFWS 2007a).

Approximately 9 acres of suitable lesser long-nosed bat forage habitat (saguaro/creosotebush–white bursage wooded shrubland) will be permanently impacted by construction of tactical infrastructure in Section CV-2. Approximately 260 saguaros occur in the Project corridor, which serve as a forage plant for lesser long-nosed bat. This potential loss of lesser long-nosed bat habitat is small compared to the suitable forage habitat available to the lesser long-nosed bat throughout the action area. Additionally, CBP will perform appropriate mitigation to lessen the impacts of the Project by avoiding sensitive or protected plant species when possible. Therefore, the planned action might affect, but is not likely to adversely affect the lesser long-nosed bat.

A beneficial effect anticipated from the Project is the reduction of foot traffic on habitat for this species. This area currently receives heavy foot traffic and these activities result in adverse effects due to reduction of habitat quantity and quality, and to the lesser long-nosed bat (USFWS 2007b). The potential cessation of these illegal activities in this area will result in short- and long-term, minor to major, beneficial effects on this species.

Sonoran pronghorn. The Project may affect, but is not likely to adversely affect the Sonoran pronghorn throughout the impact areas in Section CV-2. The AGFD documented an individual radiotagged Sonoran pronghorn that crossed the Section CV-2 project corridor and joined a herd in Mexico (Young 2008). It is possible that this is an extralimital occurrence, based on the species' current range and the fact that this was an individual Sonoran pronghorn. Although Section CV-2 will occupy part of the historical range for Sonoran pronghorn, the Project is outside the current range of the species. Additionally, because of the lack of water sources, the Project area is considered only marginal seasonal habitat (e²M 2008). Therefore, no direct effect on Sonoran pronghorn or its habitat will occur.

Improvements to the Camino del Diablo could increase vehicle and recreational use in Sonoran pronghorn habitat. However, these increases are likely to be negligible. Camino del Diablo is currently open to permitted four-wheel-drive traffic and this will not change as a result of the Project. Increased human disturbance of Sonoran pronghorn in adjacent habitat, associated with construction could occur. Increased human disturbance could result in physiological effects, such as elevated heart rate or the additional energy expended in moving away from perceived danger. Studies of captive pronghorn, other than the Sonoran subspecies, have shown that they are sensitive to disturbance such as human presence and vehicular noise. Human and vehicular traffic caused an increased heart-rate response in American pronghorn in half-acre holding pens. During times of drought, disturbances that cause pronghorns to startle and run energetically will have a more significant effect. Such expenditures of energy, particularly during times of stress, could lead to lower reproductive output or reduced survival for individual animals (USFWS 2006). However, impacts are expected to be negligible since construction will be focused outside the current range of the species.

A beneficial effect is anticipated from the Project is the reduction of illegal traffic and other illegal human activities on habitat for this species. In one area, illegal traffic has created a 38-mile road since 1999 that traverses pronghorn habitat. In addition, there are hundreds of additional miles of single vehicle tracks laid down across the otherwise undisturbed desert by undocumented cross-border violators. These activities undoubtedly result in adverse effects due to the reduction of habitat quantity and quality available to Sonoran pronghorns (USFWS 2006) and through direct disturbance of individuals. The potential cessation of these illegal activities in this area could result in short- and long-term, minor to major, beneficial effects on this species through improvement of the habitat north of the Project such that pronghorn might once again inhabit in the future.

State Species

Habitat loss or conversion for state-listed species in Section CV-2 will affect a small area and will be of little consequence to statewide viability of these species. BMPs to avoid and minimize impacts, such as pre-construction clearance surveys, are anticipated to reduce potential impacts on minor or lower in intensity. Noise created during construction will be anticipated to result in short-term, minor, adverse impacts on these state-listed species.

Long-term, minor to moderate, adverse impacts on state-listed species could result from construction and maintenance of tactical infrastructure. Potential impacts include habitat fragmentation and vehicular traffic.

Clustered barrel cactus. The Project will result in long-term, direct, minor adverse effects on the clustered barrel cactus throughout the impact areas in Section CV-2. According to NatureServe (2008) data, there are no known occurrences of this species within or immediately adjacent to the Project corridor; however, the species occurred uncommonly within the Project corridor in alluvial plain and alluvial flat habitats on sandy soils and talc with creosotebush, white bursage, brittlebush, and pencil cholla.

California barrel cactus. The Project has the potential to cause short-term, direct, minor adverse effects on California barrel cactus throughout the impact areas in Section CV-2. According to NatureServe (2008) data, there was an occurrence of the California barrel cactus approximately 2.7 miles north of the Project corridor and a mile west of the access road. Potential habitat for this species is present in Section CV-2; however, surveys revealed no plants of this species within the corridor.

Senita. The Project has the potential to cause short-term, direct, negligible adverse effects on senita throughout the impact areas in Section CV-2. According to NatureServe (2008) data, there were no known occurrences of this species in or adjacent to the Project corridor. Potential habitat for this species is present in Section CV-2; however, surveys revealed no plants of this species within the corridor.

Straw-top cholla. The Project has the potential to cause short-term, direct, negligible adverse effects on straw-top cholla throughout the impact areas in Section CV-2. According to NatureServe (2008) data, there were no known occurrences of this species in or adjacent to the Project corridor. Potential habitat for these species is present in Section CV-2; however, surveys revealed no plants of these species within the corridor.

Kearney sumac. The Project has the potential to cause short-term, direct, negligible adverse effects on Kearney sumac throughout the impact areas in Section CV-2. According to NatureServe (2008) data, there was an occurrence of Kearney sumac approximately 5.4 miles north of the Project corridor. Potential habitat for these species is present in Section CV-2; however, surveys revealed no plants of these species within the corridor.

Desert tortoise. The Project has the potential to cause short-term, direct, minor adverse effects on the desert tortoise in Section CV-2 due to unknown occurrences. According to NatureServe (2008) data, there are no occurrences of this species within the Project area; however, there is a known occurrence less than 8 miles north of the corridor. Although none were observed during the surveys, potential habitat for the species is present and desert tortoises could occur in the Project corridor (e^2M 2008).

Cactus ferruginous pygmy-owl. The Project has the potential to cause short-term, direct, minor adverse effects on the cactus ferruginous pygmy-owl throughout the impact areas in Section CV-2. According to NatureServe (2008) data, there are no occurrences of the cactus ferruginous pygmy-owl within the Project area; however there is a known occurrence less than 7 miles north of the corridor. Potential habitat for this species occurs in areas of Sonoran desert scrub. Objectives in cactus ferruginous pygmy-owl management include maintaining and increasing the current population in suitable habitat and protecting known breeding locations from disturbance.

Overall, short-term, minor adverse impacts from construction will be expected, while long-term minor adverse impacts from maintenance and operation will be expected. The fencing is expected to provide protection for state species in the areas north of the tactical infrastructure from foot traffic impacts by cross-border violators. Construction and operation of tacitical infrastructure will increase border security in the USBP Yuma Sector and can result in a change to illegal traffic patterns. However, changes to cross-border violator traffic patterns result from a myriad of factors and therefore are considered unpredictable and beyond the scope of this ESP.

3.9 CULTURAL RESOURCES

3.9.1 Definition of Resource

Although the Secretary's waiver means CBP no longer has any specific legal obligations under the National Historic Preservation Act (NHPA) for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the NHPA as the basis for evaluating potential environmental impacts and appropriate mitigations for cultural resources.

Cultural resources are defined by the NHPA of 1966 (as amended) as prehistoric and historic sites, structures, districts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Depending on the condition and historic use, such resources can provide insight into living conditions in previous civilizations and can retain cultural and religious significance to modern groups.

Typically, cultural resources are subdivided into archaeological resources (prehistoric or historic sites where human activity has left physical evidence of activities but no standing structures remain) or architectural resources (buildings or other structures or groups of structures that are of historic or aesthetic significance). Archaeological resources comprise areas where human activity has measurably altered the earth or deposits of physical remains, such as arrowheads or bottles, are found. Under NHPA and the Archeological and Historic Preservation Act, any area of human activities at least 50 years old qualifies as an archaeological site. However, the Archeological Resources Protection Act defines an archaeological site as any area of human activity at least 100 years old.

Architectural resources include standing buildings, bridges, dams, and other structures of historic or aesthetic significance. Generally, architectural resources must be more than 50 years old to be considered for nomination to the NRHP. More recent structures, such as Cold War-era resources, might warrant protection if they have the potential to gain significance in the future or if they meet “exceptional” significance criteria.

Traditional cultural properties or sacred sites are a special category of cultural resources. These site types can encompass archaeological resources, structures, neighborhoods, prominent topographic features, habitat, plants, animals, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture.

The evaluation and consultation processes promulgated in Section 106 of the NHPA require assessment an of undertaking’s potential impact on historic properties that are within the Project’s Area of Potential Effect (APE). The APE is defined as the geographic area(s) “within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.” In accordance with EO 12372, *Intergovernmental Review of Federal Programs*, determinations of an undertaking’s potential effect on historic properties are presented to the SHPO.

3.9.2 Environmental Setting

A search of existing archaeological and historical site records within 1 mile of the U.S./Mexico international border along the current APE was conducted through Arizona State Museum (ASM) AZSites online database, DOI, BLM, and USFWS. Pedestrian inventory of the APE occurred between 5 to 7 May and 7 to 13 June 2008.

File search results indicated the international border corridor within CPNWR had been inventoried for cultural resources by Gulf South Research Corporation (GSRC) and Northland Research, Inc. (NRI). In association with vehicle fence construction, International Border Monuments 174 through 177, 180, 181, and 188 were recorded as historical sites. Border Monument 188 is within 1 mile of the Project area but will not be directly affected. Only isolated objects were found in addition to the above mentioned border monuments (Hart and Lindemuth 2007).

The Project's APE is within a portion of the Camino del Diablo National Historic Landmark District, a 1-mile wide corridor associated with notoriously difficult historic travel routes between Caborca, Sonora, Mexico and Yuma, Arizona, that was used prior to 1870 when the Southern Pacific Railroad reached Yuma.

A 100-foot-wide corridor centered on a four-wheel-drive road that crosses the CPNWR along the approximate center of the Camino del Diablo National Historic Landmark District was inventoried by GSRC and NRI in anticipation of its use as a construction access road. Two small prehistoric sites (AZ Y:13:8 [ASM] and AZ Y:13:9 [ASM]) and several isolated objects were recorded within this corridor. Both sites were recommended not eligible for listing on the NRHP (Hart et al. 2008).

Border Monument 188 is in the fence corridor and eligible for listing on the NRHP under criterion A of 36 CFR 60.4 due to its significant association with the historical pattern of U.S./Mexican political and economic relations from 1848 to 1896 and under criterion C of 36 CFR 60.4 as an example of unique historic structures. The monument's period of historical significance extends to the 1848 Treaty of Guadalupe Hidalgo and subsequent treaties and agreements between 1852 and 1896 that modified and amended various previous agreements and which required the establishment of joint U. S./Mexican border surveys and demarcations. This structure will not be affected by the Project as currently planned.

The affected four-wheel-drive road within the Camino de Diablo National Historic Landmark District, between Barry M. Goldwater Range to the west and Tortillo Peak to the east, was recommended by GSRC as a non-contributing element of the district due to extensive and sustained modern use and alteration of the road corridor. This recommendation applies to the existing road corridor, to which impacts must be confined (and sites AZ Y:13:8 and AZ Y:13:9), and does not apply to other sites or structures within the Camino del Diablo National Historic Landmark District, none of which are affected by the Project.

Archaeological surveys of access routes by e²M in 2008 recorded one isolated object consisting of two Hohokam red on buff ceramic sherds in a secondary (re-deposited) context. Because of these items' status as isolated objects, the locus was not considered for NRHP inclusion.

3.9.3 Effects of the Project

Analysis of impacts on cultural resources considers various agents. Adverse impacts include physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance, introducing visual or audible elements that are out of character with the property or alter its setting; or neglecting the resource to the extent that it deteriorates or is destroyed.

The Project along the U.S./Mexico international border and associated access roads and staging areas within CPNWR includes excavation, geophysical boring, grading, road improvement, fence construction, equipment storage, and increased vehicle traffic and human presence during the construction phase and longer-term as border monitoring activities intensifies and regular road maintenance continues. However, the portion of four-wheel-drive road within El Camino del Diablo National Historic Landmark District that will be used during this project has been subjected for several decades to impacts by mechanized vehicles that have negated its historical integrity. However, the portion of four-wheel-drive road within the Camino del Diablo National Historic Landmark District affected by this Project has been subjected for several decades to impacts by mechanized vehicles that have negated its historical integrity. This segment is recommended as a non-contributing element of the historic district. The single border monument within the fence corridor, Monument 188, will be avoided. Thus, the proposed action will have no effect on historic or prehistoric sites. Archaeological monitoring is recommended, however, during construction activities within CPNWR. If cultural items are encountered during ground disturbing activities, the construction will be temporarily suspended in the area of the find and assessed by an archaeologist before construction work continues.

3.10 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.10.1 Definition of the Resource

Although the Secretary's waiver means CBP no longer has any specific legal obligations under the laws included in the waiver, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts associated with socioeconomic resources.

Socioeconomics. Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly characteristics of population and economic activity. Regional birth and death rates and immigration and emigration affect population levels. Economic activity typically encompasses employment, personal income, and industrial or commercial growth. Changes in these two fundamental socioeconomic indicators are typically accompanied by changes in other components, such as housing availability and the provision of public services. Socioeconomic data at county, state, and national levels permit characterization of baseline conditions in the context of regional, state, and national trends.

Data in three areas provide key insights into socioeconomic conditions that might be affected by a Project. Data on employment identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on personal income in a region can be used to compare the "before" and "after" effects of any jobs created or lost as a result of a project. Data on industrial or commercial growth or growth in other sectors provide baseline and trend line information about the economic health of a region.

Demographics identify the population levels and changes to population levels of a region. Demographics data might also be obtained to identify, as appropriate to the evaluation of a project, a region's characteristics in terms of race, ethnicity, poverty status, educational attainment level, and other broad indicators.

Socioeconomic data shown in this chapter are presented at census tract, county, municipality, and state levels to characterize baseline socioeconomic conditions in the context of regional and state trends. Data have been collected from previously published documents issued by Federal, state, and local agencies; and from state and national databases (e.g., U.S. Bureau of Economic Analysis' Regional Economic Information System).

Environmental Justice and Protection of Children. EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* February 11, 1994, addresses the Federal policy of Federal agencies' actions substantially affecting human health or the environment not to exclude persons, deny persons benefits, or subject persons to discrimination because of their race, color, or national origin. The purpose of the EO is to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the adverse environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, Tribal, and local programs and policies. Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations in the vicinity of a Project.

Such information aids in evaluating whether a Project will render vulnerable any of the groups targeted for protection in the EO.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, addresses the Federal policy of protection of children from exposure to disproportionate environmental health and safety risks. This EO established that each agency has a responsibility to ensure that its policies, programs, activities, and standards address risk to children that results from environmental health risks or safety risks.

3.10.2 Environmental Setting

Socioeconomics. The Project includes the construction of vehicle fence along the U.S./Mexico international border southeast of Yuma, Arizona, in Yuma County, Arizona, and north and west of Sonoyta, Mexico. The Project will occur in a rural/undeveloped area in the United States. For the purposes of this ESP, and due to the remote location of the Project, the Region of Influence (ROI) includes all of Yuma County, Arizona, (adjacent to the location of the Project). The most current census tract data are from Census 2000.

Employment types in the ROI vary (see **Table 3-8**). The largest employment type in Yuma County and Arizona is management and professional services (26.7 and 32.7 percent, respectively). A substantially larger portion of residents in the ROI (8.6 percent) were employed in the agriculture, forestry, fishing and hunting industry as compared to the average for the State of Arizona (1.0 percent). However, a substantially smaller portion of residents in the ROI (5.0 percent) were employed in manufacturing as compared to the average for the State of Arizona (10.2 percent). Other employment types in the ROI resemble the percentages of Arizona (U.S. Census Bureau 2002). In 2006, Yuma County had a 9.2 percent unemployment rate compared to a 4.9 percent unemployment rate for Arizona (U.S. Census Bureau 2006).

Table 3-8. Employment Type of Residents in Yuma County and the State of Arizona

Economic and Social Indicators	Yuma County	Arizona
Agriculture, forestry, fishing and hunting	8.6	1.0
Construction, extraction, and maintenance	10.7	11.0
Manufacturing	5.0	10.2
Farming, fishing, and forestry	6.3	0.6
Sales and office occupations	26.4	28.5
Production, transportation, and material moving	12.2	10.9
Management, professional, and related	26.7	32.7
Service	17.7	16.2
Government Workers (local, state, or federal)	22.4	15.2

Source: U.S. Census Bureau 2002

Note: Census 2000 data are the most recent comprehensive economic and demographic data for the ROI.

Sonoyta, Mexico, is more than 18 miles away from the Project, and is not likely to be impacted by the construction.

Environmental Justice. For the purposes of the environmental justice analysis for this ESP, the residents of the ROI were evaluated. The ROI is considered to have a disproportionately high percentage of low-income or minority residents under either of two conditions: (1) the percentage of low-income or minority populations within the ROI is greater than Arizona's minority percentage, or low-income percentage, or (2) the percentage of persons in low-income or minority populations within the ROI is greater than 50 percent. Based on these two conditions, the ROI is not considered to have a disproportionately high percentage of low-income or minority residents according to Census 2000 data.

Table 3-9 shows demographic data and economic indicators of Yuma County, and Arizona. Yuma County has a higher percentage of Hispanic or Latino populations than the State of Arizona, although all other minority groups are lower in the ROI than in the state. Approximately 23.6 percent of the population in the ROI, and 11.6 percent of the population in Arizona are reported as "Some other race" (see **Table 3-9**). The economic characteristics of the ROI are lower than those of the State of Arizona, with per capita income of more than $5,000 less in the ROI as compared to the state, and a median household income of more than $8,000 less. Yuma County (19.2 percent) has a higher portion of its citizens living below the poverty level than in the State of Arizona (13.9 percent) (U.S. Census Bureau 2002).

Table 3-9. Demographic and Economic Characteristics of Yuma County and the State of Arizona

	Yuma County	Arizona
Total Population	187,555	5,130,632
Percent White	68.3	75.5
Percent Black or African American	2.2	3.1
Percent American Indian Alaska Native	1.6	5.0
Percent Asian	0.9	1.8
Percent Native Hawaiian and Other Pacific Islander	0.1	0.1
Percent "Some other race"	23.6	11.6
Percent Reporting 2 or more races	3.3	2.9
Hispanic or Latino (of any race)	50.5	25.3
Percent Below Poverty	19.2	13.9
Per Capita Income	$14,802	$20,275

Median Household Income	$32,182	$40,558

Source: U.S. Census Bureau 2002

Note: Census 2000 data are the most recent comprehensive economic and demographic data for the ROI.

3.10.3 Effects of the Project

Construction expenditure impacts are assessed in terms of direct effects on the local economy and related effects on other socioeconomic resources (e.g., housing). The magnitude of potential impacts can vary greatly, depending on the location of a Project. For example, implementation of an action that creates 10 employment positions might go unnoticed in an urban area, but could have considerable impacts in a rural region. If potential socioeconomic changes were to result in substantial shifts in population trends or a decrease in regional spending or earning patterns, they will be considered adverse. Analysis of Project impacts focused on the following potential occurrences:

- Change the local business volume, employment, personal income, or population that exceeds the ROI's historical annual change
- Adversely affect social services or social conditions, including property values, school enrollment, county or municipal expenditures, or crime rates.

Socioeconomics. Short-term minor direct beneficial effects will be expected as a result of construction associated with the Project. The construction activities will occur over calendar year (CY) 2008. It is assumed that local materials, supplies, and contractors will be used. However, the limited nature of the construction and new employment associated with the Project will not substantially affect personal income, poverty levels, or other demographic employment indicators in the ROI.

Environmental Justice. Environmental justice concerns and special risks to the populations living closest to the construction include safety, noise, pollutants, and hazardous materials. Minority and low-income populations are higher in Yuma County than in the rest of Arizona. However, the Project will occur in a very remote area, approximately 20 miles away from the nearest populations. Because of this, impacts on these populations in terms of safety, noise, pollutants, and hazardous materials are minor. No environmental justice impacts are anticipated from the Project.

There is not a significant risk to children in the project area because there is not a large population of children in the project area. Safety precautions to protect children and other populations in areas surrounding work sites will include adequate measures to restrict access, minimization of hazards associated with construction activities, and proper handling and disposal of hazardous materials (see **Chapter 3.12**). These BMPs will reduce the potential for impacts on any populations or age groups, including children. Noise associated with construction will be intermittent and short in duration (described in **Chapter 3.3**).

3.11 HAZARDOUS MATERIALS AND WASTE

3.11.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), the Toxic Substances Control Act (TSCA), and the Superfund Amendments and Reauthorization Act (SARA) Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with CERCLA, RCRA, TSCA, and SARA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for hazardous materials and wastes.

In general, hazardous materials, hazardous substances, and hazardous wastes include elements, compounds, mixtures, solutions, and substances which, when released into the environment or otherwise improperly managed, could present substantial danger to the public health, welfare, or the environment.

Evaluation of hazardous materials and wastes focuses on underground storage tanks, aboveground storage tanks, and the storage, transport, handling, and use of pesticides, herbicides, fuels, solvents, oils, lubricants, asbestos containing material, and lead-based paint. Evaluation might also extend to generation, storage, transportation, and disposal of hazardous wastes when such activity occurs at or near the project area. In addition to being a threat to humans, the improper release of hazardous materials and wastes can threaten the health and well-being of wildlife species, botanical habitats, soil systems, and water resources. In the event of release of hazardous materials or wastes, the extent of contamination varies based on the type of soil, topography, and water resources.

3.11.2 Environmental Setting

The area surrounding the impact corridor is predominantly within the CPNWR. Therefore, the presence of hazardous substances is highly unlikely within or near the vehicle fence corridor. There are no known waste storage sites, waste disposal sites, or known releases of hazardous substances or petroleum products within the project corridor (USEPA 2008b, ADEQ 2008). Military users of the BMGR drop live ordnance on five pinpoint targets far removed from the CPNWR. The majority of land in the BMGR is used as a safety buffer for low-flying aircraft, providing refuge-like conditions for wildlife (USAF 2008); therefore, the presence of ordnance or hazardous materials related to military operations within the project area is highly unlikely.

3.11.3 Effects of the Project

Short-term, negligible adverse impacts will be expected. Products containing hazardous materials (e.g., fuels, oils, lubricants, pesticides, and herbicides) will be procured and used during construction. It is anticipated that the quantity of products containing hazardous materials used will be minimal and their use will be of short duration. It is anticipated that the quantity of hazardous and petroleum wastes generated from construction will be negligible.

Accidental spills could occur as a result of the construction. Spills could result from such activities as refueling of heavy equipment, loss of hydraulic oil through ruptured or leaking hoses, and possible gasoline or diesel fuel spills resulting from the unlikely event of a ruptured fuel tank. A spill could potentially result in short-term or long-term, minor to moderate adverse impacts on wildlife, soils, water, and vegetation. However, the amount of hazardous materials at the construction site will be limited and the equipment necessary to quickly contain any spill will be present when refueling. Contractors will be responsible for the management of hazardous materials and wastes. CBP will require that the contractor keep any necessary materials and equipment onsite to quickly contain any spill or leak. The management of hazardous materials and wastes will include the use of BMPs and adherence to a pollution prevention plan, refueling standard operating procedures, an SPCC Plan, and a stormwater management plan. CBP will also require the construction contractor to manage all hazardous materials and wastes in accordance with applicable Federal, state, and local regulations.

4. BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

CBP will continue to work in a collaborative manner with Tribes, local government, state and Federal land managers, and the interested public to identify environmentally sensitive resources and develop appropriate BMPs to avoid, identify, and minimize any adverse impacts on environmentally sensitive resources.

Design criteria to reduce adverse environmental impacts include selecting a route that will minimize impacts, consulting with Federal and state agencies and other stakeholders to avoid or minimize adverse environmental impacts, and developing appropriate BMPs to protect natural and cultural resources (see **Table 4-1**). Potential effects, including physical disturbance and construction of solid barriers on wetlands, riparian areas, streambeds, and floodplains, will be avoided or mitigated whenever possible. BMPs will include implementation of an SWPPP, CM&R Plan, SPCC Plan, Dust Control Plan, Fire Prevention and Suppression Plan, and Unanticipated Discovery Plan to protect natural and cultural resources.

Table 4-1. BMPs and Mitigation Measures

Resource Area	BMPs/Mitigation
Air Quality	BMPs to reduce dust and control PM_{10} emissions. Construction equipment will be kept in good operating condition to minimize exhaust. Construction speed limits will not exceed 35 miles per hour. Fire Prevention and Suppression Plan.
Noise	Equipment will be operated on an as-needed basis. A majority of the activities will occur away from population centers.
Land Use and Recreation	BMPs and mitigation not expected to be necessary.
Aesthetics	Design techniques and construction practices will be used to reduce the visual impacts of the Project. Such practices as using irregular clearing shapes, bending slopes to match existing landforms and retaining existing rock formations, vegetation, and drainage whenever possible will be used to the maximum extent practicable.
Geology and Soils	Dust Control Plan and SWPPP.
Hydrology and Groundwater	Revegetation of temporary staging areas, SWPPP, any applicable conservation methods as outlined by ADWR.
Surface Waters and Waters of the United States	SWPPP, sediment- and erosion-control plans, wetlands mitigation, and restoration plan.
Floodplains	Special fence design for stream crossings, planning guidance developed by the USACE.
Vegetation	Biological monitor on site to ensure all BMPs and mitigation plans are followed.
Wildlife and Aquatic Species	Construction start-date to consider migratory birds. Survey of nesting migratory birds.
Special Status Species	Biological monitor on site to ensure all BMPs and mitigation plans are followed.
Cultural Resources	Cultural Monitor on site to ensure all BMPs are followed. A 2-meter buffer will be used to protect border monuments during construction.
Socioeconomic and Environmental Justice	BMPs and mitigation not expected to be necessary.
Hazardous Materials and Waste	SPCC and CM&R plans.

5. RELATED PROJECTS AND POTENTIAL EFFECTS

The following analysis summarizes expected environmental effects from the Project when added to other past, current, and reasonably foreseeable future actions. The geographic scope of the analysis varies by resource area. For example, the geographic scope of cumulative impacts on resources such as noise, visual resources, soils, and vegetation is very narrow and focused on the location of the resource. The geographic scope of air quality, wildlife and sensitive species, and socioeconomic resources is much broader and considers more county- or regionwide activities. Projects that were considered for this analysis were identified by reviewing USBP documents, news releases, and published media reports, and through consultation with planning and engineering departments of local governments, and state and Federal agencies. Projects that do not occur in close proximity (i.e., within several miles) of the fence will not contribute to a cumulative impact and are generally not evaluated further.

5.1 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

Cumulative Fencing, Southern Border. As of December 2008, there are 62 miles of landing mat fence at various locations along the U.S./Mexico international border (CRS 2006); 14 miles of single, double, and triple fence in San Diego, California; 70 miles of new primary pedestrian fence approved and currently under construction at various locations along the U.S./Mexico international border; and fences at POE facilities throughout the southern border. In addition, 225 miles of pedestrian fence and 300 miles of vehicular fence (including the 9 miles addressed in this ESP), will be constructed in Texas, New Mexico, Arizona, and California.

***Past Actions*.** Past actions are those within the cumulative effects analysis areas that have occurred prior to the development of this ESP. The effects of these past actions are generally described under each resource area. For example, extensive military training in both the BMGR and CPNWR has contributed to the existing environmental conditions of the area.

***Present Actions*.** Present actions include current or funded construction projects, USBP or other agency operations in close proximity to the fence locations, and current resource management programs and land use activities within the cumulative effects analysis areas. Ongoing actions considered in the cumulative effects analysis include the following:

- <u>New Fence</u>. In August 2007, USBP approved the installation of 37 miles of pedestrian and vehicle fence in Yuma Sector on lands mostly under the control of BMGR. Referred to as Project 37, the first two of three phases focuses on deployment of tactical infrastructure and the third will focus on technology systems (GAO 2007). This activity ends just to the west of the

Project. To the east of the Project, vehicle fence Project CV-3 calls for the installation of 22.5 miles of post-on-rail and Normandy-style fence on CPNWR.

Reasonably Foreseeable Future Actions. Reasonably foreseeable future actions consist of activities that have been approved and can be evaluated with respect to their effects. The following activities are reasonably foreseeable future actions:

- SBI/SBI*net*. The Secure Border Initiative (SBI) is a comprehensive multi-year plan established by the DHS to secure America's borders and reduce illegal migration. SBI*net* is responsible for the development, installation, and integration of technology solutions, and SBI tactical infrastructure develops and installs physical components designed to secure the border consisting of the following major components: pedestrian fence, vehicle fence, roads, lights, and vegetation control. SBI*net* will improve deterrence, detection, and apprehension of illegal aliens into the United States. When fully implemented, SBI*net* and SBI tactical infrastructure will improve ability of CBP personnel to rapidly and effectively respond to illegal cross-border activity and help DHS and CBP to manage, control, and secure the Nation's borders.
- Construction of Vehicle Fence. The FY 2007 DHS Appropriations Act provided $1.2 billion for the installation of fencing, infrastructure, and technology along the border (CRS 2006). CBP will construct 300 miles of vehicle fence in the Marfa and El Paso, Texas; Tucson and Yuma, Arizona; and El Centro, California, Sectors.
- USFWS Comprehensive Conservation Plan for CPNWR USFWS has prepared a Comprehensive Management Plan, ESP, and Environmental Impact Statement which will provide future management guidance for use and protection of the resources on approximately 803,400 acres of wilderness managed by USFWS's Ajo Field Office in the western portion of Pima County, Arizona (GAO 2007).

Table 5-1 presents the cumulative effects that might occur from implementation of the Project.

5.2 AIR QUALITY

Minor short-term adverse cumulative effects on air quality are expected from the construction of tactical infrastructure in combination with other reasonably foreseeable future actions. Emissions from construction, operation, and maintenance activities will not be expected to affect local or regional air quality.

Table 5-1. Summary of Related Projects/Foreseeable Actions, and Their Potential Cumulative Effects

Resource	Past Actions	Current Background Activities	Project	Known Future Actions	Cumulative Effects
Air Quality	County nonattainment for PM_{10} and $PM_{2.5}$.	Existing emissions sources continue to adversely affect regional air quality.	Construction activities will temporarily contribute to PM emissions.	Existing emissions sources continue to adversely affect regional air quality. No new major sources identified in Yuma County.	Construction activities will temporarily contribute to PM emissions.
Noise	Military activity dominates ambient noise in ROI.	Military activity dominates ambient noise in ROI.	Short-term noise impacts from construction.	Continued military activity and USBP operations and maintenance activity.	Current military activities will be the dominant noise source. Negligible cumulative impacts from Project.
Land Use and Recreation	Military use of all Federal land withheld.	USBP and military use of land designated as Wilderness.	Most of Project will occur on Roosevelt Reservation. Access roads will be constructed in lands designated as Wilderness.	Continued activity in Wilderness lands by USBP.	Major adverse impacts on lands designated as Wilderness, Impacts offset by recognized USBP activity to protect CPNWR resources.

Resource	Past Actions	Current Background Activities	Project	Known Future Actions	Cumulative Effects
Aesthetics	Scarring of landscape by cross-border violator activity.	USBP and military use of area including off-road activity by both USBP and cross-border violators.	Minor long-term permanent impact on resource. Impact is lessened by limited access to area.	None.	Negative visual impacts of tactical infrastructure will be offset by the cumulative reduction in the aesthetic impacts of cross border activity.
Geology and Soils	Off-road activity by cross-border violators has modified soils.	Continued cross-border violators activities adversely affect soils.	Minor grading and recontouring will disturb soils.	None.	Minor long-term impact from construction of additional infrastructure.
Water Use and Quality (Hydrology and Groundwater)	None.	Groundwater currently not used.	Short-term minor adverse effects from groundwater use for dust suppression during construction.	None.	Minor short-term impact from groundwater use during construction.

Resource	Past Actions	Current Background Activities	Project	Known Future Actions	Cumulative Effects
Water Use and Quality (Surface Waters and Waters of the United States)	Off-road activity by cross-border violators has modified waters of the United States.	Continued activities by cross-border violators adversely affect waters of the United States.	Soil disturbance, erosion during construction, impacts on waters of the United States.	None.	Minor long-term effects of erosion and sediment runoff will be minimized by appropriate conveyance structures over and through Waters of the United States and overall effects will be further reduced by minimizing cross-border activity.
Biological Resources (Vegetation Resources)	Degraded habitat of sensitive and common vegetative species by illegal cross-border activity.	Continued illegal cross-border activity results in loss of native species.	Minor to moderate loss of native species and habitat.	None.	Moderate adverse impacts on native habitats and vegetation offset by reductions in cross-border activity.
Biological Resources (Wildlife and Aquatic Resources)	Loss of native habitat due to illegal cross-border and military activity.	Military activity and illegal cross-border activity degrading overall environment.	Minor loss of habitat for wildlife.	Continued disturbance to wildlife through military activity.	Minor to moderate loss of habitat. No impacts on aquatic resources.

Resource	Past Actions	Current Background Activities	Project	Known Future Actions	Cumulative Effects
Biological Resources (Special Status Species)	Degraded habitat impacted sensitive species.	Military activity and illegal cross-border activity degrading overall environment for sensitive species.	Minor loss of habitat and short-term disturbance to sensitive species.	Continued disturbance to sensitive species.	Minor to moderate loss of habitat offset by reduction in species disturbance through improved border control.
Cultural Resources	Historic use of parts of Project corridor adversely affected cultural resources.	None.	None.	None.	None.
Socioeconomics and Environmental Justice	None.	None.	Minor, temporary contribution to local construction industry.	None.	Minor stimulation of local economies from construction activities. No adverse effects on environmental justice issues, children, or human health and safety.
Hazardous Materials and Wastes	Use of hazardous substances in vehicles. Possible illegal dumping.	Use of hazardous substances in vehicles. Possible illegal dumping.	Minor use of hazardous materials during construction.	None.	None.

5.3 NOISE

Negligible cumulative effects on ambient noise will be expected as a result of construction, operation, and maintenance activities associated with the Project. Continued low flight military activities in the vicinity of the Project are expected to contribute noticeably to the overall noise environment.

5.4 LAND USE AND RECREATION

Construction of tactical infrastructure will result in moderate changes to land use. Continued USBP activities and construction of other USBP tactical infrastructure will impact upon the wilderness designation of CPNWR. Moderate cumulative impacts on land use are expected from the additive effects of the past, present, and reasonably foreseeable future actions.

5.5 AESTHETICS

Minor to moderate impacts on aesthetics are expected from the additive effects of past, present, and reasonably foreseeable future actions. The presence of construction equipment under the Project will produce a short-term adverse impact on visual resources. Once installed, the tactical infrastructure will create a permanent and fixed visual interruption at fixed points. Adverse cumulative effects could include temporary construction impacts and recreational activities such as viewing of uninterrupted vistas within a wilderness setting.

5.6 GEOLOGY AND SOILS

Additive effects include a minor increase in erosion. Construction of the tactical infrastructure will have a minor cumulative effect on soils due to continued use and maintenance.

5.7 WATER USE AND QUALITY

5.7.1 Hydrology and Groundwater

Minor adverse cumulative effects will occur on groundwater resources if groundwater was to be used for dust suppression during Project construction. Due to the short-term nature of Project construction and the lack of other foreseeable actions, potential adverse cumulative effects will be minor.

5.7.2 Surface Water and Waters of the United States

Minor impacts on surface water and waters of the United States will occur from the Project and reasonably foreseeable future actions. As discussed in **Chapter 6.2.3**, wetland delineations were completed in July 2008 and identified 61.91 acres of jurisdictional wetland impacts. Long-term adverse cumulative impacts on waters of the United States will occur following completion of Project due to the number of washes to be crossed by tactical infrastructure, the need for long-term access, and the need for continuous maintenance of associated conveyance structures. The cumulative impacts on wetlands will be long-term adverse and moderate.

5.7.3 Floodplains

No adverse cumulative impacts on floodplain resources will occur as a result of the Project.

5.8 BIOLOGICAL RESOURCES

5.8.1 Vegetation Resources

Vegetation in the Project corridor will be significantly impacted by Project construction activities. Impacts on native species vegetation and habitat are expected from the additive effects of past, present, and reasonably foreseeable future actions through unavoidable dust production and soil disturbance. Cumulative impacts will be lessened to vegetation by a reduction in illegal cross-border traffic.

5.8.2 Wildlife and Aquatic Resources

Minor impacts on wildlife and species are expected from the additive effects of past, present, and reasonably foreseeable future actions. Cumulative impacts will mainly result from loss of habitat, habitat disturbance and degradation, and construction traffic. Displaced wildlife will move to adjacent habitat if sufficient habitat exists. Wildlife will also be adversely impacted by noise during construction which, when combined with the continued noise of past present and future military option, will have an adverse effect on wildlife. No impacts on aquatic species are anticipated.

5.8.3 Special Status Species

CBP is in continuing coordination with the USFWS regarding potential impacts on listed species or designated critical habitat. Special status species are commonly protected because their historic range and habitat has been reduced and will only support a small number of individuals. Negligible adverse impacts are possible on the Sonoran pronghorn and lesser long-nosed bat due to construction activity and possible loss of habitat. Construction, operation, and maintenance of tactical infrastructure, when combined with past, present, and future military activity, have the potential to result in minor to major adverse cumulative impacts on these species. The construction of the Project, however, will serve to lessen cumulative impacts by reducing IA activity

5.9 CULTURAL RESOURCES

The Project access road use includes portions of a 4-wheel-drive road near the center of the one-mile-wide El Camino del Diablo National Historic Landmark District. Arizona SHPO has made no determinations regarding contributing or noncontributing elements of this historic district in the Project areas. The affected road segment is recommended as a noncontributing element of the district due to extensive modification and continued mechanized use, including grading and maintenance. The road is potentially significant in the broader context of recreational use of public lands in the west. The Project road use as a transportation corridor for border fence construction, however, is compatible with historical utilization and does not present an intrusive visual impact to the surrounding cultural landscape. Therefore, a determination of no effect is recommended for use of this road in relation to El Camino del Diablo National Historic Landmark District. A determination of no adverse effect is recommended for use of this road in relation to the broader theme of motor vehicle transportation and recreational use of public lands in the west.

Two prehistoric sites, AZ Y:13:8(ASM) and AZ Y:13:9(ASM), also within El Camino del Diablo National Historic Landmark District, were recommended for limited test excavation prior to evaluation of their NHRP significance (Hart et al. 2008). These sites were subjected to subsurface probing on October 8, 2008, and found to contain no buried archaeological materials. The sites are recommended ineligible for listing on the NRHP and no further management actions are recommended.

Border Monument No. 188, recorded as historical site AZ Y:13:6 and recommended for listing on the NRHP, is within the vehicle fence construction corridor. This monument, and a 2-meter buffer surrounding it, will be avoided during fence construction.

5.10 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Minor, short-term beneficial impacts on local and regional socioeconomic resources are expected from the additive effects of past, present, and reasonably foreseeable future actions. Economic benefits will be realized by construction companies, their employers and suppliers, and by Yuma County through a minor increase in tax receipts for the purchase of goods and services. Construction of tactical infrastructure has the potential for minor beneficial effects from temporary increases in construction jobs and the purchase of goods and services. Since the construction jobs will be temporary, negligible cumulative effects on population growth, income, or other services will be expected.

The cumulative impacts of USBP activities to control the border of the United States and the concomitant effects upon the Nation's health and economy, violent and drug-related crimes, community cohesion, property values, and traditional family values will be long-term and beneficial, both nationally and locally. Residents of nearby towns will benefit from increased security, a reduction in illegal drug-smuggling activities and the number of violent crimes, less damage to and loss of personal property, and less financial burden for entitlement programs. This will be accompanied by the concomitant benefits of reduced enforcement and insurance costs. Operation and maintenance of the tactical infrastructure has little potential for cumulative impacts on socioeconomics.

5.11 HAZARDOUS WASTES AND HAZARDOUS MATERIALS

Construction, operation, and maintenance of tactical infrastructure will require minimal quantities of hazardous materials and generate small quantities of hazardous wastes. In light of no other foreseeable past, present, or future activity likely to generate such wastes or materials, minimal cumulative impacts on hazardous materials and wastes will occur as a result of the Project.

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7. ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
°F	degrees Fahrenheit
ADA	Arizona Department of Agriculture
ADEQ	Arizona Department of Environmental Quality
ADFG	Arizona Department of Fish and Game
ADWR	Arizona Department of Water Resources
amsl	above mean sea level
APE	Area of Potential Effect
AQCR	air quality control region
ASM	Arizona State Museum
BLM	Bureau of Land Management
BMGR	Barry M. Goldwater Range
BMP	Best Management Practice
CAA	Clean Air Act
CBP	U.S. Customs and Border Protection
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	centimeter
CM&R	Construction Mitigation and Restoration
CO	carbon monoxide
CO_2	carbon dioxide
CPNWR	Cabeza Prieta National Wildlife Refuge
CWA	Clean Water Act
CY	calendar year
dBA	A-weighted decibels
dBC	C-weighted decibels
DHS	U.S. Department of Homeland Security
DOD	Department of Defense
DOI	Department of the Interior
EO	Executive Order
EPP	Environmental Protection Plan
ESA	Endangered Species Act
ESP	Environmental Stewardship Plan
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FPPA	Farmland Protection Policy Act
FR	Federal Register
FY	fiscal year
gpm	gallons per mile
GPS	Global Positioning System
GSRC	Gulf South Research Corporation
HS	Highly Safeguarded
IA	illegal alien
IIRIRA	Illegal Immigration Reform and Immigrant Responsibility Act
m	meter
MBTA	Migratory Bird Treaty Act

mg/m^3	milligrams per cubic meter
MMTCE	million metric tons of carbon equivalent
MYAQCR	Mohave-Yuma Intrastate Air Quality Control Region
NAAQS	National Ambient Air Quality Standards
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Northland Research, Inc.
NWR	National Wildlife Refuge
O3	ozone
OHM	ordinary high water mark
OS/RR	Open Space, Recreation, and Resources Zoning District
OSHA	Occupational Safety and Health Administration
P.L.	Public Law
Pb	lead
PM_{10}	respirable particlulate matter equal to or less than 10 microns in diameter
$PM_{2.5}$	respirable particlulate matter equal to or less than 2.5 microns in diameter
POE	Port of Entry
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SARA	Superfund Amendments and Reauthorization Act
SBI	Secure Border Initiative
SHPO	State Historic Preservation Office
SIP	state implementation plan
SO_2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures
SR	Salvage Restricted
SWPPP	Storm Water Pollution Prevention Plan
tpy	tons per year
TSCA	Toxic Substances Control Act
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USIBWC	United States Section, International Boundary and Water Commission
UTM	Universal Transverse Mercator
VOC	volatile organic compound
VRM	Visual Resources Management
WSC	Wildlife of Special Concern

APPENDIX A

Secretary of Homeland Security Determination Pursuant to Section 102 of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) of 1996, as Amended

DEPARTMENT OF HOMELAND SECURITY

Office of the Secretary

Determination Pursuant to Section 102 of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as Amended

AGENCY: Office of the Secretary, Department of Homeland Security.

ACTION: Notice of determination.

SUMMARY: The Secretary of Homeland Security has determined, pursuant to law, that it is necessary to waive certain laws, regulations and other legal requirements in order to ensure the expeditious construction of barriers and roads in the vicinity of the international land border of the United States.

DATES: This Notice is effective on April 3, 2008.

Determination and Waiver: I have a mandate to achieve and maintain operational control of the borders of the United States. Public Law 109–367, § 2, 120 Stat. 2638, 8 U.S.C. 1701 note. Congress has provided me with a number of authorities necessary to accomplish this mandate. One of these authorities is found at section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 ("IIRIRA"). Public Law 104–208, Div. C, 110 Stat. 3009–546, 3009–554 (Sept. 30, 1996) (8 U.S.C 1103 note), as amended by the REAL ID Act of 2005, Public Law 109–13, Div. B, 119 Stat. 231, 302, 306 (May 11, 2005) (8 U.S.C. 1103 note), as amended by the Secure Fence Act of 2006, Public Law 109–367, § 3, 120 Stat. 2638 (Oct. 26, 2006) (8 U.S.C. 1103 note), as amended by the Department of Homeland Security Appropriations Act, 2008, Public Law 110–161, Div. E, Title V, Section 564, 121 Stat. 2090 (Dec. 26, 2007). In Section 102(a) of IIRIRA, Congress provided that the Secretary of Homeland Security shall take such actions as may be necessary to install additional physical barriers and roads (including the removal of obstacles to detection of illegal entrants) in the vicinity of the United States border to deter illegal crossings in areas of high illegal entry into the United States. In Section 102(b) of IIRIRA, Congress has called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwest border, including priority miles of fencing that must be completed by December 2008. Finally, in section 102(c) of the IIRIRA, Congress granted to me the authority to waive all legal requirements that I, in my sole discretion, determine necessary to ensure the expeditious construction of barriers and roads authorized by section 102 of IIRIRA.

I determine that the areas in the vicinity of the United States border described on the attached document, which is incorporated and made a part hereof, are areas of high illegal entry (collectively "Project Areas"). These Project Areas are located in the States of California, Arizona, New Mexico, and Texas. In order to deter illegal crossings in the Project Areas, there is presently a need to construct fixed and mobile barriers (such as fencing, vehicle barriers, towers, sensors, cameras, and other surveillance, communication, and detection equipment) and roads in the vicinity of the border of the United States. In order to ensure the expeditious construction of the barriers and roads that Congress prescribed in the IIRIRA in the Project Areas, which are areas of high illegal entry into the United States, I have determined that it is necessary that I exercise the authority that is vested in me by section 102(c) of the IIRIRA as amended.

Accordingly, I hereby waive in their entirety, with respect to the construction of roads and fixed and mobile barriers (including, but not limited to, accessing the project area, creating and using staging areas, the conduct of earthwork, excavation, fill, and site preparation, and installation and upkeep of fences, roads, supporting elements, drainage, erosion controls, safety features, surveillance, communication, and detection equipment of all types, radar and radio towers, and lighting) in the Project Areas, all federal, state, or other laws, regulations and legal requirements of, deriving from, or related to the subject of, the following laws, as amended: The National Environmental Policy Act (Pub. L. 91–190, 83 Stat. 852 (Jan. 1, 1970) (42 U.S.C. 4321 *et seq.*)), the Endangered Species Act (Pub. L. 93–205, 87 Stat. 884 (Dec. 28, 1973) (16 U.S.C. 1531 *et seq.*)), the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) (33 U.S.C. 1251 *et seq.*)), the National Historic Preservation Act (Pub. L. 89–665, 80 Stat. 915 (Oct. 15, 1966) (16 U.S.C. 470 *et seq.*)), the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*), the Clean Air Act (42 U.S.C. 7401 *et seq.*), the Archeological Resources Protection Act (Pub. L. 96–95, 16 U.S.C. 470aa *et seq.*), the Safe Drinking Water Act (42 U.S.C. 300f *et seq.*), the Noise Control Act (42 U.S.C. 4901 *et seq.*), the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*), the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 *et seq.*), the Archaeological and Historic Preservation Act (Pub. L. 86–523, 16 U.S.C. 469 *et seq.*), the Antiquities Act (16 U.S.C. 431 *et seq.*), the Historic Sites, Buildings, and Antiquities Act (16 U.S.C. 461 *et seq.*), the Wild and Scenic Rivers Act (Pub. L. 90–542, 16 U.S.C. 1281 *et seq.*), the Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*), the Coastal Zone Management Act (Pub. L. 92–583, 16 U.S.C. 1451 *et seq.*), the Wilderness Act (Pub. L. 88–577, 16 U.S.C. 1131 *et seq.*), the Federal Land Policy and Management Act (Pub. L. 94–579, 43 U.S.C. 1701 *et seq.*), the National Wildlife Refuge System Administration Act (Pub. L. 89–669, 16 U.S.C. 668dd–668ee), the Fish and Wildlife Act of 1956 (Pub. L. 84–1024, 16 U.S.C. 742a, *et seq.*), the Fish and Wildlife Coordination Act (Pub. L. 73–121, 16 U.S.C. 661 *et seq.*), the Administrative Procedure Act (5 U.S.C. 551 *et seq.*), the Otay Mountain Wilderness Act of 1999 (Pub. L. 106–145), Sections 102(29) and 103 of Title I of the California Desert Protection Act (Pub. L. 103–433), 50 Stat. 1827, the National Park Service Organic Act (Pub. L. 64–235, 16 U.S.C. 1, 2–4), the National Park Service General Authorities Act (Pub. L. 91–383, 16 U.S.C. 1a–1 *et seq.*), Sections 401(7), 403, and 404 of the National Parks and Recreation Act of 1978 (Pub. L. 95–625), Sections 301(a)–(f) of the Arizona Desert Wilderness Act (Pub. L. 101–628), the Rivers and Harbors Act of 1899 (33 U.S.C. 403), the Eagle Protection Act (16 U.S.C. 668 *et seq.*), the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq.*), the American Indian Religious Freedom Act (42 U.S.C. 1996), the Religious Freedom Restoration Act (42 U.S.C. 2000bb), the National Forest Management Act of 1976 (16 U.S.C. 1600 *et seq.*), and the Multiple Use and Sustained Yield Act of 1960 (16 U.S.C. 528–531).

This waiver does not supersede, supplement, or in any way modify the previous waivers published in the **Federal Register** on September 22, 2005 (70 FR 55622), January 19, 2007 (72 FR

2535), and October 26, 2007 (72 FR 60870).

I reserve the authority to make further waivers from time to time as I may determine to be necessary to accomplish the provisions of section 102 of the IIRIRA, as amended.

Dated: April 1, 2008.

Michael Chertoff,

Secretary.

[FR Doc. 08–1095 Filed 4–1–08; 2:03 pm]

BILLING CODE 4410–10–P

DEPARTMENT OF HOMELAND SECURITY

Office of the Secretary

Determination Pursuant to Section 102 of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as Amended

AGENCY: Office of the Secretary, Department of Homeland Security.

ACTION: Notice of determination.

SUMMARY: The Secretary of Homeland Security has determined, pursuant to law, that it is necessary to waive certain laws, regulations and other legal requirements in order to ensure the expeditious construction of barriers and roads in the vicinity of the international land border of the United States.

DATES: This Notice is effective on April 3, 2008.

Determination and Waiver: The Department of Homeland Security has a mandate to achieve and maintain operational control of the borders of the United States. Public Law 109–367, Section 2, 120 Stat. 2638, 8 U.S.C. 1701 note. Congress has provided the Secretary of Homeland Security with a number of authorities necessary to accomplish this mandate. One of these authorities is found at section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 ("IIRIRA"). Public Law 104–208, Div. C, 110 Stat. 3009–546, 3009–554 (Sept. 30, 1996) (8 U.S.C 1103 note), as amended by the REAL ID Act of 2005, Public Law 109–13, Div. B, 119 Stat. 231, 302, 306 (May 11, 2005) (8 U.S.C. 1103 note), as amended by the Secure Fence Act of 2006, Public Law 109–367, Section 3, 120 Stat. 2638 (Oct. 26, 2006) (8 U.S.C. 1103 note), as amended by the Department of Homeland Security Appropriations Act, 2008, Public Law 110–161, Div. E, Title V, Section 564, 121 Stat. 2090 (Dec. 26, 2007). In Section 102(a) of the IIRIRA, Congress provided that the Secretary of Homeland Security shall take such actions as may be necessary to install additional physical barriers and roads (including the removal of obstacles to detection of illegal entrants) in the vicinity of the United States border to deter illegal crossings in areas of high illegal entry into the United States. In Section 102(b) of the IIRIRA, Congress has called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwest border, including priority miles of fencing that must be completed by December of 2008. Finally, in section 102(c) of the IIRIRA, Congress granted to me the authority to waive all legal requirements that I, in my sole discretion, determine necessary to ensure the expeditious construction of barriers and roads authorized by section 102 of the IIRIRA.

I determine that the area in the vicinity of the United States border as described in the attached document, hereinafter the Project Area, which is incorporated and made a part hereof, is an area of high illegal entry. In order to deter illegal crossings in the Project Area, there is presently a need to construct fixed and mobile barriers and roads in conjunction with improvements to an existing levee system in the vicinity of the border of the United States as a joint effort with Hidalgo County, Texas. In order to ensure the expeditious construction of the barriers and roads that Congress prescribed in the IIRIRA in the Project Area, which is an area of high illegal entry into the United States, I have determined that it is necessary that I exercise the authority that is vested in me by section 102(c) of the IIRIRA as amended. Accordingly, I hereby waive in their entirety, with respect to the construction of roads and fixed and mobile barriers (including, but not limited to, accessing the project area, creating and using staging areas, the conduct of earthwork, excavation, fill, and site preparation, and installation and upkeep of fences, roads, supporting elements, drainage, erosion controls, safety features, surveillance, communication, and detection equipment of all types, radar and radio towers, and lighting) in the Project Area, all federal, state, or other laws, regulations and legal requirements of, deriving from, or related to the subject of, the following laws, as amended: The National Environmental Policy Act (Pub. L. 91–190, 83 Stat. 852 (Jan. 1, 1970) (42 U.S.C. 4321 *et seq.*)), the Endangered Species Act (Pub. L. 93–205, 87 Stat. 884) (Dec. 28, 1973) (16 U.S.C. 1531 *et seq.*)), the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) (33 U.S.C. 1251 *et seq.*), the National Historic Preservation Act (Pub. L. 89–665, 80 Stat. 915 (Oct. 15, 1966) (16 U.S.C. 470 *et seq.*)), the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*), the Clean Air Act (42 U.S.C. 7401 *et seq.*), the Archeological Resources Protection Act (Pub. L. 96–95, 16 U.S.C. 470aa *et seq.*), the Safe Drinking Water Act (42 U.S.C. 300f *et seq.*), the Noise Control Act (42 U.S.C. 4901 *et seq.*), the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*), the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 *et seq.*), the Archaeological and Historic Preservation Act (Pub. L. 86–523, 16 U.S.C. 469 *et seq.*), the Antiquities Act (16 U.S.C. 431 *et seq.*), the Historic Sites, Buildings, and Antiquities Act (16 U.S.C. 461 *et seq.*), the Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*), the Coastal Zone Management Act (Pub. L. 92–583, 16 U.S.C. 1451 *et seq.*), the Federal Land Policy and Management Act (Pub L. 94–579, 43 U.S.C. 1701 *et seq.*), the National Wildlife Refuge System Administration Act (Pub. L. 89–669, 16 U.S.C. 668dd–668ee), the Fish and Wildlife Act of 1956 (Pub. L. 84–1024, 16 U.S.C. 742a, *et seq.*), the Fish and Wildlife Coordination Act (Pub. L. 73–121, 16 U.S.C. 661 *et seq.*), the Administrative Procedure Act (5 U.S.C. 551 *et seq.*), the Rivers and Harbors Act of 1899 (33 U.S.C. 403), the Eagle Protection Act (16 U.S.C. 668 *et seq.*), the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq.*), the American Indian Religious Freedom Act (42 U.S.C. 1996), the Religious Freedom Restoration Act (42 U.S.C. 2000bb), and the Federal Grant and Cooperative Agreement Act of 1977 (31 U.S.C. 6303–05).

I reserve the authority to make further waivers from time to time as I may determine to be necessary to accomplish the provisions of section 102 of the IIRIRA, as amended.

Dated: April 1, 2008.

Michael Chertoff,

Secretary.

[FR Doc. 08–1096 Filed 4–1–08; 2:03 pm]

BILLING CODE 4410–10–P

APPENDIX B

Standard Design for Tactical Infrastructure

APPENDIX B

STANDARD DESIGN FOR TACTICAL INFRASTRUCTURE

A properly designed tactical infrastructure system is an indispensable tool in deterring those attempting to illegally cross the U.S. border. Tactical infrastructure is also integral to maintaining USBP's flexibility in deploying agents and enforcement operations. A formidable infrastructure acts as a force multiplier by slowing down illegal entrants and increasing the window of time that agents have to respond. Strategically developed tactical infrastructure should enable USBP managers to better utilize existing manpower when addressing the dynamic nature of terrorists, illegal aliens, and narcotics trafficking (INS 2002).

USBP apprehension statistics remain the most reliable way to codify trends in illegal migration along the border. Based on apprehension statistics, in a 2006 report on border security, the Congressional Research Service concluded that "the installation of border fencing, in combination with an increase in agent manpower and technological assets, has had a significant effect on the apprehensions made in the San Diego sector" (CRS 2006).

Since effective border enforcement requires adequate scope, depth, and variety in enforcement activity, any single border enforcement function that significantly depletes USBP's ability to satisfactorily address any other enforcement action creates exploitable opportunities for criminal elements. For example, the intense deployment of personnel resources necessary to monitor urban border areas without tactical infrastructure adversely affects the number of agents available for boat patrol, transportation check points, patrolling remote border areas, and other tasks. Tactical infrastructure reduces this effect by reinforcing critical areas, allowing the agents to be assigned to other equally important border enforcement roles (INS 2002).

Fencing

Vehicle fences that are built on the border present a formidable physical barrier which impede cross-border violators and increases the window of time USBP agents have to respond (INS 2002).

Figure B-1 shows representative post-and-rail fencing.

Figure B-1. Post-and-Rail Vehicle Fence (VF-1)

Figure B-2. **Normandy-Style Vehicle (Fence Type VF-2)**

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APPENDIX C

Coordination Activity

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

Dr. Benjamin Tuggle
Regional Director
U.S. Fish and Wildlife Service
Southwest Region (Region 2)
P.O. Box 1306
Albuquerque, New Mexico 87103-1306

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Dr. Tuggle:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

RFJanson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

Ms. JoAnne Medley
Arizona State Parks
State Historic Preservation Office
1300 West Washington Street
Phoenix, Arizona 85007

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Ms.Medley:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive several environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 NHPA, the Secretary committed the Department to continue to protect valuable natural and cultural resources.

CBP strongly supports this commitment to protect valuable natural and cultural resources. We remain committed to being a good steward of the environment and doing our best to honor the tenants of Section 106 and all cultural resource legislation. Toward that end, we would like to maintain a collaborative relationship with your office regarding the construction of vehicle barrier along the U.S./Mexico border on the western end of the Cabeza Prieta National Wildlife Refuge, Yuma County, Arizona. In the very near future you will receive a draft cultural resources report on the project area and CBP welcomes your input on the determinations presented in the report.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please Mr. Chris Oh at (202) 344-2884. Thank you for your assistance with this project.

Sincerely,

RB Janson

Robert F. Janson
Acting Executive Director
Asset Management
U.S. Customs and Border Protection

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Delia Carlisle
Chairperson
Ak-Chin Indian Community Council
Attn: Ms. Caroline Anton, Cultural Resource Manager
Ak-Chin Him Dak Eco Museum & Archives
47685 North Eco Museum Road
Maricopa, Arizona 85239

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Chairperson Carlisle:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

RB Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Sherry Cordova
Chairperson
Cocopah Tribal Council
Attn: Lisa Wanstall, Museum Director
Cocopah Museum
County 15th and Avenue G
Somerton, Arizona 85350

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Chairperson Cordova:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

RF Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Daniel Eddy, Jr.
Chairman
Colorado River Indian Tribes
Attn: Mr. E. George Ray, Director
Colorado River Indian Tribes Museum
26600 Mohave Road
Parker, Arizona 85344

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Chairman Eddy:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

RB Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable William Rhodes
Governor
Gila River Indian Community
Attn: Mr. Barnaby Lewis, Cultural Resource Specialist
315 West Casa Blanco Road
Sacaton, Arizona 85247

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Governor Rhodes:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

B Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Benjamin H. Nuvamsa
Chairman
Hopi Tribal Council
Attn: Marvin Lalo, Acting Director
Hopi Cultural Preservation Office
1 Main Street
Kykotsmovi, Arizona 86039

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Chairman Nuvamsa:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

R Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Peter Yucupicio
Chairman
Pascua Yaqui Tribe
Attn: Ms. Amalia Reyes, Language and Cultural Preservation Specialist
7474 South Camino de Oeste
Tucson, Arizona 85746

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Chairman Yucupicio:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

R Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Mike Jackson, Jr.
President
Quechan Indian Tribe
Attn: Ms. Brigette Nash, Tribal Historic Preservation Officer
350 Picacho Road
Winterhaven, California 92283

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear President Jackson:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

R F Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Diane Enos
President
Salt River Pima-Maricopa Indian Community
Attn: Mr. Dan Daggett, Cultural Programs Supervisor
10005 East Osborn Road
Scottsdale, Arizona 85256

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear President Enos:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

RF Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and Border Protection

MAY 2 1 2008

The Honorable Wendsler Nosie, Sr.
Chairperson
San Carlos Apache Tribe
Attn: Ms. Vernelda Grant, THPO
Historic Preservation & Archaeology Department
San Carlos Avenue
San Carlos, Arizona 85550

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Chairperson Nosie:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

RB Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Ned Norris, Jr.
Chairman
Tohono O'odham Nation
Attn: Mr. Peter Steere, Cultural Affairs Program Manager
Main Tribal Building Business Loop
Sells, Arizona 85634

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear Chairman Norris:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive over 30 environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 of the NHPA, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmental responsible manner.

In support of this commitment, CBP is continuing to work collaboratively with potentially affected Tribes, the State Historic Preservation Offices, and federal land managers. Toward that end, we are conducting surveys and will prepare a cultural survey report for construction of vehicle barrier along the U.S./Mexico border from approximately 5 miles east of Douglas, Arizona to New Mexico. In the very near future you will receive a draft cultural resources report on the project area.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

The Honorable Ned Norris, Jr.
Page 2

If you require additional information or have any questions, please contact Mr. Chris Oh at (202) 344-2448. Thank you for your assistance with this project.

Sincerely,

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

MAY 2 1 2008

The Honorable Ronnie Lupe
Chairman
White Mountain Apache Tribe
Attn: Mr. Mark Atalha, THPO
White Mountain Apache Tribe Historic Preservation Office
202 East Walnut Street
Whiteriver, Arizona 85941

Subject: Construction of Vehicle Barrier along the International Border on the western edge of the Cabeza Prieta National Wildlife Refuge, Fence Segment CV-2

Dear ChairmanLupe:

On April 1, 2008, the Secretary of the Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act, as amended, 8 U.S.C. § 1103 note, exercised his authority to waive several environmental laws and regulations, including the National Historic Preservation Act (NHPA), associated with construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that the U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations to consult under Section 106 NHPA, the Secretary committed the Department to continue to protect valuable natural and cultural resources.

CBP strongly supports this commitment to protect valuable natural and cultural resources. We remain committed to being a good steward of the environment and doing our best to honor the tenants of Section 106 and all cultural resource legislation. Toward that end, we would like to maintain a collaborative relationship with your office regarding the construction of vehicle barrier along the U.S./Mexico border on the western end of the Cabeza Prieta National Wildlife Refuge, Yuma County, Arizona. In the very near future you will receive a draft cultural resources report on the project area and CBP welcomes your input on the determinations presented in the report.

This project is referred to as the CV-2 segment and consists of building permanent vehicle barriers within the 60 ft Roosevelt Reservation for approximately 11 miles. Construction equipment would access the project corridor from access roads highlighted on the attached maps. These road segments along with the border road may be moderately improved to facilitate construction vehicles.

If you require additional information or have any questions, please Mr. Chris Oh at (202) 344-2884. Thank you for your assistance with this project.

Sincerely,

R Janson

Robert F. Janson
Acting Executive Director
Asset Management
U.S. Customs and Border Protection

Enclosure(s)

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

APR 2 9 2008

Mr. Steve Spangle
U.S. Fish and Wildlife Service
2321 West Royal Palm Road
Suite 103
Phoenix, Arizona 85021-4951

Subject: Waiver to Expedite Advancements in Border Security

Dear Mr. Spangle:

Over the past several months, in accordance with applicable federal environmental laws and policies, U.S. Customs and Border Protection (CBP), a component of the Department of Homeland Security, pursued a comprehensive effort to address potential environmental impacts associated with constructing, maintaining, and operating tactical infrastructure along the southwestern border. Congress called upon the Department of Homeland Security (DHS) to construct—in the most expeditious manner possible—the infrastructure necessary to deter and prevent illegal entry on our southwestern border, including pedestrian and vehicle fencing, roads, and virtual detection technology. Section 102(b) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) requires installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border.

CBP openly scoped projects in coordination with Federal and state agencies as well as the public to ensure potential environmental impacts were identified and thoroughly evaluated for each project. We conducted extensive consultations with resource agencies and local stakeholders which resulted in numerous changes to the tactical infrastructure alignment, location of access roads, and placement of staging areas in order to minimize potential environmental impacts, and prepared and circulated for public comment and review 18 NEPA documents (EAs/EISs). CBP has conducted recent NEPA analysis on all of the currently planned pedestrian fence projects and circulated these documents in draft form for public review and comment.

On April 1, 2008, the Secretary of the DHS, pursuant to his authority under Section 102(c) of IIRIRA, exercised his authority to waive certain laws that were an impediment to the expeditious construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that CBP no longer has any specific legal obligations under these laws, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmentally responsible manner. In support of this commitment, CBP will continue to work in a collaborative manner with local government, state and federal land managers, and the interested public to identify and minimize the impact to environmentally sensitive resources.

CBP is continuing with an environmental review of the fencing projects and will publish the results of this analysis in Environmental Stewardship Plans (ESPs), including mitigation and Best Management Practices (BMPs) developed to minimize adverse effects to the environment. These ESPs will be developed for each U.S. Border Patrol (USBP) Sector scheduled for tactical infrastructure improvements and will address each segment of pedestrian and vehicle fencing covered by a waiver. The finalized ESPs will be available at local and regional libraries and at www.BorderFencePlanning.com.

We value your technical expertise, advice, and recommendations and look forward to your continued participation in project review. If you have any questions regarding this matter, please do not hesitate to contact Mr. Christopher Oh at (202) 344-2448.

Sincerely,

R Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

APR 2 9 2008

Ms. Sherry Barrett
U.S. Fish and Wildlife Service
110 South Church Avenue
Suite 3450
Tucson, Arizona 85701

Subject: Waiver to Expedite Advancements in Border Security

Dear Ms. Barrett:

Over the past several months, in accordance with applicable federal environmental laws and policies, U.S. Customs and Border Protection (CBP), a component of the Department of Homeland Security, pursued a comprehensive effort to address potential environmental impacts associated with constructing, maintaining, and operating tactical infrastructure along the southwestern border. Congress called upon the Department of Homeland Security (DHS) to construct—in the most expeditious manner possible—the infrastructure necessary to deter and prevent illegal entry on our southwestern border, including pedestrian and vehicle fencing, roads, and virtual detection technology. Section 102(b) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) requires installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border.

CBP openly scoped projects in coordination with Federal and state agencies as well as the public to ensure potential environmental impacts were identified and thoroughly evaluated for each project. We conducted extensive consultations with resource agencies and local stakeholders which resulted in numerous changes to the tactical infrastructure alignment, location of access roads, and placement of staging areas in order to minimize potential environmental impacts, and prepared and circulated for public comment and review 18 NEPA documents (EAs/EISs). CBP has conducted recent NEPA analysis on all of the currently planned pedestrian fence projects and circulated these documents in draft form for public review and comment.

On April 1, 2008, the Secretary of the DHS, pursuant to his authority under Section 102(c) of IIRIRA, exercised his authority to waive certain laws that were an impediment to the expeditious construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that CBP no longer has any specific legal obligations under these laws, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmentally responsible manner. In support of this commitment, CBP will continue to work in a collaborative manner with local government, state and federal land managers, and the interested public to identify and minimize the impact to environmentally sensitive resources.

CBP is continuing with an environmental review of the fencing projects and will publish the results of this analysis in Environmental Stewardship Plans (ESPs), including mitigation and Best Management Practices (BMPs) developed to minimize adverse effects to the environment. These ESPs will be developed for each U.S. Border Patrol (USBP) Sector scheduled for tactical infrastructure improvements and will address each segment of pedestrian and vehicle fencing covered by a waiver. The finalized ESPs will be available at local and regional libraries and at www.BorderFencePlanning.com.

We value your technical expertise, advice, and recommendations and look forward to your continued participation in project review. If you have any questions regarding this matter, please do not hesitate to contact Mr. Christopher Oh at (202) 344-2448.

Sincerely,

R F Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

U.S. Department of Homeland Security
Washington, DC 20229

U.S. Customs and
Border Protection

APR 2 9 2008

Dr. Benjamin Tuggle
Regional Director
U.S. Fish and Wildlife Service
Southwest Region (Region 2)
P.O. Box 1306
Albuquerque, New Mexico 87103-1306

Subject: Waiver to Expedite Advancements in Border Security

Dear Dr. Tuggle:

Over the past several months, in accordance with applicable federal environmental laws and policies, U.S. Customs and Border Protection (CBP), a component of the Department of Homeland Security, pursued a comprehensive effort to address potential environmental impacts associated with constructing, maintaining, and operating tactical infrastructure along the southwestern border. Congress called upon the Department of Homeland Security (DHS) to construct—in the most expeditious manner possible—the infrastructure necessary to deter and prevent illegal entry on our southwestern border, including pedestrian and vehicle fencing, roads, and virtual detection technology. Section 102(b) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) requires installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border.

CBP openly scoped projects in coordination with Federal and state agencies as well as the public to ensure potential environmental impacts were identified and thoroughly evaluated for each project. We conducted extensive consultations with resource agencies and local stakeholders which resulted in numerous changes to the tactical infrastructure alignment, location of access roads, and placement of staging areas in order to minimize potential environmental impacts, and prepared and circulated for public comment and review 18 NEPA documents (EAs/EISs). CBP has conducted recent NEPA analysis on all of the currently planned pedestrian fence projects and circulated these documents in draft form for public review and comment.

On April 1, 2008, the Secretary of the DHS, pursuant to his authority under Section 102(c) of IIRIRA, exercised his authority to waive certain laws that were an impediment to the expeditious construction of tactical infrastructure along the southwestern border. Although the Secretary's waiver means that CBP no longer has any specific legal obligations under these laws, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment and to building tactical infrastructure in an environmentally responsible manner. In support of this commitment, CBP will continue to work in a collaborative manner with local government, state and federal land managers, and the interested public to identify and minimize the impact to environmentally sensitive resources.

CBP is continuing with an environmental review of the fencing projects and will publish the results of this analysis in Environmental Stewardship Plans (ESPs), including mitigation and Best Management Practices (BMPs) developed to minimize adverse effects to the environment. These ESPs will be developed for each U.S. Border Patrol (USBP) Sector scheduled for tactical infrastructure improvements and will address each segment of pedestrian and vehicle fencing covered by a waiver. The finalized ESPs will be available at local and regional libraries and at www.BorderFencePlanning.com.

We value your technical expertise, advice, and recommendations and look forward to your continued participation in project review. If you have any questions regarding this matter, please do not hesitate to contact Mr. Christopher Oh at (202) 344-2448.

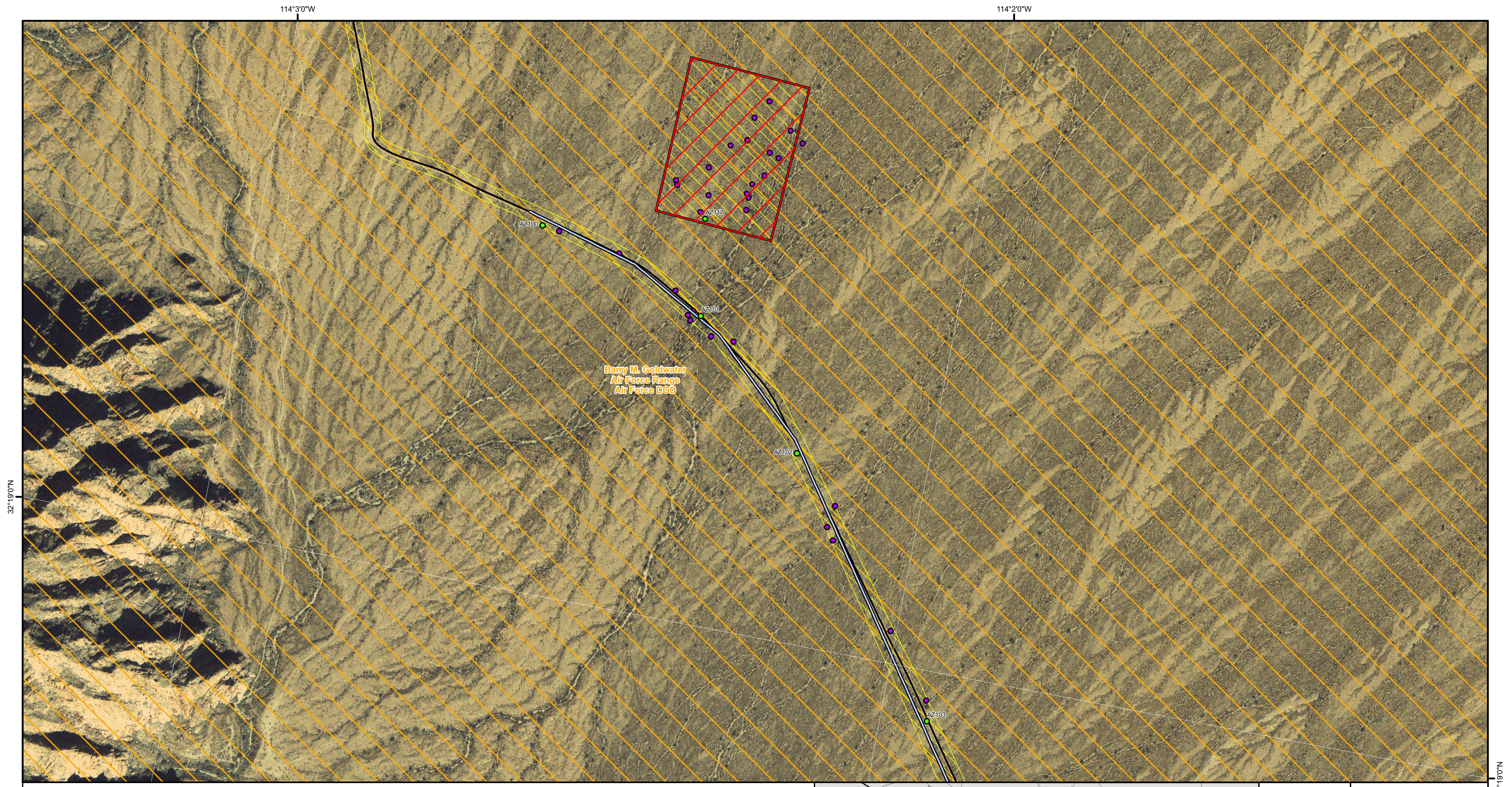
Sincerely,

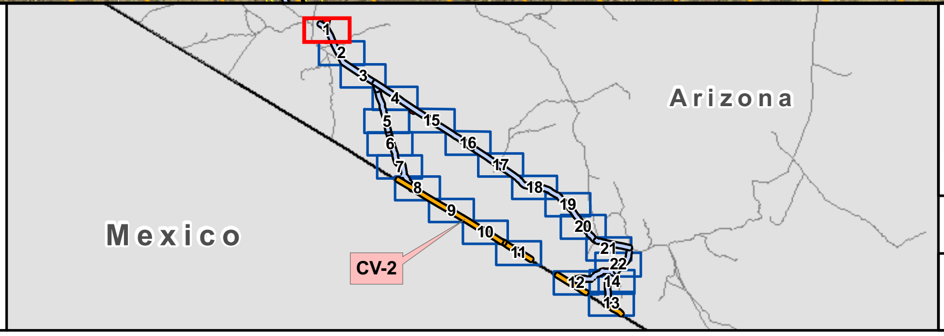
R. Janson

Robert F. Janson
Acting Executive Director
Facilities Management and Engineering

APPENDIX D

Detailed Project Maps





Veg Observation Points
Saguarros
Proposed Vehicle Fence
Proposed Access Roads
Proposed Staging Areas
GPSed Access Roads
CV2_Survey_Area
Federal Lands
Parks
NWI Wetlands

Feet
0 250 500 1,000
Scale

N

ESP
US Customs and Border Patrol
VF300
Proposed Border Fence
Field Maps

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

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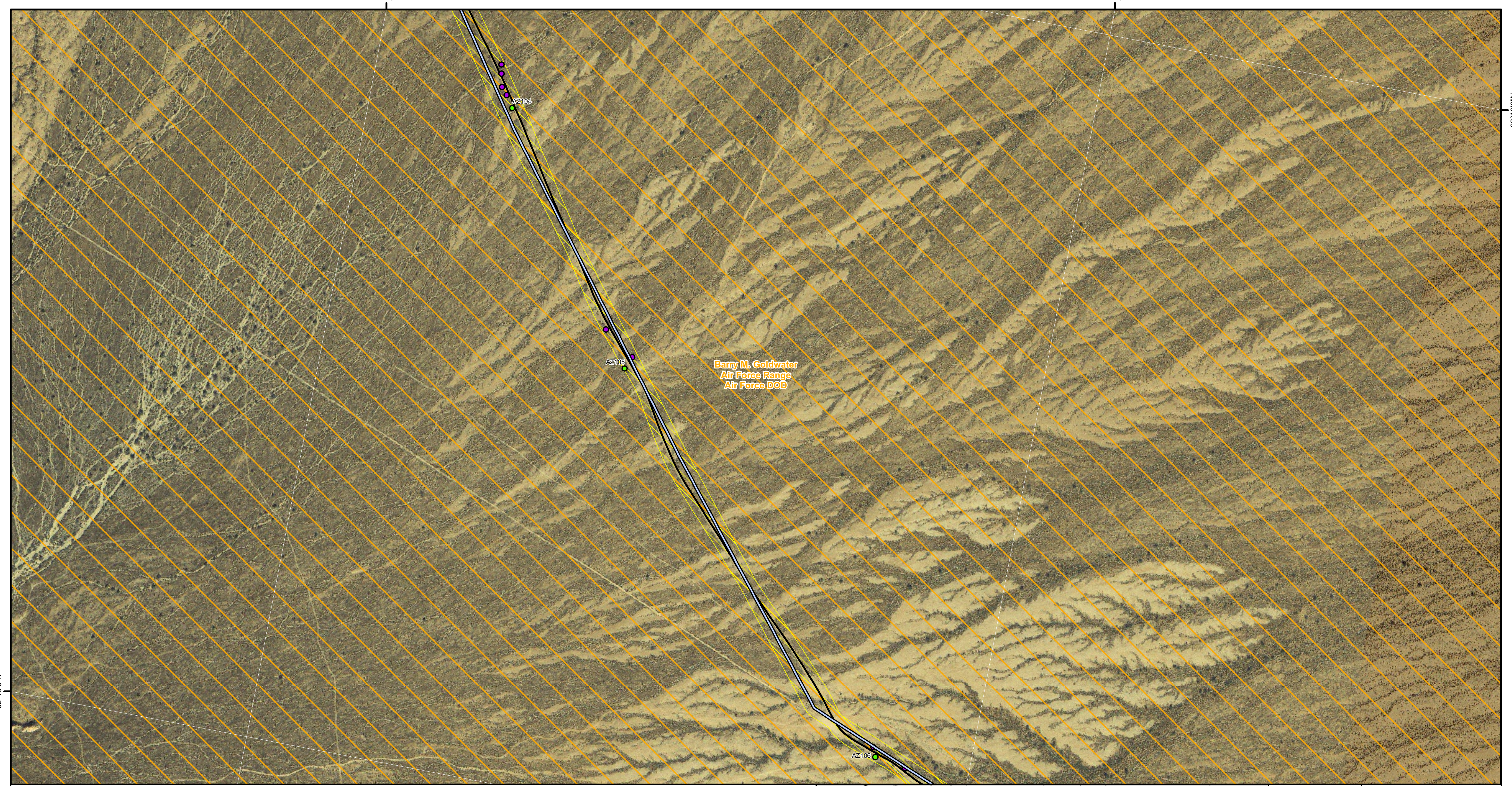

- Veg Observation Points
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- Proposed Staging Areas
- GPSed Access Roads
- CV2_Survey_Area
- Federal Lands
- Parks
- NWI Wetlands

Feet

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Scale

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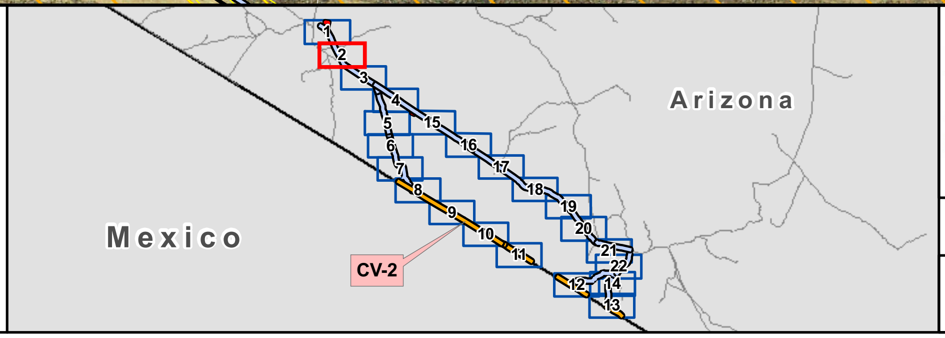

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Field Maps

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North American Datum of 1983

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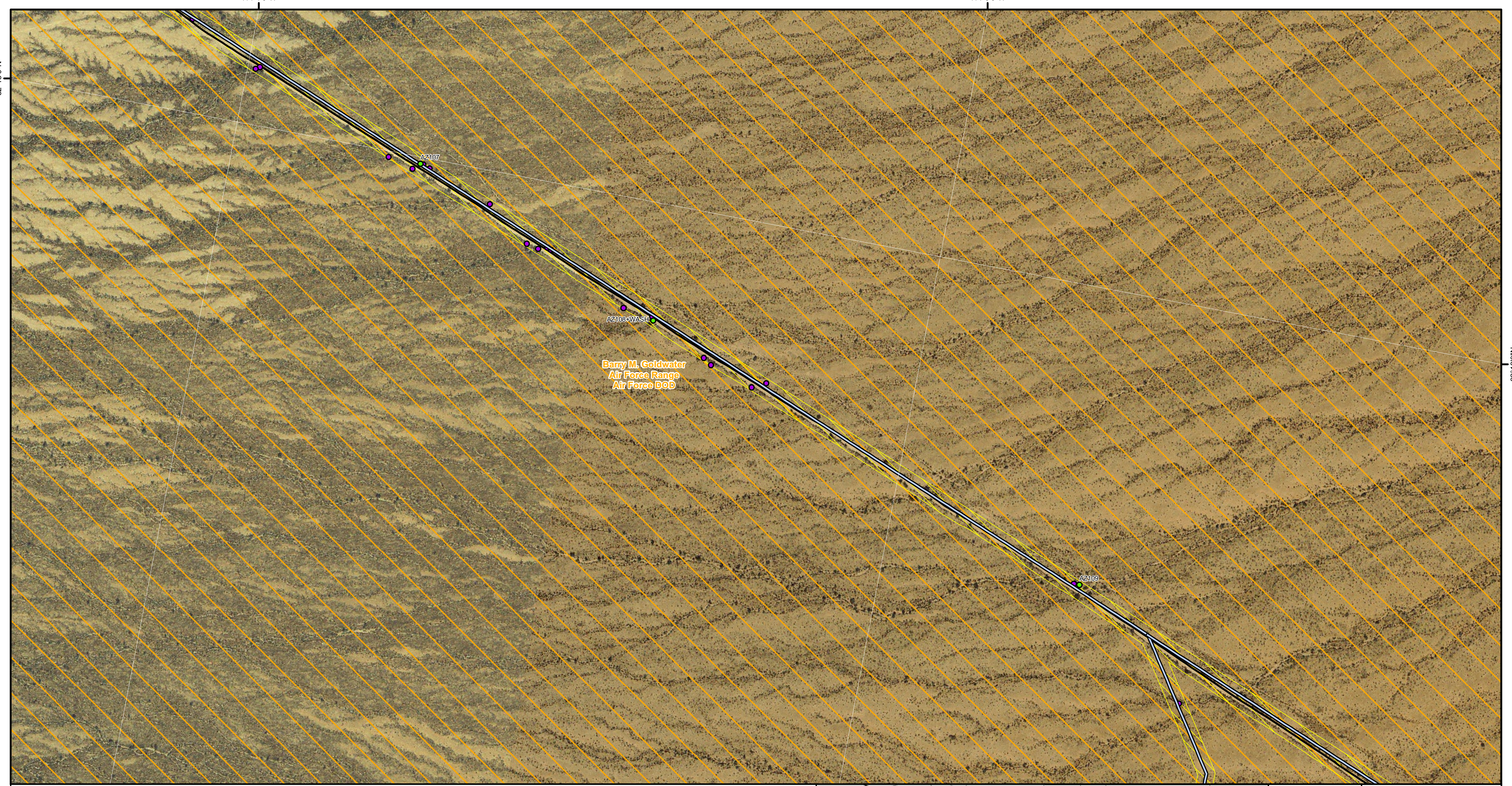

- Veg Observation Points
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- NWI Wetlands

Feet
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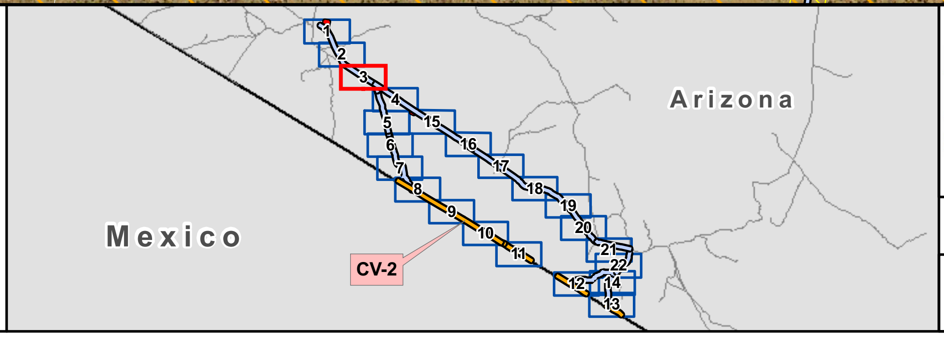

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Field Maps

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North American Datum of 1983

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Veg Observation Points
Saguarros
Proposed Vehicle Fence
Proposed Access Roads
Proposed Staging Areas
GPSed Access Roads
CV2_Survey_Area
Federal Lands
Parks
NWI Wetlands

Feet
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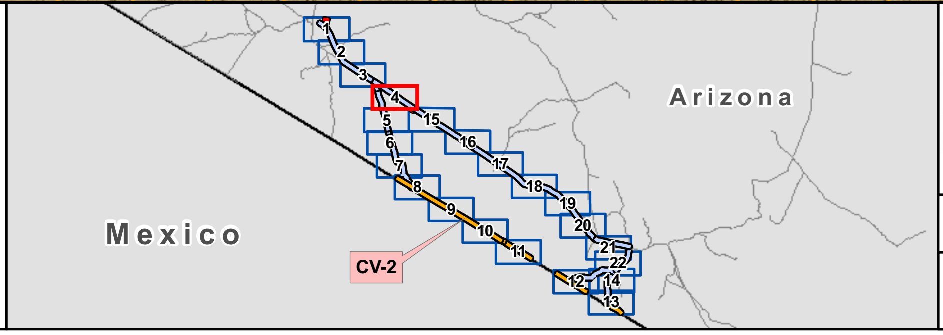

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Field Maps

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

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Checked By: SSG	Scale 1 : 8,000	July 2008

- Veg Observation Points
- Saguarros
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- GPSed Access Roads
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- Federal Lands
- Parks
- NWI Wetlands

Feet

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Scale

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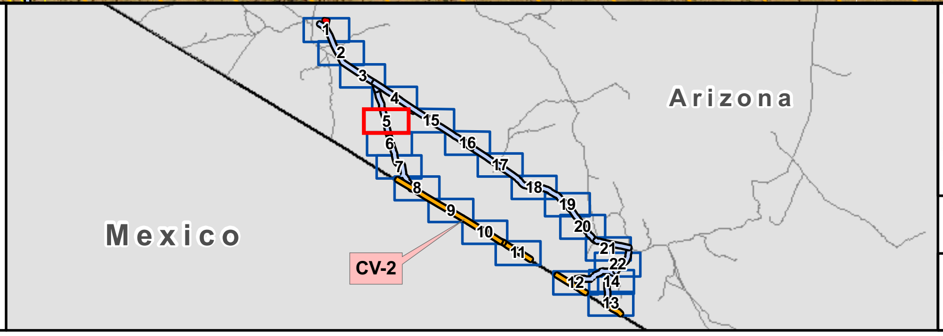

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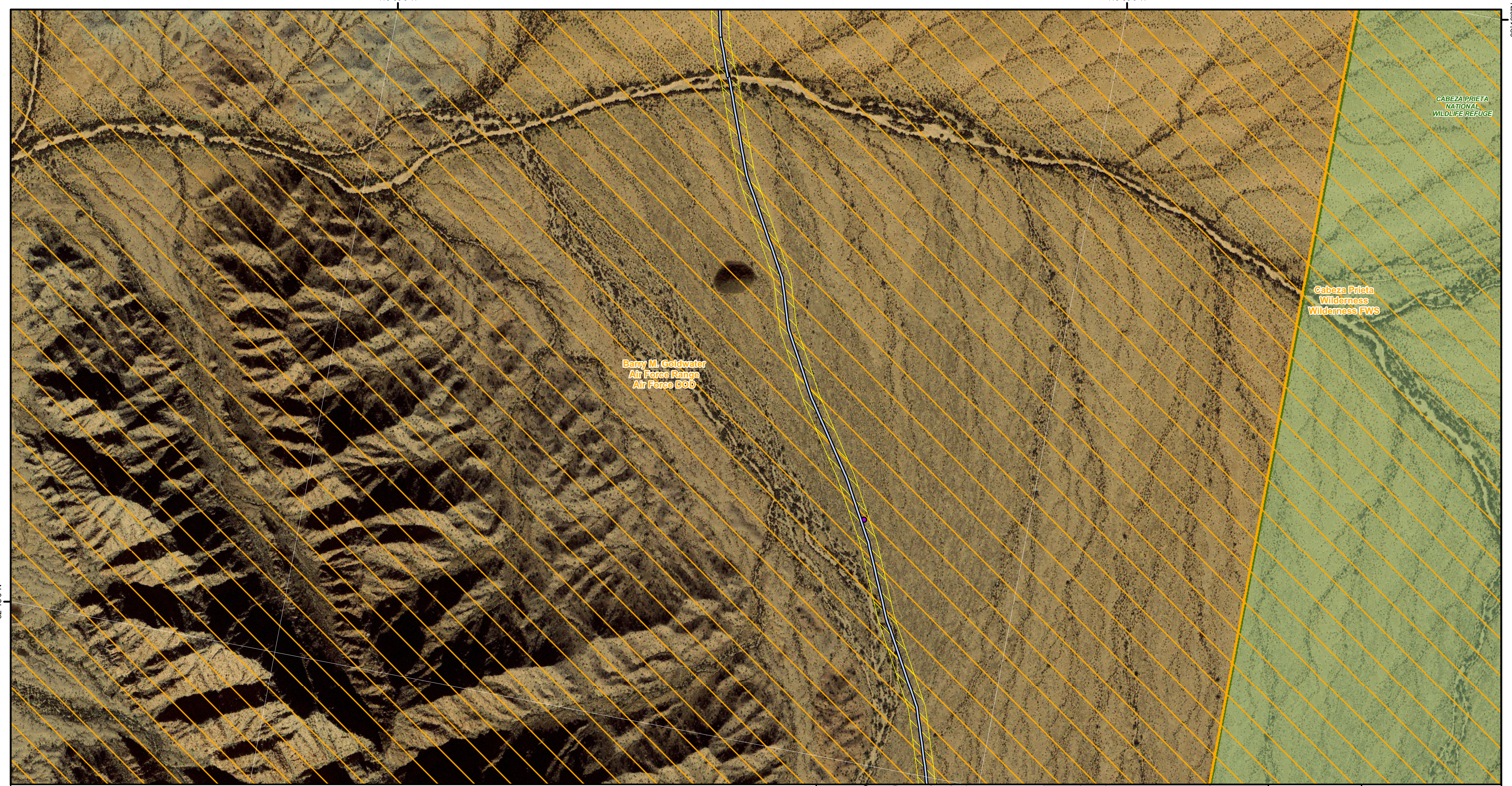

- Veg Observation Points
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Feet
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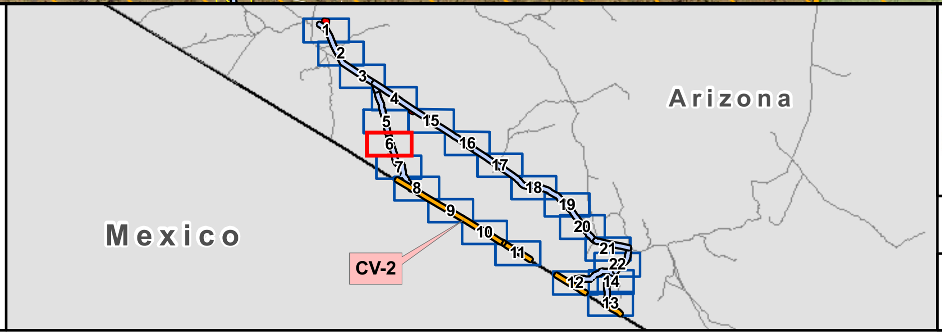

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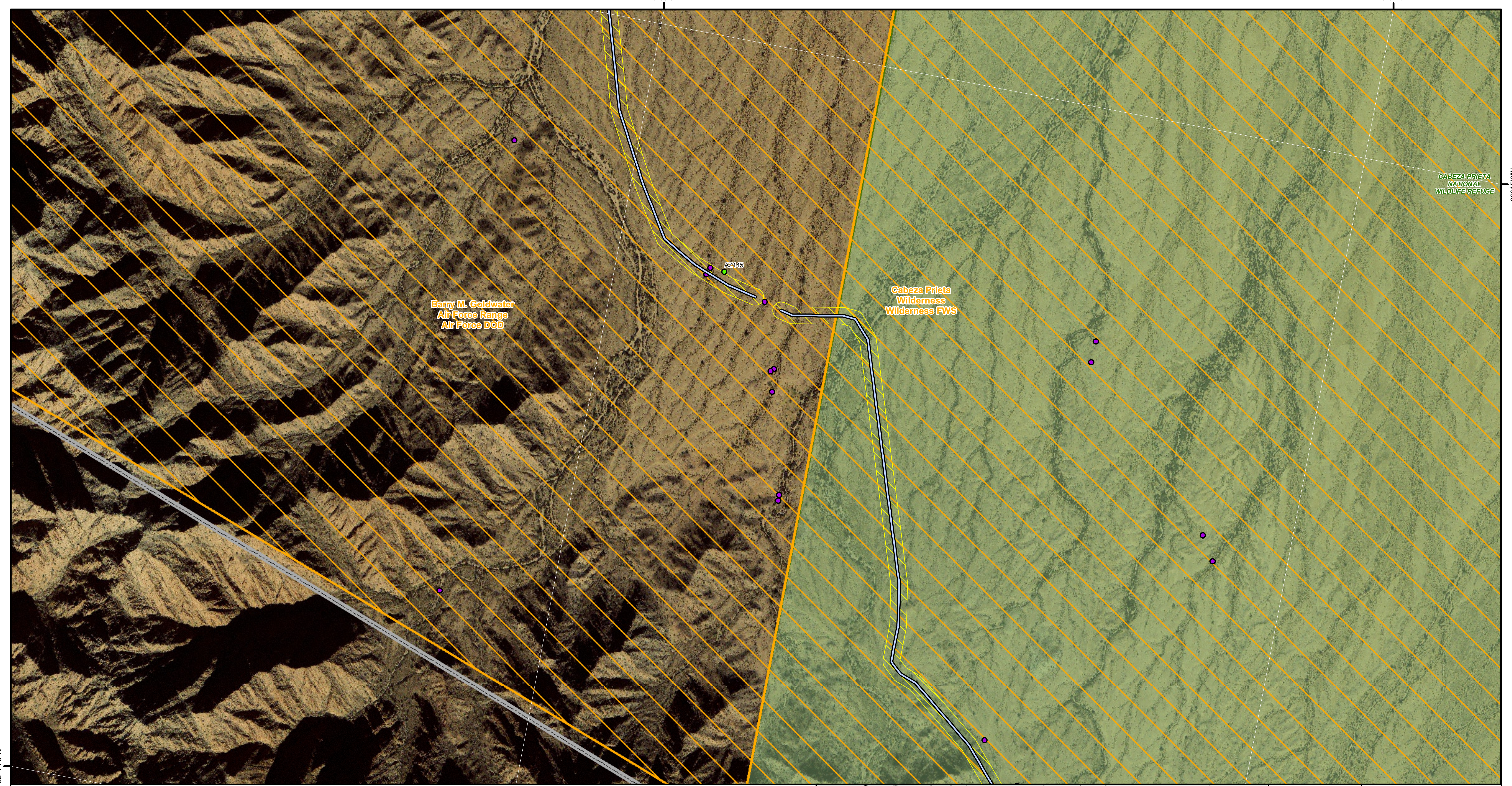

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Feet
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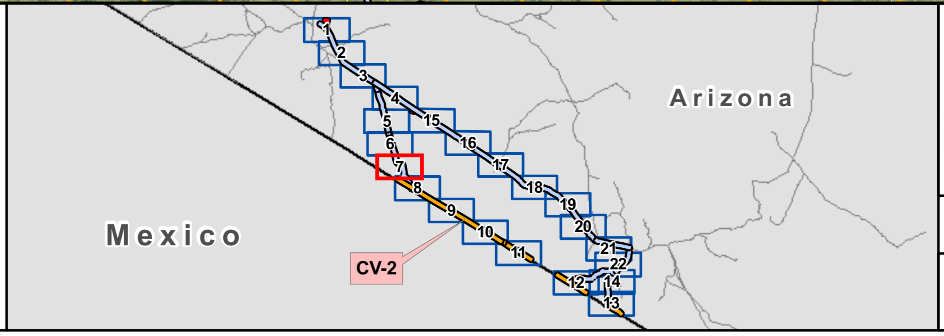

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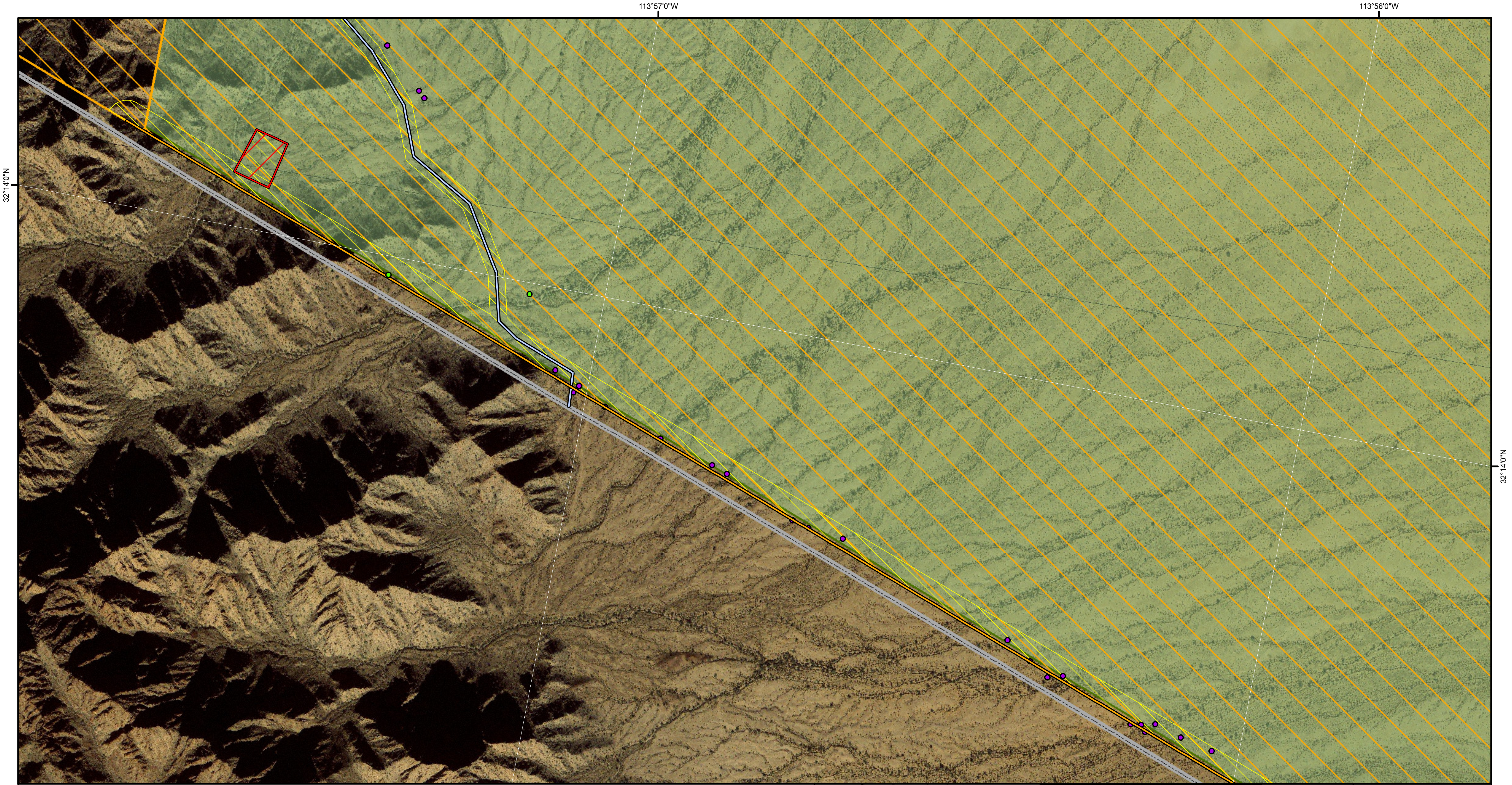

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Feet
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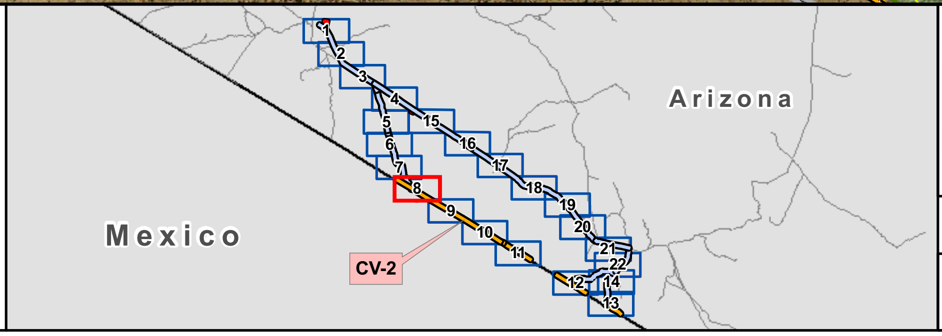

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North American Datum of 1983

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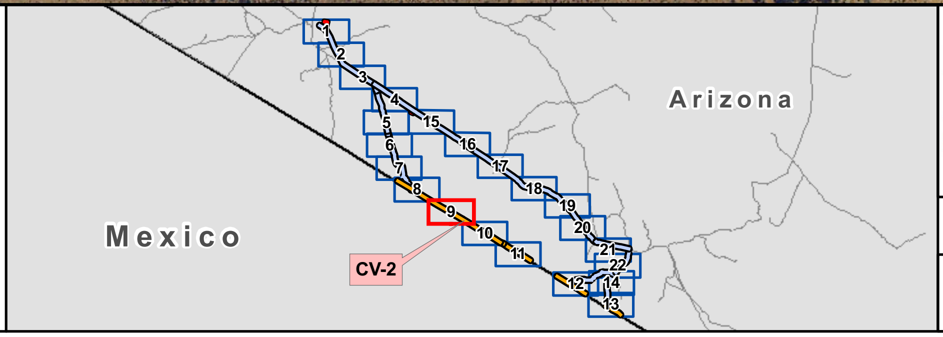

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Field Maps

Projection: Albers

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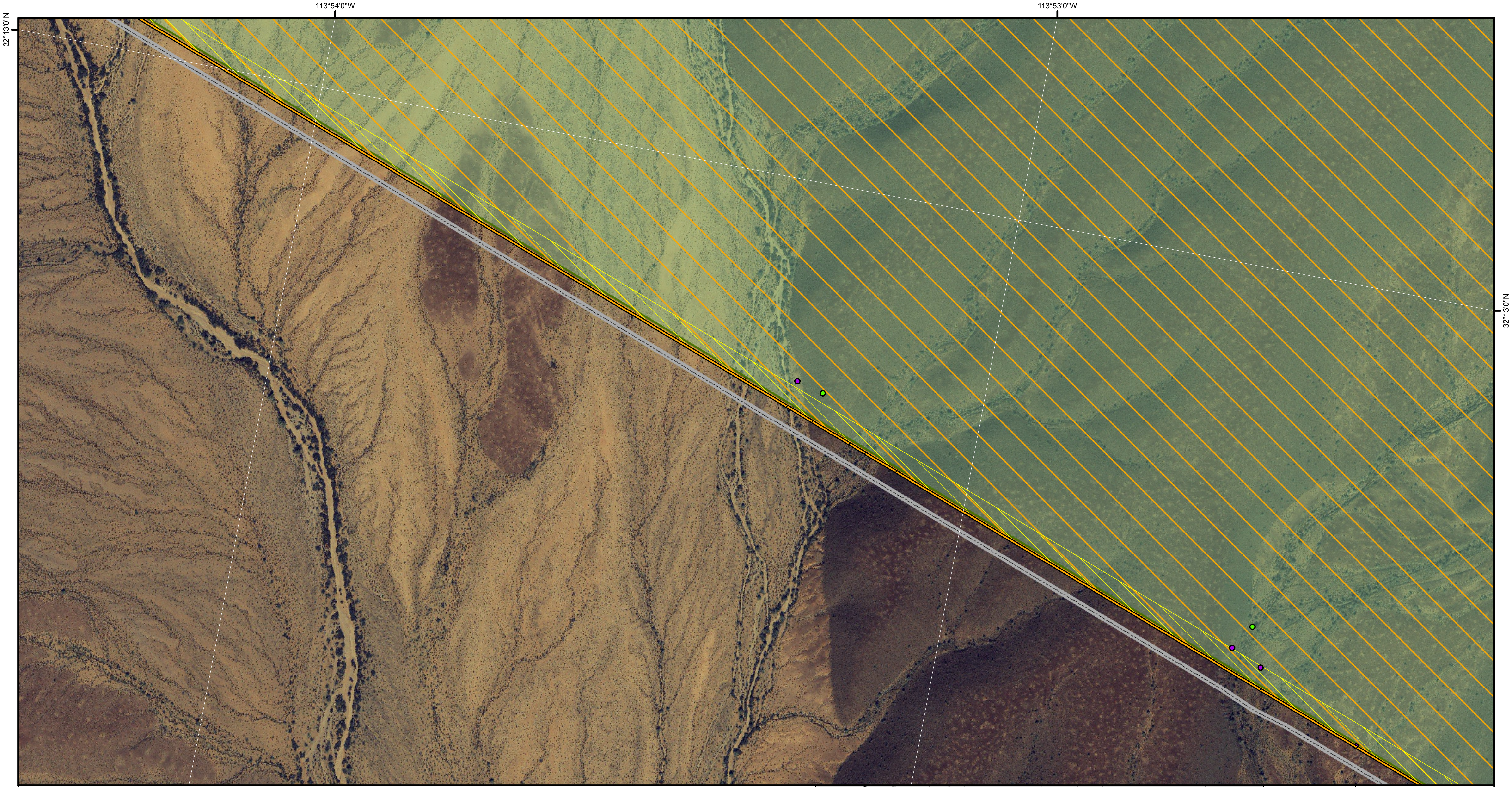

- Veg Observation Points
- Saguarros
- Proposed Vehicle Fence
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- Parks
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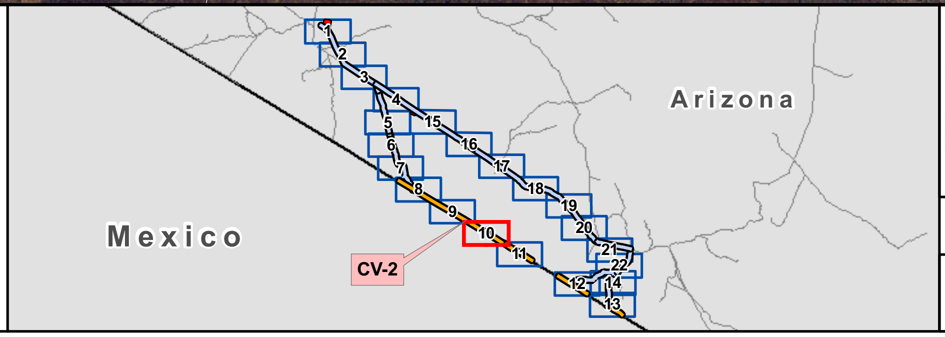

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North American Datum of 1983

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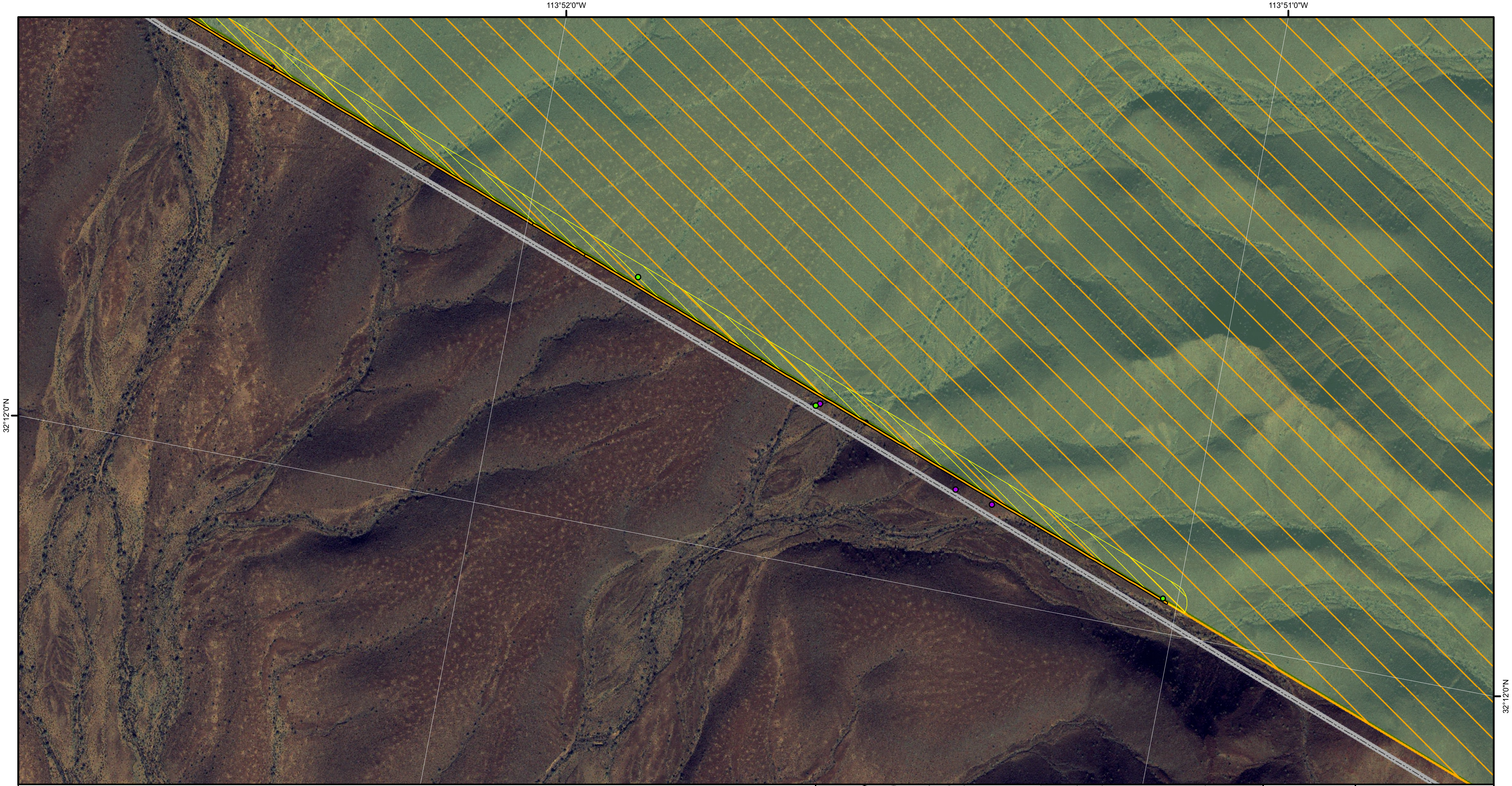

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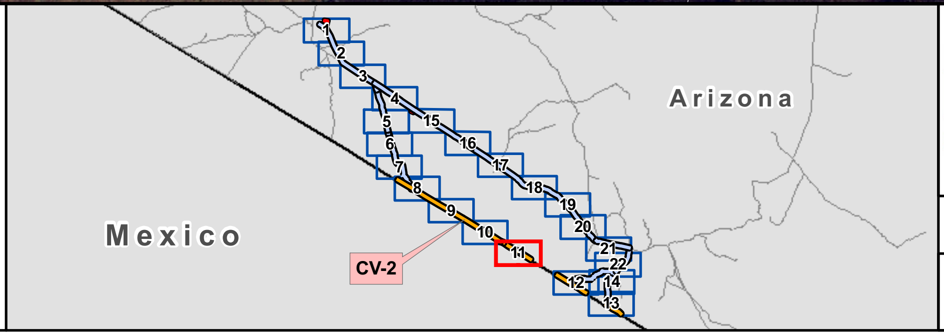

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Field Maps

Projection: Albers
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- Veg Observation Points
- Saguarros
- Proposed Vehicle Fence
- Proposed Access Roads
- Proposed Staging Areas
- GPSed Access Roads
- CV2_Survey_Area
- Federal Lands
- Parks
- NWI Wetlands

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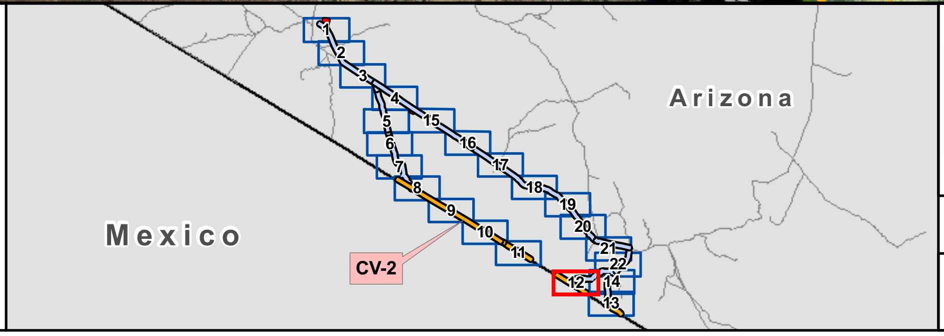

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Proposed Border Fence

Field Maps

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Projection: Albers

USA Contiguous Albers Equal Area Conic

North American Datum of 1983

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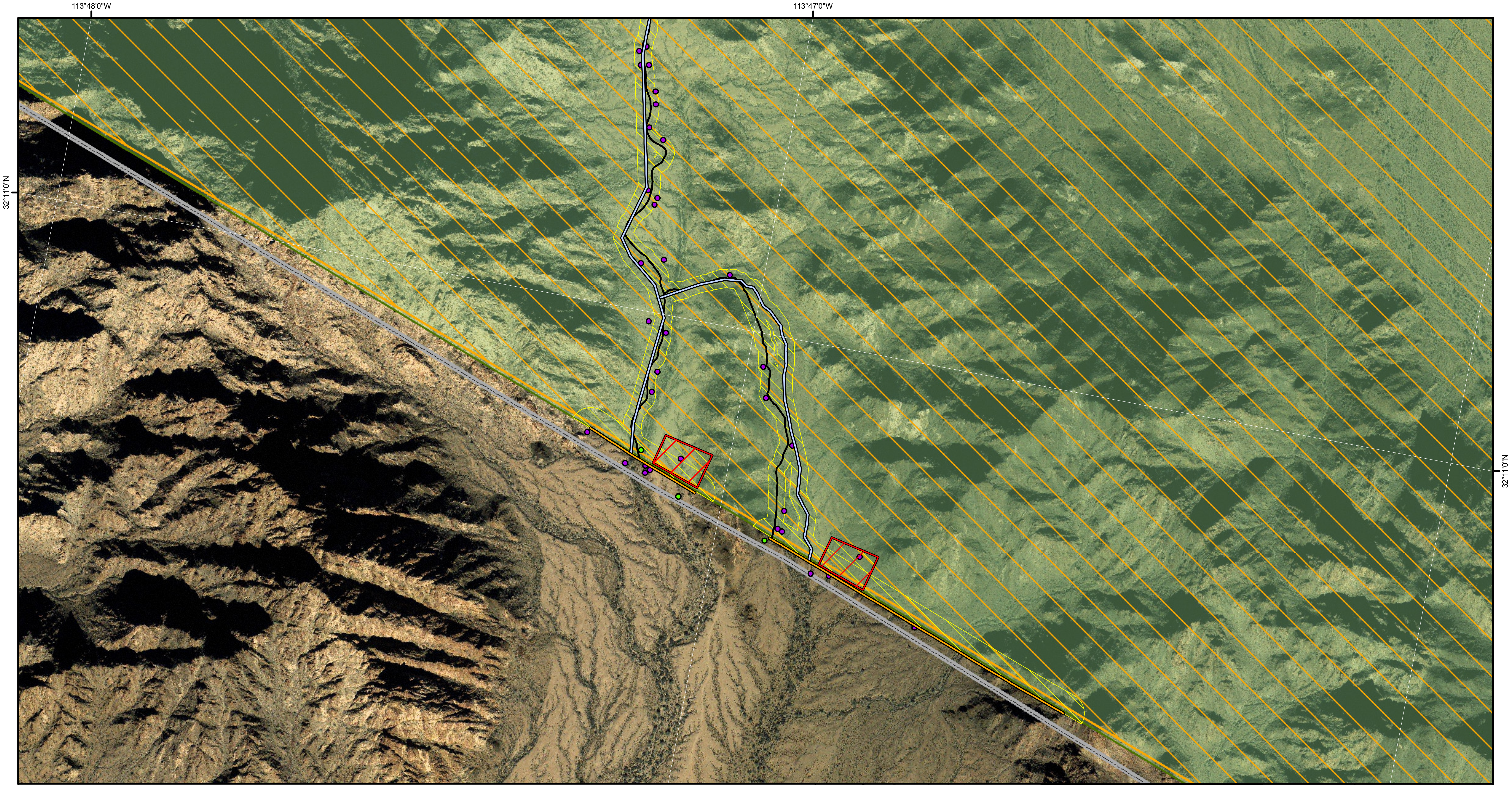
Checked By: SSG	**Scale 1 : 8,000**	**July 2008**



- Veg Observation Points
- Saguarros
- Proposed Vehicle Fence
- Proposed Access Roads
- Proposed Staging Areas
- GPSed Access Roads
- CV2_Survey_Area
- Federal Lands
- Parks
- NWI Wetlands

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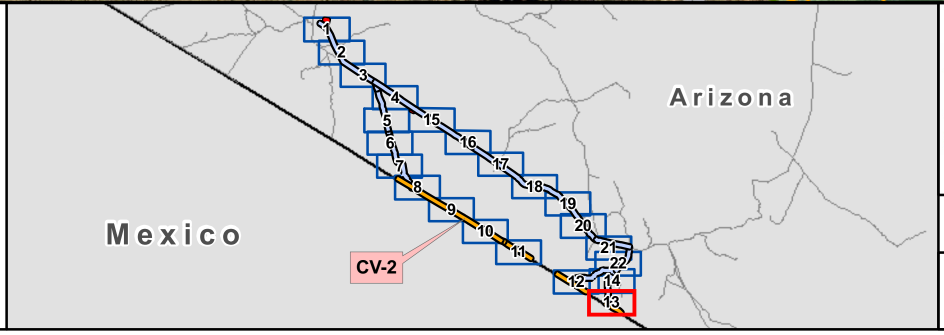

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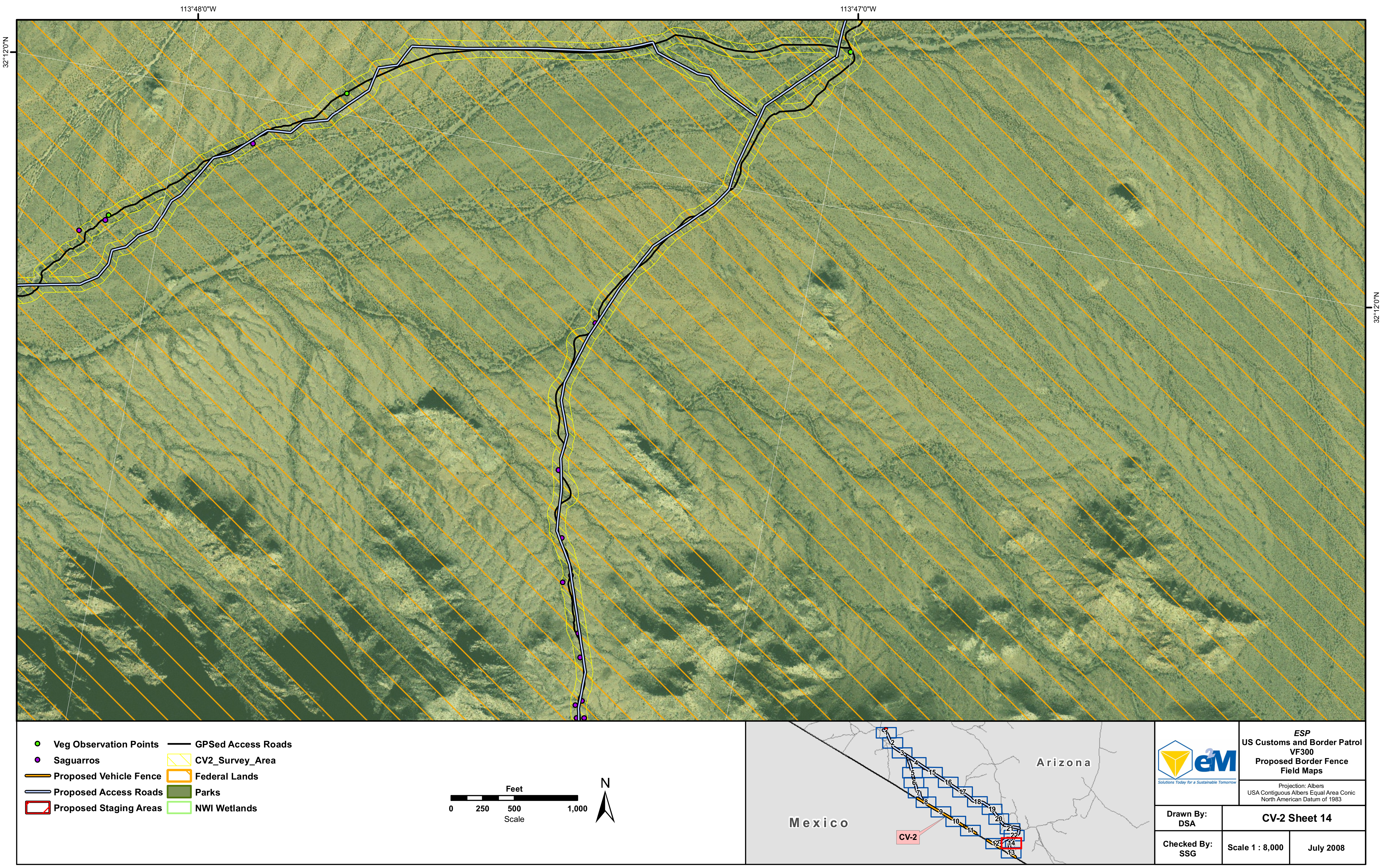
Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

Drawn By: DSA	CV-2 Sheet 13	
Checked By: SSG	Scale 1 : 8,000	July 2008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Veg Observation Points
Saguarros
Proposed Vehicle Fence
Proposed Access Roads
Proposed Staging Areas
GPSed Access Roads
CV2_Survey_Area
Federal Lands
Parks
NWI Wetlands
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Arizona
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CV-2
ESP
US Customs and Border Patrol
VF300
Proposed Border Fence
Field Maps
Solutions Today for a Sustainable Tomorrow
Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983
Drawn By: DSA
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July 2008

- Veg Observation Points
- Saguarros
- Proposed Vehicle Fence
- Proposed Access Roads
- Proposed Staging Areas
- GPSed Access Roads
- CV2_Survey_Area
- Federal Lands
- Parks
- NWI Wetlands

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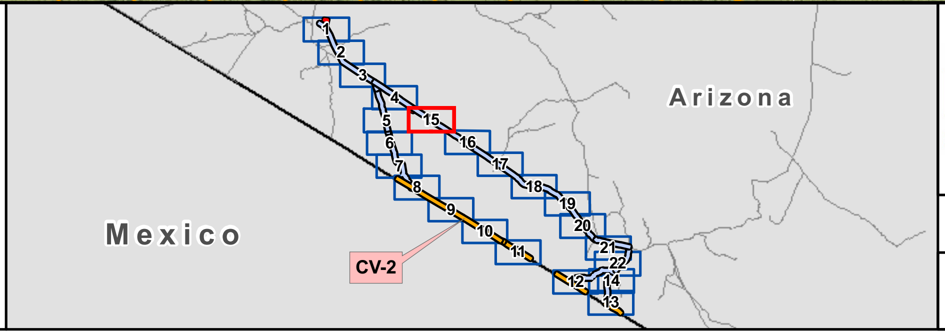

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Field Maps

Projection: Albers
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North American Datum of 1983

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- Veg Observation Points
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- Proposed Vehicle Fence
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- NWI Wetlands

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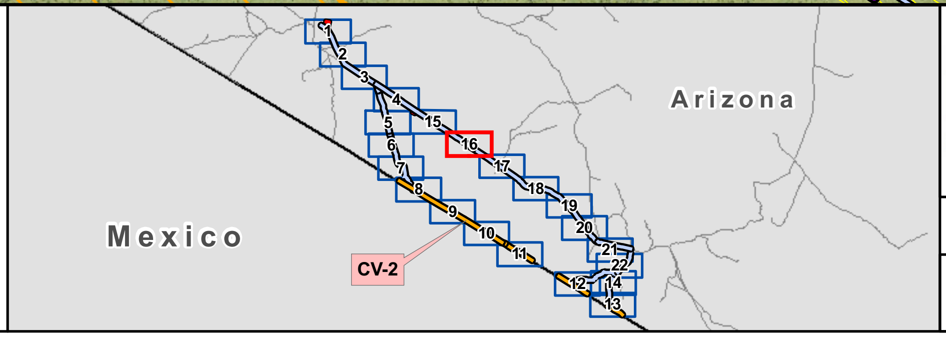

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Projection: Albers
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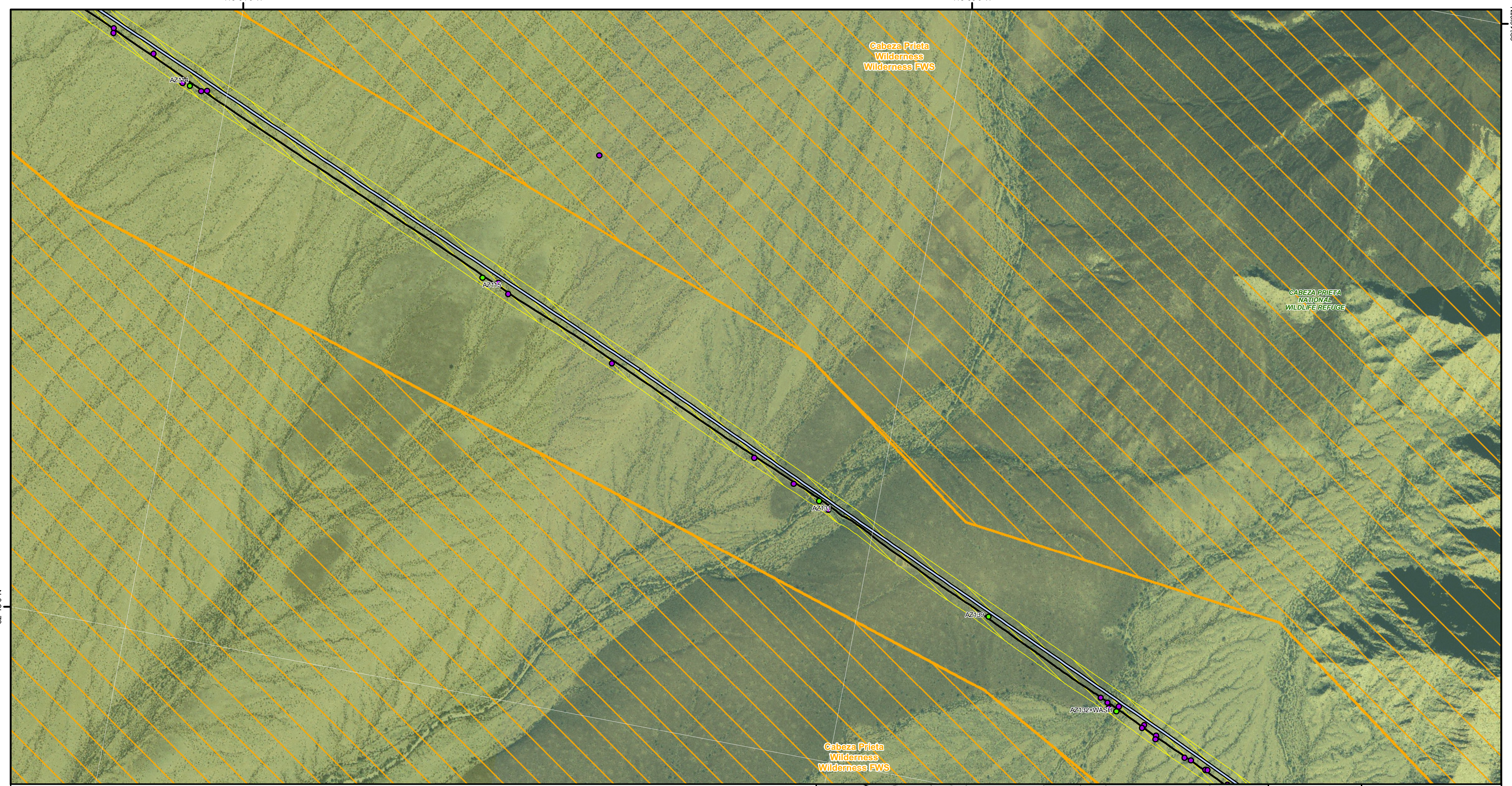
Drawn By: DSA	CV-2 Sheet 16	
Checked By: SSG	Scale 1 : 8,000	July 2008



- Veg Observation Points
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Feet

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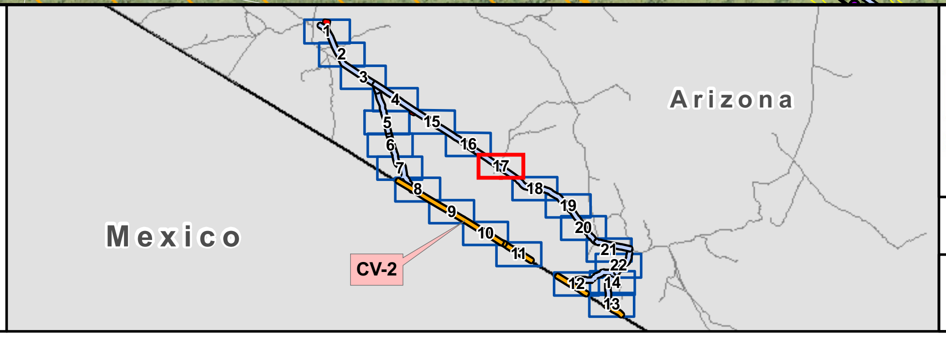

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- Veg Observation Points
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- Proposed Vehicle Fence
- Proposed Access Roads
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Feet
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Scale

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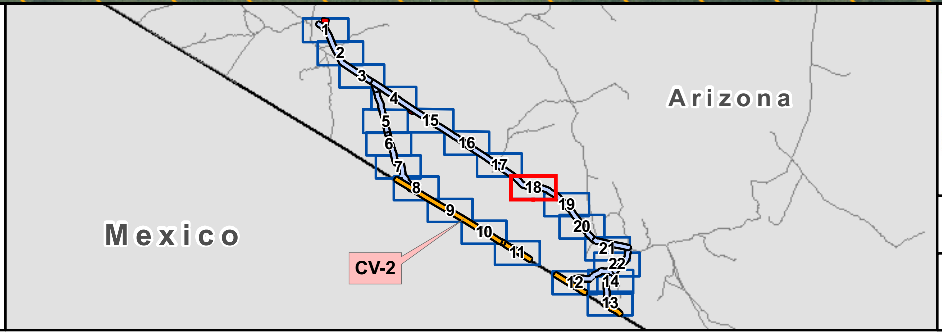

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US Customs and Border Patrol
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Proposed Border Fence
Field Maps

Projection: Albers
USA Contiguous Albers Equal Area Conic
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Drawn By: DSA	CV-2 Sheet 18	
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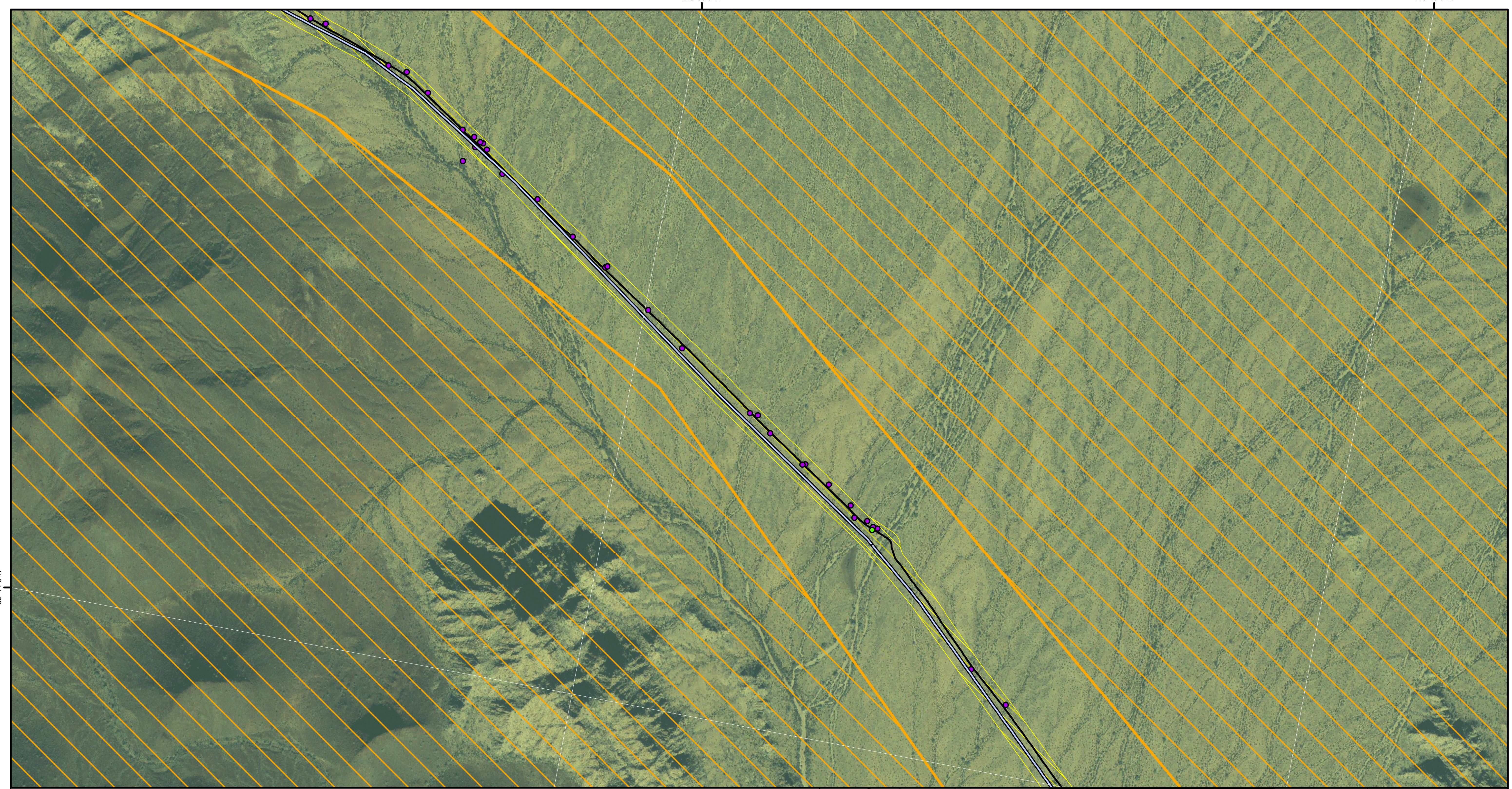

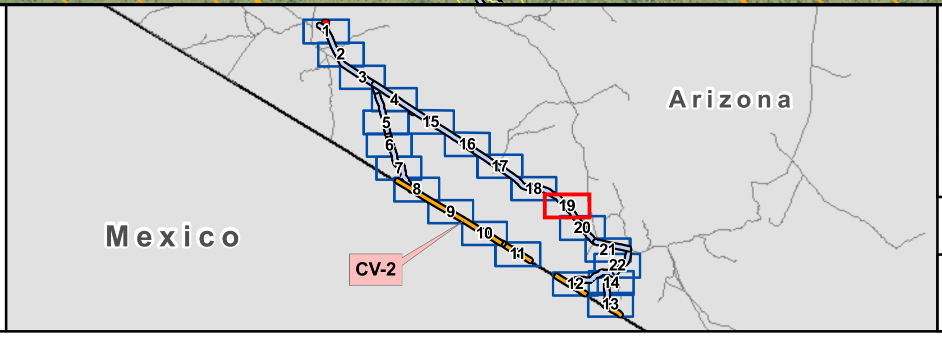

- Veg Observation Points
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0 250 500 1,000
Scale

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US Customs and Border Patrol
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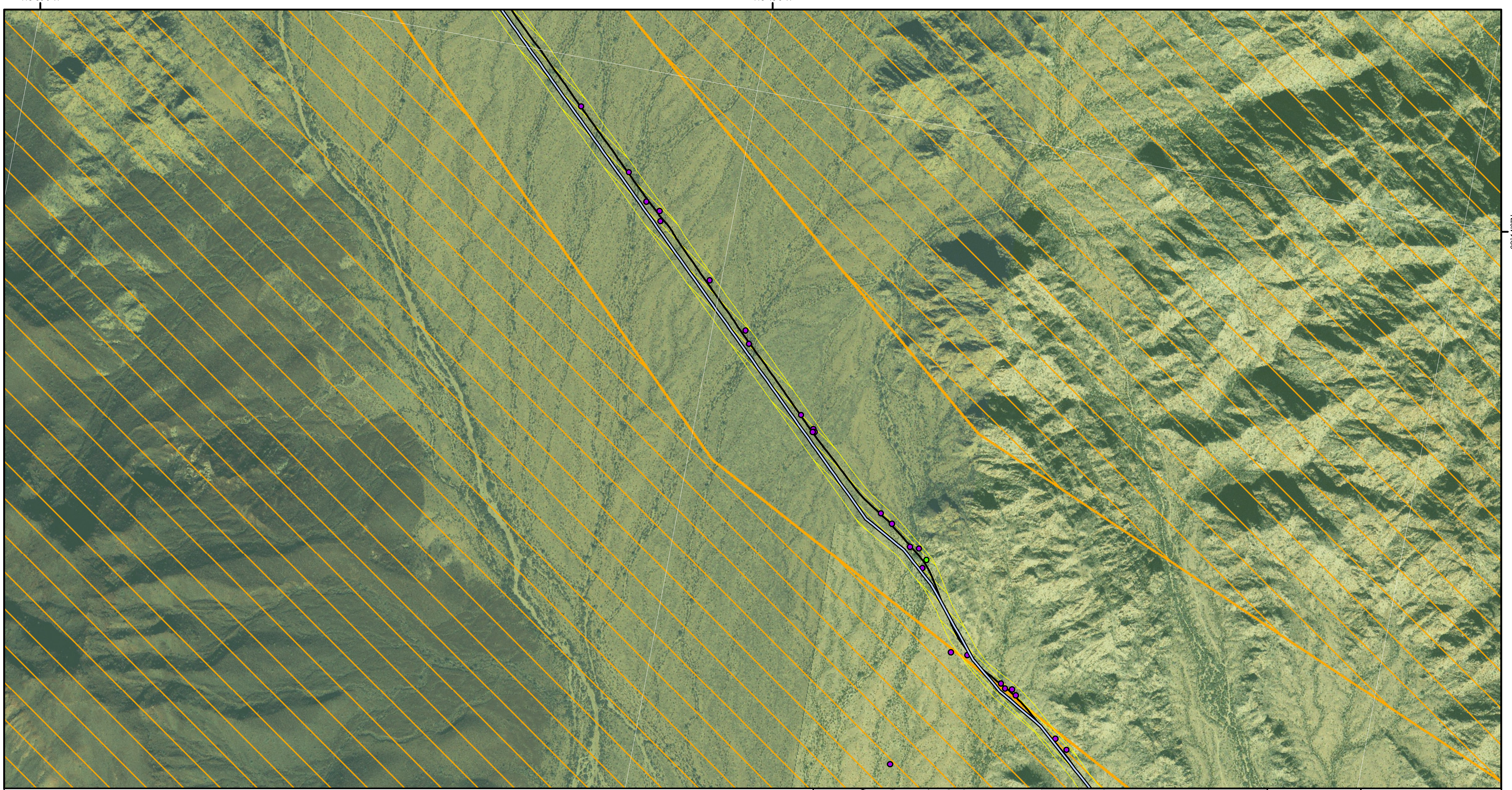
Drawn By: DSA	CV-2 Sheet 19	
Checked By: SSG	Scale 1 : 8,000	July 2008



- Veg Observation Points
- Saguarros
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Feet
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Scale

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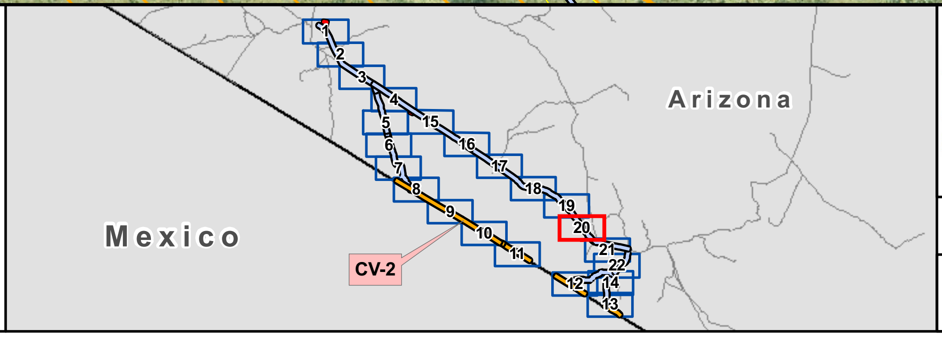

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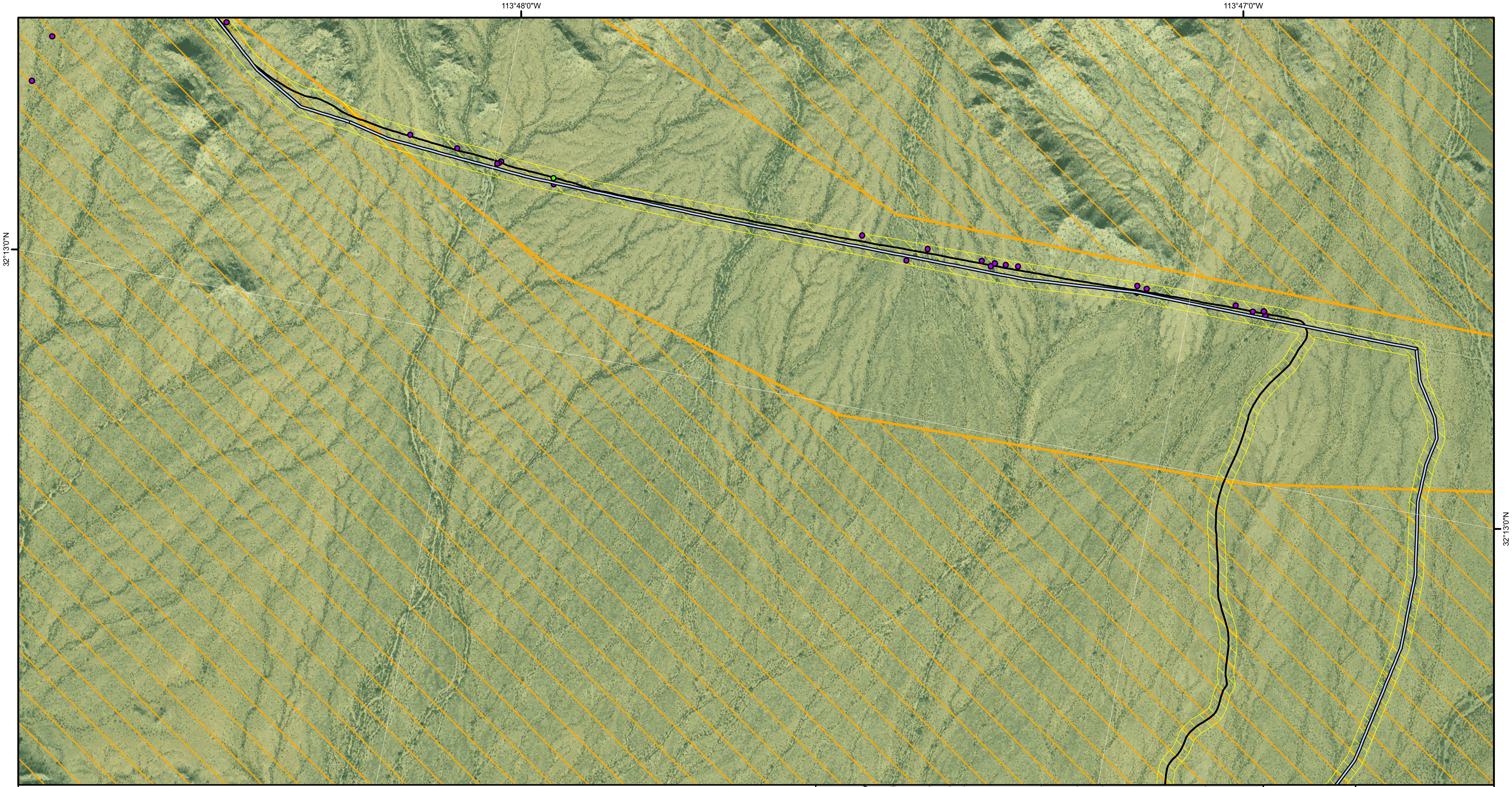
Checked By: SSG	Scale 1 : 8,000	July 2008



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Feet
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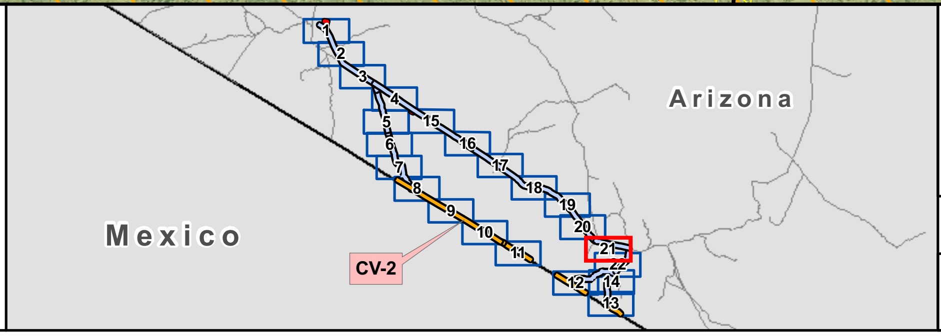

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Drawn By: DSA	**CV-2 Sheet 21**
Checked By: SSG	**Scale 1 : 8,000** / **July 2008**

113°48'0"W 113°47'0"W

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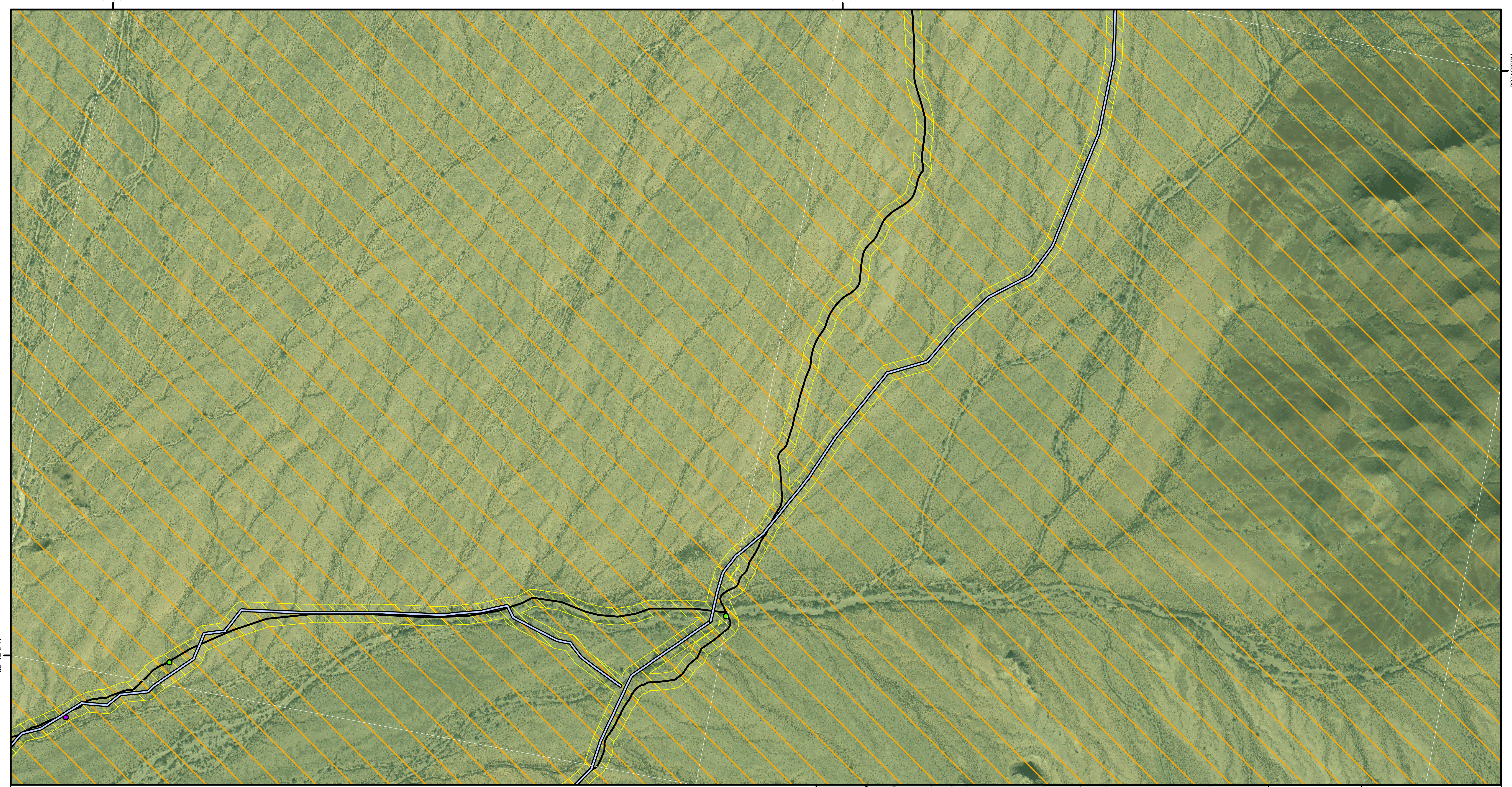

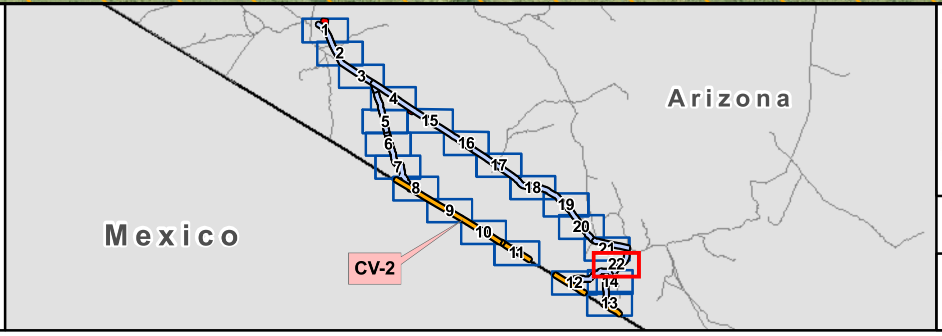

- Veg Observation Points
- Saguarros
- Proposed Vehicle Fence
- Proposed Access Roads
- Proposed Staging Areas
- GPSed Access Roads
- CV2_Survey_Area
- Federal Lands
- Parks
- NWI Wetlands

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US Customs and Border Patrol
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Proposed Border Fence
Field Maps

Solutions Today for a Sustainable Tomorrow

Projection: Albers
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Checked By: SSG	**Scale 1 : 8,000**	**July 2008**

APPENDIX E

Biological Survey Report

ABBREVIATIONS AND ACRONYMS

AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department
BMGR	Barry M. Goldwater Range
BSR	Biological Survey Report
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
CPNWR	Cabeza Prieta National Wildlife Refuge
CWA	Clean Water Act of 1977
°F	Degrees Fahrenheit
e^2M	engineering-environmental Management, Inc.
GIS	Geographic Information System
GPS	Global Positioning System
HDMS	Heritage Data Management System
ISDA	International Sonoran Desert Alliance
m	meter(s)
m^2	square meters
MJD	Multi-Jurisdictional Dataset
mph	miles per hour
NVCS	National Vegetation Classification System
OHM	Ordinary high water mark
ROE	Right of Entry
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
U.S.C	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator

BIOLOGICAL SURVEY REPORT

FOR

CONSTRUCTION, MAINTENANCE, AND OPERATION OF VEHICLE FENCE AND RELATED TACTICAL INFRASTRUCTURE YUMA SECTOR, ARIZONA

WELLTON STATION

U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. CUSTOMS AND BORDER PROTECTION
U.S. BORDER PATROL YUMA SECTOR, ARIZONA

Prepared by

DECEMBER 2008

BIOLOGICAL SURVEY REPORT
FOR
CONSTRUCTION, MAINTENANCE, AND OPERATION OF VEHICLE FENCE AND RELATED TACTICAL INFRASTRUCTURE YUMA SECTOR, ARIZONA WELLTON STATION

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1. INTRODUCTION

This Biological Survey Report (BSR) synthesizes information collected from a variety of literature sources and field surveys to describe the biological resources within the Project corridor; provides supporting information from the Project region; allows evaluation within the Project Environmental Stewardship Plan of the potential effects of the Project on those biological resources; and provides the basis of recommendations for avoidance or reduction of those effects using mitigation including best management practices. Information was gathered from publicly available literature, data provided by relevant land management agencies such as the Cabeza Prieta National Wildlife Refuge (CPNWR), review of aerial photography and U.S. Geological Survey (USGS) topographic maps, data from the State of Arizona, data from NatureServe, and field surveys of the Project corridor conducted in May and June 2008. Of particular importance were data from the Barry M. Goldwater Range (BMGR) (managed by the U.S. Marine Corps) and CPNWR (managed by the U.S. Fish and Wildlife Service [USFWS]) whose southern boundaries with Mexico encompass the Project corridor.

This BSR supports the Environmental Stewardship Plan by providing information on biological resources potentially affected by impacts resulting from the construction, operation, and maintenance of the tactical infrastructure. The BSR was prepared as an independent document that is an appendix to the Environmental Stewardship Plan developed for this Project. In general, the Project corridor is approximately 9 miles in length, approximately 67 acres within a 60- to 150-foot -wide area. In total, approximately 300 acres of mostly native vegetation providing wildlife habitat occurs in the Project corridor. The remaining area (13 acres) support land use in the form of unvegetated desert wash bottoms, roads, and trails.

Herbaceous vegetation (e.g., sparse annual grasslands, forblands) composes approximately 10 percent of the corridor for a vegetation cover total of approximately 31 acres. Shrublands (dwarf, short, and tall) compose approximately 76 percent of the corridor for a vegetation cover total of 233 acres. Wooded shrublands compose approximately 14 percent of the corridor or 42 acres vegetation cover. The vegetation represents a combination of mostly native Sonoran Desert shrublands that have become established in sparse stands on mountain toeslopes, ridges, slopes, alluvial fans, outwash plains, and along desert washes.

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2. PROJECT DESCRIPTION

U.S. Customs and Border Protection (CBP) proposes to construct, maintain, and operate tactical infrastructure consisting of vehicle barrier (post-and-rail or Normandy-type) and associated access roads and patrol roads along the U.S./Mexico international border in the U.S. Border Patrol (USBP), Yuma Sector, Wellton Station, Arizona. The locations of tactical infrastructure are based on a USBP Yuma Sector assessment of local operational requirements where it would assist USBP agents in reducing cross-border violator activities. Proposed tactical infrastructure would be constructed in Section CV-2 along the international border in Yuma County, Arizona (see **Table 2-1**). **Figure 2-1** shows a general location map of the Project region.

Table 2-1. Tactical Infrastructure Sections, Tucson Sector, Douglas Station

Barrier Section Number	USBP Sector-Station	General Location	Land Ownership / Management	Length of New Barrier Sections
CV-2	Yuma-Wellton	BMGR and CPNWR	DOD / USFWS	6.92
CV-2	Yuma-Wellton	BMGR and CPNWR	DOD / USFWS	1.48
CV-2	Yuma-Wellton	BMGR and CPNWR	DOD / USFWS	0.47
CV-2	Yuma-Wellton	BMGR and CPNWR	DOD / USFWS	0.17
			Total	**9.04 mi**

The vehicle barrier will be constructed in four distinct sections ranging from 0.17 to 6.92 miles in length, wholly within the Roosevelt Reservation, land reserved in 1907 within 60 feet of the international boundary between the U.S. and Mexico along California, Arizona, and New Mexico. The international border in the Project area currently is largely unfenced. To construct the vehicle barrier will require improving or building access roads totaling 37.74 miles in length.

The final design will be prepared by a design/build contractor with oversight from the U.S. Army Corps of Engineers (USACE). Design criteria that have been established based on USBP operational needs require minimum standards for vehicle barriers, as follows: (1) capable of withstanding a crash of a 10,000–pound (gross weight) vehicle traveling at 40 miles per hour (mph); (2) capable of withstanding vandalism, cutting, or various types of penetration; (3) designed to survive extreme climate changes; (4) designed to reduce or minimize impacts on small animal movement; (5) not impede the natural flow of surface water; and (6) to be as aesthetically pleasing as possible.

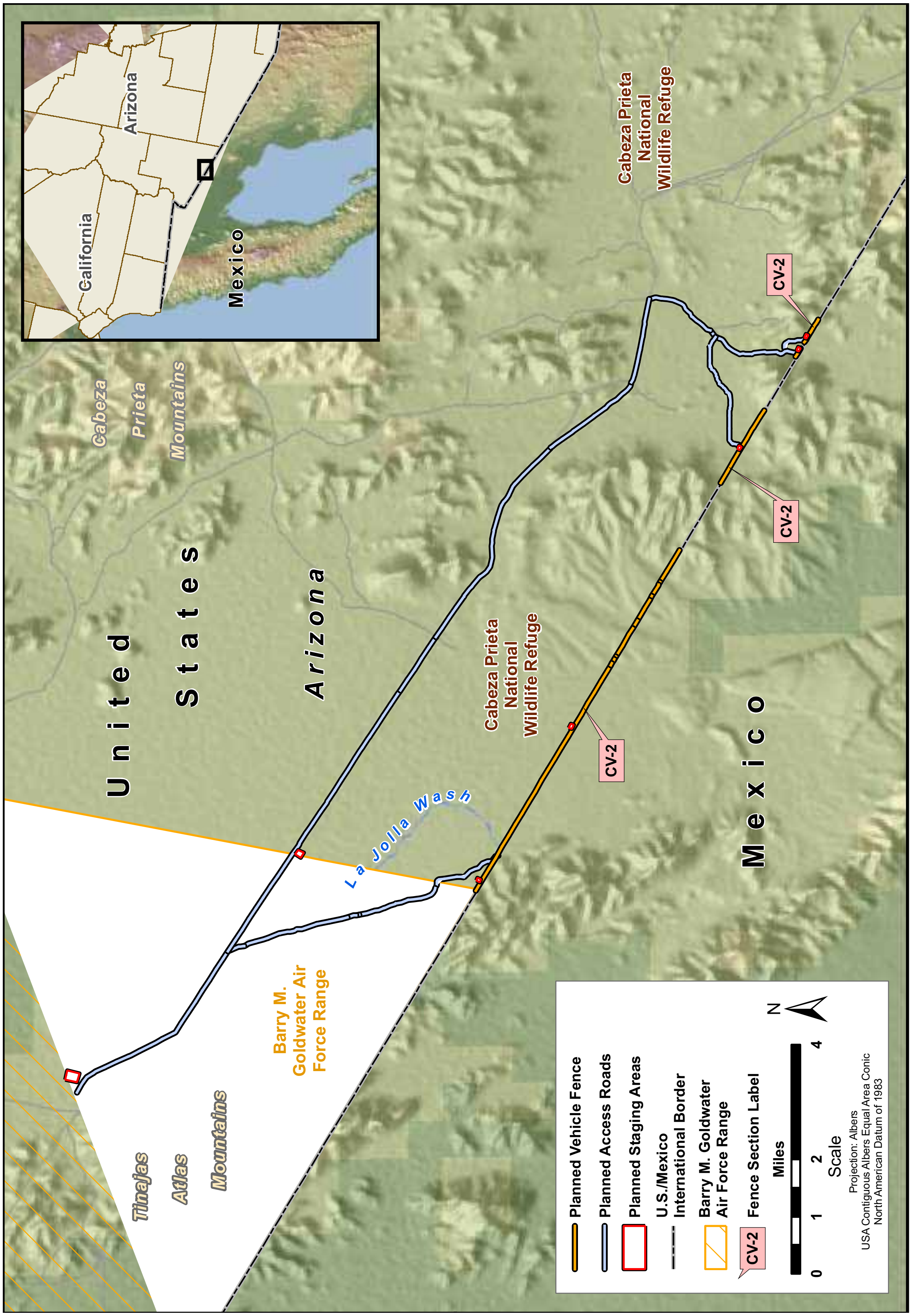

Figure 2-1. Location Map for CV-2

It is anticipated that a post-and-rail style vehicle fence will be constructed for the majority of the segment, with Normandy-style barrier used for desert wash crossings and steeper grades. The area of impact for barrier construction is approximately 60 feet wide along the entire Project corridor, with wider but temporary impacts occurring at staging areas for construction materials and vehicles. Vegetation removal and land clearing/grading activities may occur on an as-needed basis.

2.1 Survey Methods

To provide flexibility in placement of tactical infrastructure within the Project corridor, and to ensure consideration of potential impacts due to construction, patrol, and maintenance, surveys were conducted in an area extending 150 feet on the north side (i.e., the side away from the international border) of the individual tactical infrastructure sections to the ends of the section (a total of 67 acres). Along access roads, the survey was conducted 30 to 75 feet on either side of the center line or within a 150-foot-wide corridor. The narrower survey corridor occurred along the widest section of Camino del Diablo. The entirety of each staging area was surveyed. The areas thus defined are referred to hereafter as the “survey corridor” or “Project corridor.”

Field investigations of the survey corridor were conducted by biologists of engineering-environmental Management, Inc. (e²M): Jim Von Loh (senior ecologist), Summer Bennett (staff biologist), Brent Eastty (staff botanist), Shannon Cauley (senior wetlands biologist), and Domenick Alario (staff geographic information system [GIS] specialist). The May and June 2008 surveys examined the Project corridor on May 6 and 7, and from June 16 through 20, 2008. A Contractor Site Visit Request Form approved by the USACE; assistance from the USFWS, CPNWR Manager, Curt MacCasland, and Ranger Brian Krukoski; daily contact with the USBP Wellton Station Duty Desk; and daily contact with the U.S. Marine Corps BMGR Fire Desk were necessary to access properties.

Due to the schedule requirements for acquiring field information, e²M assigned senior and staff ecologists/ biologists familiar with the USBP Projects, reporting process, vegetation, wetlands/waters of the United States, wildlife habitat classification and mapping protocols, and field sampling methods to intuitively examine the landscape and Project corridor for the approximately 9-mile length. Further, senior e²M natural resources staff used USFWS species lists and comprehensive conservation planning data (USFWS 2006) to ensure accurate identification of plant species and competent surveys for rare plants, wildlife, and potential habitat. The surveys were controlled, in that right-of-entry (ROE) was approved for the entire corridor and access road widths, and survey crews were in contact with BMGR and USBP operations. While on the border, crews were accompanied by a USFWS ranger. Investigations included preparing lists of observed plant and wildlife species; an assessment of habitat and surveys for rare plant and wildlife species; landscape photography points; observation points recording dominant species, location, cover, environmental conditions, and photo-documentation; determination of waters of the United States for future research; locations of major desert washes; and general notetaking of natural resources, cultural resources, and other Environmental Stewardship Plan reporting needs.

Biologists walked and conducted vehicle surveys of the entire Project corridor, including all the access road corridors and staging areas. All occurrences of saguaro were documented and all potentially affected individual saguaros were photographed. The survey team conducted reconnaissance level surveys on areas of land use (sites devoid of vegetation including existing trails, access roads, parking and staging areas, and unvegetated desert wash bottoms) and examined in detail areas containing unique species compositions or habitat that might be conducive to sensitive species (e.g., mountain toeslopes, drainages, alluvial fans, desert shrublands). Observation data (Universal Transverse Mercator [UTM] coordinates, photographs, field notes, environmental information, vegetation structure, and plant community composition) were recorded at regular intervals along the corridor where vegetation occurred as homogenous stands and also where plant communities presented substantial shifts in species composition. These data were used to generate a vegetation classification and map to facilitate delineation of habitat types, analyses of potential sensitive species occurrences, and analyses of potential Project impacts on biological resources (see **Attachment A**). Vegetation type and land use maps are included as a digital file in this final report. The botanist and wildlife biologist specifically examined habitats to determine the presence of state- and Federal-listed species (see **Table 2-2**). Descriptions of the federally listed species are provided in **Attachment D**.

2.2 Arizona Game and Fish Department; Arizona Natural Heritage Program, Heritage Data Management System

The Arizona Heritage Data Management System (HDMS) was established to collect, synthesize, and catalog information concerning the distribution and occurrence of species and habitats in need of special attention (AZGFD 2008b). It is part of a global network of 80 Natural Heritage Programs and Conservation Data Centers. The HDMS is Arizona's most comprehensive source of information related to rare, threatened, and endangered animals, plants, exemplary natural communities, and other significant features. The data are publicly available from which to make prudent decisions weighing future development, economic growth, and environmental integrity (AZGFD 2008a). While these data are continually updated, there are gaps in coverage and species information due to lack of access to land for inventory, data from many sources, and a lack of staff and resources to collect and process data for all rare and significant resources. To request information from the HDMS online, access: http://www.azgfd.gov/w_c/edits/hdms_natural_heritage.shtml.

Table 2-2. Federal Threatened and Endangered Species and Arizona Wildlife Species of Concern Occurring Within Yuma County

Common Name	Scientific Name	County	Federal Status	State Status
FISH				
Razorback sucker	*Xyrauchen texanus*	Y	**LE**	**WSC**
REPTILES				
Desert rosy boa	*Charina trivirgata gracia*	Y	**SC**	—
Sonoran Desert tortoise	*Gopherus agassizii* (Sonoran Population)	Y	**SC**	**WSC**
Banded Gila monster	*Heloderma suspectum cinctum*	Y	**SC**	—
Flat-tailed horned lizard	*Phrynosoma mcallii*	Y	**SC**	**WSC**
Arizona chuckwalla	*Sauromalus ater* (Arizona Population)	Y	**SC**	—
Yuman Desert fringe-toed lizard	*Uma rufopunctata*	Y	**SC**	**WSC**
BIRDS				
Great egret	*Ardea alba*	Y	—	**WSC**
Western burrowing owl	*Athene cunicularia hypugaea*	Y	**SC**	—
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	Y	**C**	**WSC**
Snowy egret	*Egretta thula*	Y	—	**WSC**
Southwestern willow flycatcher	*Empidonax traillii extimus*	Y	**LE**	**WSC**
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	Y	**SC**	**WSC**
Bald eagle (wintering population)	*Haliaeetus leucocephalus*	Y	**LT, PDL**	**WSC**
Least bittern	*Ixobrychus exilis*	Y	—	**WSC**
Loggerhead shrike	*Lanius ludovicianus*	Y	**SC**	—
California black rail	*Laterallus jamaicensis coturniculus*	Y	**SC**	**WSC**
Yuma clapper rail	*Rallus longirostris yumanensis*	Y	**LE**	**WSC**
MAMMALS				
Sonoran pronghorn	*Antilocapra americana sonoriensis*	Y	**LE**	**WSC**
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Y	**SC**	—
Spotted bat	*Euderma maculatum*	Y	**SC**	**WSC**
Greater western bonneted bat	*Eumops perotis californicus*	Y	**SC**	—
Western yellow bat	*Lasiurus xanthinus*	Y	—	**WSC**

Common Name	Scientific Name	County	Federal Status	State Status
MAMMALS (continued)				
Lesser long-nosed bat	*Leptonycteris curasoae*	C, P	**LE**	**WSC**
California leaf-nosed bat	*Macrotus californicus*	Y	**SC**	**WSC**
Yuma myotis	*Myotis yumanensis*	Y	**SC**	—
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	Y	—	—
Yuma hispid cotton rat	*Sigmodon hispidus eremicus*	Y	**SC**	—
PLANTS				
Parish onion	*Allium parishii*	Y	**S**	**SR**
Kofa barberry	*Berberis harrisoniana*	Y	**S**	—
Gander's cryptantha	*Cryptantha ganderi*	Y	**S**	—
Clustered barrel cactus	*Echinocactus polycephalus* var. *polycephalus*	Y	—	**SR**
Dune spurge	*Euphorbia platysperma*	Y	**SC**	—
California barrel cactus	*Ferocactus cylindriceus* var. *cylindraceus*	Y	**PR**	**SR**
Dune sunflower	*Helianthus niveus* ssp. *tephrodes*	Y	**SC**	—
Senita	*Lophocereus schottii*	Y	—	**SR**
Straw-top cholla	*Opuntia echinocarpa*	Y	—	**SR**
Sandfood	*Pholisma sonorae*	Y	**SC**	**HS**
Kearney sumac	*Rhus kearneyi*	Y	**S**	**SR**
Schott wire lettuce	*Stephanomeria schottii*	Y	**S**	—
Blue sand lily	*Triteleiopsis palmeri*	Y	**S**	**SR**
California fan palm	*Washingtonia filifera*	Y	—	**SR**

Source: AZFGD 2008b, USFWS 2008

Notes: Y: Yuma County; C: Cochise County; P: Pima County; LE = Listed Endangered; LT = Listed Threatened; PDL = Proposed for Delisting; PR = Protected; S= Sensitive; SC = Species of Concern; WSC = Wildlife of Special Concern in Arizona; HS = Highly Safeguarded Protected Native Plants (no collection allowed); SR = Salvage Restricted Protected Native Plants

For the Project corridor, HDMS data were used to assist with the evaluation of environmental impacts of the vehicle barrier section under consideration. The interpretation and extrapolation of the data included consideration that: (1) data gaps possibly occur because of the availability of data extraction from public information sources, (2) species and geographic coverage focused on the most rare species and ecosystems, and (3) the potential lack of precise locality data in some secondary sources exists. Because of the large proportion of public land versus private land in Arizona, the HDMS includes a representative inventory of rare resources in the state. It is based on the best data available to the Arizona Game and Fish Department (AZGFD) in terms of rare species locations and distributions.

The Yuma County list of rare species was acquired from HDMS and consolidated into **Table 2-2**. The county lists include wildlife species of special concern in Arizona and highly safeguarded plant species. In general, species that appear on county lists do not all share the same probability of occurrence within a county (e.g., some species are migrants or wintering residents and a few species might be historic or considered extirpated within a county).

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3. ENVIRONMENTAL SETTING

This region is characterized by deep, northwest-trending, alluvium-filled basins separated by linear mountain ranges (Sonoran Region of the Basin and Range Province of North America). The Sonoran Desert is young having developed over the past 8,000 to 9,000 years; therefore, it lacks a distinctive faunal species component evolved to the extant conditions (USFWS 2006). Relatively recent volcanic activity was evident with many slopes covered by gravel and cobble of volcanic origin. Land surface elevations range from approximately 1,039 feet amsl to more than 2,051 feet amsl in the immediate Project region. Wildlife habitat, managed natural open space, and military training are the prominent land uses of the region. The Project area physiography includes the footslopes of the Tinajas Altas Mountains on the BMGR on its western end and the footslopes of the Cabeza Prieta and Tule mountains on its eastern terminus. The Lechugilla Desert, a relatively flat alluvial plain, occurs between these rugged desert mountain ranges.

The Project area climate is typical of the Sonoran Desert (e.g., semiarid within the Xeric Climatic Region) (in Robinson et al. 2006). Precipitation typically increases and temperatures decrease with increasing altitude in the Xeric Climatic Region during all seasons of the year. Low rainfall and high temperatures are characteristic of the basin and range lowlands (e.g., summers are long and hot and winters are short, dry, and cold and can include brief periods when temperatures are below freezing) (Robinson et al. 2006, Bailey 1995). The precipitation pattern is generally biseasonal, with much of the precipitation occurs from July to September in the form of intense thunderstorms driven by moisture from the Gulf of California (i.e., monsoons); however, gentle rains from Pacific Ocean moisture occurs from December through February (USFWS 2006). Many of the streams in the Xeric Climatic Region are intermittent or ephemeral (i.e., more than 250 days annually of no flow), but can have high flow in response to intense thunderstorms. The longest period of time with above-average precipitation occurred from 1981 to 1986 and the longest period of time with below average precipitation occurred from 1991–2002 (USFWS 2006).

The general climatic summary records for Yuma (Station 029660) have been prepared from 1948 to 2007 data (WRCC 2008). Average minimum temperatures in Yuma range from a low of 44 degrees Fahrenheit (°F) in December and January to 80 °F in July, and average high temperatures range from 69 °F in December and January to 107 °F in July (WRCC 2008). The lowest temperature recorded was 5 ^{o}F on February 18, 1995, and the highest temperature recorded was 124 ^{o}F on July 28, 1995. The average annual precipitation is 3.0 inches, which is relatively evenly distributed throughout the year. The range of precipitation is 0.3 inches (1956) to 6.8 inches (1989). A long growing season is experienced for the Project region (there are approximately 320 frost-free days annually), the prevailing wind ranges from 6.5 to 9.1 mph in a southerly direction, and the pan evaporation rate is high at 99 inches annually (WRCC 2008).

The Project area geology includes primarily granite and basalt with some sedimentary rocks composing much of the alluvial structures and drainages. Bedrock is exposed as sierras, mountain ranges characterized by jagged crests that rise steeply from the valley floor (USFWS 2006). Between mountain ranges are broad, nearly level alluvial valleys and basins generally draining to the Colorado River and the Gulf of California. The Tinajas Altas Mountains are characterized by granite and related intrusive crystalline rocks. The Tule and Cabeza Prieta mountains are composed of crystalline complex rocks with overlying lavas and sediments. Minerals associated with the regional geologic formations include the metals thorium, uranium, copper, selenium, galena, gold, silver, tellurium, and rare earth elements. Nonmetallic minerals that have been identified include beryl, barite, feldspar, mica, quartz, granite, and limestone, marble, and strontium salts.

In areas of similar climate and topography, differences in the kind and amount of vegetation are closely related to soils. Within the Project area, five broad soil map units occur, including Calciorthids, Haplargids, and Torrifluvents. These map units have a hyperthermic (very hot) temperature regime and an aridic soil moisture regime (USFWS 2006, McNab and Avers 1994). Generally, soils have not become developed on the mountain ridges and steep slopes of the Tinajas Altas, Cabeza Prieta, or Tule mountains, while more gentle lower slopes of these ranges are characterized by shallow coarse soils, gravel, or bare rock. Bare rock is predominantly exposed on the mountain ridges and slopes because the heavy, violent desert rainstorms allow little soil to accumulate. Entisols occur on the older alluvial fans and terraces and in the better-drained basins, while aridisols have become developed throughout the remainder of the Project area (McNab and Avers 1994).

Alluvial fans, bajadas, and desert wash channels contain coarse-grained deposits, which compose up to 98 percent of the soil texture. Average composition of coarse-grained soils includes approximately 30 percent gravel, cobbles, and boulders; 40 percent sand; 25 percent silt; and 5 percent clay (USFWS 2006). Coarse-grained soils are well-drained, alkaline, and support the highest diversity of plant species and communities in the Project area. Alluvial plains and playas are common in the Lechuguilla Desert and are characterized by deposits of silt and clay known locally as talc. These fine deposits are deep, up to 2 feet thick, are alkaline or saline, poorly drained, and support the lowest diversity of plant species and communities within the Project area. There are shallow accumulations of eolian or wind-blown sand and silt that have accumulated around creosotebush and other shrubs in some areas. These shallow eolian deposits support a variety of annual grasses and forbs.

Biological soil crusts occur within the Project area, particularly on alluvial fans and plains between desert washes of various sizes. These thin crusts are dark gray to nearly black in color and represent a complex community of cyanobacteria, green algae, lichens, mosses, microfungi, and other true bacteria (Belnap et al. 2001). The cyanobacteria and microfungi have filaments that weave through the top few millimeters of soil, creating a matrix that stabilizes and protects soil surfaces from wind and water erosion. Other attributes of biological soil crusts include fixing atmospheric nitrogen, building soil organic matter (Eldridge and Green 1994), and retaining soil moisture (Belnap et al. 2001). Within the Project area, biological soil crusts occupy the openings between shrub canopies and clumps of vascular plants. They also occupy thin soils over bedrock. They are typically diverse in terms of species composition, often including more species than the associated vascular plant community (Rosentreter 1986, Ponzetti et al. 1998). Where land uses including vehicle trails and livestock grazing have removed the crusts, decades can pass before they begin to reestablish.

The vegetation of the basin and range lowlands of southwestern Arizona has generally been classified under the Dry Domain (Map Unit 300), Tropical/Subtropical Desert Division (Map Unit 320) of Bailey (1995). The Project area is more finely classified by Bailey (1995) as the American Semidesert and Desert Province (Map Unit 322), Sonoran Desert Section (Map Unit 322b). The Arizona Gap Project (Bennett et al. 2004) provided discussion and described plant geography to vegetation series using topographic features, climate, vegetation types, and terrestrial vertebrates. This system placed the Project area generally in the Nearctic Upland, Tropical-Subtropical Desertland, Sonoran Desertscrub classification. Vegetation series that were described and are applicable to the Project corridor included (1) Creosotebush-Bursage Series and (2) Paloverde-Mixed Cacti Series (Bennett et al. 2004).

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4. BIOLOGICAL RESOURCES

4.1 Vegetation Classification

The USGS (Bennett et al. 2004) recognized two Nearctic Upland vegetation mapping units in the Tinajas Altas, Cabeza Prieta, and Tule mountains vicinity using a combination of plant species dominance, wildlife use, topography, hydrology, and geology. The vegetation series that are associated with the Project area include (1) Tropical-Subtropical Desertland, Sonoran Desertscrub, Creosotebush-Bursage Series; and (2) Tropical-Subtropical Desertland, Tropical-Subtropical Sonoran Desert Scrub, Paloverde-Mixed Cacti Series. The entire corridor was predominantly characterized by the Sonoran Desertscrub vegetation series of the Lower Colorado Valley subdivision of the Sonoran Desert (USFWS 2006). The Tropical-Subtropical Desertland climatic zone and the Sonoran Desertscrub biome or habitat type are concepts further described in Brown (1994).

NatureServe (2008) has defined ecological systems to represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes such as drought, fire, or flooding. Ecological systems represent classification units that are readily identifiable by conservation and resource managers in the field. The ensuing vegetation description for the Project area was prepared in the framework of ecological systems that include (1) Sonoran Granite Outcrop Desert Scrub (CES302.760), (2) North American Warm Desert Bedrock Cliff and Outcrop (CES302.745), (3) North American Warm Desert Volcanic Rockland (CES302.754), (4) Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761), (5) Sonora-Mojave Creosotebush-White Bursage Desert Scrub (CES302.756), (6) Sonoran Brittlebush-Ironwood Desert Scrub (CES302.758), (7) North American Warm Desert Wash (CES 302.755), and (8) North American Warm Desert Riparian Mesquite Bosque (CES302.752). **Table 4-1** provides a crosswalk between the biotic communities described by the USGS and the ecological systems of NatureServe (2008).

Classification of existing vegetation within this corridor was achieved by accessing the Project corridor, access roads, and staging areas as planned, sampling observation points, and relating them to the NatureServe Explorer classification database directly or as provisional types (NatureServe 2008). At the coarsest level, the eight above-named ecological systems were determined and local vegetation types described using the national system. A finer level of classification equaling or approximating the vegetation alliance level of the National Vegetation Classification System (NVCS) (NatureServe 2008) was used to prepare the plant community discussions under each ecological system.

Table 4-1. Crosswalk Relationship of USGS GAP Map Units and USFWS Habitat Types with NVCS Ecological Systems and Vegetation Alliances

Ecological System (NatureServe 2008) Provisional Vegetation Alliance	Vegetation Structure and Series	Habitat Types
Sonoran Granite Outcrop Desert Scrub - Paloverde – Ocotillo – Creosotebush Mountain Slope Wooded Shrubland - Rock Outcrop Sparse Shrubland	Sonoran Desert Scrub - Paloverde-Mixed Cacti Series	Mountain Slope Sparse Wooded Shrubland
North American Warm Desert Bedrock Cliff and Outcrop - Creosotebush – Limberbush – White Bursage Shrubland	Sonoran Desert Scrub - Creosotebush-Bursage Series	Sonoran Desert Scrub
North American Warm Desert Volcanic Rockland - Creosotebush – White Bursage Volcanic Cobble Shrubland - Creosotebush – Ocotillo Volcanic Cobble Shrubland - Creosotebush – Brittlebush - Teddy Bear Cholla Volcanic Cobble Shrubland - Brittlebush – Creosotebush Volcanic Cobble Shrubland	Sonoran Desert Scrub - Creosotebush-Bursage Series	Sonoran Desert Scrub Volcanic Cobble and Boulder
Sonoran Paloverde-Mixed Cacti Desert Scrub - Saguaro / Creosotebush – White Bursage Wooded Shrubland	Sonoran Desertscrub - Paloverde-Mixed Cacti Series	Sonoran Desert Scrub
Sonora-Mojave Creosotebush-White Bursage Desert Scrub - Creosotebush – White Bursage Shrubland - Creosotebush – Brittlebush – White Bursage Shrubland - Creosotebush / Annual Herbaceous Vegetation Shrubland - Creosotebush – White Bursage – Four-wing Saltbush Shrubland - Annual Herbaceous Vegetation / Barrens	Sonoran Desert Scrub - Creosotebush-Bursage Series	Sonoran Desert Scrub

Ecological System (NatureServe 2008) Provisional Vegetation Alliance	Vegetation Structure and Series	Habitat Types
Sonoran Brittlebush-Ironwood Desert Scrub - Ironwood / Brittlebush Desert Wash Wooded Shrubland	Sonoran Desert Scrub - Paloverde-Mixed Cacti Series	Sonoran Desert Scrub Desert Wash Scrub
North American Warm Desert Wash - Creosotebush – Triangle-leaved Bursage Desert Wash Shrubland - Four-wing Saltbush – Catclaw Acacia Desert Wash Shrubland - Smoketree – Catclaw Acacia Desert Wash Shrubland - Paloverde – Ironwood / Mixed Shrubs Desert Wash Wooded Shrubland	Sonoran Desert Scrub - Creosotebush-Bursage Series - Paloverde-Mixed Cacti Series	Sonoran Desert Wash Scrub Desert Wash Scrub
North American Warm Desert Riparian Mesquite Bosque - Honey Mesquite / Mixed Shrubs Riparian Wooded Shrubland	Sonoran Desert Scrub - Paloverde-Mixed Cacti Series	Sonoran Desert Wash Scrub Desert Wash Scrub

Note: NVCS = National Vegetation Classification System.

Habitats observed, sampled, and photographed within the Project corridor range from upland mixed desert scrub and cactus-scrub throughout the alignment to desert wash sparse woodland and shrubland stands within the BMGR and CPNWR. Much of the vegetation cover along the vehicle barrier fence section consists of native shrublands characterized by creosotebush, white bursage, brittlebush, pencil cholla, saguaro, and ocotillo; sparse to low vegetation cover occupies approximately 10 percent of the corridor. Development is limited to existing roads and trails, staging areas, and training sites; these land uses occupy approximately 4 percent of the corridor.

A brief description of each plant community observed within the section (CV-2) is provided herein; they are distinguished using the NatureServe Vegetation Alliance level of classification or an approximation. Each community is illustrated and supported by representative ground photographs and foliar cover information for dominant and characteristic plant species.

4.1.1 Sonoran Granite Outcrop Desert Scrub Ecological System (CES302.760)

Paloverde – Ocotillo – Creosotebush Mountain Slope Wooded Shrubland

The moderately steep lower slopes (up to 25 percent slope) of the Tinajas Altas and Tule mountains supported approximately 6.1 acres of this type along the international border at the western and eastern termini of the Project corridor. Sparse stands had become established in bedrock cracks, in thin materials trapped in small depressions, and on gravelly fans along toeslopes (**Figure 4-1**). Seventy-five percent or more of the substrate was exposed bedrock with the remainder predominantly composed of large and small rocks. Scattered littleleaf paloverde trees from 2 meters (m) to 5 m tall provided approximately 5 percent cover; a few ironwood trees were present in the woodland layer. The tall shrubs ocotillo and saguaro contributed up to 2 percent cover. The short and dwarf-shrub layers contributed up to 5 percent cover and included creosotebush, limberbush, teddy bear cholla, elephant tree, and white bursage. Annual forbs and grasses that included species of buckwheat, Indian plantain, and six-weeks fescue contributed sparse cover, up to 2 percent.

Rock Outcrop Sparse Shrubland

Rock outcrops occurred along the Camino del Diablo where the road/trail crossed the footslopes of the Cabeza Prieta Mountains and approximately 0.3 acres occur within the Project corridor. The outcrops were steep, up to 35 percent slope, and were composed of approximately 95 percent granite bedrock, with vegetation growing from cracks and between boulders that had fallen from the steep slopes (see **Figure 4-2**). Total vegetation cover was less than 5 percent and included the shrubs desert lavender, brittlebush, California snakeweed, barrel cactus, buckwheat, and white bursage. Annual forbs contributed < 1 percent cover and were characterized by wild buckwheat and six–weeks fescue.

4.1.2 North American Warm Desert Bedrock Cliff and Outcrop Ecological System (CES302.745)

Creosotebush – Limberbush – White Bursage Shrubland

A relatively diverse shrub community had become established on the alluvial fans associated with the footslopes of the Tinajas Altas and Tule mountains along the Project corridor on the international border. The substrate consisted of approximately 18.4 acres of shallow to moderately deep alluvium of fans and low bajadas cut by narrow desert washes, typically from 1.0 m to 5.0 m wide and up to 2.5 m deep (see **Figure 4-3**). The short shrubs creosotebush and limberbush and the dwarf-shrub white bursage each contributed from 1 percent to 4 percent cover, depending on the site and slope exposure. Where the alluvial fans were broad, creosotebush and white bursage were present with higher cover. Where

Figure 4-1. Representative Photographs of Mountain Slope Habitat

Figure 4-2. Representative Photograph of Outcrop/Bedrock Habitat

Figure 4-3. Representative Photographs of Footslope and Upper Alluvial Fan Habitat

more desert washes occurred and dissected the fans, limberbush became the dominant short shrub. Littleleaf paloverde, ocotillo, and saguaro were typically present as small trees or tall shrubs contributing sparse cover (up to 2 percent). Additional short and dwarf-shrubs contributed sparse cover and included teddy bear cholla, wolfberry, elephant tree, brittlebush, ratany, and cholla. The herbaceous layer contributed sparse cover, up to 4 percent, and included Indian-wheat, buckwheat, spineflower, and scorpion-weed. Cryptobiotic crust was rarely present and provided low cover in one stand.

4.1.3 North American Warm Desert Volcanic Rockland Ecological System (CES302.754)

Creosotebush – White Bursage Volcanic Cobble Shrubland

Small exposures of volcanic cobble rarely occurred within large expanses of alluvium formed from granitic rocks of the nearby Cabeza Prieta Mountains. Volcanic cobble-covered ridges and slopes of the Tule Mountains were extensive along the international border and approximately 4.1 acres occurred in the Project corridor. The volcanic cobbles and gravel typically provided up to 60 percent cover and attained diameters to 2 feet. These sites were characterized in the short shrub layer by creosotebush that provided 2 percent to 4 percent cover and in the dwarf-shrub layer by white bursage that provided up to 1 percent cover (see **Figure 4-4**). The tall shrub layer contributed sparse cover and included ocotillo, blue paloverde, and saguaro. Additional short and dwarf-shrubs that could occur with sparse cover included teddy bear cholla and dagger cholla. Annual forbs provided sparse cover in the herbaceous layer, which was characterized by fleabane, Indian wheat, and rigid spineflower.

Figure 4-4. Representative Photographs of Creosotebush – White Bursage Volcanic Cobble Habitat

Creosotebush – Ocotillo Volcanic Cobble Shrubland

Surface deposits of volcanic cobble, rocks, and gravel occurred on the Tule and Cabeza Prieta mountain footslopes, capping bajadas, ridges, and slopes. The sites occurred on approximately 14.0 acres, were gently sloped (3 percent to 6 percent slopes) and consistently supported low cover, approximately 10 percent total cover of predominantly short shrubs (see **Figure 4-5**). The stands were characterized by creosotebush short shrubs and ocotillo tall shrubs that provided from 5 to 6 percent cover and 1 to 3 percent cover, respectively. The

Figure 4-5. Representative Photographs of Creosotebush – Ocotillo Volcanic Cobble Habitat

dwarf-shrubs multiple-headed barrel cactus and ratany contributed sparse cover. The herbaceous layer was composed of sparse cover by annual forbs of which Indian wheat, an annual plantain, provided up to 1 percent cover.

Creosotebush – Brittlebush – Teddy Bear Cholla Volcanic Cobble Shrubland

The volcanic rock fields of the Tule Mountains footslopes and a small bajada near the Cabeza Prieta Mountains supported a consistent sparse cover of short shrubs on volcanic rocks, gravel, and cobble up to 18 inches in diameter (see **Figure 4-6**). Approximately 7.1 acres of this type occurred within the Project corridor. This community was characterized by creosotebush, brittlebush, and teddy bear cholla that together provided approximately 8 percent cover. Creosotebush was typically the dominant stand, contributing approximately half the cover; however, in one east-facing stand, teddy bear cholla dominated and provided 5 percent cover. The tall shrub ocotillo was scattered throughout the

Figure 4-6. Representative Photographs of Creosotebush – Brittlebush – Teddy Bear Cholla Volcanic Cobble Habitat

stands and provided sparse cover (up to 1 percent). Blue paloverde provided sparse cover in the tall shrub layer at the bajada site. Sparse white bursage dwarf-shrubs also occurred on the bajada habitat. An herbaceous layer occurred and contributed sparse cover characterized by fluffgrass and annual wild buckwheat.

Brittlebush – Creosotebush Volcanic Cobble Shrubland

Extensive volcanic rock-covered ridges occurred on the footslopes of the Tule Mountains on the international border near the center of the Project corridor. The upper slopes or shoulders of the ridges were armored by large volcanic rocks and supported approximately 0.5 acres of nearly pure stands of the short shrub brittlebush, which provided from 5 to 15 percent cover (see **Figure 4-7**). Additional cover of the short shrubs creosotebush and buckhorn cholla contributed up to 5 percent cover in the shoulder-slope stands. Sparse cover (up to 2 percent) was provided by the tall shrub ocotillo, which were scattered within the stands. The herbaceous layer provided sparse cover by annual forbs; wild buckwheat was the most common species sampled.

Figure 4-7. Representative Photographs of Brittlebush – Creosotebush Volcanic Cobble Habitat

4.1.4 Sonoran Paloverde-Mixed Cacti Desert Scrub Ecological System (CES302.761)

Saguaro / Creosotebush – White Bursage Wooded Shrubland

This unique vegetation type occurred on the alluvial fans and plains adjacent to the footslopes of the Cabeza Prieta Mountains where stands were traversed by the Camino del Diablo. They became established on approximately 8.7 acres within the Project corridor where small braided shallow washes emerged in the gently sloped alluvial deposits below the footslopes. The stands were characterized by sparse canopy cover, up to 10 percent cover of 5– to 10- m tall saguaro, ironwood, and littleleaf paloverde trees (see **Figure 4-8**). The tall shrub layer provided sparse cover and was characterized by ocotillo. The short and dwarf-shrub layers were diverse for this region, provided up to 15 percent cover, and were characterized by creosotebush, wolfberry, teddy bear cholla, buckhorn cholla, four-wing saltbush, brittlebush, white burrobush, and rush bebbia. Creosotebush short shrubs provided at least half of the short and dwarf-shrub total cover in each stand. Big galleta can occur with sparse cover in the herbaceous layer within this vegetation type and annual forbs provided from 1 to 3 percent cover. Cryptobiotic crust had become established on the terraces above the active drainage channels and provided from 3 to 15 percent cover.

Figure 4-8. Representative Photographs of Saguaro / Creosotebush – White Bursage Alluvial Fan, Desert Wash, and Plain Habitat

4.1.5 Sonora-Mojave Creosotebush-White Bursage Desert Scrub Ecological System (CES302.756)

Creosotebush – White Bursage Shrubland

This common vegetation type occurred extensively across the Project area covering approximately 106.6 acres of the Project corridor. Occupied habitats included alluvial fans, alluvial plains, and footslopes including sites with small drainages and with substrates ranging from silt to small gravel. Stands were characterized by the short shrub creosotebush and the dwarf-shrub white bursage, which provided 3 to 9 percent and 1 to 4 percent cover, respectively (see **Figure 4-9**). The tall shrub layer often occurred (including saguaro up to 10 m tall), and contributed sparse cover (less than 5 percent), and was characterized by ocotillo, saguaro, littleleaf paloverde, ironwood, honey mesquite, and blue paloverde. The remaining short and dwarf-shrub layers contributed sparse cover and included wolfberry, brittlebush, four-wing saltbush, limberbush, ratany, desert agave, teddy bear cholla, pencil cholla, dagger cholla, and multiple-headed barrel cactus. The herbaceous layer was composed mostly of annual grasses and forbs, which provided sparse cover and included the perennial bunchgrass big galleta, annual grasses six-weeks fescue and Mediterranean grass, and the annual forbs Indian wheat and chaenactis. Cryptobiotic crust nearly always occurred in low to moderate cover, from < 1 to 20 percent cover; one sparsely vegetated site adjacent to the Camino del Diablo supported biotic crust of approximately 60 percent cover.

Figure 4-9. Representative Photographs of Creosotebush – White Bursage Alluvial Fan, Plain, and Footslope Habitat

Figure 4-9 (continued). Representative Photographs of Creosotebush – White Bursage Alluvial Fan, Plain, and Footslope Habitat

Creosotebush – Brittlebush – White Bursage Shrubland

This type became established on the extensive alluvial flats or plains crossed by the Camino del Diablo and within the large planned staging area on the western terminus of the Project. The soils of these stands were well-armored by small gravel and very small drainages regularly crossed the flats. Approximately 61.2 acres of this type occurred within the Project corridor. The short and dwarf-shrubs creosotebush, brittlebush, and white bursage characterized the type, and together, provided up to 15 percent cover (see **Figure 4-10**). Cover by creosotebush short shrubs ranged from 5 to 12 percent. The tall shrubs or short trees ocotillo, saguaro, ironwood, and littleleaf paloverde can provide sparse cover, up to 3 percent. Pencil cholla was a common component of the dwarf-shrub layer and typically provided about 1 percent cover. In the herbaceous layer, annual forbs contributed sparse cover and were characterized by Indian wheat. Cryptobiotic crust was common and typically contributed 10 percent cover within this vegetation type.

Figure 4-10. Representative Photographs of Creosotebush – Brittlebush – White Bursage Alluvial Flats Habitat

Creosotebush / Annual Herbaceous Vegetation Shrubland

Alluvial plains near the middle of the Project corridor occurred on flat to gently sloping sites and were composed of fine sediments, including thick silt beds known locally as talc. Where the westernmost access roads crossed these plains, approximately 11.2 acres of nearly monotypic stands of creosotebush short shrubs had become established within the Project corridor (see **Figure 4–11**). Creosotebush provided up to 6 percent cover and sparse cover (less than 1 percent) can be contributed by small saguaro, multiple-headed barrel cactus, and buckhorn cholla. The understory was characterized by sparse to low cover, up to 10 percent, of annual herbaceous vegetation that had become established on eolian deposits captured under the shrub canopies. The annual grass six-weeks fescue provided from 2 to 7 percent cover and the annual forbs Indian wheat, peppergrass, rigid spineflower, wild buckwheat, and others contributed up to 5 percent cover. On flat sites between shrubs, cryptobiotic crust had become established and can provide up to 15 percent cover.

Creosotebush – White Bursage – Four-wing Saltbush Shrubland

Stands of this uncommon vegetation type had become established in the eastern Project corridor and were bisected by the Camino del Diablo and the easternmost access road. The stands occupied approximately 5.4 acres of alluvial plains between relatively large desert washes; these plains collected small eolian deposits from adjacent beds of fine silt (talc beds) that formed small mounds beneath shrub canopies (see **Figure 4-12**). The short and dwarf-shrub layers were characterized by creosotebush, four-wing saltbush, and white bursage, which together provided up to 15 percent cover. Creosotebush and four-wing saltbush were nearly co-equally dominant in these stands. The canopy tree saguaro and the short shrub pencil cactus can provide sparse cover. Eolian deposits supported sparse cover of annual forbs in the herbaceous layer, characterized by Indian wheat. Exposed alluvium supported low cover (up to 10 percent) of cryptobiotic crust.

Figure 4-11. Representative Photographs of Honey Mesquite with Little Understory Cover Silt Bed Habitat

Figure 4-12. Representative Photographs of Creosotebush – White Bursage – Four-wing Saltbush Silt Bed Habitat

Annual Herbaceous Vegetation / Barrens

Alluvial plains of the western and middle portions of the Project corridor occurred on flat to gently sloping sites and were composed of fine sediments including thick silt beds known locally as talc or on coarse sand and small gravel eroded from the adjacent granitic mountains. Where the westernmost access roads crossed these plains, nearly barren areas occurred on approximately 31.2 acres between small desert washes and stands of creosotebush – white bursage short shrublands (see **Figure 4-13**). These sites were devoid of vegetation or supported less than 5 percent cover of annual herbaceous grasses and forbs including six-weeks fescue, Mediterranean grass, Indian wheat, peppergrass, rigid spineflower, wild buckwheat, chaenactis, and others. Cryptobiotic crust had often become established and provided up to 15 percent cover.

Figure 4-13. Representative Photographs of Desert Annuals or Barren Habitat

4.1.6 Sonoran Brittlebush-Ironwood Desert Scrub Ecological System (CES302.758)

Ironwood / Brittlebush Desert Wash Wooded Shrubland

Small- to medium-sized desert washes (3 m to 15 m wide) supported this vegetation type on the western end of the Camino del Diablo and in the large adjacent staging area; the type was uncommon in the Project corridor occurring on approximately 6.6 acres. Stands were characterized by 2- to 5-m-tall ironwood trees in the canopy layer and brittlebush in the short shrub layer, which contributed 3 to 4 percent and 1 to 7 percent cover, respectively (see **Figure 4–14**). The tall shrub layer contributed sparse cover and included saguaro, ocotillo, and honey mesquite. The remaining short and dwarf-shrub layers were diverse and contributed sparse to low cover; they included creosotebush, wolfberry, four-wing saltbush, buckhorn cholla, teddy bear cholla, white bursage, ratany, and pencil cholla. The herbaceous layer provided sparse cover and was composed of mostly annual grasses and forbs, including big galleta, six-weeks fescue, wild buckwheat, pepperweed, and catseye. The parasite California mistletoe had become established in many ironwood trees. Cryptobiotic crust can occur with sparse cover (less than 5 percent).

Creosotebush – Triangle-leaf Bursage Desert Wash Shrubland

The eastern access road crosses this shallow wash and flat area composed of silt or talc that is characterized by a unique short shrub stand of creosotebush and triangle-leaf bursage, which together provide up to 20 percent cover (see **Figure 4-15**). A small area of less than 0.5 acre of this type was documented in the Project corridor. In the herbaceous layer, annual forbs provided sparse cover and were characterized by pepperweed. Intershrub areas not affected by recent flows supported approximately 10 percent cover of biotic crust.

Four-wing Saltbush – Catclaw Acacia Desert Wash Shrubland

Desert washes bisected by access roads in the eastern Project corridor uncommonly supported four-wing saltbush dominated stands on approximately 3.4 acres of the Project corridor. The washes were large, up to 80 m wide, were often braided, and occurred within silty soils (see **Figure 4-16**). The short shrub four-wing saltbush contributed low cover, (from 6 to 8 percent) and the tall shrub catclaw acacia provided sparse cover (up to 2 percent). Ironwood trees occasionally occurred and provided sparse cover. Additional short shrubs included creosotebush, brittlebush, and cheeseweed that together provided up to 5 percent cover. The herbaceous layer provided sparse cover and was characterized by annual forbs including pepperweed.

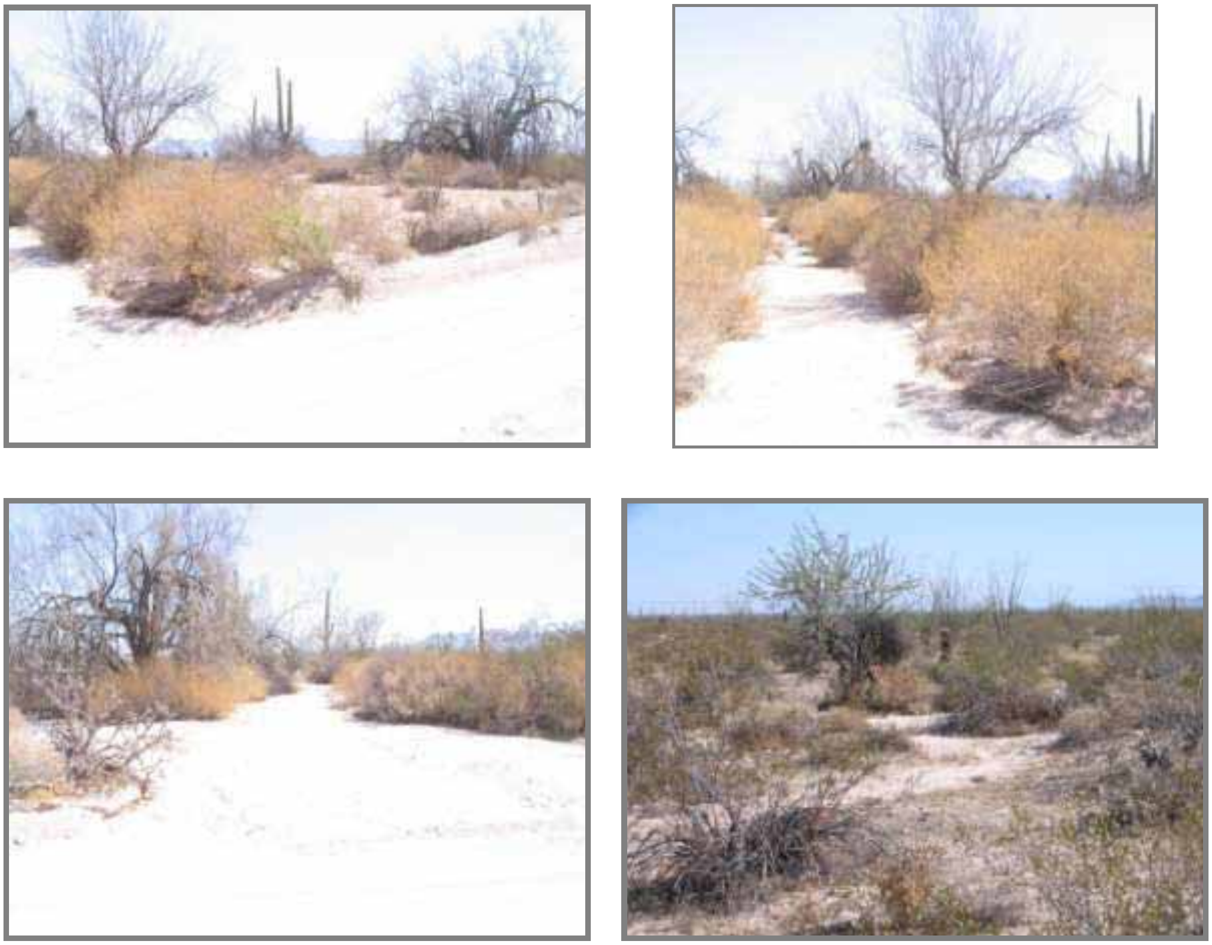

Figure 4-14. Representative Photographs of Ironwood / Brittlebush Desert Wash Habitat

Figure 4-15. Representative Photographs of Creosotebush – Triangle-leaf Bursage Silt Flats Habitat

Figure 4-16. Representative Photographs of Four-wing Saltbush – Catclaw Acacia Desert Wash Habitat

4.1.7 North American Warm Desert Wash Ecological System (CES302.755)

Smoketree – Catclaw Acacia Desert Wash Shrubland

This vegetation type occurred at two locations on the eastern end of the Project corridor—both occurrences were in large desert washes up to 60 m wide and together occupied approximately 1.8 acres. Vegetation cover was dense on the desert wash banks and scattered within the otherwise barren channel bottoms (see **Figure 4-17**). The canopy layer was characterized by 3- to 5-m-tall smoke trees, which provided up to 10 percent cover, and the tall shrub layer was characterized by catclaw acacia, which provided up to 15 percent cover. Additional sparse canopy and tall shrub cover was contributed by littleleaf paloverde and honey mesquite. The short shrub layer contributed sparse cover and included four-wing saltbush, rush bebbia, cheeseweed, and wolfberry. The herbaceous layer contributed sparse cover and was characterized by annual forbs including pepperweed.

Figure 4-17. Representative Photographs of Smoketree – Catclaw Acacia Desert Wash Habitat

Paloverde – Ironwood / Mixed Shrub Desert Wash Wooded Shrubland

This vegetation type represented the common community established on small to large desert washes that dissected alluvial fans near the footslopes of the Tinajas Altas, Cabeza Prieta, and Tule mountains. The desert wash bottoms were typically armored by granite cobbles and gravel or had downcut to bedrock or caliche layers. The stands occurred on approximately 10.9 acres of the wash banks and terraces and were characterized by the 2- to 5-m-tall canopy trees littleleaf paloverde and ironwood that together provided sparse to low cover (up to 10 percent) (see **Figure 4-18**). The dominant trees often harbored California mistletoe and some were stressed or had recently succumbed due to this parasite. Saguaro up to 10 m tall often provided sparse cover in the canopy layer. The tall shrub layer contributed sparse cover and included catclaw acacia, desert lavender, limberbush, wolfberry, and elephant tree. The short and dwarf-shrub layer provided sparse to low cover, contributed by creosotebush, brittlebush, teddy bear cholla, and triangle-leaf bursage. The herbaceous layer often included sparse cover of the perennial bunchgrass, big galleta, and sparse to low cover of annual grasses and forbs including six-weeks fescue,

Figure 4-18. Representative Photographs of Paloverde – Ironwood / Mixed Desert Wash Habitat

pepperweed, chaenactis, wild buckwheat, and fleabane. In one stand, big galleta contributed 6 percent cover, one of the densest patches observed in the Project corridor.

4.1.8 North American Warm Desert Riparian Mesquite Bosque Ecological System (CES302.752)

Honey Mesquite / Mixed Shrubs Riparian Wooded Shrubland

Mesic desert washes and one small playa supported wooded shrublands dominated by honey mesquite, including a long reach of the Camino del Diablo where water flowed down the roadbed between roadside banks dominated by honey mesquite trees. This community occupied approximately 6.1 acres in the Project corridor and was characterized by 2- to 5-m-tall honey mesquite trees or tall shrubs, which provided from 5 to 60 percent cover (see **Figure 4-19**). Additional trees and tall shrubs that occurred with sparse cover in the canopy layer included ironwood, littleleaf paloverde, and catclaw acacia. The short and dwarf-shrub layers were characterized by sparse to low cover of creosotebush,

Figure 4-19. Representative Photographs of Honey Mesquite / Mixed Shrubs Riparian Wooded Shrubland Habitat

four-wing saltbush, rush bebbia, cheeseweed, California brickelbush, and white bursage. The herbaceous layer was characterized primarily by sparse cover of annual forbs. In one honey mesquite stand that occupied a playa, the annual mustard London rocket provided 45 percent cover. Cryptobiotic crust can be present on terraces above active channels and can provide up to 5 percent cover.

4.2 Plant Species Identified

A list of plant species prepared during the field surveys and annotated for nonnative and Arizona protected status is provided in **Table 4-2**. The number of taxa identified during a spring survey was 85.

Table 4-2. Plant Species List, Relative Abundance in the Project Corridor, and Habitat for Wellton Station, CV-2

Species / Common Name	Distribution	Location / Habitat
Trees and Tall Shrubs		
Bursera microphylla / Elephant tree[3]	Rare	Rock outcrops, desert washes at high elevations
Carnegia gigantea / Saguaro[3]	Common	Rock outcrops, alluvial fans, desert washes
Cercidium floridum / Blue paloverde[4]	Uncommon	Desert washes
Cercidium microphyllum / Foothill paloverde[4]	Common	Desert washes, mountain slopes
Fouquieria splendens / Ocotillo[3]	Common	Rocky slopes, alluvial plains
Olneya tesota / Ironwood[4,5]	Common	Desert washes
Prosopis glandulosa / Honey mesquite[4,5]	Common	Rocky slopes, alluvial fans, Desert washes
Psorothamnus spinosus / Smoke tree[4]	Uncommon	Desert washes
Short and Dwarf Shrubs		
Agave deserti / Desert agave[3]	Rare	Upper banks of washes, alluvial fans, rock outcrops
Acacia constricta / Whitethorn	Uncommon	Desert washes, alluvial fans
Acacia greggii / Catclaw	Uncommon	Desert washes
Ambrosia deltoidea / Triangle-leaf bursage	Common	Desert washes
Ambrosia dumosa / White bursage	Abundant	Slopes, alluvial flats, Alluvial plains, desert washes
Anisacanthus thurberi / Justicia californica / Chuparosa	Uncommon	Desert washes
Atriplex canescens / Fourwing saltbush	Common	Alluvial fans, desert washes
Bebbia juncea / Rush bebbia	Uncommon	Desert washes
Brickellia coulteri / Coulter brickelbush	Rare	Desert washes
Brickellia desertorum / Desert brickelbush	Rare	Desert washes
Echinocactus engelmannii / Engelmann hedge-hog cactus[3]	Rare	Rocky slopes
Echinocactus polycephalus / Clustered barrel cactus[3]	Uncommon	Alluvial plains, desert washes
Encelia farinosa / Brittlebush	Common	Rocky slopes, desert Washes

Species / Common Name	Distribution	Location / Habitat
Short and Dwarf Shrubs (continued)		
Ericameria laricifolia / Turpentine bush	Rare	Alluvial fans
Ferocactus wislizeni / Southwest barrel cactus[3]	Rare	Alluvial fans, desert washes
Gutierrezia californica / California matchweed	Uncommon	Rock outcrops, alluvial fans
Gutierrezia microcephala / Sticky snakeweed	Uncommon	Desert washes
Hymenoclea monogyra / Burro bush	Uncommon	Desert washes
Hymenoclea salsola / Cheesebush	Uncommon	Desert washes
Hyptis emoryi / Desert lavender	Rare	Desert washes
Jatropha cuneata / Limberbush	Uncommon	Mountain toeslopes, alluvial fan drainages at high elevations
Justicia californica / Chuparosa	Uncommon	Desert washes
Krameria grayi / White ratany	Uncommon	Mountain toeslopes, desert washes
Larrea tridentata / Creosotebush	Abundant	Most upland habitats
Lycium andersonii / Anderson thornbush	Common	Desert washes
Mammillaria tetrancistra / Fishhook pincushion cactus[3]	Rare	Rocky slopes, alluvial fans
Nolina microcarpa / Beargrass[3,5]	Rare	Rock outcrops
Opuntia acanthocarpa / Buckhorn cholla[3]	Uncommon	Alluvial fans, desert washes
Opuntia basilaris / Beavertail cactus[3]	Uncommon	Alluvial fans, alluvial plains, Desert washes
Opuntia bigelovii / Teddy bear cholla[3]	Common	Desert washes, alluvial fans, Alluvial plains
Opuntia kunzei / Devil's club cholla, Dog cholla[3]	Common	Alluvial fans, alluvial plains
Opuntia leptocaulis / Desert Christmas cactus[3]	Common	Desert washes, alluvial plains, rocky slopes
Opuntia phaeacantha / Engelmann prickly pear[3]	Rare	Rocky slopes, alluvial fans
Opuntia ramosissima / Diamond cholla, Pencil cholla[3]	Common	Desert washes, alluvial plains
Salazaria mexicana / Paperbag bush	Rare	Large desert washes
Trixis californica / American trixis	Rare	Desert washes
Yucca arizonica / Yucca[3]	Uncommon	Rocky slopes, alluvial fans

Species / Common Name	Distribution	Location / Habitat
Graminoids		
Aristida adscensionis / Six-weeks three-awn	Uncommon	Alluvial fans, alluvial plains
Bouteloua barbata / Six-weeks grama	Uncommon	Alluvial fans, alluvial plains
Erioneuron pulchellum = Tridens pulchellus / Fluffgrass	Uncommon	Alluvial fans
Pleuraphis rigida / Big galleta	Uncommon	Desert washes
Schismus barbatus / Mediterranean grass[1]	Uncommon	Alluvial fans, alluvial plains
Vulpia octoflora / Six-weeks fescue	Abundant	Alluvial plains, alluvial fans, eolian deposits
Forbs		
Amsinckia tessellata / Fiddleneck	Common	Alluvial flats, desert washes
Asclepias erosa / Desert milkweed	Rare	Desert washes
Asclepias subulata / Rush milkweed	Rare	Desert flats and washes
Brassica tournefortii / Sahara mustard[1]	Rare	Desert washes
Chaenactis stevioides / Desert pincushion	Common	All habitats
Chamaesyce sp. / Sandmat	Rare	Alluvial fans, alluvial plains
Chorizanthe rigida / Desert spiny herb	Common	Alluvial fans
Cryptantha spp. / Cryptantha	Common	Most upland habitats
Datura discolor / Thorn apple	Rare	Desert washes
Datura meteloides / Sacred datura	Rare	Desert washes
Descurainia pinnata / Tansy mustard[1]	Rare	Desert washes
Dyssodia concinna / Dogweed	Rare	Desert washes
Erodium cicutarium / Filaree[1]	Uncommon	Alluvial flats
Eriogonum deflexum / Skeleton weed	Common	Alluvial fans, alluvial plains
Eriogonum trichopes / Little trumpet	Common	Alluvial fans, alluvial plains
Eriogonum sp. / Wild buckwheat	Common	Alluvial fans, alluvial plains
Eucnide rupestris / Rock nettle	Rare	Desert washes
Lappula redowskii / Stickweed	Uncommon	Rocky slopes, Cienega, disturbed roadsides
Lepidium lasiocarpum / Peppergrass	Common	All upland habitats, desert washes

Species / Common Name	Distribution	Location / Habitat
Forbs (continued)		
Lesquerella gordoni / Gordon’s bladderpod	Rare	Rock outcrops, alluvial fans
Malacothrix fendleri / Desert dandelion	Rare	Alluvial fans, desert washes
Mentzelia sp. / Stickleaf	Rare	Alluvial fans, desert washes
Oenothera sp. / Evening primrose	Uncommon	Alluvial fans, alluvial plains
Petalonyx thurberi / Sandpaper plant	Rare	Desert washes
Phoradendron californicum / Mistletoe	Uncommon	Honey mesquite trees and shrubs
Plantago patagonica / Plantain	Common	Rocky slopes, alluvial fans, Plains
Proboscidea altheafolia / Devil’s claw	Rare	Alluvial plains, desert washes
Salsola tragus / Russian-thistle[1]	Rare	Disturbed roadsides
Sarcostemma cynanchoides / Climbing milkweed	Uncommon	Desert washes
Selaginella sp. / Club moss	Rare	Limestone bedrock
Silene antirrhinum / Sleepy catchfly[1]	Uncommon	Most upland habitats
Sisymbrium irio / London rocket[1]	Rare	Desert washes, disturbed roadsides
Sphaeralcea sp. / Narrowleaf globemallow	Rare	Desert washes
Streptanthella longirostris / Long-beaded twist plant[1]	Rare	Desert washes

Notes:
[1] Nonnative species (noxious weeds were not identified within the corridor).
[2] Highly Safeguarded Protected Native Plants (this category was not identified within the corridor; *Carnegia gigantea* occurs, but not the protected crested or fantop form): species of native plants whose prospect for survival in Arizona are in jeopardy or are in danger of extinction).
[3] Salvage Restricted Protected Native Plants (species of native plants that are subject to damage by theft or vandalism).
[4] Salvage Assessed Protected Native Plants (species of native plants that have a sufficient value if salvaged to support the cost of salvage).
[5] Harvest Restricted Protected Native Plants (species of native plants that are subject to excessive harvesting or overcutting because of their intrinsic value).

4.3 Proposed Project Area Characteristics and Description of Habitat Quality

To ensure the most recent data were acquired for rare species analyses, e²M requested Element Occurrence Data from NatureServe Central Databases in Arlington, Virginia, through a referral from the USFWS (NatureServe and e²M 2007). Additionally, rare species data were acquired from AZGFD and USFWS at Project inception. General descriptions of the habitat quality as it relates to rare plant species and the landscape characteristics of the CV-2 vehicle barrier section are provided herein and are based on field observations, personal communications, and the literature (ie., USFWS 2006)

Section CV-2

County: Yuma
Potential Listed
Plant Occurrence:
Allium parishii (Parish onion) (Federal [S], state [SR])
Berberis harrisoniana (Kofa barberry) (Federal [S])
Cryptantha ganderi (Gander's cryptantha) (Federal [S])
Echinocactus polycephalus var. *polycephalus* (Clustered barrel cactus) (state [SR])
Euphorbia platysperma (Dune spurge) (Federal [SC])
Ferocactus cylindraceus var. *cylindraceus* (California barrel cactus) (Federal [PR], state [SR])
Helianthus niveus ssp. tephrodes (Dune sunflower) (Federal [SR])
Lophocereus schottii (Senita) (state [SR])
Opuntia echinocarpa (Straw-top cholla) (state [SR])
Pholisma sonorae (Sandfood) (Federal [SC], state [HS])
Rhus kearneyi (Kearney sumac) (Federal [S], state [SR])
Stephanomeria schottii (Schott wire lettuce) (Federal [S])
Triteliopsis palmeri (Blue sand lily) (Federal [S], state [SR])
Washingtonia filifera (California fan palm) (state [SR])

Listed Plants Observed: clustered barrel cactus occurred uncommonly in alluvial plain and alluvial flat habitats on sandy soils and talc with creosotebush, white bursage, brittlebush, and pencil cholla.

Suitable Listed Plant Habitat Present: Possible habitat: (1) gravelly, rocky, or sandy soils could support *Ferocactus cylindraceus*; (2) bajadas and alluvial valley soils could support *Opuntia echinocarpa*; and (3) rocky slopes of the Tinajas Altas and Tule mountains could support *Rhus kearneyi*.

If so, Habitat Quality: Poor to Good

Section Habitat Description: This section includes approximately 9.04 miles of vehicle barrier corridor with associated access/construction/maintenance road and 28.65 miles of access roads in the area southeast of Wellton and south of and including the Camino del Diablo. Construction staging areas include approximately 30 acres. The western portion of section CV-2 occurs on steep slopes of the Tinajas Altas Mountains dominated by littleleaf paloverde, ironwood, ocotillo, and creosotebush transitioning to alluvial fans and plains characterized by creosotebush, limberbush, white bursage, brittlebush, saguaro, blue paloverde, ironwood, pencil cholla, and honey mesquite shrubs. Flats occur that contain thick beds of silt or talc and support sparse stands of creosotebush with annual plant species in the understory. Several slopes, bajadas, and ridges are armored by volcanic cobble where creosotebush, ocotillo, white bursage, brittlebush, and teddy bear cholla dominate. Gullies and desert washes commonly occur in this terrain supporting limberbush and saguaro in addition to ironwood, paloverde, wolfberry, and brittlebush. The easternmost portion of the CV-2 section consists of the Cabeza Prieta and Tule mountain slopes, ridges, alluvial fans, and alluvial plains and desert washes supporting the same suite of species described above, except for flats that also support stands that include four-wing saltbush. Rare plant species are summarized below in terms of habitat and potential occurrence.

- Parish onion occurs on north-facing slopes of the Kofa Mountains in Yuma County in Joshua tree woodland habitat. This habitat does not occur within the Project corridor.
- Kofa barberry occurs on north-facing talus slopes in the Kofa Mountains of Yuma County and elsewhere in southwestern Arizona and northern Mexico. Talus slopes were not present in the Project corridor, nor was this species observed during Project corridor surveys.
- Gander's cryptantha occurs in sand dunes and sand flats of the Pinta Sands and Mohawk Sand Dunes east of the Project corridor. Sand dune habitat does not occur in the Project corridor.
- Clustered barrel cactus occurs on alluvial plains and flats in sand and silt substrate. The clustered barrel cactus uncommonly occurs within the Project corridor and was noted during field surveys.
- Dune spurge occurs in active sand dune habitat of southern California, southwestern Arizona, and northern Mexico. This habitat does not occur in the Project corridor.
- California barrel cactus occurs on gravelly or rocky hillsides, canyon walls, alluvial fans, and desert wash margins on igneous and limestone substrates. Known from the Gila and Kofa mountains near the Project corridor, in southern Arizona, southern California, and northern Mexico, it was not observed during surveys of the Project corridor. This habitat comprises the entire Project corridor.
- Dune sunflower occurs in active sand dunes. This habitat does not occur in the Project corridor.

- Senita occurs on desert soils that are heavy or sandy and form valleys and plains, which comprises much of the Project corridor. The species was not observed during inventories of the Project corridor.
- Straw-top cholla occurs in desert mountain and desert floor habitats. This habitat comprises the Project area, but this species was not observed during corridor surveys.
- Sandfood (*Pholisma sonorae*) occurs in sand dune habitat. This habitat does not occur in the Project corridor.
- Kearney sumac occurs in canyons and drainages of the Tinajas Altas, Cabeza Prieta, and Gila mountains. This habitat is encountered on the termini of the vehicle barrier segment, but the shrub was not observed during walking surveys of the corridor.
- Schott wire lettuce occurs on semi-stabilized sand dunes of southern Yuma County and northern Sonora, Mexico; known from Pinta Sands, Mohawk Dunes, Yuma Desert, and San Cristobal Valley. This habitat is uncommon to absent in the Project corridor.
- Blue sand lily occurs in loose sandy soils of the Gila Mountains, Pinta Sands, and Tule Desert of Yuma County; elsewhere in southern Arizona; and in Baja California. This habitat is uncommon to absent in the Project corridor.
- California fan palm occurs in or near seeps and springs where they form small oases. This habitat does not occur within the Project corridor.

4.4 Wetlands and Waters of the United States

Wetlands and waters of the United States can be confusing terms and are defined here for the convenience of document users. The USACE has jurisdiction to protect wetlands under section 404 of the Clean Water Act using the following definition:

> *. . . areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 Code of Federal Regulations [CFR] 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas.*

Wetlands have three diagnostic characteristics that include (1) more than 50 percent of the dominant species present must be classified as obligate, facultative wetland; or facultative, (2) the soils must be classified as hydric; and (3) the area is either permanently or seasonally inundated (Environmental Laboratory 1987).

Waters of the United States are defined under 33 *United States Code* (U.S.C.) 1344, as follows:

a. The term "waters of the United States" means

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
    i. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    ii. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    iii. Which are used or could be used for industrial purpose by industries in interstate commerce;
4. All impoundments of waters otherwise defined as waters of the United States under the definition;
5. Tributaries of waters identified in paragraphs (a)(1)-(4) of this section;
6. The territorial seas;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1)-(6) of this section.
8. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with the EPA.
9. Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act (CWA) (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States.

b. The term "wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

c. The term "adjacent" means bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are "adjacent wetlands."

d. The term "high tide line" means the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

e. The term "ordinary high water mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

The term “tidal waters” means those waters that rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by hydrologic, wind, or other effects.

The Project corridor lies within the Lechuguilla Desert within the Colorado River basin and surface flows from the mountains drain to the Gila River or into Mexico (USFWS 2006). The watershed occurs in the Wellton – Mohawk Valley Natural Resources Conservation District (NRCS 2008).

Generally, the Lechuguilla Desert is a broad alluvial valley or basin that lies between isolated mountain ranges composed of crystalline rocks (e.g., Tinajas Altas, Cabeza Prieta, and Tule mountains). The mountains serve as aquifer boundaries and the basin is a tectonically depressed trough that filled to a depth of several thousand feet with unconsolidated alluvium eroded from the mountain ranges (ADEQ 2008). Faulting is common at the margins of the basin in addition to other portions of the basin. Surface runoff from rainfall that is not trapped in natural tinajas, developed watering systems, and depressions flows to closed alluvial basins and valleys or into desert washes.

Within the Project area there are five active tinajas or tanks and two inactive tinajas or tanks located in the Cabeza Prieta and Tule mountains. Five types of water developments to support wildlife occur within CPNWR, including buried reservoirs with collection points and drinking troughs, runoff tanks, charcos (i.e., repressos or dugout ponds), wells, and tanks with drinkers (USFWS 2006).

Deep alluvial sediments of the valley floors provide large reservoirs for groundwater, which has accumulated over thousands of years with very small annual increments added (USFWS 2006). Potential aquifers occur in coarse gravel and sand wedge zones; groundwater occurs from 25 to 665 feet deep within BMGR (2007). Little information exists concerning groundwater quality, but it is generally considered unsuitable for irrigation due to its high salt content, extreme depth (costly to acquire), or the possibility of insufficient yield (USFWS 2006).

4.4.1 Field Evaluation Summary

Observations and initial identification of potential wetlands and waters of the United States for the Project corridor were recorded during the July 2008 field inventory.

Field surveys were conducted in Section CV-2 on July 7 through 9, 2008, to delineate jurisdictional wetlands and other Waters of the United States within the Project areas. Delineations were also conducted along access roads and staging areas associated with the fence alignments. Formal delineations were conducted within a 150-foot corridor associated with the fence alignments, 60 feet to either side of the center line of access roads, and within staging areas.

Determination of the occurrence and extent of jurisdictional wetlands and other Waters of the United States were based on the application of procedures established in the USACE *Wetlands Delineation Manual*, Technical Report Y–87–1 (USACE 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region,* Technical Report ERDC/EL TR-06-16 (USACE 2006). Determination of the occurrence of jurisdictional wetlands was based on the presence or absence of hydrophytic (wetland) vegetation, hydric (wetland) soils, and wetland hydrology. The presence of all three of the criteria is necessary for an area to be designated as a jurisdictional wetland under normal conditions.

Determination of the extent of jurisdictional washes and other Waters of the United States in the Project areas was based on characterization of the landward extent of the ordinary high water mark (OHM). Indicators used to determine the occurrence and extent of jurisdictional washes included the presence of developed channels, typically 2 feet or greater in width; the occurrence of an OHM; the absence of fine sediments along flow paths; distinct changes in the vegetative assemblage or larger or more dense vegetation than surrounding areas; the presence of cut banks; the presence of litter, debris, or wrack lines;

occurrence of desiccation cracks or other indicators of hydrology; and other indicators of the occurrence of intermittent water flow regimes.

All wetlands and other Waters of the United States within the Project areas were delineated.

Table 4-3 provides Waters of the United States types and locations UTM coordinates, NAD83, zone 12N); general channel characteristics and general vegetation on the banks of each wash; delineated acreages within a 150-foot corridor associated with the fence alignments, 60 feet to either side of the center line of access roads, or within planned staging areas; and potential impact acreages in Section CV-2. A 60-foot impact corridor to the north of the fence alignment or adjacent to access roads is considered the maximum width of potential impact associated with implementing the Project. All WOUS acreages within staging areas are included as potential impact areas. Maps showing the locations and boundaries of delineated Waters of the United States in the Project assessment areas are provided in **Appendix C** in the ESP.

Based on the field surveys, 83 ephemeral wash channels occur within the 150-foot corridor associated with the fence alignments, 60 feet to either side of the center line of access roads, or within staging areas. Of the 61.91 total delineated acres of Waters of the United States, 17.95 acres occur within the potential impact areas. There were no vegetated wetlands identified within the Project corridor. Waters of the United States delineated in Section CV-2 were designated as W1 through W83.

4.4.2 Waters of the United States Vegetation Summary

Waters of the United States delineated within the Project corridor included desert wash scrub vegetation types. The characteristic vegetation for each desert wash type sampled and delineated during the July 2008 field inventory are presented below by desert scrub ecological system type and plant community (vegetation alliance) as described in **Section 4.1** (NatureServe 2008). Specific vegetation species observed on the banks of each wash channel are described in **Table 4-3**.

4.4.3 Sonoran Paloverde-Mixed Cacti Desert Scrub Ecological System (CES302.761)

One plant community, the Saguaro / Creosotebush – White Bursage Wooded Shrubland, is found in the Project area within the Sonoran Paloverde-Mixed Cacti Desert Scrub Ecological System.

4.4.4 Sonoran Brittlebush-Ironwood Desert Scrub Ecological System (CES302.758)

One plant community, the Ironwood / Brittlebush Desert Wash Wooded Shrubland, is found in the Project area within the Sonoran Brittlebush-Ironwood Desert Scrub Ecological System.

4.4.5 North American Warm Desert Wash Ecological System (CES302.755)

Four plant communities are found in the Project area within the North American Warm Desert Wash Ecological System. They include: Creosotebush – Triangle-leaved Bursage Desert Wash Shrubland, Four-wing Saltbush – Catclaw Acacia Desert Wash Shrubland, Smoketree – Catclaw Acacia Desert Wash Shrubland, and Paloverde – Ironwood / Mixed Shrubs Desert Wash Wooded Shrubland.

4.4.6 Wetlands Soil Summary

No vegetated wetlands were identified within the Project corridor. The general sediment composition of each Waters of the United States was characterized and is described in **Table 4-3** as “General Substrate Comp. (percent).”

Table 4-3. General Characteristics, Delineated Acreages, and Potential Impact Acreages of Delineated WOUS in CV-2

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W1	Wash	213735.36 E 3580441.96 N	S	5	1–2	45	90 S 10 G	**Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata* *Opuntia ramosissima*	0.36	0.21
W2	Wash	213793.87 E 3580759.49 N	NE	8	1	45	90 S 10 G	**Trees and Tall Shrubs:** *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata*	0.27	0.15
W3	Wash	213947.12 E 3580509.63 N	SW	8–10	1–3	45–90	90 S 10 G	**Trees and Tall Shrubs:** *Carnegia gigantea* *Olneya tesota* **Short Shrubs and Forbs:** *Atriplex canescens* *Encelia farinosa* *Krameria grayi* *Larrea tridentata*	0.94	0.55

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W4	Wash	237384.25 E 3564099.53 N	S	4–12	3–5	35–45	50 S 20 G 30 C	**Short Shrubs and Forbs:** *Aloysia wrightii* *Encelia farinosa* *Larrea tridentata*	3.15	0.65
W5	Wash	237686.99 E 3563876.72 N	S	12	3	45	40 S 20 G 20 C 20 B	**Trees and Tall Shrubs:** *Acacia greggii* *Bursera microphylla* *Cercidium microphyllum* *Fouquieria splendens* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata*	0.98	0.12
W6	Wash	237781.17 E 3563724.99 N	S	5	2	35	60 S 20 G 20 C	**Trees and Tall Shrubs:** *Bursera microphylla* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata* *Salsola tragus*	0.27	0.19

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W7	Wash	238002.17 E 3563590.72 N	SE	3	5	45	20 S 20 G 40 C 20 B	**Trees and Tall Shrubs:** *Bursera microphylla* *Carnegia gigantea* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata*	0.21	0.05
W8	Wash	238144.23 E 3563542.53 N	S	40	5	45	60 S 10 G 20 C 10 B	**Trees and Tall Shrubs:** *Bursera microphylla* *Carnegia gigantea* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata* *Opuntia bigelovii*	0.58	0.10

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W9	Wash	237467.20 E 3563836.75 N	S	3	4	45	60 S 20 G 20 C	**Trees and Tall Shrubs:** *Carnegia gigantea* *Cercidium microphyllum* *Bursera microphylla* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata* *Salsola tragus*	0.18	0.11
W10	Wash	237332.52 E 3563882.67 N	SE	7	4	30	60 S 20 G 20 C	**Trees and Tall Shrubs:** *Acacia greggii* *Bursera microphylla* *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata* *Salsola tragus* *Opuntia leptocaulis*	0.17	0.10

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W11	Wash	237320.80 E 3564252.88 N	E	3	2–5	60	40 S 20 G 20 C	**Trees and Tall Shrubs:** *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Ambrosia dumosa* *Encelia farinosa* *Larrea tridentata* *Opuntia bigelovii* *Opuntia leptocaulis*	0.35	0.14
W12	Wash	237318.68 E 3564327.87 N	E	2	4	45	20 S 80 C	**Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata* *Opuntia leptocaulis* *Salsola tragus*	0.24	0.05

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W13	Wash	237304.23 E 3564436.13 N	E	25	4	45–60	20 S 20 G 40 C 20 B	**Trees and Tall Shrubs:** *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Aloysia wrightii* *Encelia farinosa* *Larrea tridentata* *Opuntia leptocaulis* *Salsola tragus*	0.30	0.11
W14	Wash	237295.28 E 3564489.65 N	E	20	4	45	40 S 30 G 30 C	**Trees and Tall Shrubs:** *Acacia greggii* *Fouquieria splendens* **Short Shrubs and Forbs:** *Aloysia wrightii* *Encelia farinosa* *Larrea tridentata* *Opuntia leptocaulis* *Salsola tragus*	0.28	0.12

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W15	Wash	237296.40 E 3564556.78 N	E	8	5	60	50 S 20 G 20 C 10 B	**Trees and Tall Shrubs:** *Acacia greggii* *Bursera microphylla* *Carnegia gigantea* **Short Shrubs and Forbs:** *Aloysia wrightii* *Encelia farinosa* *Larrea tridentata* *Salsola tragus*	0.23	0.08
W16	Wash	237132.88 E 3565641.12 N	W	25	3	45	50 S 50 C	**Trees and Tall Shrubs:** *Acacia greggii* *Carnegia gigantea* *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Ambrosia dumosa* *Larrea tridentata* *Salsola tragus*	0.63	0.14

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W17	Wash	237470.75 E 3566244.71 N	W	5	3	35–45	100 S	**Trees and Tall Shrubs:** *Acacia greggii* *Carnegia gigantea* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Krameria grayi* *Larrea tridentata*	1.72	1.28
W18	Wash	237324.18 E 3566326.48 N	W	60	3	45	80 S 20 G	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Larrea tridentata*	7.04	1.98
W19*	Wash	235757.65 E 3565511.75 N	SW	4–8	2–4	—	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Larrea tridentata*	0.51	0.23

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W20*	Wash	235649.84 E 3565498.20 N	SW	4–8	2–4	—	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Larrea tridentata*	0.32	0.19
W21*	Wash	235343.89 E 3565463.88 N	SW	4–8	2–4	—	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Larrea tridentata*	0.12	0.07
W22*	Wash	235183.24 E 3565483.79 N	S	4–8	2–4	—	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Larrea tridentata*	0.32	0.08
W23*	Wash	235092.07 E 3565430.83 N	S	4–8	2–4	—	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Larrea tridentata*	0.24	0.09

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W24*	Wash	235013.45 E 3565395.93 N	S	4–8	2–4	—	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Larrea tridentata*	0.63	0.16
W25*	Wash	234957.21 E 3565418.30 N	S	4–8	2–4	—	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Larrea tridentata*	0.34	0.11
W26*	Wash	234852.96 E 3565368.41 N	SW	4–8	2–4	—	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Larrea tridentata*	0.72	0.18
W27	Wash	234476.99 E 3565179.72 N	S	25	2	—	100 Si/S	**Trees and Tall Shrubs:** *Prosopis glandulosa* **Short Shrubs and Forbs:** *Larrea tridentata*	5.52	1.65

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W28	Wash	234693.84 E 3564931.79 N	S	75	3	45	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Larrea tridentata*	1.96	0.16
W29	Wash	234728.15 E 3564889.95 N	S	110	2	90	100 Si/S	**Short Shrubs and Forbs:** *Larrea tridentata* *Salsola tragus*	0.26	0.05
W30	Wash	234894.52 E 3564849.41 N	S	200	2	90	100 S	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* *Psorothamnus spinosus* **Short Shrubs and Forbs:** *Larrea tridentata*	2.86	0.31

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W31	Wash	234963.33 E 3564803.93 N	N	10–12	4	45	50 S 20 C 30 B	**Trees and Tall Shrubs:** *Carnegia gigantea* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata*	0.11	0.03
W32	Wash	235124.45 E 3564746.49 N	N	12	3	45–90	40 S 30 G 20 C 10 B	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata*	0.52	0.14
W33	Wash	234301.51 E 3565061.97 N	S	15	2–3	35–45	50 S 50 G	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata*	0.24	0.04

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W34	Wash	227967.46 E 3567569.85 N	S	4	3	35	70 S 25 G 5 C	**Trees and Tall Shrubs:** *Acacia greggii* *Olneya tesota* **Short Shrubs and Forbs:** *Larrea tridentata* *Encelia farinosa*	0.09	0.02
W35	Wash	228013.09 E 3567532.27 N	S	3 (several channels)	1–3	25–35	50 S 20 G 30 C	**Trees and Tall Shrubs:** *Cercidium microphyllum* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata*	1.34	0.18
W36	Wash	228536.14 E 3567345.91 N	S	4	3	55	10 S 70 C 20 B	**Trees and Tall Shrubs:** *Celtis pallida* *Cercidium microphyllum* *Psorothamnus spinosus* **Short Shrubs and Forbs:** *Larrea tridentata*	0.16	0.02

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W37	Wash	228914.09 E 3567225.29 N	S	30 (several channels)	2	60	70 S 20 G 5 C 5 B	**Trees and Tall Shrubs:** *Acacia constricta* *Cercidium microphyllum* *Olneya tesota*	2.52	0.24
W38	Wash	229584.91 E 3566959.33 N	S	50	3	60	25 S 20 G 40 C 15 B	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Larrea tridentata*	1.13	0.10
W39	Wash	230486.80 E 3566567.09 N	S	50	6	65	10 S 50 G 20 C 20 B	**Trees and Tall Shrubs:** *Acacia constricta* *Olneya tesota* **Short Shrubs and Forbs:** *Larrea tridentata*	0.85	0.15
W40	Wash	231033.70 E 3566369.84 N	S	40–50	4	45	10 S 30 G 30 C 30 B	**Trees and Tall Shrubs:** *Carnegia gigantea* *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Opuntia bigelovii*	0.86	0.06

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W41	Wash	227809.67 E 3567624.54 N	S	25	3	65	100 S	**Trees and Tall Shrubs:** *Cercidium microphyllum* **Short Shrubs and Forbs:** *Larrea tridentata*	0.33	0.05
W42	Wash	227696.33 E 3567680.51 N	S	150	3	60	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Encelia farinosa*	1.52	0.23
W43	Wash	226279.83 E 3568232.00 N	S	62	2	45	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* *Olneya tesota* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Larrea tridentata*	0.36	0.08

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W44	Wash	226214.02 E 3568264.07 N	S	100 (2 channels)	3	45	100 Si/S	**Trees and Tall Shrubs:** *Cercidium microphyllum* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Atriplex canescens* *Encelia farinosa* *Larrea tridentata*	0.74	0.10
W45	Wash	225844.03 E 3568418.29 N	S	65 (2 channels)	3	35	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* *Olneya tesota*	0.69	0.13
W46	Wash	225012.82 E 3568724.42 N	N	70 (2 channels)	3	45	90 Si/S 10 G	**Trees and Tall Shrubs:** *Carnegia gigantea* *Celtis pallida* *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Opuntia bigelovii*	0.21	0.04

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W47	Wash	224111.62 E 3569106.17 N	N	3	2	40	80 Si/S 20 G	**Trees and Tall Shrubs:** *Acacia greggii* *Carnegia gigantea* **Short Shrubs and Forbs:** *Larrea tridentata*	0.15	0.02
W48	Wash	223999.78 E 3569145.19 N	N	3	3	55	80 Si/S 20 G	**Trees and Tall Shrubs:** *Carnegia gigantea* *Olneya tesota* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Encelia farinosa*	0.11	0.02
W49	Wash	223427.59 E 3569360.27 N	E	8	1	30	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* *Celtis pallida* **Short Shrubs and Forbs:** *Larrea tridentata* *Opuntia leptocaulis*	0.09	0.02

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W50	Wash	222198.62 E 3569842.03 N	N	3	3	45	70 S 10 G 10 C 10 B	**Trees and Tall Shrubs:** *Acacia greggii* *Carnegia gigantea* *Olneya tesota* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Opuntia bigelovii* *Opuntia kunzei* *Encelia farinosa*	0.09	0.02
W51	Wash	221775.23 E 3570066.33 N	N	15	3	45	90 S 10 C	**Trees and Tall Shrubs:** *Bursera microphylla* *Celtis pallida* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Aloysia wrightii* *Opuntia bigelovii*	0.52	0.11

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W52	Wash	221709.97 E 3570249.99 N	N	3	3–5	35	70 S 20 C 10 BR	**Trees and Tall Shrubs:** *Acacia greggii* *Celtis pallida* *Cercidium microphyllum* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Encelia farinosa*	0.24	0.11
W53	Wash	221231.28 E 3570255.25 N	NE	2	3	35	50 S 50 C	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Opuntia leptocaulis*	0.22	0.06
W54	Wash	221133.98 E 3570269.62 N	N	20	3	65	90 S 5 C 5 B	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Aloysia wrightii* *Encelia farinosa*	0.38	0.07

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W55	Wash	220209.31 E 3572317.52 N	N	15	3	90	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Atriplex canescens* *Encelia farinosa*	4.28	1.20
W56	Wash	219710.03 E 3573436.83 N	W	100	3	30	100 S	**Trees and Tall Shrubs:** *Acacia greggii* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Cuscuta spp.* *Larrea tridentata* *Encelia farinosa* *Ambrosia ambrosioides*	1.39	0.37

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W57	Wash	237863.71 E 3568207.73 N	S	115 (braided)	1–2	35–45	90 S 10 G	**Trees and Tall Shrubs:** *Carnegia gigantea* *Cercidium microphyllum* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata* *Opuntia leptocaulis*	0.30	0.15
W58	Wash	237741.00 E 3568228.61 N	S	15 (2 channels)	2	65	100 Si/S	**Trees and Tall Shrubs:** *Carnegia gigantea* **Short Shrubs and Forbs:** *Larrea tridentata* *Opuntia leptocaulis* *Opuntia ramosissima*	0.12	0.06
W59	Wash	237621.26 E 3568223.86 N	S	70 (2 channels)	1–2	65–90	90 S 10 G	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Larrea tridentata* *Encelia farinosa*	0.39	0.23

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W60	Wash	237219.81 E 3568241.38 N	S	6	1–3	75–90	90 Si/S 10 G	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Atriplex canescens* *Encelia farinosa* *Larrea tridentata* *Opuntia kunzei*	0.12	0.04
W61	Wash	237098.22 E 3568252.21 N	S	15	1	90	90 Si/S 10 G	**Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Encelia farinosa*	0.11	0.04
W62	Wash	236699.10 E 3568254.53 N	S	45	1	90	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* *Olneya tesota* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Ambrosia ambrosioides*	0.39	0.16

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W63	Wash	236327.04 E 3568257.88 N	S	4	2–3	90	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Atriplex canescens* *Cuscuta spp.* *Encelia farinosa* *Larrea tridentata*	0.17	0.11
W64	Wash	236146.28 E 3568300.20 N	S	3	2	90	100 Si/S	**Trees and Tall Shrubs:** *Acacia greggii* **Short Shrubs and Forbs:** *Ambrosia deltoidea* *Encelia farinosa* *Larrea tridentata* *Opuntia leptocaulis*	0.24	0.05

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W65	Wash	236044.09 E 3568288.24 N	S	175 (braided)	2	35	90 Si/S 10 G	**Trees and Tall Shrubs:** *Acacia greggii* *Carnegia gigantea* *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Aloysia wrightii* *Ambrosia ambrosioides*	0.83	0.40
W66	Wash	235484.67 E 3568471.71 N	S	6	2	35–65	100 S	**Trees and Tall Shrubs:** *Carnegia gigantea* *Cercidium microphyllum* *Fouquieria splendens* **Short Shrubs and Forbs:** *Larrea tridentata*	0.15	0.05
W67	Wash	235092.11 E 3568854.97 N	S	10	1	65–90	90 S 10 G	**Trees and Tall Shrubs:** *Carnegia gigantea* **Short Shrubs and Forbs:** *Atriplex canescens* *Encelia farinosa* *Larrea tridentata*	0.14	0.06

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W68	Wash	234250.83 E 3569632.33 N	S	15	2	35–45	100 S	**Trees and Tall Shrubs:** *Acacia greggii* *Carnegia gigantea* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Ambrosia ambrosioides*	0.18	0.07
W69	Wash	233627.31 E 3570264.37 N	S	80 (braided)	3	65	90 S 10 G	**Trees and Tall Shrubs:** *Acacia greggii* *Celtis pallida* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Ambrosia ambrosioides*	0.87	0.30

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potentia l Impact Area (acres)
W70	Wash	233542.29 E 3570300.76 N	S	10	2	35–45	100 Si/S	**Trees and Tall Shrubs:** *Carnegia gigantea* *Cercidium microphyllum* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Opuntia leptocaulis* *Salsola tragus*	0.17	0.07
W71	Wash	231539.44 E 3571381.16 N	W	3	2	45	90 Si/S 10 G	**Trees and Tall Shrubs:** *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Larrea tridentata* *Opuntia leptocaulis*	0.98	0.86

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W72	Wash	231019.02 E 3571471.41 N	S	100 (braided)	2	25	100 Si/S	**Trees and Tall Shrubs:** *Carnegia gigantea* *Cercidium microphyllum* *Psorothamnus spinosus* **Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata* *Opuntia bigelovii* *Opuntia leptocaulis*	1.61	0.62
W73	Wash	230447.58 E 3571411.90 N	S	12	2	90	100 Si/S	**Trees and Tall Shrubs:** *Prosopis glandulosa* **Short Shrubs and Forbs:** *Krameria grayi* *Larrea tridentata* *Opuntia leptocaulis* *Ambrosia ambrosioides*	0.15	0.06

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W74	Wash	229995.38 E 3571394.52 N	S	8	2	90	60 S 20 G 20 BR	**Trees and Tall Shrubs:** *Acacia greggii* *Carnegia gigantea* *Celtis pallida* *Cercidium microphyllum* **Short Shrubs and Forbs:** *Aloysia wrightii* *Opuntia leptocaulis*	0.17	0.10
W75	Wash	229364.05 E 3571815.20 N	S	55 (2 channels)	2	45	100 Si/S	**Trees and Tall Shrubs:** *Carnegia gigantea* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata* *Opuntia leptocaulis*	0.32	0.17
W76	Wash	228975.40 E 3572018.23 N	S	8	2	45	80 Si/S 10 G	**Trees and Tall Shrubs:** *Carnegia gigantea* **Short Shrubs and Forbs:** *Larrea tridentata* *Opuntia leptocaulis*	0.10	0.04

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W77	Wash	228240.60 E 3572369.90 N	SW	160 (braided)	5–8	65–90	100 S	**Trees and Tall Shrubs:** *Acacia greggii* *Cercidium microphyllum* *Olneya tesota* **Short Shrubs and Forbs:** *Atriplex canescens* *Larrea tridentata*	1.41	0.54
W78	Wash	225976.84 E 3573379.54 N	S	15	2	65–90	100 Si/S	**Trees and Tall Shrubs:** *Carnegia gigantea* *Celtis pallida* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Larrea tridentata*	0.39	0.09
W79	Wash	224635.58 E 3573961.73 N	W	70 (several incised channels)	2	90	80 Si/S 20 G	**Trees and Tall Shrubs:** *Carnegia gigantea* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Krameria grayi* *Larrea tridentata* *Opuntia kunzei*	0.70	0.28

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W80	Wash	215572.16 E 3578009.68 N	E	2 (several channels upstream)	2	65–90	80 Si/S 10 G 10 C	**Trees and Tall Shrubs:** *Acacia constricta* *Acacia greggii* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Krameria grayi* *Ferocactus wislizeni* *Opuntia ramosissima*	0.11	0.06
W81	Wash	214174.65 E 3579958.34 N	N	6	2	35	100 S	**Short Shrubs and Forbs:** *Encelia farinosa* *Larrea tridentata*	0.06	0.04
W82	Wash	213908.58 E 3580264.32 N	S	70 (2 channels)	1	35	100 S	**Trees and Tall Shrubs:** *Acacia greggi* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Encelia farinosa*	0.75	0.29

Waters of the United States ID	Waters of the United States Type	Location (UTM Coordinates)	Flow	Approx Channel Width at Base (feet)	Approx Bank Height (feet)	Approx Bank Slope (%)	General Substrate Comp. (%)	General Vegetation on Banks	WOUS Area Mapped (acres)	Potential Impact Area (acres)
W83	Wash	213885.48 E 3580291.92 N	S	5	1	35	100 S	**Trees and Tall Shrubs:** *Acacia constricta* *Prosopis glandulosa* **Short Shrubs and Forbs:** *Atriplex canescens* *Encelia farinosa* *Larrea tridentata*	0.11	0.04
								Total Acreage	**61.91**	**17.95**

Notes:
* Channel and bank characteristics averaged.
B = Boulder
BR = Bedrock
C = Cobble
G = Gravel
S = Sand
Si = Silt

4.5 Noxious Weeds and Invasive Nonnative Plant Species

Noxious weeds have been addressed nationally under Public Law 108-412 (U.S.C. 2004) "Subtitle E – Noxious Weed Control and Eradication." The Arizona legislature addressed noxious weeds under Title 3 – Agriculture; Chapter 2 – Regulatory Provisions; Article 1 – Dangerous Plant Pests and Diseases; Section 3-205.01 – Summary abatement of noxious weeds, crop pests, or diseases under preapproved programs (State of Arizona 2008). The Project corridor does not support Federal- or state-listed noxious weeds (USDA 2006). Eight nonnative plant species were observed onsite (see **Table 4-2**), all were annuals. Nonnative plant species occurred on desert plains and flats, eolian deposits, disturbed staging areas, roadsides, excavated areas, and sandy desert wash bottoms.

In general, nonnative noxious and invasive plant species represent a serious management concern and their inventory, monitoring, and control can be expensive for land managers. Nonnative species usually lower the value of wildlife habitat and they increase with disturbance, including livestock grazing and road maintenance. Once inventoried, methods commonly used to control nonnative species include biological, mechanical, and chemical. Controls must be ongoing to be effective in reducing, but only rarely eliminating, nonnative plant species.

4.6 Protected Native Plants

The Arizona Department of Agriculture (AZDA) oversees rules to use and harvest native plants, including protected native plant species (see **Table 4-2**) (AZDA 2008b, 2008c). Four categories of protected native plants have been established by the AZDA (2008c):

1. Highly Safeguarded – prospects for survival in Arizona are in jeopardy or are in danger of extinction.
2. Salvage Restricted – subject to damage by theft or vandalism.
3. Salvage Assessed – have sufficient value if salvaged to support the cost of salvage.
4. Harvest Restricted – subject to excessive harvesting or overcutting because of their intrinsic value.

There were no highly safeguarded protected native plants observed within the Wellton Station Project corridor. Typical saguaro cacti occur within the Project corridor, but the fan-top or crested form that is listed under the highly safeguarded protected native plants does not occur. Regional distribution and known locations of listed plant species are discussed in the "Threatened and Endangered Species" section. Sixteen species of "salvage restricted" protected native plants were observed (see **Table 4-2**); the most common of these were ocotillo and pencil cholla. Saguaro are also salvage restricted native plants that are important as habitat for the federally endangered lesser long-nosed bat and other wildlife species, therefore a database was prepared to locate individual saguaros and provide photographs of each occurrence (see **Attachment E**). Blue paloverde, little-leaf paloverde, ironwood, honey mesquite, and smoke tree were the five species of "salvage assessed" protected native plants to occur on-site (see **Table 4-2**). Three species of "harvest restricted" protected native plants were observed (see **Table 4-2**); ironwood and honey mesquite were the most commonly observed small tree or tall shrub species of this category.

In general, 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 (AZDA 2008b). 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 from the AZDA. Prior to temporary use of the parcel and prior to full-scale development of the parcel, the U.S. government would notify the AZDA relative to the destruction of protected plants under Arizona Revised Statutes (Department Statutes) 3-901 through 3-916 and under Arizona Administrative Code (Department Rules) Article 11: Arizona Native Plants; Sections R3-3-1101 through R3-3-1111 and Appendix A (AZDA 2008a) (accessible online at: http://www.azda.gov).

4.7 Wildlife and Wildlife Habitat

4.7.1 Introduction

Wildlife habitats of the Project corridor are predominantly Sonoran Desert sparse shrublands that at the highest elevations on granitic mountain slopes are characterized by paloverde, ironwood, ocotillo, creosotebush, and limberbush. Where volcanic rocks and cobble cover the slopes and ridges, the vegetation is characterized by creosotebush, white bursage, ocotillo, and teddy bear cholla. On alluvial fans and desert plains, which compose most of the Project corridor, creosotebush, white bursage, brittlebush, four-wing saltbush, and ocotillo comprise the shrubland canopy. Associated desert washes are common and support paloverde, ironwood, saguaro, catclaw acacia, honey mesquite, brittlebush, and a variety of associated plant species. There are deep beds of silt on the lowest elevations that typically support creosotebush, white bursage, and annual herbaceous species.

The entire Project area occurs within the Colorado River basin, a large watershed that in part drains southwestern Arizona in the United States and western Sonora in Mexico. Extensive desert plains and alluvial fans compose the Lechuguilla Desert across which the Project corridor has been designed. This desert is bounded by the Tinajas Altas Mountains on the BMGR to the west and by the Cabeza Prieta and Tule mountains on the CPNWR on the east.

Recreation at CPNWR is centered on wildlife and on the open desert landscape (USFWS 2006). Typical forms include public education of wildlife species and habitats, birdwatching, landscape and wildlife photography, and hiking or backpacking. In season, hunting by permit for desert bighorn sheep is permitted on designated sites in the refuge.

4.7.2 Wildlife and Habitat Overview

The Project corridor supports diverse populations and individuals of vertebrate and invertebrate wildlife species (**Attachment F**) and unique-to-common native wildlife habitats, described as vegetation alliances, plant associations, or land–use types in this BSR. **Table 4-4** lists wildlife observed during the field surveys that were conducted in June 2008. Along the international border, climate, geology, soils, land forms, geography, precipitation, and plant communities combine to provide moderate habitat diversity.

Within the CV-2 Project corridor the broad habitat types available to resident and migrating wildlife species include sparse herbaceous vegetation, shrubland, and woodland. Most of the available wildlife habitat consists of arid desert shrubland communities that have become established on ridges, slopes, alluvial fans and plains, and along arroyos, gullies, and desert washes. This section provides a brief summary of wildlife habitats observed and sampled in 2008 during Environmental Stewardship Plan preparation, categorized as follows:

1. Herbaceous Vegetation: this class of wildlife habitat includes annual and perennial species of grasses, forbs, and graminoids, which typically are characterized by no more than 10 percent cover by shrubs or trees. Stands of herbaceous vegetation are short-stature, typically less than 0.5 m tall and low to moderate in terms of cover. Cover values are much greater following germination after the monsoon rains of mid-summer. Herbaceous wildlife habitat occurs as annual growth on shallow eolian deposits and on alluvial fans and desert plains.

    a. *Grasslands* – annual grass species including six-weeks fescue, six-weeks threeawn, six-weeks grama, needle grama, and Mediterranean grass occur in patches and small stands on shallow eolian deposits or extensive silt beds along with sparse creosotebush shrubs. A few patches of the perennial big galleta occurred on the banks of desert washes, but there were no large stands. Annual grassland-dominated habitats occur on approximately 11.2 acres within the Project corridor and provide forage for several species of wildlife. Species and groups common to annual grassland habitats include desert cottontail, black-tailed jackrabbit, kangaroo rats, ground squirrels, pocket mice, deer mice, coyote, kit fox, falcons, hawks, turkey vultures, quail, doves, loggerhead shrikes, sparrows, lizards, and snakes.

Table 4-4. Wildlife Species Observed Within the Project Corridor Proposed Staging Areas, and Associated Access Roads

Group / Scientific Name	Common Name	Relative Abundance
BIRDS		
Falco sparverius	American kestrel	Uncommon
Corvus corax	Common raven	Uncommon
Geococcyx californianus	Greater roadrunner	Rare
Zenaida asiatica	White-winged dove	Rare
Zenaida macroura	Mourning dove	Common
Buteo jamaicensis	Red-tailed hawk	Uncommon
Mimus polyglottos	Northern mockingbird	Uncommon
Micrathene whitneyi	Elf owl	Rare
Callipepla gambelii	Gambel's quail	Common
Tyrannus verticalis	Western kingbird	Uncommon
Cathartes aura	Turkey vulture	Common
Melanerpes uropygialis	Gila woodpecker	Uncommon
MAMMALS		
Ammospermophilus harrisii	Yuma antelope squirrel	Common
Canis latrans	Coyote	Uncommon
Lepus californicus	Black-tailed jackrabbit	Common
Ovis canadensis mexicana	Desert bighorn	Rare
Sylvilagus audubonii	Desert cottontail	Abundant
Vulpes macrotis macrotis	Kit fox	Uncommon
HERPETILES		
Cnemidophorus sp.	Whiptail	Common
Crotalus scutulatus	Mojave rattlesnake	Rare
Crotaphytus collaris	Collared lizard	Common
Phrynosoma sp.	Horned lizard	Unknown

b. *Forblands* – annual forbs, including Indian wheat, wild buckwheat, desert spineflower, catseye, and chaenactis are rare dominants within the Project corridor, becoming established on flats between desert washes and on eolian deposits between scattered shrubs. Annual forb-dominated habitats occur on approximately 20 acres within the Project corridor and provide forage for several species of wildlife. Species common to annual forbland habitats include desert cottontail, black-tailed jackrabbit, kangaroo rats, ground squirrels, pocket mice, deer mice, coyote, kit fox, falcons, hawks, turkey vultures, quail, doves, loggerhead shrikes, sparrows, lizards, and snakes.

2. Shrublands: this habitat class is dominant within the Project corridor, occupying approximately 233.3 acres. The characteristic shrubs are typically sparse to low in terms of cover, range from 0.5 m to 4.0 m tall and include creosotebush, limberbush, white bursage, brittlebush, pencil cholla, triangle-leaf bursage, teddy bear cholla, and rush bebbia. Characteristic shrubs of desert washes include catclaw acacia, wolfberry, four-wing saltbush, brittlebush, and honey mesquite. Shrublands provide sparse to low cover and are common on the alluvial fans and desert plains of the Project corridor.

a. *Short Shrublands* – stands of short shrubs occur throughout the Project corridor on approximately 228.5 acres of extensive alluvial fans and alluvial plains, gravelly to cobbly ridges, hills, and slopes, on exposed bedrock, and along desert washes and gullies. Short shrub stands were characterized by creosotebush, white bursage, brittlebush, limberbush, and pencil cholla, primarily. Stands ranged from 1 m to 3 m tall and provided sparse to low foliar cover. Nearly all wildlife species within the Project corridor use the short shrub habitats for forage, escape cover, breeding/nesting, and resting. The most common species included bats, desert cottontail, black-tailed jackrabbit, ground squirrels, pocket mice, deer mice, other mice, kangaroo rats, ground squirrels, coyotes, kit fox, bobcat, red-tailed hawks, American kestrel, turkey vultures, quail, greater roadrunners, owls, nighthawks, flycatchers, kingbirds, ravens, wrens, thrashers, sparrows, collared lizards, horned lizards, colubrid snakes, and rattlesnakes.

b. *Tall Shrublands* – stands of tall shrubs occurred on ridges and slopes, along desert washes, and on flats characterized by ocotillo, catclaw acacia, paloverdes, and honey mesquite. Tall shrubs typically range from 3 m to 6 m tall; this habitat type ranges from sparse to low in terms of foliar cover, and approximately 4.8 acres occur in the Project corridor. Tall shrubs provided important perching, breeding, nesting, brood rearing, and escape cover for a variety of wildlife including bats, desert cottontail, black-tailed jackrabbits, ground squirrels, pocket mice, deer mice, other mice, kangaroo rats, coyotes, kit fox, bobcats, red-tailed hawks, American kestrel, turkey vultures, quail, owls, nighthawks, flycatchers, kingbirds, ravens, warblers, wrens, thrashers, towhees, sparrows, lizards, colubrid snakes, and rattlesnakes.

3. Woodlands or Wooded Shrublands: open-canopy stands of trees and the columnar cactus saguaro occupy approximately 41.8 acres of desert wash, alluvial fan and plain, and mountain slope habitats. These topographic features were characterized by ironwood, blue paloverde, littleleaf paloverde, honey mesquite, smoketree, saguaro wooded shrublands, and, less often, woodlands. Woodlands typically provide sparse to moderate canopy cover and range between 4 m to 6 m tall. Understories of short and tall shrubs enhance the wildlife habitat value in terms of structure.

   a. *Desert Wash Banks, Alluvial Fans, and Mountain Slopes* – stands of trees or more typically, scattered trees occurred primarily along desert washes and minor drainages and were characterized by paloverde, ironwood, honey mesquite, and saguaro. Scattered paloverde and ironwood trees had become established on granitic lower slopes of the Tinajas Altas and Tule mountains. A number of avifauna use the desert wash bank and terrace wooded shrubland/woodland habitat for foraging, breeding, nesting, brood rearing, perching, and escape cover, including turkey vultures, red-tailed hawks, American kestrels, doves, owls, nighthawks, Gila woodpeckers, flycatchers, kingbirds, vireos, verdins, northern mockingbirds, and sparrows. Mammal use is high in these structured habitats with common species and groups including bats, desert cottontail, mice, coyote, and bobcat. Herpetiles common to the wooded shrubland habitats of these washes include species of toads, lizards, colubrid snakes, and rattlesnakes. Moderate to high diversity of invertebrates occurs within these wooded shrublands and woodlands.

4. Land Use: small acreages in the Project corridor are maintained on a fairly regular basis (e.g., maintenance on Camino del Diablo to less periodic maintenance on staging areas and turnouts, secondary access roads, and trails). Even though subject to disturbance these habitats can be important to some species of resident and migratory wildlife, which use them as movement corridors, foraging sites, and sunning sites. There are a number of two-track trails that result from military training activities at BMGR and illegal alien access and USBP operational needs on CPNWR.

   a. *Highways, Roads, and Trails* – wildlife species use established transportation corridors to move and disperse rapidly across the landscape. As a result, low to moderately high death rates can be experienced depending on adjacent habitat importance to wildlife, population levels, and design speed and safety features of transportation corridors. Snake species often sun on Camino del Diablo in the Project area. Wildlife that forage on carrion or are omnivorous, including the turkey vulture, other raptors, and coyote, can benefit from the presence of road-killed animals. One road-killed kit fox carcass attracted ravens, turkey vultures, and a red-tailed hawk.

4.8 Species Groups and Habitat Affinity

4.8.1 Mammals

Forty-eight species of mammals have been recorded in the CPNWR habitats and also use adjacent landscapes of the Project corridor (see **Attachment F**). The largest species groups include bats (13) and rats and mice, including pocket mice (13). Most of the mammals are nocturnal (night-active) or crepuscular (dusk- and dawn-active), and with the exception of the bat species are year-round residents. Relatively common species of mammals within the Project area include desert cottontail, black-tailed jackrabbit, coyote, kit fox, desert kangaroo rat, round-tailed ground squirrel, Arizona pocket mouse, cactus mouse, southern grasshopper mouse, and pocket gopher. Two federally endangered mammal species and two species of conservation concern occur within the Project region—the Sonoran pronghorn, lesser long-nosed bat, California leaf-nosed bat, and desert bighorn sheep, which are described below in more detail.

Sonoran pronghorns occur within the Project region within BMGR and CPNWR with the refuge being central to its distributional range (USFWS 2006). Telemetry work in the 1990s determined that the Sonoran pronghorn most frequently use the valleys and hills of Pinta Sands, Mohawk Valley, San Cristobal Valley, and Growler Valley east of the Project area. It is likely that the Project area provides only seasonal habitat following sufficient rains that allow new vegetation growth because no permanent water sources are present. In 2004, the population estimate was 58 individuals and the trend has generally been downward since 1992. In 2002, extreme drought resulted in the loss of 85 percent of the U.S. Sonoran pronghorn herd. Sonoran pronghorns inhabit sites with good visibility and escape opportunities (e.g., the alluvial fans and plains, but will use higher elevation alluvial fans and hills with less visibility where vegetation is more abundant). Their preferred forage is annual forbs, then they use the shrubs and trees of desert washes and hills as the forbs dry (132 plant species are known to compose the Sonoran pronghorn diet). Desert washes provide important thermal cover. Sonoran pronghorns use free-standing water when it is available and also rely on moisture from vegetation in addition to metabolic water.

The Sonoran pronghorn population was reduced drastically during the 1800s and 1900s due to hunting; livestock grazing; exposure to livestock diseases; predation by coyote, mountain lion, and bobcat; drought; dewatering of river systems; construction of highways, railroads, and canals; military training; exposure to recreationists; illegal drug smuggling activities; undocumented alien crossings of habitat; and long-term climate change to a hotter and drier environment. The recovery objectives focus on maintaining genetic diversity (i.e., a minimum of 500 animals); a population of at least 300 adult Sonoran pronghorn was necessary to ensure long-term survival (with some loss of genetic diversity).

The lesser long-nosed bat is a federally endangered mammal that roosts in caves and abandoned tunnels in southern Arizona and New Mexico and the adjacent Mexican states of Sonora and Chihuahua. It forages at night primarily on nectar, pollen, and fruit of columnar cactus and agave and has been observed foraging at hummingbird feeders. Lesser long-nosed bats occur in southwestern Arizona from April to September and use a maternity roost within CPNWR, one of three maternity roosts in the United States. The lesser long-nosed bat also uses smaller roost sites within the refuge, and surveys of potential roost sites are ongoing. Two migration routes are apparently used (e.g., an early spring route connects maternity colonies in coastal Sonora and southwestern Arizona and Jalisco via the west coast of Mexico). Late season routes connect transitory roosts in southeastern Arizona with winter range in Mexico, including the foothills of the Sierra Madre.

As many as 60,000 individual lesser long-nosed bats might forage and roost in southern Arizona and New Mexico (USFWS 2006). They roost in caves and mine shafts near populations of columnar cacti (two species) and agave (three species). The reasons for listing this species were (1) long-term decline in populations, (2) recent reports of its absence from previously occupied sites, (3) decline in the pollination of certain agave species, and (4) concern about death of an ecosystem if these bats are absent. The *Lesser Long-nosed Bat Recovery Plan* (1994) included six objectives: (1) continue protecting roost sites and evaluate the need for and implement protection for food plants; (2) monitor all major roosts in Arizona, New Mexico, and Mexico once per year; (3) continue surveying for additional roosts in the United States and Mexico; (4) develop and conduct a public education and information campaign in Arizona, New Mexico, and Mexico on the beneficial aspects of bats in general and the lesser long-nosed bat specifically; and (5) conduct critical research on population census techniques, physical requirements for roosts, foraging ranges of roosts, reproduction and mating systems, and other life history and habitat questions.

California leaf-nosed bats are a species of conservation concern whose north-central range includes the Project area (USFWS 2006). This tropical bat species does not hibernate; rather, it spends its days in caves or mine shafts and feeds on insects during warm nights. The present distribution might have expanded due to mining activity creating shafts and tunnels that expanded roosting and maternity sites. All winter roosts and maternity sites in Arizona are in abandoned mines. California leaf-nosed bats and bats in general are sensitive to disturbances and sites used in CPNWR have an absence of visitation, development, and ongoing mining activities.

Desert bighorn sheep, the Mexican race that occurs on CPNWR, are a species of conservation concern and are a wilderness-dependent species (USFWS 2006). This species is intolerant of many human activities and its population has been reduced or extirpated from much of its former range. CPNWR was created to preserve and protect the desert bighorn sheep from extinction beginning in 1939; a population of 50 to 100 animals was present at that time. During the 2005 survey, five desert bighorn sheep were estimated for the Tule Mountains and 111 individuals were estimated for the Cabeza Prieta Mountains, which occur on the eastern Project terminus. There were no estimates of population levels for the Tinajas Altas Mountains, which occur on BMGR; an individual desert bighorn sheep was observed in the Tinajas Altas Mountains on the western terminus of the vehicle barrier Project during field surveys.

Desert bighorn sheep occur in rough, rocky terrain with clear fields of view, adequate escape cover, and shade. In the Project area, this habitat exists in the Tinajas Altas Mountains to the west and the Cabeza Prieta and Tule mountains to the east, which are separated by the broad Lechuguilla Desert. They forage on a large number of plant species including annual forbs and grasses, big galleta, ocotillo, range ratany, brittlebush, catclaw acacia, littleleaf paloverde, ironwood, honey mesquite, mistletoe, barrel cactus, and saguaro. Water is a critical need and desert bighorn sheep can obtain it as metabolic (breakdown of forage), preformed (natural moisture in vegetation), and free (seeps, springs, tanks, guzzlers) sources.

The principal factors driving the population decline of desert bighorn sheep historically to the present include climate, hunting, livestock grazing and diseases, predation, habitat loss and fragmentation, and illegal border crossings and interdiction. Temperature trends have been increasing, while precipitation trends have been decreasing particularly since the 1990s. Desert bighorn sheep have low tolerances of excessive human presence and activities and they require large, rugged expanses of mountainous terrain, escape cover, thermal cover, lambing areas, movement corridors, nutritious forage, and dependable water sources. Overhunting occurred historically, but is now controlled using permits based on population levels. The hunts are limited to rams and from one to seven permits have been distributed annually. Some poaching might occur. Livestock (e.g., cattle, goats, sheep, burros, and horses) occurred in large numbers through the 1980s and competed directly with desert bighorn sheep for forage and water. Diseases introduced by domestic livestock included scabies, chronic sinusitis, leptospirosis, contagious exzema, Epizootic Hemorrhagic Disease, bluetongue, and pneumonia. The principal predators of desert bighorn sheep are mountain lions, coyotes, bobcats, and golden eagles. Three desert bighorn sheep were killed by a mountain lion in the Tinajas Altas, Cabeza Prieta, and Sierra Pinta mountains over a period of several months in 2002. At CPNWR, the growing numbers of illegal foot and vehicle traffic related to drug smuggling and undocumented aliens crossing the international border is having a probable, but unknown effect on desert bighorn sheep. The illegal activity occurs on mountain passes used by desert bighorn sheep. The undocumented aliens sometimes use shelter and rest stops at water developments preventing wildlife use of the water and depleting the water reserves.

The primary desert bighorn sheep management strategy on the refuge is to enhance existing water sources and develop new ones. These sources are heavily used by desert bighorn sheep, particularly during the hottest months and during periods of drought.

4.8.2 Birds

CPNWR and the Project corridor support at least 212 bird species, 41 species are known to nest in the refuge (see **Attachment F**) (USFWS 2006). Raptors that commonly use area habitats include red-tailed hawk, Cooper's hawk, Harris hawk, elf owl, turkey vulture, and raven (USFWS 2006). Passerine bird species and groups of birds common to the Project corridor include mourning and white-winged doves; Gambel's quail; greater roadrunner; lesser nighthawk; cactus wren; phainopepla; Costa's hummingbird; black-tailed gnatcatcher; loggerhead shrike; verdin; LeConte's thrasher; western wood peewee; Nashville, MacGillivray's, yellow, and Wilson's warblers; ruby-crowned kinglet; black-throated, Brewer's, vesper, white-crowned, and sage sparrows; black-headed grosbeak; gilded flicker; and Gila woodpecker.

In general, threats to nesting birds of the Project region include urbanization, fire, grazing, and browsing by burros. The refuge does not have these threats and serves as an important refugium for cavity-nesting, insectivorous, ground-nesting, and low-shrub foraging species of birds (USFWS 2006).

More than 800 species of birds spend all or part of their lives in the United States as they migrate from summer breeding grounds in the north to winter in warmer climates of the south, including Latin America. Because migratory birds depend on habitats across many political boundaries, a coordinated conservation effort has been established internationally, with the USFWS being the principal Federal authority in the United States. Moderate numbers of birds migrate seasonally through the Lechuguilla Desert and adjacent mountain ranges using the natural habitats for forage, roosting, and cover. The drainages and linear mountain ranges can serve as leading lines to guide raptors and neotropical migrants during migration.

The establishment of the CPNWR in addition to other Federal lands is important to migratory bird management. The primary function of lands managed under the National Wildlife Refuge System is to provide habitat for waterfowl and shorebirds in addition to other wildlife-related benefits. Federal agencies in general are responsible to protect migratory birds under Executive Order 13186 (Federal Register 2001). This executive order states that migratory birds are of great ecological and economical value to the United States and other countries. They contribute to biological diversity and bring tremendous enjoyment to those who study, watch, feed, or hunt them and the critical importance of this shared resource has been recognized through ratification of international, bilateral conventions for migratory bird conservation. A list of all migratory birds included under this executive order is available under 50 *Code of Federal Regulations*

(CFR) 10.13. A focused list for species occurring in the Project corridor is presented in **Attachment F**.

The cactus ferruginous pygmy-owl was delisted as federally endangered in 2006 but remains a species of conservation concern. Its range includes CPNWR in the northwestern portion, essentially the Sonoran desert scrub habitat. Two occurrences within CPNWR have been documented one in the Cabeza Prieta Mountains and one farther east in the Agua Dulce Mountains. Objectives in cactus ferruginous pygmy-owl management include maintaining and increasing the current population in suitable habitat and protecting known breeding locations from disturbance.

The loggerhead shrike is a species of conservation concern that has been listed as a Migratory Nongame Bird of Management Concern by the USFWS. Loggerhead shrikes occur in grassy areas with low density trees and shrubs; they have been observed within CPNWR during winter bird counts and can breed on the refuge (USFWS 2006). Conservation measures identified include protection of native grasslands, controlling grazing and mowing, and maintaining brush along fencelines.

LeConte's thrasher is a species of conservation concern that occurs in sparsely vegetated habitats where it forages on the desert floor (USFWS 2006). Two occurrences of LeConte's thrasher as probable/possible breeders were documented for the Tule Mountain area near the western terminus of the vehicle barrier Project. Objectives in LeConte's thrasher management include protecting at-risk breeding territories, avoiding recreational vehicle use during the breeding season, protecting large tracts of optimal habitat, and conducting adequate levels of research (response to rehabilitated farmland, presence in good habitat with high human use, use of artificial nest trees, distribution limitation factors, and population and range trends). The refuge initiated a long-term monitoring program examining breeding success and habitat use by LeConte's thrasher in 2002.

4.8.3 Herpetiles

A species list of 52 herpetiles was compiled for CPNWR habitats (see **Attachment F**). Included were 20 lizard species, 14 colubrid snakes, 6 rattlesnakes, the Gila monster, desert tortoise, and 9 amphibians. During late spring wildlife surveys of the Project corridor, scat of the Mojave rattlesnake, collared and whiptail lizards, and horned lizard was observed. Other herpetile species that could occur in the Project corridor include the desert tortoise, Gila monsters, western diamondback rattlesnakes, gopher snakes, coachwhips, desert iguanas, zebra-tailed lizards, spiny lizards, side-blotched lizards, whiptails, and Couch's spadefoot and western spadefoot toads in the available rock outcrop, mountain slope, volcanic cobble, alluvial fan, alluvial plain, and desert wash habitats (USFWS 2006).

Three reptile species of conservation concern have been addressed by CPNWR (2006). These species are the Arizona chuckwalla, desert tortoise, and flat-tailed horned lizard. The flat-tailed horned lizard is adapted to active sand dunes and flats, has not been documented in the CPNWR (2006), but could occur in the Pinta Sands area east of the Project corridor. Arizona chuckwallas are adapted to rocky sites including lava flows, outcrops, hillsides, and slopes; they are active in temperatures exceeding 102 °F. The Arizona chuckwalla forages primarily on annual vegetation, a few perennial plants, and sometimes insects (USFWS 2006). Desert tortoises of the Project region are of the Sonoran population that is not considered federally endangered (the Mojave population is federally listed). They occur in paloverde-mixed cacti associations where boulders, outcrops, and natural cavities with deep enough soil to support excavations as shelters are important habitat components. Desert tortoises forage on annual vegetation (they prefer native species over nonnatives), perennial plants, vegetation litter, cactus fruits, arthropods, bones, soil, and vertebrate feces. Populations appear to be stable or increasing based on 10-year-old studies (USFWS 2006). Principal threats to populations and individual desert tortoise include (1) habitat fragmentation, (2) habitat loss and degradation due to development, (3) wildfires fueled by invasive and nonnative forbs and grasses, (4) illegal collection, and (5) genetic contamination by escaped or released captive tortoises from the pet trade.

4.8.4 Invertebrates

Invertebrates are important in the Sonoran Desert, for example, a species of termite that consumes woody material and provides soil nutrients from both dead and living plant tissues (USFWS 2006). Invertebrates are important pollinators of desert flowers and provide a source of food for birds, mammals, and herpetiles species. A list of the Sonoran Desert arthropods has been prepared by the Cabeza Prieta Natural History Association (2008). **Attachment F** provides the species that have been identified to date, but many more species, particularly bugs and beetles, are likely to occur in the Project region. The list presently includes 99 butterfly, skipper, and moth species; 13 spiders; 6 bees, wasps, and flies; 5 scorpions, 3 centipede and millipede species; and 3 bug and beetle species.

4.9 Prehistoric Humans, Spanish Settlement, and Current Land Conservation

This section briefly summarizes human use of the Project area. Generally the Project corridor was used by prehistoric humans, historically for grazing livestock, and more recently for military training and wilderness. The Tinajas Altas, Cabeza Prieta, and Tule mountains and Lechuguilla Desert have attracted humans, both prehistorically and historically, resulting in the basis for much of the discussion herein.

This area has likely supported humans since prehistoric times, probably dating more than 10,000 years ago to the Clovis culture. Prehistoric sites can be categorized as surface remains and suggest ephemeral use or occupation of locations by widely dispersed and small groups of hunter-gatherers (USFWS 2006). Sites include low-density artifact scatters of lithic material and ceramics, fire-burned rock and hearths, trails, bedrock mortars, rock alignments, stone piles or cairns, stone windbreaks, sleeping circles, shallow rock shelters, and petroglyphs. Prehistoric sites recorded to present do not exhibit depth, subsurface features, or middens. Two sites contained deposits of shell debris that support the prehistoric shell trade route postulated for the more eastern Growler Valley.

The Project area was a portion of the Hia C-ed O'odham or Sand Papago ethnic group homeland, probably for more than 1,000 years (USFWS 2006). They were Piman-speaking people who conducted a hunting-gathering lifestyle through historic times. They were encountered by the Spaniards and Jesuits and by users of the trade route known as the Camino del Diablo.

The Coronado-led Spanish expedition passed near the Project area in search of the Seven Cities of Cibola during 1540 (USFWS 2008). European presence in the Project corridor dates to around 1694 when Jesuit Padre Eusabio Francisco Kino (an Italian priest) and Captain Juan Mateo Manje traveled through the areas of southern Arizona and northern Sonora. Padre Kino established good relations with the indigenous Piman groups and assisted them in resisting the Apache tribes. He was also credited with introducing agriculture and animal husbandry including wheat and domestic livestock, particularly cattle and sheep. East of the Project area near Tucson, Jesuit priests established a mission during the 1700s and a Spanish Presidio was established there in 1774 (USFWS 2006).

The historic sites include early 20th century mining camps and prospecting strikes (USFWS 2006). Between approximately 1540 and the late 1800s, the Camino del Diablo, a famous historic trade corridor, traversed the Project area. This route was a braided corridor of travel rather than a distinct road and is not represented accurately by the modern CPNWR road. During the gold rush of 1849, El Camino del Diablo was used by prospectors and miners to reach the west coast. A second group of prospectors and miners used the route in the 1860s when gold was unearthed in the Colorado River valley. Miner's graves represent landmarks along the route.

Livestock grazing, primarily cattle and goats, was conducted regionally beginning in 1919, mostly east of the Project area. It was curtailed throughout the CPNWR in 1981 (USFWS 2006). East of the Project area, trespass livestock grazing occurred in the 1940s and continues currently. Trespass livestock include cattle, horses, and burros, the latter two selectively browse woody vegetation in riparian or desert wash corridors, often girdling paloverde and other trees, which represent important habitat structure and species diversity for wildlife use. Goats are a host animal for the larval stage of the parasitic bot fly, which also parasitizes desert bighorn sheep. In desert bighorn sheep, the larvae cause chronic sinusitis, which is debilitating and often fatal to the wild animals, resulting in population decline.

CPNWR was established as a game range in 1939 to assist in the recovery of desert bighorn sheep assisted by public demand from a number of groups and agencies (USFWS 2006). From 1941 to 1943 Congress withdrew game rangelands for military flight training during World War II. The game range officially became CPNWR in 1975. Under the Arizona Desert Wilderness Act of 1990, approximately 93 percent of the CPNWR was designated wilderness. In 1966, public recreation including hunting was opened on CPNWR and desert bighorn sheep were a featured game. Permits to hunt them have ranged from one to seven annually based on population levels, which have generally been increasing.

The Project area includes a small portion of the BMGR (formerly Luke Air Force Range), a Department of Defense training area operational since 1941 that provides training for aircraft crews in aerial and air-to-ground combat and for the evaluation of new weapons and tactics necessary to develop skills for national defense. Among other training, it is used for bombing practice by pilots of A-10, F-16, F-18, and AV-8B Harrier aircraft (ADEQ 2008).

4.10 Habitat Conservation, Restoration, and Monitoring

The USFWS adopted an ecosystem approach to wildlife conservation within the CPNWR in order to recognize the interdependence of all elements of the system, increase cooperation among USFWS programs, and increase partnerships to achieve conservation goals (USFWS 2006). CPNWR occurs in the southwestern corner of the Gila/Salt/Verde Ecosystem, one of nine ecosystem units within the USFWS Southwest Region. Wildlife conservation objectives related to the desert system of the Project area are listed as action items under the strategy statement "Protect, maintain, and restore ecosystem function for terrestrial habitats including federally listed, candidate, and state-listed species" applicable action items include (1) gather information on habitat use (and role of free water) and disturbances to Sonoran pronghorn through telemetry, behavioral, and habitat studies; (2) complete rangewide Sonoran pronghorn surveys over a 6-year period to establish a trend for recovery purposes; (3) upgrade GIS hardware and complete electronic database for Sonoran pronghorn range; (4) initiate and design a comprehensive strategic regional plan for the area represented by the International Sonoran Desert Alliance (ISDA), which integrates individual management plans; (5) determine presence and genetics of obligate rock-dwelling reptiles to investigate effects of isolated desert mountain ranges; and (6) initiate a pilot study of desert bighorn sheep to determine genetics of isolated bands to further determine degree of isolation for disease and transplant implications (USFWS 2006).

The ISDA is a nonprofit corporation founded in 1993 and is governed by a board of directors representing the indigenous and nonindigenous populations of the United States and Mexico (ISDA 2008). The corporation (1) promotes the concept and practice of conservation throughout the Sonoran bioregion, (2) provides education in ways of protecting and respecting valuable biological and cultural resources and traditions, (3) develops creative and sustainable solutions to critical local issues such as housing and economic development, and (4) provides practical opportunities for individual and community action. ISDA also hosts public meetings that provide opportunities for broad community participation and seeks input from a wide cross-section of organizations, individuals, and cultures.

Habitat restoration Projects are performed by the ISDA using modern vertical mulching techniques (e.g., "disappearing roads" Project seeks to revegetate and hide unnecessary or illegal vehicle tracks in the desert). The following tenets are foremost in the restoration program:

- Publicity and participation in these Projects help educate the public about the reasons to avoid off-road driving.
- If the desert can be protected from off-road abuse, it will eventually regenerate and heal itself.
- For the same reasons, ISDA sponsors regular trash and litter removal Projects that collect man-made refuse near desert water sources.

A Sonoran pronghorn Project is being conducted by ISDA and includes the following steps:

- ISDA volunteers have removed miles of barbed-wire fencing at Cameron Tank and Bandeja Well in Arizona that were impediments to both Sonoran pronghorn migration and access to water.
- ISDA has helped obtain funds to purchase equipment needed by the Pinacate Biosphere Reserve (Mexico) to monitor its Sonoran pronghorn herd.

5. RARE SPECIES DATA

To ensure the most recent data were acquired for rare species analyses, e²M requested Element Occurrence Data from NatureServe Central Databases in Arlington, Virginia, through a referral from the USFWS (NatureServe and e²M 2007). The data fields requested and geographic scope of this request were as follows:

1. Location and habitat data for endangered, threatened, and candidate species were provided in list form by the USFWS and supplemented with online information from the AZGFD and information from the NatureServe database.
2. The USFWS requested that all rare species occurring within 25 miles of the international border with Mexico be considered in this data search. Data were therefore requested for the southern Arizona counties of Cochise, Santa Cruz, Pima, and Yuma.
3. Data were requested to be delivered electronically in the form of GIS layers depicting population polygons or point locations and Excel tables for species lists/tabular data and narratives of habitat and natural history information.

To protect sensitive data, a license agreement between NatureServe and e²M was signed in 2007. Data covered under the license agreement reside in a Multi-Jurisdictional Dataset (MJD), which includes all precise species location data for species that are federally listed (listed endangered, listed threatened, or candidate) or are listed under the State of Arizona endangered/protected species legislation. Additionally, the license agreement describes a 25-mile occurrence corridor north of the international border between the United States and Mexico as the licensed data set for this Project. Data and text fields delivered by NatureServe under the license agreement included life history, threats, trends and management recommendations, classification status, confidence extent, county name, element information, U.S. Federal Information Processing Standard Code, first observation date, global information, habitat types for animals, observation dates, location information, subnational information, survey information, and species status information.

The license agreement provides guidelines that stipulate external use of the data:

1. “Named” Locations: species names linked with locations cannot be displayed at a scale of less than 1:100,000 or the precise species location must be randomized within a USGS topographic quadrangle.
2. “Blind” Locations: when species names are not linked with locations, specific locations can be displayed, except when the species records are flagged “sensitive” or if they can be identified easily by geographic attributes at a particular location.

3. Exceptions: the only allowable exception to the guidelines occurs when data are obtained from a source independent from NatureServe and the member programs.

6. PROJECT DATABASE AND INTERACTIVE GIS

A Microsoft Access database was developed to serve as a centralized storage system for data collected during biological field surveys. The database data entry form closely mimics the field form used to record ecological information within the vehicle fence Project corridor (see **Attachment A**).

During field surveys, UTM coordinates were collected with global positioning system (GPS) receivers to locate observation points, photodocumentation points, drainage bottoms, wetlands, and the like. The GPS data were post-processed and incorporated into feature classes for use in a GIS. Additional data collected in the field were manually entered into the MS Access database.

The information stored in the database was also linked to an interactive GIS. The interactive file, or published map document, can be viewed with ESRI's ArcReader. The data sets collected and included in the published map are biological survey areas, observation points, National Wetlands Inventory wetlands, e²M delineated wetlands and waters of the United States, plant communities, wildlife habitats, military lands, wildlife areas and refuges, land use, and aerial photography. The observation points are interactively hyperlinked with ground photographs acquired in the field.

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BIOLOGICAL SURVEY
ATTACHMENT A

OBSERVATION POINT FORM AND INSTRUCTION MANUAL

OBSERVATION SURVEY FORM

SURVEY AND SITE INFORMATION

Point Code: AZ __ __ __ Quad name: ____________________ BPU Code: ________ Aerial Photo #: ________

Type of Observation (Please Circle One): VEG/OBS OTHER (Specify) ________________________________

Site Name____

Survey Date________________ Surveyors____________________________ Size of Area: ______________

GPS file name_____________ Field UTM X__ __ __ __ __ __ __m E Field UTM Y__ __ __ __ __ __ __ __m N

☐ Coordinates from USGS Quad Map (if checked enter coordinates under GPS comments)

Datum NAD 83 Zone: ______ GPS Unit: _____________ PDOP: ______ 3D Differential? Y / N

GPS Comments: Error: +/- _____m

Camera Name and Model: ________________________

Roll #	Frame #	Photographer	Direction/Comments

ENVIRONMENTAL DESCRIPTION

Elevation ___________ m / ft From: GPS / Map (circle one) Slope ______________ Aspect______________

Topographic Position:

Landform: Geology:

Cowardin System
___ Upland ___ Palustrine

Hydrology
___ Permanently Flooded ___ Unknown
___ Semipermanently Flooded ___ Seasonally Flooded ___ Temporarily Flooded
___ Saturated ___ Intermittently Flooded

Environmental Comments:

Unvegetated Surface: *(please use cover scale below)*
___ Bare soil ___ Small rocks (0.2-10cm) ___ Wood (>1cm) ___ Other (describe) ______________
___ Bedrock ___ Large rocks (>10cm) ___ Litter / duff
___ Sand (0.1-2mm)

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic Class	Cover scale for strata and unvegetated surfaces:
<u>Trees and Shrubs</u> __Evergreen __Cold-deciduous __Mixed evergreen-cold-deciduous <u>Herbs</u> __Annual __Perennial	__Broad-leaved __Needle-leaved __Microphyllous __Graminoid __Forb __Pteridophyte __Non-vascular __Mixed (describe)	__Forest __Woodland __Shrubland __Wooded Shrubland __Dwarf Shrubland __Shrub Herbaceous __Herbaceous __Nonvascular __Sparsely Vegetated __Wooded herbaceous	01 = 0 – 10% 02 = 10 – 25% 03 = 25 – 60% 04 = 60 – 100%

OBSERVATION SURVEY FORM

Provisional Community Name: ______________________________ Plot Code: AZ __ __ __

	Stratum Height Class	Stratum Cover Class	Dominant Species (mark Diagnostic species with *)	% Cover
T1 Emergent	______	______	______	______
T2 Canopy	______	______	______	______
T3 Sub-canopy	______	______	______	______
S1 Tall shrub (> 2 m)	______	______	______	______
S2 Short Shrub (< 2 m)	______	______	______	______
S3 Dwarf Shrub (< 0.5 m)	______	______	______	______
H Herbaceous	______	______	______	______
N Non-vascular	______	______	______	______

Height Scale for strata:

01 = < 0.5 m	06 = 10-15m
02 = 0.5-1 m	07 = 15-20m
03 = 1-2 m	08 = 20-35 m
04 = 2-5 m	09 = 35-50 m
05 = 5-10 m	10 = >50 m

Cover scale for strata and unvegetated surfaces:

01 = 0 – 10%
02 = 10 – 25%
03 = 25 – 60%
04 = 60 – 100%

Vegetation Characterization in Arizona
OBSERVATION POINT MANUAL - 2008

This document is intended to assist you in collecting observation point data in Arizona during the 2008 field season. Detailed, field-by-field instructions for data collection are provided.

VEGETATION DATA COLLECTION INSTRUCTIONS

LOCATING AN OBSERVATION POINT

You will locate sampling points based on homogenous or unique aerial photo signatures and by using site maps, topographic maps, handheld GPS receivers, and/or aerial photos.

- Topography (Topo) maps are useful in identifying the landscape through which you will be navigating, and in determining the elevation of a site.
- Aerial photos aid in navigating through the landscape, and are essential in determining where to sample to inform photo-interpreters (this will be explained in more detail). **Please** record the vegetation, and its condition, that you walk through and sample on the photo or accompanying digital orthophoto. Feel free to write comments regarding unique features as well.

Along the way...look around. Context is everything – you will have a much better sense of how your sample sites represent the landscape if you are always in analysis mode. Keep in mind that the goal of this field work and field work being conducted for vegetation classification is to sample **all** the different vegetation and geologic types that occur at the site.

Special Features... in the process of locating observation points you will encounter unique features or vegetative stands too small to sample, record their coordinates using the GPS receiver and note them on aerial photos and maps. These UTM coordinates may be added to the final production map as "Special Features. Locations of significant weed occurrences (highly invasive species that pose a big threat) and large areas of infestation may also be documented as they may represent a "semi-natural" vegetation type.

OBSERVATION POINT FORM INSTRUCTIONS – 2008

The primary role of Observation Point forms is to inform aerial photo interpretation; a secondary role is to help fill out plant association descriptions and provide distribution information for writing local descriptions of plant associations. They are representative of large and homogenous aerial photo signatures, unusual signatures, confusing signatures, and signatures that are slightly different due to shifts in dominant/understory species composition. The same vegetation type should be sampled where it occurs on different geology, where slope aspect leads to changes in density, and where effects due to fire, landslide, etc. have occurred.

- **IDENTIFIERS / LOCATORS SECTION**

Observation Point Code
This is a unique identifier you give each sample plot using the format "AZ.XXX". **Please record the observation point code on both sides of the form in the provided field.**

Quad Name
Record the **full name** of the 7.5-minute quadrangle, such as "The Knoll".

1

Aerial Photo Number
The photo number is in the upper right hand corner of the photo in the format FLIGHTLINE-FRAME #. Record this number on the form. Locate your observation point on the Mylar overlay of the photo, and mark your location with a dot in a circle and the observation point number. ***Again, please draw and comment on the photo overlay regarding the vegetation of the plot and the surroundings.***

County
This field will be completed in the office as part of processing the GPS data.

State
AZ

Site Name
This is best determined from a topographic or site map. Select a nearby feature that is an obvious waypoint, such as the name of a canyon, lava flow, etc. This name does not need to be unique. If you sample a number of observation points in a small area, you can use the same site name for all of them.

Survey Date
Date the plot was sampled. Please use this format: Month - Day - Year.

Surveyors
List the last names of the field team members present.

GPS File Name - this is the name you give to the waypoint when you mark the observation point location in your GPS receiver. When logging an observation point, the file name would be "AZ" and the number (e.g., AZ101 for point #101). Mark the aerial photo with a dot with a circle around it and the observation point number, "AZ101.

Datum
ALWAYS check datum settings on your GPS unit at the beginning of each day. It should **always** be NAD83: This information is **CRITICAL** for correctly applying your waypoints to the final vegetation map. If it is anything other than NAD83, **please, please, please** record this on the form. This step will keep your work from being wasted.

UTM Zone
This value is recorded from the GPS unit read-out.

Field UTM X, Field UTM Y
Record the UTM easting and northing you saved as a waypoint in your GPS receiver. Please double-check to make sure that the easting is six digits and the northing is seven digits. If recorded incorrectly, your plot will show up in Venezuela or the middle of Wyoming.

In mountainous or deep canyon country it is often difficult to obtain UTM coordinates from a GPS receiver (your unit has to be able to receive at least three or four satellites). If you are unable to obtain UTM coordinates in the observation point, or if the PDOP is greater than 8 (or EPE is greater than ±50m), first try to acquire a signal from a higher point outside (but still close to) the site. If that fails, you will need to estimate the UTM coordinates from the topo map, and manually enter these UTMs into the GPS unit.

Use a map which is in NAD83 if at all possible, since the project standard is the NAD83 datum. However, you may need to use USGS 7.5 minute maps, which use the NAD27 datum, note this.

GPS Unit:
Record the name and model of the GPS receiver being used to record data for the observation point. If a GPS unit was not used to determine UTMs record 'none' here and be sure to complete the 'GPS Comments' field below.

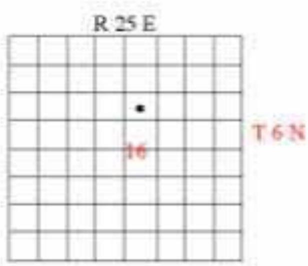
2

GPS Error
Note the PDOP (or "Estimated Position Error" (EPE), if you're using a Garmin unit) displayed on your GPS unit. The lower the number, the more accurate your reading.

3D Differential?
Circle Y or N accordingly. 3D differential is obtained when your GPS unit can "see" a satellite that does nothing but correct the tiny errors in the positioning or clocks of other GPS satellites. This satellite broadcasts a real-time differential correction so that your location coordinates are as accurate as possible. It is in geosynchronous orbit in the southern sky, so if you can see the southern sky, you will generally be able to obtain 3D differential. This system is known as the Wide-Area Augmentation System, or WAAS. The Garmin and Trimble units have a field in their setup pages for turning WAAS on or off. Please make sure that WAAS is **always** on.

GPS Comments:
VERY IMPORTANT: If you resorted to estimating the observation point location UTMs on the topo map, note that in this field. If you're usual GPS croaked and you had to borrow an old Magellan from a friend, note that. Also, if you left the site to obtain a reading from a high point, record that here, along with the compass bearing and distance of the GPS location from the observation point site (unless you used the offset function on the Trimble GeoXM- in that case, enter "point offset.")

Directions to Observation Point
Give precise directions to the observation point beginning with a landmark (e.g., a named point on the topo map, a major highway, marked trailhead) readily locatable on a 7.5 minute topo map as the starting point. Use clear sentences that will be understandable to someone who is unfamiliar with the area and has only your directions to follow. Give distances and use compass directions. Be aware of the ambiguity of words like "above", "near", beyond", "on the back side of", "past". Again, using the GPS unit to give distances can be very helpful. If observation point locations lack major landmark features as guides, use township, range and sections from the topo maps. If there are no features within a reasonable distance of your site and writing directions is taking an inordinately long time, you can use a TRS description to the nearest quarter-quarter-quarter section. The TRS for the plot in the section below is "NW4SW4NE4 Sec. 16, T 6 N, R 25 E".



Photos Taken?
Circle Y or N accordingly for observation point photos.

Camera Name and Model
Circle or enter the name and model of your camera

Photos: Type/Roll Number/Frame Number/Photographer/Direction and Comments
For each photo taken at the observation point record the following: *Photo type:* indicate whether photo is a 'stand' or 'landscape' photo. *Photo number:* record photo number. *Photographer:* record last name of person taking photograph.

3

Directions/Comments: record the direction the photos were taken from and towards (eg. SE→NW) and any other comments to clarify contents of the photo (especially landscape/scenery photos).

Taking photographs

Take one representative digital photo of each observation point. The purpose is to obtain a good representation of the vegetation, not individual species. Try to include a little sky (about 10%) for perspective. Use a chalkboard to record the observation point number and the direction the photo is taken. Thus, for observation point 241, the board in the photo taken from the SE edge, facing NW, will read "SDC241, SE→NW". Take the photograph looking across the contour if site occupies a steep slope. In addition, you will need to keep a photograph log for all photos not taken on observation points.

SDC241 SE→NW

- **ENVIRONMENTAL DESCRIPTION SECTION**

Elevation

Take this measurement from the GPS receiver, in meters. Specify on the data sheet whether the measurement is in feet or meters, and whether your elevation source was the GPS unit or the topo map.

Slope

Measure the slope in degrees using a clinometer. The degree scale is the left-hand scale as you look through the clinometer. If the slope varies, estimate an average. If the observation point is on rolling microtopography, enter "variable." Describe these further under the Environmental Comments section.

Aspect

Measure the site aspect in degrees using a compass (set for local magnetic declination). If the slope is flat, enter "n/a" for aspect. If the site wraps around different aspects on a slope, enter "variable" and describe further under the Environmental Comments section.

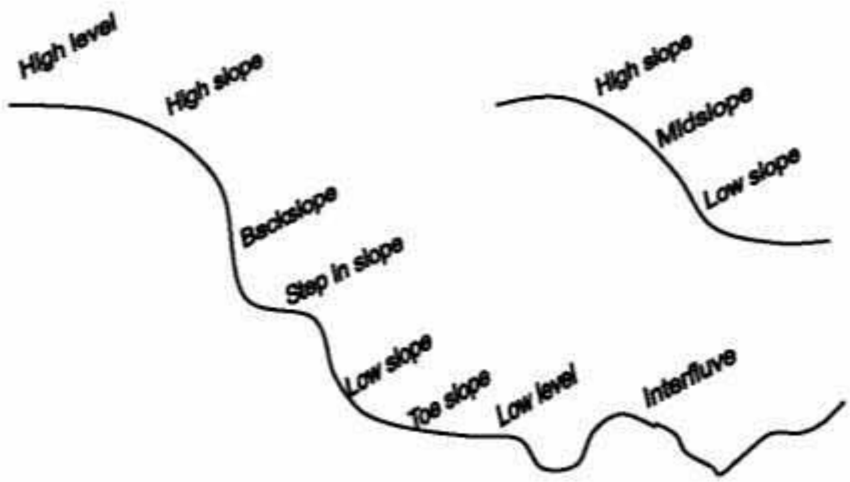
Topographic Position

This is the position of the observation point on its related landform. Determining this requires you to think of the landform in cross-section, which is roughly diagramed below. You **must** use the terms listed below:

Interfluve (crest, summit, ridge). Linear top of ridge, hill, or mountain; the elevated area between two drainages that sheds water to the drainages.
High slope (shoulder slope, upper slope, convex creep slope). The uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.
High level (mesa, summit). Level top of a plateau.
Midslope (transportational midslope). Intermediate slope position.
Backslope (dipslope). Subset of midslopes that are steep, linear, and may include cliff segments.
Step in slope (ledge, terracette). Nearly level shelf interrupting a steep slope, rock wall, or cliff face.
Lowslope (lower slope, foot slope, colluvial footslope). Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between midslope or backslope, and toeslope.
Toeslope (alluvial toeslope). Outermost gently inclined surface at base of a slope. In profile, usually gentle, linear and characterized by alluvial deposition.
Low level (terrace). Valley floor or shoreline representing the former position of an alluvial plain, or lake.

4

TOPOGRAPHIC POSITION



Landform
Enter the landform(s) that describes the site where the plot was sampled. Referring to the topo map for the landscape context may help you decide what landform(s) to choose. Note that the landform choices may describe different scales, or that a landform feature can be described by more than one term. For example, your plot may be on a ledge on the rim of a canyon. A suggested list of landforms and definitions is provided in **APPENDIX 1.**

> ***Note:*** *The topographic position selected above should relate to the scale of the landform chosen here.*

Surficial Geology
Note the geologic substrate where the plant community occurs. The geology map should help, but if you can't tell the geology at all or you do not have the geology map with you at the plot, put a general description (e.g., coarse sandstone, green shale, aeolian sands, or obscured by soils).

Cowardin System
The majority of the plots you'll be conducting will be "Uplands". Any wetland plots will be in the Palustrine category. This includes riparian stands. They are all fed by groundwater and support vascular plant communities.

> **Palustrine:** All nontidal wetlands dominated by trees, shrubs, persistent emergent species, emergent mosses, or lichens. This category also includes wetlands lacking such vegetation but with all of the following characteristics: (1) area less than 8 ha; (2) lacking an active wave-formed or bedrock boundary; (3) water depth in the deepest part of the basin less than 2 m (6.6 ft) at low water; and (4) ocean-derived salinities less than 0.5 parts per thousand.

Hydrology
This field will mostly be completed if you are in a wetland, however, some areas considered uplands may be subject to intermittent flooding. Select from the following definitions (from Cowardin et al. 1979):

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Permanently flooded. Water covers the land surface at all times of the year in all years.
Semipermanently flooded. Surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface.
Seasonally flooded. Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface.
Saturated. Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season.
Temporarily flooded. Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands.
Intermittently flooded. Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations.
Unknown. The water regime of the area is not known. The unit is labeled a non-tidal wetland.

Environmental Comments
Enter any additional noteworthy comments on the environmental setting and its effect on the vegetation. Examples include: "stunted trees due to shallow soils", "vegetation only where pockets of soil occur", or "large colluvial boulders and small rocks litter surface of soil". This field can also be used to describe site history such as fire events. This is an extremely important field for crews to document so please take the time to do a thorough job. Information from this field will be used to prepare local descriptions of the plant community and for photo interpretation.

Ground Cover
Estimate the approximate percentage of the *total* surface area covered by each category. The sum of all fields should equal 100%. A helpful hint in making ocular estimates is that in a 0.5-hectare (1.24-acre) observation point, one 7 x 7m square is equal to 1%. The sum of the cover values should equal 100%. *Notes*: Estimating lichens, dark cyanobacteria and moss also take an extra step in visualization. Also note that it is possible to have bare soil and sand in a plot if sand has blown in, or to have sand on the surface of the site. If a category is present but covers less than 1% (> 0.5%) of the ground, enter a "T" on the line next to it. If a category is present but covers a tiny bit (<0.5%) of ground, enter "t".

Animal Use Evidence
Comment on any evidence of use of the site by non-domestic animals (i.e., tracks, scat, burrows, etc.) and domestic animal use (grazing) under the Environmental Comments.

Natural and Anthropogenic Disturbance
Comment on any evidence of natural or anthropogenic disturbance and specify the source, severity and effects on the vegetation. Common disturbances on sites include gullies, colluvial deposition of rocks on slopes flash flooding and sometimes old tin cans from cowboys or miners. Notes on livestock grazing and other disturbances you may encounter in the buffer include off-road vehicle use, fire, and mass-wasting are valuable. Enter disturbance comments under the Environmental Comments

Other Comments
Record any other comments. What is the extent of the community you sampled? Describe the landscape context of the community. Describe the adjacent plant communities and their relationship to the plot. Are there any other landscape features or processes influencing this community? Is there an important species that occurs in the stand but is not within your plot? Is there a large amount of a dead plant material in the plot? Record these under the Environmental Comments field.

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Unvegetated Surface
This field is an ocular estimate of ground cover. Because there is no designated sample size for areas surveyed as Observation Points, you will have to estimate percent covers for whatever size the documented area encompasses. For this estimate, you must use the cover classes listed in the bottom right hand corner of the data sheet. If an unvegetated surface category is not present in your observation point area (e.g., water is very uncommon in the sampling units), leave the corresponding line blank.

- **VEGETATION DESCRIPTION SECTION**

Leaf Phenology
Select the best description for the leaf phenology of the **dominant** stratum. The dominant stratum is the tallest stratum that contains at least 10% cover. Leave blank for non-vascular plots.

Evergreen. Greater than 75% of the total woody cover is never without green foliage. (Some tricky examples: most *Artemisia* and all *Chrysothamnus*)
Cold deciduous. Greater than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost.
Mixed evergreen - cold deciduous. Evergreen and deciduous species are mixed within the type and generally contribute 25-75% of the total woody cover.
Perennial. Herbaceous vegetation composed of more than 50% perennial species.
Annual. Herbaceous vegetation composed of more than 50% annual species.

Leaf Type
Select the best description for the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% total plot coverage. Within that dominant stratum, the species that makes up greater than 50% of cover defines the leaf type.

Broad-leaved. Woody vegetation that is primarily broad-leaved (Sagebrush, oak, California lilac).
Needle-leaved. Woody vegetation that is primarily needle-leaved (Juniper, pine, spruce, fir, hemlock).
Microphyllous. Woody cover that is primarily microphyllous (*Ephedra*).
Graminoid. Herbaceous vegetation composed of more than 50 percent graminoid species (grasses, sedges, rushes, etc).
Forb (broad-leaf-herbaceous). Herbaceous vegetation composed of more than 50% broad-leaf forb species (*Phlox, Astragalus, Lupinus, Thalictrum, Erigeron,* etc).
Pteridophyte. Herbaceous vegetation composed of more than 50 percent ferns or fern allies (scouring rushes).
Non-vascular. Dominated by lichens or mosses.
Mixed. As with leaf phenology, the dominant stratum may be composed approximately equally of species with several different leaf types. Describe the mix briefly or circle leaf types that apply.

Physiognomic Class
This represents what you see when you are standing in the plot looking across at the vegetation. The following definitions can be used as guidelines. For example, areas with scattered pines and junipers may not fit the cover classes below but they would best be described as a woodland.

Forest. Trees with their crowns overlapping (generally forming 60-100% cover).
Woodland. Open stands of trees with crowns not usually touching (generally forming 10-60% cover). Canopy tree cover may be less than 10% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover, respectively.
Shrubland. Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 10% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation composed of woody vines is included this class.
Wooded Shrubland
Trees forming approximately equal cover with a shrub component.

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Dwarf-shrubland. Low-growing shrubs usually under 0.5 m tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 10% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively.
Shrub Herbaceous. Low or taller shrubs forming approximately equal cover with a grass or forb component. Individuals or clumps of shrubs generally not touching and usually forming more than 25% cover, trees less than 10% cover. Spaces between shrubs are generally mostly occupied by grasses and/or forbs.
Wooded Herbaceous. Trees forming approximately equal cover with a grass or forb component.
Herbaceous. Perennial herbs (graminoids or forbs) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 10% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.
Nonvascular. Nonvascular cover (bryophytes, lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular perennial vegetation cover may be less than 25%, as long as it exceeds tree, shrub, dwarf-shrub, and herb cover.
Sparsely Vegetated. Abiotic substrate features dominant. Perennial vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources. Total vegetation cover is typically less than 10% and greater than 2%. Badlands, ash fields, lava beds, or sand dunes supporting communities of annual plants should be included in this category, regardless of cover.

Provisional Community Name
Record the dominant species names creating the association which most closely resembles your observation point. Devise the name based on: (1) the dominant species of the dominant strata (including nonvascular) and (2) indicate the physiognomic class (this must match the physiognomic class checked on the back side of the datasheet). For example, if you are in a P-J woodland with only scattered shrubs but a really nice galleta grass layer, you would use a provisional name like "*Pinus edulis – Juniperus osteosperma / Pleuraphis jamesii* Woodland". The provisional name is also a great help to the ecologists who will be using your work to construct a classification. Note: this field should be completed only after the entire plot is completed.

- **DOMINANT PLANT SPECIES LIST**

Species/Strata Data. The form has been developed for recording information on *species* composition and cover and *strata* cover and height. Species lists (diagnostic species) and cover estimates should be completed first; then cover class and height class estimates for strata should be recorded. Write out the complete species name. The main body of the table is dedicated to recording species names and associated cover estimates. To begin, the observer needs to make a species list for the diagnostic species in the stand and assign each species to the appropriate stratum. The next section provides a brief discussion on assigning species to the appropriate strata, followed by instructions for completing the species level information.

Stratum: Species names will be recorded within the appropriate stratum. It is important that all crew members are consistent in assignment of species to strata throughout this project. Following are some guidelines to use in determining strata. Begin by assessing the strata at your site. Trees are defined as single-stemmed woody plants, generally 5 m in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 5 m in height at maturity and under optimal growing conditions.

T1 Emergent, T2 Canopy, T3 Subcanopy. A uniform stand of pine or hemlock trees would be a good example of T2"canopy", but where trees are absent you would begin with the shrubs, or herbaceous species if no shrubs are present. If the tree crowns in your plot are mostly touching and similar in height, but a given tree species is much taller that species would be a T1"emergent." Occasionally, you will sample an area where there may be several tall, scattered pines and then shorter scattered junipers. In this case, the pines would be your "canopy" and the junipers would be the "subcanopy". You may also have pines listed in the "subcanopy" layer, if there are a number of short saplings in addition to mature tall trees.

The remaining vegetative strata are (remember to check with plant list for consistency):

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S1 Tall Shrub. >2 meters tall. For example, *Sambucus racemosa, Amelanchier utahensis,*and *Cercocarpus ledifolius.*
S2 Short Shrub. <2 meters tall. For example, *Artemisia tridentata,* all *Symphoricarpos* spp.
S3 Dwarf Shrub. <0.5 meters tall. For example, *Artemisia arbuscula.*
H1 Graminoid. All grass species, including *Carex* spp. and *Juncus* spp.
H2 Forb. All forbs. (*Typha* is a forb.)
H3 Fern or Fern Ally. All ferns, including *Equisetum laevigatum.*
H4 Tree Seedlings. Seedlings are trees with vertical stems less than 1.5 m tall, but that may vary by species.
N Nonvascular. This is mainly mosses and lichens.
V Vine/liana. All vine species.
E Epiphyte. All epiphytic species.

Height can be used to define strata, but is not how species should be placed in strata. **Species characteristically belong to one stratum or another** (e.g., quaking aspen and juniper are canopy (T2), Utah serviceberry is a tall shrub (S1), antelope bitterbrush is a short shrub (S2), low sagebrush is a dwarf-shrub (S3), etc.), **EVEN when unusual environmental circumstances dictate that the plants have an unusually tall or unusually short growth form**. So even if the junipers growing in cracks are only 1.5 m tall, as long as they are mature trees, they are placed in the T2 category. About the only rule regarding height should be that the tree layer is (usually) higher than the tall shrub layer, is taller than the short shrub layer, etc.

The second point is to avoid splitting species between strata. If a few willow have been browsed to <1m tall, but most are 2m tall, they all are placed into the tall shrub stratum. There are two exceptions: (1) each height class covers more than 10% of plot, or (2) there is a reproductive layer of seedling shrubs or young trees.

The third point is how to define some of the "borderline/confusing" species. What we want to avoid is some folks calling *Apocynum* a forb and some calling it a dwarf-shrub or short shrub, for example.

Species / Percent Cover Estimates. Once you have identified your strata, list all diagnostic plant species in that strata and complete cover estimates per the following instructions.

1. **Species Name:** Refer to the plant list you have been provided for plant names used in this area. Always record the full scientific name for each species.
2. **Cover Class:** Estimate the aerial / crown cover of **each** species listed, using the cover class codes for the bottom of the page. These classes are as follows:
   01 = 0-10% 02 = 10-25% 03 = 25-60% 04 = 60-100%
3. **% Cover:** Record continuous cover value used to make cover class estimates.

Unknowns. If you can't identify or easily key out the plant at the site, assign a name to it to be recorded on your data sheet. For example, if you know what family it is in or its genus, label it "unknown Asteraceae sp." or "Unk. *Erigeron* sp.". If there is more than one unknown in a family, add a number to the name you give them. If you do not know the family, label the plant "Unknown 1", using consecutive numbers for additional unknowns. Record the cover class and other data for the unknown as you would for any other species. Then, take a sample of the species with as much of the plant as possible, especially intact sexual parts, if present. Place the sample in a plastic baggie, and either label the plant (if you are putting more than one plant in the baggie) or label the baggie with the plot code, the date and the name you gave it on the data form. Plant samples in baggies can be stored in coolers or refrigerators for short periods. If you are not able to key the plant out soon after collecting it, or you intend to keep the sample for the park collection, press the plant and with a label stating the plot or location of its collection (include UTMs if the sample is not from a plot), date, collectors name and name you assigned the plant. Also, thoroughly label any plant specimens collected as proof of plant occurrence for plants not listed on the site plant list.

Strata / Height Class, Cover Class and Diagnostic Species. Once the species list and associated cover data have been completed, the observer should then complete the following fields as specified below.

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1. Indicate the average height class of the stratum in the first column, using the Height Scale at the bottom of the form. The height scale for this project is as follows:
2.

01 – <0.5 m	03 – 1-2 m	05 – 5 – 10 m	07 – 15-20 m	09 – 35 – 50 m
02 – 0.5 – 1 m	04 – 2-5 m	06 – 10-15 m	08 – 20-35 m	10 – >50 m

3. Enter the average percent cover class of the whole stratum in the second column, using the Cover Scale at the bottom of the form (same cover scale as for species above).
4. "*" – This Column is used to indicate which species in the strata are particularly abundant.

Record information on ***dominant species only***. There is one column that corresponds to the "Stratum" column in this table:

1. **Height.** Use the number code that best describes the heights of all plant species within a given stratum. The number codes are listed in the bottom left-hand corner of the data sheet.
2. **Cover Class.** For this ocular estimation you are looking at the aerial cover of **all** plants within a given stratum. Use the cover class codes listed in the bottom right hand corner of the data sheet and presented below.

Cover Classes	
01	0 – 10%
02	10 – 25%
03	25 - 60%
04	60 – 100%

3. **Dominant Species (Mark species that characterize the stand with a *).** List the plant species using the full scientific name. You may find that there are not enough lines, in which case you can write in the blank area under the stratum name and number codes.
4. **% Cover.** Estimate the percent aerial cover (T-100%) for each diagnostic plant species.

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APPENDIX 1: Landform Glossary
(http://soils.usda.gov/technical/handbook/contents/part629glossary1.html)

alluvial cone - A semi-conical type of alluvial fan with very steep slopes; it is higher, narrower, and steeper (e.g., > 40% slopes) than a fan, and composed of coarser, and thicker layers of material deposited by a combination of alluvial episodes and to a much lesser degree, landslides (e.g., debris flow). Compare - alluvial fan, talus cone.

alluvial fan - A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes, shaped like an open fan or a segment of a cone, deposited by a stream (best expressed in semiarid regions) at the place where it issues from a narrow mountain or upland valley; or where a tributary stream is near or at its junction with the main stream. It is steepest near its apex which points upstream and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

alluvial flat (a) (colloquial: western US) A nearly level, graded, alluvial surface in bolsons and semi-bolsons which commonly does not manifest traceable channels, terraces or floodplain levels. Compare - flood-plain step, terrace, valley flat. (b) (**not preferred**) A general term for a small flood plain bordering a river, on which alluvium is deposited during floods.

alluvial plain - (a) A large assemblage of fluvial landforms (braided streams, terraces, etc.,) that form low gradient, regional ramps along the flanks of mountains and extend great distances from their sources (e.g., High Plains of North America. SW (b) (not recommended, use flood plain.) An general, informal term for a broad flood plain or a low-gradient delta. Compare - alluvial flat.

alluvial plain remnant - An erosional remnant of an alluvial plain which retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to a present-day stream or drainage network. Compare - alluvial plain, erosional remnant, paleoterrace.

alluvial terrace - (not preferred) refer to stream terrace.

alluvium - Unconsolidated, clastic material subaerially deposited by running water, including gravel, sand, silt, clay, and various mixtures of these. Compare - colluvium, slope alluvium.

anticline - (a) A unit of folded strata that is convex upward and whose core contains the stratigraphically oldest rocks, and occurs at the earth's surface. In a single anticline, beds forming the opposing limbs of the fold dip away from its axial plane. Compare - monocline, syncline, fold. (b) A fold, at any depth, generally convex upward whose core contains the stratigraphically older rocks.

arroyo - (colloquial: southwest A.) The channel of a flat-floored, ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material; sometimes called a wash. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed. Where arroyos intersect zones of ground-water discharge, they are more properly classed as intermittent stream channels.

artificial levee - An artificial embankment constructed along the bank of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel.

backslope - The hillslope profile position that forms the steepest and generally linear, middle portion of the slope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below. They may or may not include cliff segments (i.e. free faces). Backslopes are commonly erosional forms produced by mass movement, colluvial action, and running water. Compare - summit, shoulder, footslope, toeslope.

backswamp - A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces. Compare - valley flat.

badlands - A landscape which is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interfluves. Badlands develop on surfaces with little or no vegetative cover, overlying unconsolidated or poorly cemented materials (clays, silts, or in some cases sandstones) sometimes with soluble minerals such as gypsum or halite.

bajada - (colloquial: southwestern US.) A broad, gently inclined, alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins. Synonym - coalescent fan piedmont. Compare - colluvial apron.

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ballena - (colloquial: western US.) A fan remnant having a distinctively-rounded surface of fan alluvium. The ballena's broadly-rounded shoulders meet from either side to form a narrow summit and merge smoothly with concave sideslopes and then concave, short pediments which form smoothly-rounded drainageways between adjacent ballenas. A partial ballena is a fan remnant large enough to retain some relict fan surface on a remnant summit. Compare - fan remnant.

ballon - (colloquial: western US). A rounded, dome-shaped hill, formed by erosion or uplift.

bar - A general term for a ridge-like accumulation of sand, gravel, or other alluvial material formed in the channel, along the banks, or at the mouth of a stream where a decrease in velocity induces deposition; e.g. a channel bar or a meander bar. A generic term for any of various elongate offshore ridges, banks, or mounds of sand, gravel, or other unconsolidated material submerged at least at high tide, and built up by the action of waves or currents, especially at the mouth of a river or estuary, or at a slight distance offshore from the beach.

barchan dune - A crescent-shaped dune with tips extending leeward (downwind), making this side concave and the windward (upwind) side convex. Barchan dunes tend to be arranged in chains extending in the dominant wind direction. Compare - parabolic dune.

base slope - A geomorphic component of hills consisting of the concave to linear slope (perpendicular to the contour) which, regardless of the lateral shape is an area that forms an apron or wedge at the bottom of a hillside dominated by colluvial and slope wash processes and sediments (e.g., colluvium and slope alluvium). Distal base slope sediments commonly grade to, or interfinger with, alluvial fills, or gradually thin to form pedisediment over residuum. Compare - head slope, side slope, nose slope, interfluve, free face.

basin - (a) Drainage basin; (b) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated. (c) (colloquial: western US) A general term for the nearly level to gently sloping, bottom surface of an intermontane basin (bolson). Landforms include playas, broad alluvial flats containing ephemeral drainageways, and relict alluvial and lacustrine surfaces that rarely, if ever, are subject to flooding. Where through-drainage systems are well developed, flood plains are dominant and lake plains are absent or of limited extent. Basin floors grade mountainward to distal parts of piedmont slopes.

basin floor - A general term for the nearly level, lower-most part of intermontane basins (i.e. bolsons, semi-bolsons). The floor includes all of the alluvial, eolian, and erosional landforms below the piedmont slope. Compare - basin, piedmont slope.

basin-floor remnant - (colloquial: western US) A flat erosional remnant of any former landform of a basin floor that has been dissected following the incision of an axial stream.

bench - (not preferred) refer to structural bench.

beveled base - The lower portion of a canyon wall or escarpment marked by a sharp reduction in slope gradient from the precipitous cliff above, and characteristically composed of thinly mantled colluvium (e.g. < 1 m) and / or carapaced with a thin surficial mantle of large rock fragments from above, which overly residuum of less resistant rock (e.g., shale) whose thin strata intermittently outcrop at the surface; a zone of erosion and transport common in the canyonlands of the semi-arid, southwestern US. Compare - talus slope.

blowout - A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand, loose soil, or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Commonly small, some blowouts may be large (kilometers in diameter). Compare - deflation basin.

bluff - (a) A high bank or bold headland, with a broad, precipitous, sometimes rounded cliff face overlooking a plain or body of water, especially on the outside of a stream meander; ex. a river bluff. (b) (not preferred) use cliff. Any cliff with a steep, broad face.

bolson - (colloquial: western US.) A landscape term for an internally drained (closed) intermontane basin into which drainages from surrounding mountains converge inward toward a central depression. Bolsons are often tectonically depressed areas and, according to Peterson, include alluvial flat, alluvial plain, beach plain, barrier beach, lake plain, sand sheets, dunes, and playa. The piedmont slope includes slopes of erosional origin adjoining the mountain front (pediments) and complex construction surfaces (fans). A semi-bolson is an externally drained (open) bolson. Synonym - intermontane basin.

borrow pit - An excavated area from which earthy material has been removed typically for construction purposes offsite; also called barrow pit.

bottomland - (not recommended) use flood plain. An obsolete, informal term loosely applied to varying portions of a flood plain.

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box canyon - a) A narrow gorge or canyon containing an intermittent stream following a zigzag course, characterized by high, steep rock walls and typically closed upstream by a similar wall, giving the impression, as viewed from its bottom, of being surrounded or "boxed in" by almost vertical walls. b) A steep-walled canyon heading against a cliff a dead-end canyon.

braided stream - A channel or stream with multiple channels that interweave as a result of repeated bifurcation and convergence of flow around inter-channel bars, resembling (in plan view) the strands of a complex braid. Braiding is generally confined to broad, shallow streams of low sinuosity, high bedload, non-cohesive bank material, and a steep gradient. At bank-full discharge, braided streams have steeper slopes and shallower, broader, and less stable channel cross sections than meandering streams. Compare - meandering channel, flood-plain landforms.

break - (slopes) An abrupt change or inflection in a slope or profile. Compare - knickpoint, shoulder, escarpment. (geomorphology) A marked variation of topography, or a tract of land distinct from adjacent land, or an irregular or rough piece of ground. Compare - breaks.

breaks - (colloquial: western US) A landscape or large tract of steep, rough or broken land dissected by ravines and gullies and marks a sudden change in topography as from an elevated plain to lower hilly terrain, or a line of irregular cliffs at the edge of a mesa or a river (e.g., the Missouri River breaks).

butte - An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments, commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks. Compare - mesa, plateau, cuesta.

caldera - A large, more or less circular depression, formed by explosion and/or collapse, which surrounds a volcanic vent or vents, and whose diameter is many times greater than that of the included vent, or vents. Compare - crater.

canyon - A long, deep, narrow, very steep-sided valley cut primarily in bedrock with high and precipitous walls in an area of high local relief (e.g., mountain or high plateau terrain), often with a perennial stream at the bottom; similar to but larger than a gorge. Compare - gorge, box canyon, slot canyon.

canyon bench - One of a series of relatively narrow, flat landforms occurring along a canyon wall and caused by differential erosion of alternating strong and weak horizontal strata; a type of structural bench.

canyonlands - A deeply and extensively dissected landscape composed predominantly of relatively narrow, steep-walled valleys with small flood plains or valley floors; commonly with considerable outcrops of hard bedrock on steep slopes, ledges, or cliffs, and with broader summits or interfluves than found in badlands. Sideslopes exhibit extensive erosion, active back-wearing, and relatively sparse vegetation.

channel - (a) The hollow bed where a natural body of surface water flows or may flow. The deepest or central part of the bed of a stream, containing the main current and occupied more or less continuously by water. (b) (colloquial: western US.) The bed of a single or braided watercourse that commonly is barren of vegetation and is formed of modern alluvium. Channels may be enclosed by banks or splayed across and slightly mounded above a fan surface and include bars and mounds of cobbles and stones. (c) Small, trough-like, arcuate or sinuous channels separated by small bars or ridges, caused by fluvial processes; common to flood plains and young alluvial terraces; a constituent part of *bar and channel* topography.

cinder cone - A conical hill formed by the accumulation of cinders and other pyroclastics, normally basaltic or andesitic composition. Slopes generally exceed 20 percent.

cliff - Any high, very steep to perpendicular or overhanging face of rock or earth; a precipice. Compare - bluff.

climbing dune - A dune formed by the piling-up of sand by wind against a cliff or mountain slope; very common in arid regions with substantial local relief and strong winds. Compare - sand ramp.

closed depression - A generic name for an enclosed area that has no surface drainage outlet and from which water escapes only by evaporation or subsurface drainage; an area of low ground indicated on a topographic map by a hachured contour line forming a closed loop. Compare - open basin.

collapse sinkhole - A type of sinkhole that is formed by collapse of a cave within the underlying soluble bedrock (e.g., limestone, gypsum, salt). Compare - solution sinkhole.

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colluvium - Unconsolidated, unsorted material being transported or deposited on sideslopes and/or at the base of slopes by mass movement (e.g. direct gravitational action) and by local, unconcentrated runoff. Compare - alluvium, slope alluvium, scree, talus, mass movement.

complex landslide - A category of mass movement processes, associated sediments (complex landslide deposit) or resultant landforms characterized by a composite of several mass movement processes none of which dominates or leaves a prevailing landform. Numerous types of complex landslides can be specified by naming the constituent processes evident (e.g. a complex earth spread - earth flow landslide). Compare - fall, topple, slide, lateral spread, flow, landslide.

crest - (a) The commonly linear, narrow top of a ridge, hill, or mountain. It is appropriately applied to elevated areas where retreating backslopes are converging such that these high areas are almost exclusively composed of convex shoulders; (b) (not preferred) Sometimes used as an alternative for the hillslope component *summit*. Compare - summit (*part b*), saddle.

cuesta - An asymmetric, homoclinal ridge capped by resistant rock layers of slight to moderate dip (commonly less than 15 percent); produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope), that roughly parallels the inclined beds, and on the other side has a relatively short and steep or cliff-like slope (scarp) that cuts through the tilted rocks. Compare - hogback, mesa, dipslope, scarp slope, cuesta valley.

cuesta valley - A low relief, low angle, asymmetrical depression which lies parallel to the strike of underlying strata; a type of strike valley. It's formed by the differential erosion of weaker strata interbedded with more resistant bedrock. It may or may not contain a local drainage network and commonly lies above and is not connected to the regional drainage system. Compare - cuesta, valley, trough, hanging valley.

debris fall - The process, associated sediments (debris fall deposit) or resultant landform characterized by a rapid type of *fall* involving the relatively free, downslope movement or collapse of detached, unconsolidated material which falls freely through the air (lacks an underlying slip face); sediments have substantial proportions of both fine earth and coarse fragments; common along undercut stream banks. Compare - rock fall, soil fall, landslide.

debris flow - The process, associated sediments (debris flow deposit) or landform resulting from a very rapid type of *flow* dominated by a sudden downslope movement of a mass of rock, soil, and mud (more than 50% of the particles are > 2mm), and whether saturated or comparatively dry, behaves much as a viscous fluid when moving. Compare - lahar, mudflow, landslide.

deflation basin - A topographic basin excavated and maintained by wind erosion which removes unconsolidated material and commonly leaves a rim of resistant material surrounding the depression. Unlike a blowout, a deflation basin does not include adjacent deposits derived from the basin. Compare - blowout.

depression - Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage (e.g. a sinkhole). An open depression has a natural outlet for surface drainage. Compare - closed depression, open depression.

desert pavement - A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments, mantling a desert surface. It is formed where wind action and sheetwash have removed all smaller particles or where coarse fragments have migrated upward through sediments to the surface. It usually protects the underlying, finer-grained material from further deflation. The coarse fragments commonly are cemented by mineral matter. Compare - erosion pavement, stone line.

dike - A tabular igneous intrusion that cuts across the bedding or foliation of the country rock. Compare – sill.

dip - A geomorphic component (characteristic piece) of flat plains (e.g., lake plain, low coastal plain, low-relief till plain) consisting of a shallow and typically closed depression that tends to be an area of focused groundwater recharge but not a permanent water body and that lies slightly lower and is wetter than the adjacent talf, and favors the accumulation of fine sediments and organic materials.

ditch - An open and usually unpaved (unlined), channel or trench excavated to convey water for drainage (removal) or irrigation (addition) to or from a landscape; smaller than a canal; some ditches are modified natural waterways.

divide - (a) The line of separation; (b) The summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction. Compare – interfluve.

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dome - (a) An uplift or anticlinal structure, either circular or elliptical in outline, in which the rocks dip gently away in all directions. A dome may be small (e.g. a salt dome) or many kilometers in diameter. (b) A smoothly rounded landform of rock mass such as a rock-capped mountain summit, that roughly resembles the dome of a building. (e.g. the rounded granite peaks of Yosemite, CA).

drainageway - (a) A general term for a course or channel along which water moves in draining an area. (b) a term restricted to relatively small, roughly linear or arcuate depressions that move concentrated water at some time, and either lack a defined channel (e.g. head slope, swale) or have a small, defined channel (e.g. low order streams).

draw - A small, natural watercourse cut in unconsolidated materials, generally more open with a broader floor and more gently sloping sides than an arroyo, ravine or gulch, and whose present stream channel may appear inadequate to have cut the drainageway that it occupies.

dune - A low mound, ridge, bank or hill of loose, windblown, subaerially deposited granular material (generally sand), either barren and capable of movement from place to place, or covered and stabilized with vegetation, but retaining its characteristic shape. (See barchan dune, parabolic dune, parna dune, shrub-coppice dune, seif dune, transverse dune).

dune field - An assemblage of moving and/or stabilized dunes, together with sand plains, interdune areas, and the ponds, lakes, or swamps produced by the blocking of steams by the sand. See dune lake.

earthflow - The process, associated sediments (earthflow deposit) or resultant landforms characterized by slow to rapid types of flow dominated by downslope movement of soil, rock, and mud (more than 50% of the particles are < 2 mm), and whether saturated or comparatively dry, behaves as a viscous fluid when moving. Compare - debris flow (coarser, less fluid), mudflow (finer, more fluid).

eolian deposit - Sand, silt or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess. Conventionally, primary volcanic deposits (e.g. tephra) are handled separately. Compare - loess, parna, beach sands.

eolian sands - Sand-sized, clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sand sheet. Compare - beach sands.

ephemeral stream - Generally a small stream, or upper reach of a stream, that flows only in direct response to precipitation. It receives no protracted water supply from melting snow or other sources and its channel is above the water table at all times. Compare - arroyo, intermittent stream, perennial stream.

eroded fan remnant - All, or a portion of an alluvial fan that is much more extensively eroded and dissected than a fan remnant; sometimes called an *erosional fan remnant*. It consists primarily of a) eroded and highly dissected sides (*eroded fan-remnant sideslopes*) dominated by hillslope positions (shoulder, backslope, etc.), and b) to a lesser extent an intact, relatively planar, relict alluvial fan "summit" area best described as a tread.

eroded fan-remnant sideslope - A rough or broken margin of an *eroded fan remnant* highly dissected by ravines and gullies that can be just a fringe or make up a large part of an eroded alluvial fan; its bounding escarpments (risers), originally formed by inset channels, have become highly dissected and irregular such that terrace components (tread and riser) have been consumed or modified and replaced by hillslope positions and components (shoulder, backslope, footslope, etc.); sometimes referred to as *fan remnant sideslopes*. Compare - eroded fan remnant.

escarpment - A continuous, steep slope or cliff produced by erosion or faulting and that topographically interrupts or breaks the general continuity of more gently sloping land surfaces . The term is most commonly applied to cliffs produced by differential erosion. Synonym = scarp.

falling dune - An accumulation of sand that is formed as sand is blown off a mesa top or over a cliff face or steep slope, forming a solid wall, sloping at the angle of repose of dry sand, or a fan extending downward from a re-entrant in the mesa wall. Compare - climbing dune, sand ramp.

fan - (a) A gently sloping, fan-shaped mass of detritus forming a section of a low-angle cone commonly at a place where there is a notable decrease in gradient; specifically an alluvial fan (not preferred – use alluvial fan). Compare - alluvial fan, alluvial cone. (b) A fan-shaped mass of congealed lava that formed on a steep slope by the continually changing direction of flow.

fan apron - A sheet-like mantle of relatively young alluvium and soils covering part of an older fan piedmont (and occasionally alluvial fan) surface, commonly thicker and further down slope (e.g., mid-fan or mid-fan piedmont) than a fan collar. It somewhere

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buries an older soil that can be traced to the edge of the fan apron where the older soil emerges as the land surface, or relict soil. No buried soils should occur within a fan-apron mantle itself. Compare - fan collar.

fan collar - A landform comprised of a thin, short, relatively young mantle of alluvium along the very upper margin (near the proximal end or apex) of a major alluvial fan. The young mantle somewhere buries an older soil that can be traced to the edge of the collar where the older soil emerges at the land surface as a relict soil. Compare - fan apron.

fan remnant - A general term for landforms that are the remaining parts of older fan-landforms, such as alluvial fans, fan aprons, inset fans, and fan skirts, that either have been dissected (erosional fan-remnants) or partially buried (nonburied fan-remnants). An erosional fan remnant must have a relatively flat summit that is a relict fan-surface. A nonburied fan-remnant is a relict surface in its entirety. Compare - eroded fan remnant, ballena.

fan skirt - The zone of smooth, laterally-coalescing, small alluvial fans that issue from gullies cut into the fan piedmont of a basin or that are coalescing extensions of the inset fans of the fan piedmont, and that merge with the basin floor at their toeslopes. These are generally younger fans which onlap older fan surfaces.

fault-line scarp - (a) A steep slope or cliff formed by differential erosion along a fault line, as by the more rapid erosion of soft rock on the side of a fault as compared to that of more resistant rock on the other side; e.g. the east face of the Sierra Nevada in California. (b) (not recommended) A fault scarp that has been modified by erosion. This usage is not recommended because the scarp is usually not located on the fault line.

fen - Waterlogged, spongy ground containing alkaline decaying vegetation, characterized by reeds, that develops into peat. It sometimes occurs in sinkholes of karst regions. Compare - bog, marsh, swamp.

finger ridge - One in a group of small, tertiary spur ridges that form crudely palmate extensions of erosional remnants along the flanks or nose of larger ridges. Compare - ballena, rib.

flat - (a) (adjective) Said of an area characterized by a continuous surface or stretch of land that is smooth, even, or horizontal, or nearly so, and that lacks any significant curvature, slope, elevations, or depressions. (b) (noun) An informal, generic term for a level or nearly level surface or small area of land marked by little or no local relief. Compare - mud flat. (c) (not recommended) A nearly level region that visibly displays less relief than its surroundings.

flood plain - The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the streams.

foothills - A steeply sloping upland composed of hills with relief of 30 up to 300 meters and fringes a mountain range or high-plateau escarpment. Compare - hill, mountain, plateau. SW &

footslope - The hillslope profile position that forms the concave surface at the base of a hillslope. It is a transition zone between upslope sites of erosion and transport (shoulder, backslope) and downslope sites of deposition (toeslope). Compare - summit, shoulder, backslope, and toeslope.

free face - A geomorphic component of hills and mountains consisting of an outcrop of bare rock that sheds rock fragments and other sediments to, and commonly stands more steeply than the angle of repose of, the colluvial slope immediately below; most commonly found on shoulder and backslope positions, and can comprise part or all of a nose slope or side slope. Compare - interfluve, crest, nose slope, side slope, head slope, base slope.

gorge - (a) A narrow, deep valley with nearly vertical, rocky walls, smaller than a canyon, and more steep-sided than a ravine; especially a restricted, steep-walled part of a canyon. (b) A narrow defile or passage between hills or mountains.

graben - An elongate trough or basin bounded on both sides by high-angle, normal faults that dip towards the interior of the trough. It is a structural form that may or may not be geomorphically expressed as a rift valley. Compare - horst.

gravel pit - A depression, ditch or pit excavated to furnish gravel for roads or other construction purposes; a type of borrow pit.

ground soil - Any soil at the present-day land surface and actively undergoing pedogenesis,

gulch - (colloquial: western US.; not preferred - refer to ravine) A small stream channel, narrow and steep-sided in cross section, and larger than a gully, cut in unconsolidated materials. General synonym - ravine. Compare - arroyo, draw, gully, wash.

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gully - A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water usually during and immediately following heavy rains or ice / snow melt. A gully generally is an obstacle to wheeled vehicles and too deep (e.g., > 0.5 m) to be obliterated by ordinary tillage; (a rill is of lesser depth and can be smoothed over by ordinary tillage). Compare - rill, ravine, arroyo, swale, draw.

hanging valley - A tributary valley whose floor at the lower end is notably higher than the floor of the main valley in the area of junction.

head slope - A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway, resulting in converging overland water flow (e.g. sheet wash); head slopes are dominated by colluvium and slope wash sediments (e.g., slope alluvium); contour lines form concave curves. Slope complexity (downslope shape) can range from simple to complex. Headslopes are comparatively moister portions of hillslopes and tend to accumulate sediments (e.g., cummulic profiles) where they are not directly contributing materials to channel flow. Compare - side slope, nose slope, free face, interfluve, crest, base slope.

headwall - A steep slope at the head of a valley; e.g. the rock cliff at the back of a cirque. Compare - cirque headwall.

high hill - A generic name for an elevated, generally rounded land surface with high local relief, rising between 90 meters (approx. 300 ft.) to as much as 300 m (approx. 1000 ft.) above surrounding lowlands. Compare - low hill, hill, hillock.

hill - A generic term for an elevated area of the land surface, rising at least 30 m (100 ft.) to as much as 300 meters (approx. 1000 ft.) above surrounding lowlands, usually with a nominal summit area relative to bounding slopes, a well-defined, rounded outline and slopes that generally exceed 15 percent. A hill can occur as a single, isolated mass or in a group. A hill can be further specified based on the magnitude of local relief: ***low hill*** (30 - 90 m) or ***high hill*** (90 - 300 m). Informal distinctions between a hill and a mountain are often arbitrary and dependent on local convention. Compare - hillock, plateau, mountain, foothills, hills.

hillock - A generic name for a small, low hill, generally between 3 - 30 m in height and slopes between 5 and 50% (e.g., bigger than a mound but smaller than a hill); commonly considered a microfeature. Compare - mound, hill.

hillslope - A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of the hill. Compare - mountain slope.

hogback - A sharp-crested, symmetric (homoclinal) ridge formed by highly tilted resistant rock layers; produced by differential erosion of interlayered resistant and weak rocks with dips greater than about 25 degrees (45 percent). Compare - cuesta.

hoodoo - A bizarrely shaped column, pinnacle, or pillar of rock produced by differential weathering or erosion in a region of sporadically heavy rainfall. Formation is facilitated by joints and layers of varying hardness. Compare - earth pillar.

horst - An elongate block that is bounded on both sides by normal faults that dip away from the interior of the horst. It is a structural form and may or may not be expressed geomorphically.

hummock - (a) (not preferred - see hillock). An imprecise, general term for a rounded or conical mound or other small elevation. (b) (not preferred) A slight rise of ground above a level surface.

impact crater - a) A generally circular or elliptical depression formed by hypervelocity impact of an experimental projectile or ordinance into earthy or rock material. Compare - caldera, crater, meteorite crater. SW; b) (not recommended - use meteorite crater) A generally circular crater formed by the impact of an interplanetary body (projectile) on a planetary surface.

inset fan - (colloquial; western US) The flood plain of an ephemeral stream that is confined between fan remnants, ballenas, basin-floor remnants, or closely-opposed fan toeslopes of a basin.

interdune - The relatively flat surface, whether sand-free or sand-covered, between dunes. GG

interfluve - A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways. Compare - divide.

intermittent stream - A stream, or reach of a stream, that does not flow year-round (commonly dry for 3 or more months out of 12) and whose channel is generally below the local water table; it flows only when it receives a) base flow (i.e. solely during wet periods),

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or b) ground-water discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources. Compare - ephemeral stream.

island - (a) Land completely surrounded by water; (b) An elevated area of land surrounded by swamp, or marsh, or isolated at high water or during floods. Compare - barrier island.

knob - (a) A rounded eminence, a small hill or mountain; especially a prominent or isolated hill with steep sides, commonly found in the Southern United States. (b) A peak or other projection from the top of a hill or mountain. Also, a boulder or group of boulders or an area of resistant rocks protruding from the side of a hill or mountain. Compare - stack.

knoll - A small, low, rounded hill rising above adjacent landforms.

lake - An inland body of permanent standing water, fresh or saline, occupying a depression, generally of appreciable size (larger than a pond) and too deep to permit vegetation (excluding subaqueous vegetation) to take not completely across the expanse of water.

lakebed - (a) The flat to gently undulating ground underlain or composed of fine-grained sediments deposited in a former lake. (b) The bottom of a lake; a lake basin.

lakeshore - The narrow strip of land in contact with or bordering a lake; especially a beach.

landslide - A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials, caused by gravitational forces and which may or may not involve saturated materials. Names of landslide types generally reflect the dominant process and/or the resultant landform. The main operational categories of mass movement are *fall* (rockfall, soil fall, topple), *slide* (rotational landslide, block glide, debris slide, lateral spread), *flow* [rock fragment flow (especially rockfall avalanche), debris avalanche, debris flow (e.g., lahar), earthflow, (creep, mudflow)], and *complex landslides*. Compare - solifluction.

ledge - (a) A narrow shelf or projection of rock, much longer than wide, formed on a rock wall or cliff face, as along a coast by differential wave action on softer rocks; erosion is by combined biological and chemical weathering. (b) A rocky outcrop; solid rock. (c) A shelf-like quarry exposure or natural rock outcrop. Compare - structural bench.

levee - An artificial or natural embankment built along the margin of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel. Compare artificial levee, natural levee.

longitudinal dune - A long, narrow sand dune, usually symmetrical in cross profile, oriented parallel to the prevailing wind direction; it is wider and steeper on the windward side but tapers to a point on the lee side. It commonly forms behind an obstacle in an area where sand is abundant and the wind is strong and constant. Such dunes can be a few meters high and up to 100 km long. Compare - seif dune, transverse dune.

low hill - A generic name for an elevated, generally rounded land surface with low local relief, rising between 30 meters (100 ft.) to as much as 90 m (approx. 300 ft.) above surrounding lowlands. Compare - high hill, hill, hillock.

lowland - (a) A generic, imprecise term for low-lying land or an extensive region of low-lying land, especially near a coast and including the extended plains or country lying not far above tide level. (b) (not preferred) A generic, imprecise term for a landscape of low, comparatively level ground of a region or local area, in contrast with the adjacent higher country. (c) (not recommended - use valley, bolson, etc.) A generic term for a large valley. Compare - upland.

marsh - Periodically wet or continually flooded areas with the surface not deeply submerged. Covered dominantly with sedges, cattails, rushes, or other hydrophytic plants. Compare - salt marsh, swamp, bog, fen.

meander belt - The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops. Landform components of the meander-belt surface are produced by a combination of gradual (lateral and down-valley) migration of meander loops and avulsive channel shifts causing abrupt cut-offs of loop segments. Landforms flanking the sinuous stream channel include: point bars, abandoned meanders, meander scrolls, oxbow lakes, natural levees, and flood-plain splays. Meander belts may not exhibit prominent natural levee or splay forms. Flood plains of broad valleys may contain one or more abandoned meander belts in addition to the zone flanking the active stream channel.

meander scar - (a) A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream which impinged upon and undercut the bluff; if it's no longer adjacent to the modern stream channel it indicates an abandoned route of the stream; (b) (not recommended - refer to oxbow) An abandoned meander, commonly filled in by deposition and vegetation, but still discernable.

meander scroll - (a) One of a series of long, parallel, close fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank. Compare - meander belt, point bar. (b) (not recommended; refer to oxbow lake) - A small, elongate lake on a flood plain in a well-defined part of an abandoned stream channel.

mesa - A broad, nearly flat-topped, and usually isolated landmass bounded by steep slopes or precipitous cliff and capped by layers of resistant, nearly horizontal, rocky summit width greater than the height of bounding escarpments. (Colloquial: western US; not preferred) Also used to designate broad structural benches and alluvial terraces that occupy intermediate levels in stepped sequences of platforms bordering canyons and valleys. Compare - butte, plateau, cuesta.

monocline - (a) A unit of folded strata that dips from the horizontal in one direction only, is not part of an anticline or syncline, and occurs at the earth's surface.. This structure is typically present in plateau areas where nearly flat strata locally assume steep dips caused by differential vertical movements without faulting. Compare - anticline, syncline, fold. (b) - A local steepening in an otherwise uniform gentle dip.

mountain - A generic term for an elevated area of the land surface, rising more than 300 meters above surrounding lowlands, usually with a nominal summit area relative to bounding slopes and generally with steep sides (greater than 25 percent slope) with or without considerable bare-rock exposed. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by tectonic activity and/or volcanic action and secondarily by differential erosion. Compare - hill, hillock, plateau, foothills, mountains.

natural levee - A long, broad low ridge or embankment of sand and coarse silt, built by a stream on its flood plain and along both sides of its channel, especially in time of flood when water overflowing the normal banks is forced to deposit the coarsest part of its load. It has a gentle slope away from the river and toward the surrounding floodplain, and its highest elevation is closest to the river bank. Compare - levee, artificial levee, meander belt.

open depression - A generic name for any enclosed or low area that has a surface drainage outlet whereby surface water can leave the enclosure; an area of lower ground indicated on a topographic map by contour lines forming an incomplete loop or basin indicating at least one surface exit. Compare - closed basin.

overbank deposit - Fine-grained sediments (silt and clay) deposited from suspension on a flood plain by floodwaters that cannot be contained within the stream channel.

overflow stream channel - A watercourse that is generally dry but conducts flood waters that have overflowed the banks of a river, commonly from large storms or annual meltwater.

oxbow - A closely looping stream meander having an extreme curvature such that only a neck of land is left between the two parts of the stream. (colloquial: northeastern A.) the land enclosed, or partly enclosed, within an oxbow. Compare - meander belt, oxbow lake, bayou.

oxbow lake - The crescent-shaped, often ephemeral body of standing water situated by the side of a stream in the abandoned channel (oxbow) of a meander after the stream formed a neck cutoff and the ends of the original bend were silted up. Compare - meander belt, oxbow.

parabolic dune - A sand dune with a long, scoop-shaped form, convex in the downwind direction so that its horns point upwind, whose ground plan, when perfectly developed, approximates the form of a parabola.

peak - Sharp or rugged upward extension of a ridge chain, usually at the junction of two or more ridges; the prominent highest point of a summit area.

pediment - A gently sloping erosional surface at the foot of a receding hill or mountain slope. The surface may be essentially bare, exposing earth material that extends beneath adjacent uplands; or it may be thinly mantled with alluvium and colluvium, ultimately in transit from upland front to basin or valley lowland. In hill-foot slope terrain the mantle is designated "pedisediment." The term has been used in several geomorphic contexts: Pediments may be classed with respect to (a) landscape positions, for example, intermontane-basin piedmont or valley-border footslope surfaces (respectively, apron and terrace pediments); (b) type of material eroded, bedrock or regolith; or (c) combinations of the above. Compare - Piedmont slope.

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perennial stream - A stream or reach of a stream that flows continuously throughout the year and whose surface is generally lower than the water table adjacent to the region adjoining the stream. Compare - Ephemeral stream, Intermittent stream.

piedmont - (adjective) Lying or formed at the base of a mountain or mountain range; e.g., a piedmont terrace or a piedmont pediment. (noun) An area, plain, slope, glacier, or other feature at the base of a mountain; e.g., a foothill or a bajada. In the United States, the Piedmont is a low plateau extending from New Jersey to Alabama and lying east of the Appalachian Mountains.

piedmont slope - (colloquial - western US) The dominant gentle slope at the foot of a mountain; generally used in terms of intermontane-basin terrain in arid to subhumid regions. Main components include: (a) An erosional surface on bedrock adjacent to the receding mountain front (pediment, rock pediment); (b) A constructional surface comprising individual alluvial fans and interfan valleys, also near the mountain front; and (c) A distal complex of coalescent fans (bajada), and alluvial slopes without fan form. Piedmont slopes grade to basin-floor depressions with alluvial and temporary lake plains or to surfaces associated with through drainage (e.g., axial streams). Compare - bolson, fan piedmont.

plain - A general term referring to any flat, lowland area, large or small, at a low elevation. Specifically, any extensive region of comparatively smooth and level gently undulating land. A plain has few or no prominent hills or valleys but sometimes has considerable slope, and usually occurs at low elevation relative to surrounding areas. Where dissected, remnants of a plain can form the local uplands. A plain may be forested or bare of trees and may be formed by deposition or erosion. Compare - lowland, plateau.

plateau - A comparatively flat area of great extent and elevation; specifically an extensive land region considerably elevated (more than 100 meters) above adjacent lower-lying terrain, and is commonly limited on at least one side by an abrupt descent, has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level. Compare - hill, foothill, mountain, mesa, plain.

playa - The usually dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those occurring on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation-runoff events. Playa deposits are fine grained and may or may not have high water table and saline conditions.

point bar - One of a series of low, arcuate ridges of sand and gravel developed on the inside of a growing meander by the slow addition of individual accretions accompanying migration of the channel toward the outer bank. Compare - meander scroll.

pond - (a) A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger than a pool. (b) A small artificial body of water, used as a source of water. Compare - salt pond.

pool - A small, natural body of standing water, usually fresh; e.g. a stagnant body of water in a marsh, or a transient puddle in a depression following a rain.

quarry - Excavation areas, open to the sky, usually for the extraction of stone.

ravine - A small stream channel; narrow, steep-sided, commonly V-shaped in cross section and larger than a gully, cut in unconsolidated materials. General synonym (not preferred) - gulch. Compare - arroyo, draw, gully.

reef - (a) A ridge-like or mound-like structure, layered or massive, built by sedentary calcareous organisms, especially corals, and consisting mostly of their remains; it is wave-resistant and stands above the surrounding contemporaneously deposited sediment. Also, such a structure built in the geologic past and now enclosed in rock, commonly of differing lithology. (b) A mass or ridge of rocks, especially coral and sometimes sand, gravel, or shells, rising above the surrounding sea or lake bottom to or nearly to the surface, and dangerous to navigation; specifically such a feature at 10 fathoms (18.3 m) or less, formerly 6 fathoms (11 m).

ridge - A long, narrow elevation of the land, usually sharp crested with steep sides and forming an extended upland between valleys. The term is used in areas of both hill and mountain relief.

rill - A very small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water, usually during and immediately following moderate rains or after ice/snow melt. Generally, a rill is not an obstacle to wheeled vehicles and is shallow enough to be obliterated by ordinary tillage. Compare - gully.

rim - The border, margin, edge, or face of a landform, such as the curved brim surrounding the top part of a crater or caldera; specifically the rimrock of a plateau or canyon.

rise - (refer to lake plain) (a) A general term for a slight increase in slope and elevation of the land surface, usually with a broad summit and gently sloping sides. (b) same as (a) but the term is restricted to microfeatures in areas of very low relief such as lake plains or coastal plains.

river - (a) A general term for a natural, freshwater surface stream of considerable volume and generally with a permanent base flow, moving in a defined channel toward a larger river, lake, or sea. (b) (not recommended: colloquial - New England, US) A small watercourse which elsewhere in the US is known as a *creek*. Compare - stream.

river valley - an elongate depression of the Earth's surface; carved by a river during the course of it's development. Compare - valley side, valley floor.

rockfall - The process, associated sediments (rockfall deposit) or resultant landform characterized by a very rapid type of *fall* dominated by downslope movement of detached rock bodies which fall freely through the air or by leaps and bounds (lacks an underlying slip face); also spelled rock fall. Compare - debris fall, soil fall, landslide.

rock pediment - An erosion surface of low relief, cut directly into and across bedrock and composed of either bare rock or thinly veneered pedisediment or residuum (e.g. < 1.5 m) over bedrock; it occurs along the flanks of mountain fronts, or at the base of mountains or high hills. Its surface grades to the backwearing mountain slopes or hillslopes above, and generally grades down to and merges with a lower-lying alluvial plain, piedmont slope or valley floor below.

rotational slide - The process, associated sediments (rotational landslide deposit) or resultant landforms characterized by an extremely slow to moderately rapid type of slide, composed of comparatively dry and largely soil-rock materials, portions of which remain largely intact and in which movement occurs along a well-defined, concave shear surface and resulting in a backward rotation of the displaced mass. The landform may be single, successive (repeated up and down slope), or multiple (as the number of slide components increase). Compare - rotational debris slide, rotational earth slide, rotational rock slide, translational slide, lateral spread, landslide.

rubble - An accumulation of loose angular rock fragments, commonly overlying outcropping rock; the unconsolidated equivalent of a breccia. Compare - scree, talus.

saddle - A low point on a ridge or interfluve, generally a divide (pass, col) between the heads of streams flowing in opposite directions. Compare - summit, crest.

sandhills - A region of semi-stabilized sand dunes or sandy hills, either covered with vegetation or bare, as in north-central Nebraska and the midlands of the Carolinas.

sand plain - (a) A sand-covered plain which may originate by deflation of sand dunes, and who's lower limit of erosion is governed by the ground-water level. Also spelled *sandplain*. (b) (not preferred - refer to *sandy* outwash plain) A small outwash plain composed chiefly of sand deposited by meltwater streams flowing from a glacier.

sand ramp - A sand sheet blown up onto the lower slopes of a bedrock hill or mountain and forming an inclined plane, sometimes filling small mountain-side valleys and even crossing low passes. Compare - climbing dune, sand sheet.

sand sheet - A large, irregularly shaped, commonly thin, surficial mantle of eolian sand, lacking the discernible slip faces that are common on dunes.

scarp - An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or structural bench. A scarp may be of any height. Compare - escarpment.

scarp slope - The relatively steeper face of a cuesta, facing in a direction opposite to the dip of the strata. Compare - dip slope.

scree - A collective term for an accumulation of coarse rock debris or a sheet of coarse debris mantling a slope. Scree is not a synonym of talus, as scree includes loose, coarse fragment material on slopes without cliffs. Compare - talus, colluvium, mass movement.

scree slope - A portion of a hillside or mountainslope mantled by scree and lacking an up-slope rockfall source (i.e. cliff). Compare - talus slope, scree, talus.

seep - (noun) An area, generally small, where water or oil percolates slowly to the land surface. For water, it may be considered as a seepage spring, but it is used by some for flows too small to be considered as springs.

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shoulder - The hillslope profile position that forms the convex, erosional surface near the top of a hillslope. If present, it comprises the transition zone from summit to backslope. Compare - summit, crest, backslope, footslope, and toeslope.

shrub-coppice dune - A small, streamlined dune that forms around brush and clump vegetation.

side slope - A laterally planar area of a hillside, resulting in predominantly parallel overland water flow (e.g., sheet wash); contour lines generally form straight lines. Side slopes are dominated by colluvium and slope wash sediments. Slope complexity (downslope shape) can range from simple to complex. Compare - head slope, nose slope, free face, interfluve, crest, base slope. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluve. It is generally linear along the slope width.

slide - (a) Mass movement processes, associated sediments (slide deposit) or resultant landforms (e.g., rotational, translational, and snow slide) characterized by a failure of earth, snow, or rock under shear stress along one or several surfaces that are either visible or may reasonably be inferred. The moving mass may or may not be greatly deformed, and movement may be rotational (rotational slide) or planar (translational slide). A slide can result from lateral erosion, lateral pressure, weight of overlying material, accumulation of moisture, earthquakes, expansion owing to freeze-thaw of water in cracks, regional tilting, undermining, fire, and human agencies. Compare -fall, topple, lateral spread, flow, complex landslide. (b) The track of bare rock or furrowed earth left by a slide. (c) The mass of material moved by or deposited by a slide.

slip face - The steeply sloping surface of a dune, standing at or near the angle of repose of loose sand, and advancing downwind by a succession of slides wherever that angle is exceeded.

slope - (also called slope gradient or gradient) The inclination of the land surface from the horizontal. Percent slope is the vertical distance divided by the horizontal distance, then multiplied by 100.

slope alluvium - Sediment gradually transported down mountain or hill slopes primarily by non-channel alluvial processes (i.e., slope wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of coarse fragments and may be separated by stone lines. Sorting of pebbles or cobbles and burnished peds distinguish these materials from unsorted colluvial deposits. Compare - colluvium, slope wash.

slope wash - A collective term for non-fluvial, incipient alluvial *processes* (e.g. overland flow, minor rills) that detach, transport, and deposit sediments down hill and mountain slopes. Related sediments (*slope alluvium*) exhibit nominal sorting or rounding of particles, peds, etc., and lateral sorting downslope on long slopes; stratification is crude and intermittent and readily destroyed by pedoturbation and frost action. Also called *slope wash processes*. Compare - slope alluvium, colluvium, valley-side alluvium.

slot canyon - A long, narrow, deep and tortuous channel or drainageway with sheer rock walls eroded into sandstone or other sedimentary rocks, especially in the semi-arid western US (e.g. Colorado Plateau); subject to flash flood events; depth to width ratios exceed 10:1 over most of its length and can approach 100:1; commonly containing unique ecological communities distinct from the adjacent, drier uplands.

strath terrace - A type of stream terrace, formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

stream - (a) A body of running water that moves under gravity to progressively lower levels, in a relatively narrow but clearly defined channel on the ground surface, in a subterranean cavern, or beneath or in a glacier. It is a mixture of water and dissolved, suspended, or entrained matter. (b) A term used in quantitative geomorphology interchangeably with channel. Compare - river.

stream terrace - One or a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition (i.e., currently very rarely or never floods; inactive cut and fill and/or scour and fill processes). Erosional surfaces cut into bedrock and thinly mantled with stream deposits (alluvium) are called "strath terraces." Remnants of constructional valley floors thickly mantled with alluvium are called alluvial terraces. Compare - alluvial terrace, flood-plain step, strath terrace, terrace.

strike valley - A subsequent valley eroded in, and developed parallel to the strike of, underlying weak strata; such as a cuesta; a valley that often, but not necessarily contains a strike valley.

structural bench - A platform-like, nearly level to gently inclined erosional surface developed on resistant strata in areas where valleys are cut in alternating strong and weak layers with an essentially horizontal attitude. Structural benches are bedrock controlled,

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and in contrast to stream terraces, have no geomorphic implication of former, partial erosion cycles and base-level controls, nor do they represent a stage of flood-plain development following an episode of valley trenching. Compare - pediment, ledge; see scarp.

summit - (a) The topographically highest position of a hillslope profile with a nearly level (planar or only slightly convex) surface. Compare - shoulder, backslope, footslope, and toeslope, crest. (b) A general term for the top, or highest area of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluve area of relatively gentle slope that is flanked by steeper slopes, e.g., mountain fronts or tableland escarpments.

swale - (a) A shallow, open depression in unconsolidated materials which lacks a defined channel but can funnel overland or subsurface flow into a drainageway. Soils in swales tend to be more moist and thicker (cummulic) compared to surrounding soils. (b) A small, shallow, typically closed depression in an undulating ground moraine formed by uneven glacial deposition; Compare - swell-and-swale topography. (c) (not preferred; refer to interdune) A long, narrow, generally shallow, trough-like depression between two beach ridges, and aligned roughly parallel to the coastline.

syncline - (a) A unit of folded strata that is concave upward whose core contains the stratigraphically younger rocks, and occurs at the earth's surface. In a single syncline, beds forming the opposing limbs of the fold dip toward its axial plane. Compare - monocline, syncline, fold. (b) A fold, at any depth, generally concave upward whose core contains the stratigraphically younger rocks.

tableland - A term for a broad upland with an extensive, nearly level or undulating summit area and steep side slopes descending to surrounding lowlands. Compare - plateau, mesa, cuesta.

talus - Rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of loose broken rock formed chiefly by falling, rolling, or sliding. Compare - talus slope, colluvium, mass movement, scree.

talus cone - A small, steep, cone-shaped landform at the base of a cliff or escarpment, that heads in a relatively small declivity or ravine, and composed of poorly sorted rock and soil debris that has accumulated primarily by episodic rockfall or, to a lesser degree, by slope wash. Not to be confused with an *alluvial cone*, a similar feature but of fluvial origin, composed of better stratified and more sorted material, and that tapers up into a more extensive drainageway. Compare - alluvial cone, beveled base, talus slope.

talus slope - a portion of a hillslope or mountainslope mantled by talus and lying below a rockfall source (e.g. cliff). Compare - scree slope, scree, talus. Compare - beveled base.

tank - (colloquial: southwestern US) A natural depression or cavity in impervious rocks in which water collects and remains for the greater part of the year.

terrace - A step-like surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, or lake or sea shore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper slope (scarp, riser), descending to a lower base level. Compare - stream terrace, flood-plain step. Practically, terraces are considered to be generally flat alluvial areas above the 100 yr. flood stage.

terracettes - Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock such as sheep or cattle. Synonyms (not preferred) - catstep, sheep or cattle track.

toeslope - The hillslope position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear, and are constructional surfaces forming the lower part of a hill-slope continuum that grades to valley or closed-depression floors. Compare - summit, shoulder, backslope, footslope, valley floor.

translational slide - A category of mass movement processes, associated sediments (translational slide deposit) or resultant landforms characterized by the extremely slow to moderately rapid downslope displacement of comparatively dry soil-rock material on a surface (slip face) that is roughly parallel to the general ground surface, in contrast to falls, topples, and rotational slides. The term includes such diverse *slide* types as translational debris slides, translational earth slide, translational rock slide, block glides, and slab or flake slides. Compare - rotational slide, slide, landslide.

transverse dune - A very asymmetric sand dune elongated perpendicular to the prevailing wind direction, having a gentle windward slope and a steep leeward slope standing at or near the angle of repose of sand; it generally forms in areas of sparse vegetation. Compare - longitudinal dune.

valley - An elongate, relatively large, externally drained depression of the Earth's surface that is primarily developed by stream erosion or glacial activity. Compare - basin.

valley floor - A general term for the nearly level to gently sloping, lowest surface of a valley. Landforms include axial stream channels, the flood plain, flood-plain steps, and, in some areas, low terrace surfaces. Compare - flood-plain landforms, meander, braided channel, valley side.

valley side - The sloping to very steep surfaces between the valley floor and summits of adjacent uplands. Well-defined, steep valley sides have been termed valley walls (not recommended). Note: Scale, relief, and perspective may require use of closely related terms such as hill slope or mountain slope.

wash (dry wash) - (colloquial: western US.) The broad, flat- floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium. Note: When channels reach intersect zones of ground-water discharge they are more properly classed as "intermittent stream" channels. Synonym - arroyo. Compare - gully.

zibar - A small, low-relief sand dune that lacks discernible slip faces and commonly occurs on sand sheets, in interdune areas, or in corridors between larger dunes. Zibar spacing can range from 50-400 m with local relief < 10 m. Unlike coppice dunes, zibars are unrelated to deposition around vegetation. Generally dominated by coarse sand. Compare - dune, coppice dune.

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CONSIDERATIONS FOR PLANNING

Planning for the day:

1. Safety and sustenance: Plenty of food, water, first-aid kit, raingear, sunscreen.
2. Field communications:
   a. Develop a plan with team-mate for check-in time.
   b. Does park staff know the area in which you will be working?
3. Make sure you have the right maps and photos.
4. Check your GPS receiver (Datum set to NAD83? WAAS on? Needs new batteries?).
5. Plan the day's mission before departing using a) USGS quads, b) aerial photos, c) Park/BLM/FS maps.
6. Considerations for mission planning:
   a. Plan travel based on topography, best access routes, density and complexity of vegetation (more time for forest and woodland sites, less for herbaceous and shrub).
   b. Plan data collection based on priority needs; new types get higher priority.
   c. Communicate to make sure you aren't duplicating effort when unnecessary.

Planning for the Week (do this on the first day of the trip)

1. Do you have all appropriate maps, photos?
2. Develop a reasonable estimate of the number of plots for each team broken up by day and based on an estimate of individual team's travel logistics for the week.
3. Develop plan of attack for the week to capture all essential associations in the work area.
4. Balance points two and three above with the expected work schedule of the teams and ensure adequate time-off and reduce over-time concerns.
5. Do you have all necessary information and backups for the week's planning? E.g., blank field forms, film, plenty of batteries.

Wrapup

1. Clean, recharge and repair equipment.
2. Hold brief meeting to discuss data collection issues, things that came up during the day/week, and plan for next days activities.
3. Edit field forms and file them systematically.
4. Re-file the aerial photos and maps.
5. Download flashcards.
6. Key unknown plants.
7. Enter edited data into database.

Communicate among teams / Topics for wrap-up meetings.

1. What were your questions about the sites visited daily/weekly?
2. Do you have any questions about the forms or fields?
3. What was accomplished, what was not accomplished?
4. Pass on developments and questions, e.g., were there problems with interpreting the aerial photos, or are there personnel issues, problems in consistency in interpreting the forms, or with park-related logistics?

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Materials Checklist

- Site research permit
- Topo maps
- Site maps for general navigation
- Digital orthophoto for easy reference
- Geology map
- Aerial photos
- Compass with adjustable declination
- Clinometer
- GPS receiver
- Plenty of AA batteries for GPS receivers, walkie talkies, etc.
- Radio or walkie talkie and/or cell phone
- Digital camera and flash cards
- Baggies for temporary storage of unknown plants, and masking tape for labeling
- Plant press & paper
- Plant Keys / Flora(s)
- Pens / sharpies
- Forms: observation point
- Clipboard/forms holder
- Pens, pencils, pencil lead, slate board, chalk, and chalkboard eraser
- Most recent version of provisional classification of the park
- All ancillary information (cheat sheet, species list, floras, main sampling protocol).
- First aid kit, personal gear (food, water, rain gear, etc.)

BIOLOGICAL SURVEY
ATTACHMENT B

ARIZONA PLANT PROTECTION DOCUMENTS

Arizona's Native Plants Administrative Rules and Laws

Department Statutes

3-901	Definitions
3-902	Administration and enforcement
3-903	Protected group of plants; botanical names govern; categories of protected plants; power to add or remove plants; annual hearing
3-904	Destruction of protected plants by private landowners; notice; exception
3-905	Destruction of protected plants by state
3-906	Collection and salvage of protected plants; procedures, permits, tags and seals; duration; exception
3-907	Cutting or removal of harvest restricted plants for their by-products, fiber or wood; procedures; exceptions
3-908	Prohibited acts; use of permits, tags, seals and receipts
3-909	Shipment of plants; exhibition of permit and certificate of inspection to carrier; sale of highly safeguarded plants
3-910	Compiling information; reports; native plant surveys; investigations; technical advisory board
3-911	Conservation and public education
3-912	Rules; additional notice requirements
3-913	Fiscal provisions; fees; Arizona protected native plant fund
3-914	Board of supervisors; power to preserve plants
3-915	Exemptions
3-916	Salvage of native plants by homeowners' association or other nonprofit organization; definition

3-901. Definitions

In this chapter, unless the context otherwise requires:

1. "Associate director" means the associate director of the division.
2. "Division" means the environmental services division of the Arizona department of agriculture.
3. "State agency" means any agency or political subdivision of the state.
4. "State land" includes land owned by this state or by a state agency.

3-902. Administration and enforcement

The director shall administer and oversee the enforcement of this chapter.

3-903. Protected group of plants; botanical names govern; categories of protected plants; power to add or remove plants; annual hearing

A. The protected group of native plants shall include, and protected native plants shall be, any plant or part of a plant, except, unless otherwise specifically included, its seeds or fruit, which is growing wild on state land or public land or on privately owned land without being propagated or cultivated by human beings and which is included by the director on any of the definitive lists of protected categories of protected native plants described in this section. The director by definitive lists may divide any protected category into subcategories which are to receive different treatment under the rules adopted under this article to conserve or protect such plants. In the preparation of each list of plants within a protected category or subcategory the director shall list by botanical names all of those protected plants which are to fall within the protection of that category or subcategory. The botanical names of the listed plants govern in all cases in the interpretation of this article and any rules adopted under this article.

B. The director shall establish by rule the lists of plants in the following categories of protected native plants:
1. Highly safeguarded native plants to be afforded the exclusive protections, including the use of scientific or threatened collection and salvage permits, provided this category in this chapter. This category includes those species of native plants and parts of plants, including the seeds and fruit, whose prospects for survival in this state are in jeopardy or which are in danger of extinction throughout all or a significant portion of their ranges, and those native plants which are likely within the foreseeable future to become jeopardized or in danger of extinction throughout all or a significant portion of their ranges. This category also includes those plants resident to this state and listed as endangered, threatened, or category 1 in the federal endangered species act of 1973 (P.L. 93-205; 87 Stat. 884; 16 United States Code sections 1531 et seq.), as amended, and any regulations adopted under that act.
2. Salvage restricted native plants to be afforded the exclusive protections involving the use of salvage permits, tags and seals provided in this chapter. This category includes those native plants which are not included in the highly safeguarded category but are nevertheless subject to a high potential for damage by theft or vandalism.
3. Salvage assessed native plants to be afforded the exclusive protections, involving the use of salvage tags and seals and annual salvage permits, provided in this chapter. This category includes those native plants which are not included in either the highly safeguarded or salvage restricted categories but nevertheless have a sufficient value if salvaged to support the cost of salvage tags and seals.
4. Harvest restricted native plants to be afforded the exclusive protections involving the use of harvest permits and wood receipts provided in this chapter. This category includes those native plants which are not included in the highly safeguarded category but are subject to excessive harvesting or overcutting because of the intrinsic value of their by-products, fiber or woody parts.

C. The director by rule may add or remove a native plant to or from the protected group or any of the categories of protected native plants.

D. The director shall hold a public hearing on native plants at least every twelve months after giving notice as required by section 3-912, subsection B.

3-904. Destruction of protected plants by private landowners; notice; exception

A. This chapter does not prevent the destruction of protected native plants or clearing of land or cleaning or removing protected native plants by the owner of the land or the owner's agent if:
1. The land is in private ownership.
2. The protected native plants are not transported from the land or offered for sale.
3. The owner or the owner's agent notifies the department pursuant to this section of the intended destruction at least:
(a) Twenty days before the plants are destroyed over an area of less than one acre.

(b) Thirty days before the plants are destroyed over an area of one acre or more but less than forty acres.
(c) Sixty days before the plants are destroyed over an area of forty acres or more.
4. The protected plants are destroyed within one year of the date of destruction disclosed in the notice given the department in paragraph 3 of this subsection.

B. The notice under subsection A, paragraph 3, subdivision (a) may be oral or written. The notice under subsection A, paragraph 3, subdivisions (b) and (c) must be in writing. The notice under subsection A, paragraph 3, whether written or oral, shall include:
1. The name and address of the owner of the land and, if the owner is not a resident of this state, the name and address of the owner's agent in this state to be contacted regarding the destruction or salvage of the native plants.
2. The earliest date that destruction of the protected native plants will begin.
3. A general description of the area in which the protected native plants will be destroyed.
4. Whether the owner intends to allow salvage of the plants to be destroyed.

C. The director by rule shall:
1. Prescribe the form and content of the notice that shall be adequate and comply with subsection B and shall provide landowners with copies of the notice on request.
2. Provide for an alternative procedure in cases in which the landowner is not required to notify the department in writing. The alternative procedure shall include:
(a) Oral notification by the landowners to the department.
(b) Preparation by the department of a written notice form. The department shall transmit a confirming copy to the landowner, and the owner may not begin destruction of protected native plants until the owner receives the written confirmation and the time prescribed under subsection A, paragraph 3 has elapsed.

D. The written notice form, whether completed by the landowner or the department, shall include the following notice in bold-faced type:
Notice: Consent of the landowner is required before entering any lands described in this notice.

E. Within five working days after receiving the notice required under this section the department shall post a copy of the notice in a conspicuous location in the public area of the division office that administers the department activities in the county where the land is located on which the native plants are to be destroyed. The division shall also mail a copy of the notice to any salvage operator or interested party that has requested notice of such activities occurring during the current calendar year. The director by rule may establish and the associate director shall collect a reasonable fee from those receiving copies of the notice to cover the cost of providing this notice.

F. If the department receives a notice of intended destruction under subsection A, paragraph 3 and subsequently receives a complete and correct application for a salvage permit executed by the owner of the land or the owner's agent for any highly safeguarded or salvage restricted native plants intended to be destroyed under the notice, the department shall facilitate the prompt salvage of the plants by issuing a permit, and any associated tags and seals, within four working days.

G. The notice requirements of subsection A, paragraph 3 do not apply to the destruction of native plants that occurs in the normal course of mining, commercial farming and stock raising operations.

H. This section does not apply to the destruction of protected native plants on individually owned residential property of ten acres or less where initial construction has already occurred.

3-905. Destruction of protected plants by state

A. Except in an emergency, if a state agency proposes to remove or destroy protected native plants over an area of state land exceeding one-fourth acre, the agency shall notify the department in writing as provided in section 3-904 at least sixty days before the plants are destroyed, and any such destruction must occur within one year of the date of destruction disclosed in the notice. The department shall post and disseminate copies of the notice as provided in section 3-904, subsection E. This state and its agencies and political subdivisions are exempt from any fees established for salvaged plants.

B. If the director determines that the proposed action by the state agency may affect a highly safeguarded plant, he shall consult with the state agency and other appropriate parties and use the best scientific data available to issue a written finding as to whether the proposed action would appreciably reduce the likelihood of survival or recovery of the plant taxon in this state. If the determination is affirmative, the director shall also specify reasonable, prudent and distinct alternatives to the proposed project that can be implemented and are consistent with conserving the plant taxon.

C. The director shall adopt rules for the disposal and salvage of native plants subject to removal or destruction by a state agency either under permit to other government agencies or nonprofit organizations or sale to the general public or commercial dealers. The department may issue permits to donate, sell, salvage or harvest the plants after the it ascertains the validity of the request and determines the kinds and approximate number of the plants involved. The permit shall specify the number and species of protected native plants and the area from which they may be taken.

3-906. Collection and salvage of protected plants; procedures, permits, tags and seals; duration; exception

A. Except as provided in this chapter a person shall not take, transport or possess any protected native plant taken from the original growing site in this state without possessing a valid permit issued by the division. The division shall issue permits in either a name or business name. A permit to take, transport or possess native plants is nontransferable, except that a permittee, by subcontract or otherwise, may allow its agents to work under the permit if the permittee remains primarily responsible for the actions of persons acting under his expressed or implied authority.

B. In addition to the requirements prescribed by this section, a person who moves or salvages a saguaro cactus (cereus giganteus) that is more than four feet tall, from other than its original growing location, must purchase a permit, tag and seal from the department. A person may move a saguaro cactus without obtaining a permit, tag and seal only if the person maintains documentation of a previous legal movement or if the department has record of a previous legal movement of the cactus by the person. Saguaro cacti that are propagated by humans are exempt from the requirements of this subsection.

C. Permits applicable to highly safeguarded native plants may be issued only for collection for scientific purposes or for the noncommercial salvage of highly safeguarded native plants whose existence is threatened by intended destruction, or by their location or by a change in land usage, and if the permit may enhance the survival of the affected species.

D. Permits issued for the salvage of salvage assessed native plants shall be issued for a period of one calendar year without respect to the land from which the plants will later be taken. The associated tags and seals shall be issued individually or in bulk on payment of any fees required under section 3-913, subsection A, without respect to the specific plants for which they will be used. All such tags and seals remain valid for use in subsequent years as long as the permit is renewed.

E. The division shall provide tags and seals for each permit issued for taking, transporting or possessing highly safeguarded, salvage restricted or salvage assessed native plants. The director by rule shall establish procedures and forms for permits, tags and seals to be issued for the collection and salvage of highly safeguarded native plants and the salvage of salvage restricted and salvage assessed native plants. The director by rule may establish and modify the form and character of the tags and seals described in this section. All such tags and seals shall be attached to the plants at the time of taking and before transporting. It is unlawful to remove a tag or seal from a protected native plant that has been taken and tagged pursuant to this article before the plant has been transplanted at its designated site. A tag or seal may be removed only by a designated agent of the division or by the owner of the plant.

F. This section does not apply to the transporting of protected native plants by a landowner or his agent from one of his properties to another if the plants are not offered for sale.

3-907. Cutting or removal of harvest restricted plants for their by-products, fiber or wood; procedures; exceptions

A. The division shall provide harvest or wood permits, and wood receipts with each wood permit, authorizing the taking, transporting or possessing of harvest restricted native plants cut or removed for manufacturing or processing purposes, for their by-products, fiber or wood. It is unlawful for a person to take, transport or possess such a plant for its by-products, fiber or wood if he is not in possession of a permit and any required receipt. A permit or receipt is not transferable by the permittee or his agent, nor may it be used by anyone other than the person to whom it was issued, except that the permittee shall transfer the receipt to the purchaser as proof of ownership of the wood covered by the receipt.

B. A person in possession of a valid permit for the removal of dead plants, wood, fiber or other by-products issued by the United States department of agriculture or the United States department of the interior from lands under the administration of the United States forest service or the United States bureau of land management is exempt from the permit required by subsection A.

C. This chapter shall not be construed to prohibit any person from cutting, removing, transporting or possessing any harvest restricted native plant or part for manufacturing or processing purposes in amounts of one hundred pounds or less, or any such plant or part as wood in amounts of two cords or less in quantity from land owned or leased by that person, other than state-owned land or other public land, or from land if the owner has given written consent to the person to cut, remove, transport or use the plant, or its fiber or wood.

D. This section does not apply to the use of dead wood for branding fires or at permissible camping or cooking sites for camping or cooking fires or cutting, removing, transporting or possessing dead harvest restricted plants or the dead parts from such plants from land owned or leased by that person.

3-908. Prohibited acts; use of permits, tags, seals and receipts

A. Except as provided in this chapter, it is unlawful for a person to destroy, dig up, mutilate, collect, cut, harvest or take any living highly safeguarded native plant or the living parts of any highly safeguarded native plant, including seeds or fruit, or any other living protected native plant or the living parts of any other protected plant, except seeds or fruit, from state land or public land without obtaining any required permit, tags, seals or receipts from the department, or from private land without obtaining written permission from the landowner, and any required permit, tags, seals or receipts from the department. It is unlawful for a person to falsify any paper or document issued to give permission for a person to take native plants of the protected group or to take more protected native plants than authorized by the permit or to take protected native plants from areas other than authorized by the permit.

B. Permits issued for the removal of protected native plants, or any parts of protected native plants, except permits issued for the salvage of salvage assessed native plants, shall be granted only on submission to the division of an application executed by both the landowner or his agent and the party who intends to be the permittee, after being completed by either or both, and are valid for a stated period of time to allow the permittee to remove the specific amount of plants, by-products, fiber or wood stated in the permit, or that period of time stated by the landowner as part of the landowner's permission, whichever is shorter. The permit expires on the termination date shown on the permit, when the tags and seals issued with the permit have been attached to the plants covered by the permit and the plants are no longer in the possession of the permittee or when the receipts have been transferred to the purchaser of the wood covered by the receipts.

C. A permit is valid for taking plants or parts of plants listed on the permit but not removed from the land described in the permit until the permit's expiration or for one year from the date of issuance, whichever occurs first, except that for any permit the tags and seals, or receipts, issued therewith but not yet used by the permittee become invalid if the land on which the plants are growing, and described in the permit, changes ownership, unless the new owner certifies in writing that the permittee may continue taking the plants or parts of plants as specified on the permit.

D. It is unlawful for a person or scientific or educational institution to misuse a permit in any manner. A permittee shall make permits, tags, seals and receipts available for inspection by the department or any peace officer as provided for in this chapter. A tag, seal or receipt is invalid unless it is issued with a valid permit. A permit is invalid unless it bears the required tag numbers or receipt numbers on its face. It is unlawful to alter or deface any permit, tag, seal or receipt.

E. The director may give written permission for a person or a scientific institution to take a definite number of specified plants in a protected group from areas specified by the department for scientific purposes. In addition the director may give written permission for a person to take specific plants or parts of plants not in the highly safeguarded category from areas specified by the department for salvage or for manufacturing or processing purposes or for the cutting or removal of wood and assess reasonable and proper fees for such taking of the plants or parts of the plants. The director may give written permission for a landowner to transfer specified plants in the protected group from land he owns to another property owned by him, and such permits shall be exempt from fees.

3-909. Shipment of plants; exhibition of permit and certificate of inspection to carrier; sale of highly safeguarded plants

A. No person or common carrier may transport a plant, or any part of a plant, belonging to the protected group, nor receive or possess a protected native plant for transportation within or without this state, except for manufactured wood articles, unless the person offering the plant for shipment exhibits to the person or common carrier a valid written permit for the transportation of the plant or part of a plant and has securely and properly attached a valid required native plant tag and seal to the plant. If for transport without the state, the plant shall also bear a certificate of inspection by the department. All protected native plant species or varieties, not grown in Arizona and imported into this state, shall be transported directly to a department field office at which a movement permit and seals must be purchased before proceeding to the final destination.

B. Plants of the protected group that are shipped into this state shall be accompanied by all permits, tags and seals required by the exporting state or country.

C. It is unlawful for a person to commercially sell or offer for commercial sale in interstate commerce any highly safeguarded native plant or in the course of interstate commercial activity to deliver, receive, carry, transport or ship by any means any such plant in furtherance of a commercial sale or offer for commercial sale.

3-910. Compiling information; reports; native plant surveys; investigations; technical advisory board

A. At the request of any person, including a state or federal agency, and if the person provides the department with a suitable description of the land in question, the director may enter into agreements with any such person to conduct native plant surveys on the applicable private or state land. Unless the survey is limited to the simple determination of whether or not protected species exist on the land, the department may collect fees as reimbursement for the services which are reasonably based on the time factor, vegetation density and acreage. Notwithstanding section 35-148, subsection A, the director shall deposit any monies received under this subsection in the fund established by section 3-913.

B. The director by rule may require written reports from persons engaged in salvaging or harvesting protected native plants as to the location and quantities of protected native plants and their parts which have been salvaged or harvested under this chapter. The director by rule may make the filing of these reports a condition to the issuance or renewal of any permits, tags, seals or receipts provided for in this chapter.

C. The department may conduct investigations of the status of all species of native plants in order to develop information relative to population distribution, habitat needs, limiting factors and other biological data and to determine measures and requirements, including transplantation and propagation, necessary for their conservation or survival. If protected native plants or significant communities of such plants are vulnerable to depletion from their collection or harvest as a commercial resource, the department may collect statistical information and conduct investigations to determine what harvests are sustainable without depleting the plants or plant communities or destroying significant habitat provided by such plants or plant communities.

D. The director may appoint, utilize and contract with a technical advisory board, serving without compensation, to annually review the number of permits and tags issued in order to assess whether plant species, communities or populations are being depleted and recommend revisions to the protected plant categories. The board shall consist of representatives of the scientific community, including the botanical and zoological fields, and representatives from the native plant industries, including salvage, revegetation, propagation, landscaping and harvesting concerns.

3-911. Conservation and public education

A. The department may conserve the highly safeguarded native plants including the use, and encouraging the use, of all methods and procedures that are necessary to bring the highly safeguarded native plants to the point where they are no longer in need of federal protection as endangered or threatened plants or state protection as highly safeguarded native plants. These methods and procedures include all activities associated with scientific resource management such as research, census, law enforcement, habitat protection and maintenance, propagation and transplantation.

B. The department shall encourage commercial businesses engaged in land development or other activities conducted on private land to salvage protected native plants to the greatest extent feasible.

C. The department may produce, and collect reasonable fees for, seminars, courses, pamphlets and other educational programs and publications concerning the effect, intent and interpretation of this chapter, the identification, nature or condition of protected native plants and the feasibility and techniques for their conservation and salvage for presentation and dissemination to:
1. State agencies and political subdivisions, including state and local law enforcement agencies and counties or municipalities which have enacted or consider enacting ordinances preserving protected native plants.
2. Real estate and other commercial businesses engaged in land development and other activities conducted on private land.
3. Landowners and the public at large.
4. Persons or entities that are convicted of violating this chapter or rules and ordinances adopted pursuant to this chapter and that are ordered by the court to attend educational classes or programs as part of their sentences.

D. Notwithstanding section 35-148, subsection A, the director shall deposit any monies received under this section in the fund established under section 3-913.

3-912. Rules; additional notice requirements

A. The director shall adopt rules to enforce this chapter pursuant to title 41, chapter 6.

B. In addition to the notice requirements prescribed in title 41, chapter 6, at least thirty days before any hearing at which a new rule or a change in a rule will be considered the department shall send a copy of the notice by first class mail to persons or entities requesting notice pursuant to section 3-904, subsection E.

3-913. Fiscal provisions; fees; Arizona protected native plant fund

A. The department shall collect nonrefundable fees for issuing permits, tags, seals and receipts under this article, except for scientific purposes, from landowners moving protected plants from one of their properties to another, or from the independent owner of residential property of ten acres or less if no such plants are to be offered for sale.

B. The director shall establish the amount of the fee by rule to reasonably reflect the cost to the department for administering this chapter or to reflect the value of the service, permit, tag, seal or receipt, including at least the following amounts:
1. For cereus giganteus (saguaro), at least three dollars for each plant.
2. For native plants which the director determines to be useful for revegetation and which cannot be salvaged economically at a higher fee, at least twenty-five cents per plant.
3. For all other native plants, at least two dollars for each plant.
4. For all receipts for live harvest restricted native plants cut or removed for wood, at least one dollar per cord.
5. For a permit for the by-products or fiber of harvest restricted native plants, at least one dollar per ton.

C. The Arizona protected native plant fund is established. All fees and other monies collected under this chapter except civil penalties assessed pursuant to section 3-933 or 3-934 shall be deposited, pursuant to sections 35-146 and 35-147, in the fund. The monies deposited constitute a separate and permanent fund for use by the director, subject to legislative appropriation, to administer and enforce this chapter. The director shall administer the fund. On notice from the director, the state treasurer shall invest and divest monies in the fund as provided by section 35-313 and monies earned from investment shall be credited to the fund.

3-914. Board of supervisors; power to preserve plants
The board of supervisors of each county is authorized to adopt and enforce ordinances not in conflict with law for the preservation of protected groups of plants.

3-915. Exemptions

A. This chapter does not apply to existing canals, laterals, ditches, electrical transmission and distribution facilities, rights-of-way and other facilities, structures or equipment owned, operated, used or otherwise possessed by public service corporations and special districts established under title 48, chapter 11, 12, 17, 18, 19, 21 or 22.

B. This chapter does not apply to normal and routine maintenance of improvements which may cause the incidental or unavoidable destruction of native plants.

3-916. Salvage of native plants by homeowners' association or other nonprofit organization; definition

A. A homeowners' association or any other community based nonprofit organization may collect and salvage native plants under this section without obtaining a permit, tag, seal or receipt or paying a fee otherwise required by this chapter. Native plants may be obtained under this section only for noncommercial salvage and only if their existence is threatened by intended destruction, by their location or by a change in land use.

B. Before collecting any plant under this section, the homeowners' association or nonprofit organization shall submit to the department:
1. A letter of permission from the owner of the property on which the native plants are currently growing authorizing the homeowners' association or nonprofit organization to enter the property and remove the plants.
2. A copy of a resolution adopted by the governing body of the county, city or town authorizing the homeowners' association or nonprofit organization to collect and salvage native plants pursuant to this section in the unincorporated area of the county or in the city or town, as applicable.
3. A written statement from the homeowners' association or nonprofit organization including:
(a) The name of the association or organization.
(b) The name, address and telephone number of a contact person representing the association or organization.
(c) The name, address and telephone number of the owner of the property on which the native plants are currently growing.
(d) The physical location of the property on which the plants are growing.
(e) A signed statement that:
(i) The plants will be transplanted in a common area owned, managed or leased by the homeowners' association or on public property.
(ii) The plants will not be sold, exchanged or otherwise disposed of except as provided by this section.

C. A person who possesses a permit, tag or seal issued under this chapter for collection or salvage of native plants has priority over the homeowners' association or nonprofit organization in obtaining any native plant.

D. The department shall issue a notice to the homeowners' association or nonprofit organization of any violation of the terms and conditions prescribed by this section or of any statement submitted to the department under subsection B. In the case of any subsequent violation, the department shall issue another notice prohibiting further collection or salvage of plants. The department shall transmit a copy of each notice to the governing body of the county, city or town.

E. For purposes of this section "homeowners' association" means a nonprofit corporation or association that is organized in this state and that meets both of the following requirements:
1. It is established to own, lease or manage common, limited access lots, parcels, areas, grounds or streets of a real estate development in this state.
2. It has the power under its organizing documents to assess and compel association members to pay the expenses incurred in performing the association's obligations.

Arizona Administrative Code

Article 11: Arizona Native Plants

Article 11, consisting of Sections R3-3-1101 through R3-3-1111 and Appendix A, recodified from 3 A.A.C. 4, Article 6 at 10 A.A.R. 726, effective February 6, 2004 (Supp. 04-1).

Section

R3-3-1101. Definitions

In addition to the definitions provided in A.R.S. § 3-901, the following terms apply to this Article:

1. "Agent" means a person authorized to manage, represent, and act for a landowner.

2. "Cord" means a specific type string or small rope issued by the Department for attaching tags and seals to protected native plants.

3. "Destroy" means to cause the death of any protected native plant.

4. "Landowner" means a person who holds title to a parcel of land.

5. "Original growing site" means a place where a plant is growing wild and is rooted to the ground or any property owned by the same landowner where a protected native plant is relocated or transplanted.

6. "Permittee" means any person who is issued a valid permit for removing and transporting protected native plants.

7. "Pincushion" means any coryphantha or mammillaria cactus and for purposes of assessing tag fees in R3-3-1104(D) includes any protected plant 8" or less.

8. "Protected native plant" means any living plant or plant part listed in Appendix A and growing wild in Arizona.

9. "Scientific collection" means a controlled experimental project of protected native plants conducted by qualified individuals.

10. "Securely affixed" means to fasten in a tight and secure manner to prevent removal of tags, seals, or cord.

11. "Survey" means the process by which a parcel of land is examined for the presence of protected native plants.

a. Simple survey determines only whether protected native plants are present;

b. Complete survey establishes the kind and number of each species present.

12. "White tag" means a white tag issued by the Department to identify any saguaro cactus being moved from its original growing site.

13. "Yellow tag" means a yellow tag issued by the Department to identify any protected native plant, except a saguaro cactus, being moved from its original growing site.

R3-3-1102. Protected Native Plant Destruction

A. Department notification

1. Before any protected native plant is destroyed, the landowner shall submit the following information to the Department on a Notice of Intent form:

a. The name, address, and telephone number of the landowner;

b. The name, address, and telephone number of the landowner's agent if the landowner is not a resident of this state or is otherwise unavailable;

c. The most recent tax parcel identification number or other tax assessment document indicating land ownership;

d. A legal description, assessor's parcel number, map, address, or other description of the area in which the protected native plants subject to the destruction are located;

e. The earliest date of the plant destruction; and

f. The landowner's intentions for the disposal or salvage of protected native plants on the private land.

2. A landowner who will destroy protected native plants over an area less than one acre may orally submit the information required in subsection (A)(1).

B. A landowner shall not destroy any protected native plants until a written confirmation notice is received from the Department and the time prescribed under A.R.S. § 3-904(A)(3) has elapsed.

C. Any salvage operator or interested person may obtain protected native plant destruction notice information by providing that person's name, address, and telephone number, and an annual non-refundable $25.00 fee.

R3-3-1103. Disposal and Salvage of Protected Native Plants by a State Agency

A state agency shall notify the Department, under A.R.S. § 3-905, and may dispose of protected native plants using any of the following methods:

1. The plants may be sold at a public auction;

2. The plants may be relocated or transported to a different location on the same property or to another property owned by the state;

3. The state agency may obtain permits for removal of the plants for revegetation projects;

4. The plants may be donated to scientific, educational, and charitable institutions;

5. The plants may be donated to other state agencies or political subdivisions;

6. The plants may be salvaged by the general public or commercial dealers.

R3-3-1104. Protected Native Plant Permits; Tags; Fees

A. A person shall not collect, transport, possess, sell, offer for sale, dispose, or salvage protected native plants unless that person is 18 years of age or older and holds a permit.

B. A permit applicant shall submit the following information to the Department, if applicable:

1. The name, business name, address, telephone number, social security number, and signature of the applicant;

2. The name and number of plants to be removed;

3. The purpose of the plant removal;

4. Whether the applicant has a conviction of a state or federal statute regarding the protection of native plants within the previous five years;

5. Except for salvage assessed native plants;

a. The name, address, telephone number, and signature of the landowner;

b. The location of the permitted site and size of acreage;

c. The destination address where the plants will be transplanted;

d. The legal and physical description of the location of the original growing site; and

e. The more recent tax parcel identification number available for the permitted site, or other tax assessment documents indicating land ownership.

C. Permit fees.

1. Any person removing and transporting protected native plants shall submit the following applicable fee to the Department with the permit application:

a. Salvage assessed native plants, annual use, $25.00;

b. Harvest restricted native plants, annual use, $25.00;

c. All other native plants, one-time use, $5.00.

2. Exemptions. The following protected native plants are exempt from fees if:

a. The protected native plants intended for personal use by a landowner are taken from one piece of land owned by the landowner to another piece of land also owned by the landowner, remain on the property of the landowner, and are not sold or offered for sale;

b. The protected native plants are collected for scientific purposes; or

c. A landowner donates the protected native plant to a scientific, educational, or charitable institution.

D. Tag fees.

1. Any person obtaining a white tag or yellow tag shall submit the following applicable fee to the Department at the time the tag is obtained:

a. Saguaro, $6.00 per plant;

b. Trees cut for firewood and listed in the harvest restricted category, $4.00 per cord;

c. Pincushion, $.50 per plant;

d. All other protected native plants referenced in A.R.S. § 3-903(B) and listed in Appendix A, $4.00 per plant.

2. Harvested restricted native plants, of nolina and yucca parts is $4.00 per ton.

E. Salvage assessed permits and plant tags are valid for the calendar year in which they are issued. The tags expire at the end of the calendar year unless the permit is renewed.

R3-3-1105. Scientific Permits

A. A person shall not collect protected native plants for research projects unless that person holds a scientific permit.

B. A permit applicant shall submit the following information to the Department:

1. The name, address, and telephone number of the company or research facility applying for the permit;

2. The name and title of the person conducting the research project;

3. The purpose and intent of the research project;

4. The results of the research, whether the results will be published, and the media used to publish the results;

5. The controls used;

6. The variables considered;

7. The length of time the project will take;

8. The expected results;

9. The type of reports and recordkeeping used to monitor the project;

10. The type of funding that will be used;

11. The funding of the company or research facility;

12. The written approval for collection of the plants from the legal owner;

13. The date of the application; and

14. The signature of the person authorized on behalf of the company or research facility affirming that the plants collected will not be sold or used for personal interests.

C. Scientific research permits shall be issued if all of the following are met:

1. The native plant removal site is restored to a natural appearance and the site restoration is approved by the site owner;

2. The removal and movement of the native plants are accomplished by a person equipped and experienced in native plant removal and transplantation;

3. The native plants used in the project are accessible to the scientific community and state and local regulatory agencies;

4. The ecology of the project site is beneficial to the growth of the specific plants in the project;

5. Arrangements are made for a suitable permanent planting site for the surviving plants after the project's completion; and

6. Security is provided at the project site to prevent the destruction or theft of native plants used in the research.

D. Scientific permits are valid for the calendar year in which they are issued.

R3-3-1106. Protected Native Plant Surveys; Fee

A. Except for permits issued for salvage assessed native plants, any person harvesting protected native plants shall conduct a survey and provide a written report to the Director of the plant survey results before a permit is issued.

B. The landowner, permittee, or agent may conduct the survey or request that the survey be conducted by the Department.

1. If the landowner, permittee, or agent conducts the survey, the following information shall be completed on a survey form furnished by the Department:

a. The name, address, telephone number, and signature of the landowner, permittee, or agent performing the survey;

b. The date the survey is performed;

c. The survey results including the names and numbers of plants.

2. If the Department conducts the survey, the survey shall be completed within 20 working days. Upon completion, the Department shall notify the landowner, permittee, or agent of:

a. The date the survey was performed;

b. The amount of the survey fee payable to the Department;

c. The name of Department personnel performing the survey;

d. The survey results including the names and numbers of protected native plants.

C. The following fees for a Department-conducted survey shall be paid to the Department within 30 days from the date of the notification.

1. Simple survey, no fee;

2. Complete survey, includes time and travel, as prescribed under A.R.S. §§ 38-611(B) and 38-623(C) and (D).

R3-3-1107. Movement Permit; Tags, Metal Seals, and Cord Use

A. Any person moving a protected native plant previously transplanted from its original growing site in Arizona and transplanting it to another location shall apply to the Department for a Movement Permit. The landowner from where the plant is being moved shall provide the following information on the permit application:

1. The name, telephone number, and signature of the landowner;

2. The location of the plant;

3. The name, address, and telephone number of the receiver;

4. The name, address, and telephone number of the carrier;

5. The number, species, and description of the plant being removed;

6. The tax parcel identification number; and

7. The date of the application.

B. Movement of protected native plants obtained outside > Arizona.

1. Any person moving a protected native plant obtained outside Arizona and transporting and planting it within the state shall declare the protected native plant at the agricultural inspection station nearest the port of entry. The Department shall place the protected native plant under "Warning Hold" to the nearest district office.

2. If no agricultural station is in operation at the port of entry, the person shall declare the protected native plant at the nearest district office.

3. After the plants have been declared, the district office shall issue a Movement Permit and a green seal.

C. Any person moving protected native plants shall obtain, at cost, the following metal seals from the Department and securely attach the appropriate seal to each protected native plant:

1. Blue seals identify protected native plants that will be moved from locations that are not the original growing sites.

2. White seals identify the protected saguaro cactus.

3. Green seals identify all imported protected native plants.

4. Yellow seals identify all protected native plants, except imported protected native plants and the protected saguaro cactus.

D. Tag, metal seal, and cord attachment.

1. A tag shall be attached to each protected native plant taken from its original growing site, using cord provided by the Department, before being transported. No other type of rope, string, twine, or wire is allowed.

2. The cord shall be securely affixed around the plant and knotted with the tag attached so that it cannot be removed without breaking the seal or cutting the cord.

3. The metal seal shall be placed directly over the knot and snapped firmly closed.

R3-3-1108. Salvage Assessed and Harvest Restricted Native Plants

A. Harvest restricted native plants.

1. Unprocessed nolina and yucca fiber shall be weighed at a state-certified bonded scale;

2. The harvester shall submit payment and weigh certificates to the Department no later than the 10th day of the month following each harvest.

B. Recordkeeping.

1. Salvage Assessed Native Plants.

a. A permittee shall maintain a record of each protected native plant removed under an annual permit for two years from the date of each transaction and allow Department inspection of the records during normal business hours. The transaction record shall include the date salvage restricted protected native plants were removed, and the permit and tag numbers.

b. Before January 31, the permittee shall submit to the Department a copy of each transaction record for the prior calendar year.

2. Harvest Restricted Native Plants. No later than the 10th day of each month, a permittee shall submit the transaction records for transactions that took place the previous month, or a written statement that no transaction was conducted for that month.

R3-3-1109. Arizona Native Plant Law Education

A. Seminars and training courses shall be scheduled on an as-needed basis.

B. In addition to the following fees, charges for printed materials or pamphlets shall be assessed based upon the document printing and mailing costs:

1. Any person attending a seminar or training course in Arizona native plant law shall pay a nonrefundable fee of $5.00 to the Department before the class.

2. Any person convicted of violating the Arizona native plant statutes or rules and ordered by a court to attend a native plant law educational class shall pay a nonrefundable fee of $15.00 to the Department before the class.

3. Schools, law enforcement agencies, and government entities are exempt from seminar and training course fees.

C. The Department shall provide written confirmation of satisfactory completion to any person ordered by a court to attend the class.

R3-3-1110. Permit Denial, Revocation, and Suspension

A. In addition to the prohibited acts listed in A.R.S. § 3-908(A), the Director may deny, revoke, or suspend a permit for any of the following:

1. A violation of 3 A.R.S. 7; 3 A.A.C. 3, Article 11; or any federal native plant law;

2. Misuse of a permit, tag, or metal seal;

3. Failure of an applicant or permittee to submit a complete and accurate permit application or a transaction report; and

4. Failure to allow the Department to inspect transaction records.

B. The applicant or permittee may request in writing that the Department provide an administrative hearing under 41 A.R.S. 6, Article 10, to appeal any denial, revocation, or suspension of a permit.

R3-3-1111. Confiscation of Plants, Plant Parts, Wood, Fiber, or Artifacts as Evidence

A. Following any determination by a court or the Department that a native plant law has been violated, all protected native plants, plant parts, wood, fiber, or artifacts confiscated and held as evidence shall become the property of the state, unless the court or the Department orders otherwise.

B. All confiscated evidence that becomes the property of the state shall be disposed of by the Department.

PROTECTED PLANT LISTS (AZDA 2008)

A.Highly Safeguarded Protected Native Plants

The following list includes those species of native plants and parts of plants, including the seeds and fruit, whose prospects for survival in Arizona are in jeopardy or which are in danger of extinction.

AGAVACEAE Agave Family (including Nolinaceae)

Agave arizonica Gentry & Weber-Arizona agave

Agave delamateri Hodgson & Slauson

Agave murpheyi Gibson-Hohokam agave

Agave parviflora Torr.-Santa Cruz striped agave, Small-flowered agave

Agave schottii Engelm. var. treleasei (Toumey) Kearney & Peebles

APIACEAE Parsley Family. [= Umbelliferae]

Lilaeopsis schaffneriana (Schlecht.) Coult. & Rose ssp. recurva (A. W. Hill) Affolter-Cienega false rush, Huachuca water umbel.
Syn.: Lilaeopsis recurva A. W. Hill

APOCYNACEAE Dogbane Family

Amsonia kearneyana Woods.-Kearney's bluestar

Cycladenia humilis Benth. var. jonesii (Eastw.) Welsh & Atwood-Jones' cycladenia

ASCLEPIADACEAE Milkweed Family

Asclepias welshii N. & P. Holmgren-Welsh's milkweed

ASTERACEAE Sunflower Family [= Compositae]

Erigeron lemmonii Gray-Lemmon fleabane

Senecio franciscanus Greene-San Francisco Peaks groundsel

Senecio huachucanus Gray-Huachuca groundsel

BURSERACEAE Torch Wood Family

Bursera fagaroides (H.B.K.) Engler-Fragrant bursera

CACTACEAE Cactus Family

Carnegiea gigantea (Engelm.) Britt. & Rose-Saguaro: `Crested' or `Fan-top' form only
Syn.: Cereus giganteus Engelm.

Coryphantha recurvata (Engelm.) Britt. & Rose-Golden-chested beehive cactus
Syn.: Mammillaria recurvata Engelm.

Coryphantha robbinsorum (W. H. Earle) A. Zimmerman-Cochise pincushion cactus, Robbin's cory cactus.
Syn.: Cochiseia robbinsorum W.H. Earle

Coryphantha scheeri (Kuntze) L. Benson var. robustispina (Schott) L. Benson-Scheer's strong-spined cory cactus.
Syn.: Mammillaria robustispina Schott

Echinocactus horizonthalonius Lemaire var. nicholii L. Benson-Nichol's Turk's head cactus

Echinocereus triglochidiatus Engelm. var. arizonicus (Rose ex Orcutt) L. Benson-Arizona hedgehog cactus

Echinomastus erectocentrus (Coult.) Britt. & Rose var. acunensis (W.T. Marshall) L.Benson-Acuna cactus
Syn.: Neolloydia erectocentra (Coult.) L. Benson var. acunensis (W. T. Marshall) L. Benson

Pediocactus bradyi L. Benson-Brady's pincushion cactus

Pediocactus paradinei B. W. Benson-Paradine plains cactus

Pediocactus peeblesianus (Croizat) L. Benson var. fickeiseniae L. Benson

Pediocactus peeblesianus (Croizat) L. Benson var. peeblesianus Peebles' Navajo cactus, Navajo plains cactus
Syn.: Navajoa peeblesiana Croizat

Pediocactus sileri (Engelm.) L. Benson-Siler pincushion cactus
Syn.: Utahia sileri (Engelm.) Britt. & Rose

COCHLOSPERMACEAE Cochlospermum Family

Amoreuxia gonzalezii Sprague & Riley

CYPERACEAE Sedge Family

Carex specuicola J. T. Howell-Navajo sedge

FABACEAE Pea Family [=Leguminosae]

Astragalus cremnophylax Barneby var. cremnophylax Sentry milk vetch

Astragalus holmgreniorum Barneby-Holmgren milk-vetch

Dalea tentaculoides Gentry-Gentry indigo bush

LENNOACEAE Lennoa Family

Pholisma arenarium Nutt.-Scaly-stemmed sand plant

Pholisma sonorae (Torr. ex Gray) Yatskievych-Sandfood, sandroot
Syn.: Ammobroma sonorae Torr. ex Gray

LILIACEAE Lily Family

Allium gooddingii Ownbey-Goodding's onion

ORCHIDACEAE Orchid Family

Cypripedium calceolus L. var. pubescens (Willd.) Correll-Yellow lady's slipper

Hexalectris warnockii Ames & Correll-Texas purple spike

Spiranthes delitescens C. Sheviak

POACEAE Grass Family [=Gramineae]

Puccinellia parishii A.S. Hitchc.-Parish alkali grass

POLYGONACEAE Buckwheat Family

Rumex orthoneurus Rech. f.

PSILOTACEAE Psilotum Family

Psilotum nudum (L.) Beauv. Bush Moss, Whisk Ferm

RANUNCULACEAE Buttercup Family

Cimicifuga arizonica Wats.-Arizona bugbane

Clematis hirsutissima Pursh var. arizonica (Heller) Erickson-Arizona leatherflower

ROSACEAE Rose Family

Purshia subintegra (Kearney) J. Hendrickson-Arizona cliffrose, Burro Creek cliffrose
Syn.: Cowania subintegra Kearney

SALICACEAE Willow Family

Salix arizonica Dorn-Arizona willow

SCROPHULARIACEAE Figwort Family

Penstemon discolor Keck-Variegated beardtongue

B. Salvage Restricted Protected Native Plants

The following list includes those species of native plants that are not included in the highly safeguarded category but are subject to damage by theft or vandalism. In addition to the plants listed under Agavaceae, Cactaceae, Liliaceae, and Orchidaceae, all other species in these families are salvage restricted protected native plants.

AGAVACEAE Agave Family (including Nolinaceae)

Agave chrysantha Peebles

Agave deserti Engelm. ssp. simplex Gentry-Desert agave

Agave mckelveyana Gentry

Agave palmeri Engelm.

Agave parryi Engelm. var. couseii (Engelm. ex Trel.) Kearney & Peebles

Agave parryi Engelm. var. huachucensis (Baker) Little ex L. Benson
Syn.: Agave huachucensis Baker

Agave parryi Engelm. var. parryi

Agave schottii Engelm. var. schottii - Shindigger

Agave toumeyana Trel. ssp. bella (Breitung) Gentry

Agave toumeyana Trel. ssp. toumeyana

Agave utahensis Engelm. spp. kaibabensis (McKelvey) Gentry
Syn.: Agave kaibabensis McKelvey

Agave utahensis Engelm. var. utahensis

Dasylirion wheeleri Wats.-Sotol, desert spoon

Nolina bigelovii (Torr.)Wats.-Bigelow's nolina

Nolina microcarpa Wats.-Beargrass, sacahuista

Nolina parryi Wats.-Parry's nolina

Nolina texana Wats. var. compacta (Trel.) Johnst.-Bunchgrass

Yucca angustissima Engelm. var. angustissima

Yucca angustissima Engelm. var. kanabensis (McKelvey) Reveal
Syn.: Yucca kanabensis McKelvey

Yucca arizonica McKelvey

Yucca baccata Torr. var. baccata-Banana yucca

Yucca baccata Torr. var. vespertina McKelvey

Yucca baileyi Woot. & Standl. var. intermedia (McKelvey) Reveal
Syn.: Yucca navajoa Webber

Yucca brevifolia Engelm. var. brevifolia-Joshua tree

Yucca brevifolia Engelm. var. jaegeriana McKelvey

Yucca elata Engelm. var. elata-Soaptree yucca, palmilla

Yucca elata Engelm var. utahensis (McKelvey) Reveal
Syn.: Yucca utahensis McKelvey

Yucca elata Engelm. var. verdiensis (McKelvey) Reveal
Syn.: Yucca verdiensis McKelvey

Yucca harrimaniae Trel.

Yucca schidigera Roezl.-Mohave yucca, Spanish dagger

Yucca schottii Engelm.-Hairy yucca

Yucca thornberi McKelvey

Yucca whipplei Torr. var. whipplei-Our Lord's candle
Syn.: Yucca newberryi McKelvey

AMARYLLIDACEAE Amaryllis Family

Zephyranthes longifolia Hemsl.-Plains Rain Lily

ANACARDIACEAE Sumac Family

Rhus kearneyi Barkley-Kearney Sumac

ARECACEAE Palm Family [=Palmae]

Washingtonia filifera (Linden ex Andre) H. Wendl-California fan palm

ASTERACEAE Sunflower Family [=Compositae]

Cirsium parryi (Gray) Petrak ssp. mogollonicum Schaak

Cirsium virginensis Welsh-Virgin thistle

Erigeron kuschei Eastw.-Chiricahua fleabane

Erigeron piscaticus Nesom-Fish Creek fleabane

Flaveria macdougalii Theroux, Pinkava & Keil

Perityle ajoensis Todson-Ajo rock daisy

Perityle cochisensis (Niles) Powell-Chiricahua rock daisy

Senecio quaerens Greene-Gila groundsel

BURSERACEAE Torch-Wood Family

Bursera microphylla Gray-Elephant tree, torote

CACTACEAE Cactus Family

Carnegiea gigantea (Engelm.) Britt. & Rose-Saguaro
Syn.: Cereus giganteus Engelm.

Coryphantha missouriensis (Sweet) Britt. & Rose

Coryphantha missouriensis (Sweet) Britt. & Rose var. marstonii (Clover) L. Benson

Coryphantha scheeri (Kuntze) L. Benson var. valida (Engelm.) L. Benson

Coryphantha strobiliformis (Poselger) var. orcuttii (Rose) L. Benson

Coryphantha strobiliformis (Poselger) var. strobiliformis

Coryphantha vivipara (Nutt.) Britt. & Rose var. alversonii (Coult.) L. Benson

Coryphantha vivipara (Nutt.) Britt. & Rose var. arizonica (Engelm.) W. T. Marshall
Syn.: Mammillaria arizonica Engelm.

Coryphantha vivipara (Nutt.) Britt. & Rose var. bisbeeana (Orcutt) L. Benson

Coryphantha vivipara (Nutt.) Britt. & Rose var. deserti (Engelm.) W. T. Marshall
Syn.: Mammillaria chlorantha Engelm.

Coryphantha vivipara (Nutt.) Britt. & Rose var. rosea (Clokey) L. Benson

Echinocactus polycephalus Engelm. & Bigel. var. polycephalus

Echinocactus polycephalus Engelm. & Bigel. var. xeranthemoides Engelm. ex Coult.
Syn.: Echinocactus xeranthemoides Engelm. ex Coult.

Echinocereus engelmannii (Parry ex Engelm.) Lemaire var. acicularis L. Benson

Echinocereus engelmannii (Parry ex Engelm.) Lemaire var. armatus L. Benson

Echinocereus engelmannii (Parry ex Engelm.) Lemaire var. chrysocentrus L. Benson

Echinocereus engelmannii (Parry ex. Engelm.) Lemaire var. engelmannii

Echinocereus engelmannii (Parry) Lemaire var. variegatus (Engelm.) Engelm. ex Rümpler

Echinocereus fasciculatus (Engelm. ex B. D. Jackson) L. Benson var. fasciculatus
Syn.: Echinocereus fendleri (Engelm.) Rümpler var. fasciculatus (Engelm. ex B. D. Jackson) N. P. Taylor, Echinocereus fendleri (Engelm.) Rümpler var. robusta L. Benson; Mammillaria fasciculata Engelm.

Echinocereus fasciculatus (Engelm. ex B. D. Jackson) L. Benson var. bonkerae (Thornber & Bonker) L. Benson.

Syn.: Echinocereus boyce-thompsonii Orcutt var. bonkerae Peebles; Echinocereus fendleri (Engelm.) Rümpler var. bonkerae (Thornber & Bonker) L. Benson

Echinocereus fasciculatus (Engelm. ex B. D. Jackson) L. Benson var. boyce-thompsonii (Orcutt) L. Benson
Syn.: Echinocereus boyce-thompsonii Orcutt

Echinocereus fendleri (Engelm.) Rümpler var. boyce-thompsonii (Orcutt) L. Benson

Echinocereus fendleri (Engelm.) Rümpler var. fendleri

Echinocereus fendleri (Engelm.) Rümpler var. rectispinus (Peebles) L. Benson

Echinocereus ledingii Peebles

Echinocereus nicholii (L. Benson) Parfitt.
Syn.: Echinocereus engelmannii (Parry ex Engelm.) Lemaire var. nicholii L. Benson

Echinocereus pectinatus (Scheidw.) Engelm. var. dasyacanthus (Engelm.) N. P. Taylor
Syn.: Echinocereus pectinatus (Scheidw.) Engelm. var. neomexicanus (Coult.) L. Benson

Echinocereus polyacanthus Engelm. (1848) var. polyacanthus

Echinocereus pseudopectinatus (N. P. Taylor) N. P. Taylor
Syn.: Echinocereus bristolii W. T. Marshall var. pseudopectinatus N. P. Taylor, Echinocereus pectinatus (Scheidw.) Engelm. var. pectinatus sensu Kearney and Peebles, Arizona Flora, and L. Benson, The Cacti of Arizona and The Cacti of the United States and Canada.

Echinocereus rigidissimus (Engelm.) Hort. F. A. Haage.
Syn.: Echinocereus pectinatus (Scheidw.) Engelm. var. rigidissimus (Engelm.) Engelm. ex Rümpler-Rainbow cactus

Echinocereus triglochidiatus Engelm. var. gonacanthus (Engelm. & Bigel.) Boiss.

Echinocereus triglochidiatus Engelm. var. melanacanthus (Engelm.) L. Benson
Syn.: Mammillaria aggregata Engelm.

Echinocereus triglochidiatus Engelm. var. mojavensis (Engelm.) L. Benson

Echinocereus triglochidiatus Engelm. var. neomexicanus (Standl.) Standl. ex W. T. Marshall.
Syn.: Echinocereus triglochidiatus Engelm. var. polyacanthus (Engelm. 1859 non 1848) L. Benson

Echinocereus triglochidiatus Engelm. var. triglochidiatus

Echinomastus erectocentrus (Coult.) Britt. & Rose var. erectocentrus
Syn.: Neolloydia erectocentra (Coult.) L. Benson var. erectocentra

Echinomastus intertextus (Engelm.) Britt. & Rose Syn.: Neolloydia intertexta (Engelg.) L. Benson

Echinomastus johnsonii (Parry) Baxter-Beehive cactus
Syn.: Neolloydia johnsonii (Parry) L. Benson

Epithelantha micromeris (Engelm.) Weber ex Britt. & Rose

Ferocactus cylindraceus (Engelm.) Orcutt var. cylindraceus-Barrel cactus
Syn.: Ferocactus acanthodes (Lemaire) Britt. & Rose var. acanthodes

Ferocactus cylindraceus (Engelm.) Orcutt var. eastwoodiae (Engelm.) N. P. Taylor
Syn.: Ferocactus acanthodes (Lemaire) Britt. & Rose var. eastwoodiae L. Benson; Ferocactus eastwoodiae (L. Benson) L. Benson

Ferocactus cylindraceus (Engelm.) Orcutt. var. lecontei (Engelm.) H. Bravo
Syn.: Ferocactus acanthodes (Lemaire) Britt. & Rose var. leconti (Engelm.) Lindsay; Ferocactus lecontei (Engelm.) Britt. & Rose

Ferocactus emoryi (Engelm.) Orcutt-Barrel cactus
Syn.: Ferocactus covillei Britt. & Rose

Ferocactus wislizenii (Engelm.) Britt. & Rose-Barrel cactus

Lophocereus schottii (Engelm.) Britt. & Rose-Senita

Mammillaria grahamii Engelm. var. grahamii

Mammillaria grahamii Engelm. var. oliviae (Orcutt) L. Benson
Syn.: Mammillaria oliviae Orcutt

Mammillaria heyderi Mühlenpf. var. heyderi
Syn.: Mammillaria gummifera Engelm. var. applanata (Engelm.) L. Benson

Mammillaria heyderi Mühlenpf. var. macdougalii (Rose) L. Benson
Syn.: Mammillaria gummifera Engelm. var. macdougalii (Rose) L. Benson; Mammillaria macdougalii Rose

Mammillaria heyderi Mühlenpf. var. meiacantha (Engelm.) L. Benson
Syn.: Mammillaria gummifera Engelm. var. meiacantha (Engelm.) L. Benson

Mammillaria lasiacantha Engelm.

Mammillaria mainiae K. Brand.

Mammillaria microcarpa Engelm.

Mammillaria tetrancistra Engelm.

Mammillaria thornberi Orcutt

Mammillaria viridiflora (Britt. & Rose) Bödeker. Syn.: Mammillaria orestra L. Benson

Mammillaria wrightii Engelm. var. wilcoxii (Toumey ex K. Schumann) W. T. Marshall
Syn.: Mammillaria wilcoxii Toumey

Mammillaria wrightii Engelm. var. wrightii

Opuntia acanthocarpa Engelm. & Bigel. var. acanthocarpa-Buckhorn cholla

Opuntia acanthocarpa Engelm. & Bigel. var. coloradensis L. Benson

Opuntia acanthocarpa Engelm. & Bigel. var. major L. Benson
Syn.: Opuntia acanthocarpa Engelm. & Bigel var. ramosa Peebles

Opuntia acanthocarpa Engelm. & Bigel. var. thornberi (Thornber & Bonker) L. Benson
Syn.: Opuntia thornberi Thornber & Bonker

Opuntia arbuscula Engelm.-Pencil cholla

Opuntia basilaris Engelm. & Bigel. var. aurea (Baxter) W. T. Marshall-Yellow beavertail
Syn.: Opuntia aurea Baxter

Opuntia basilaris Engelm. & Bigel. var. basilaris-Beavertail cactus

Opuntia basilaris Engelm. & Bigel. var. longiareolata (Clover & Jotter) L. Benson

Opuntia basilaris Engelm. & Bigel. var. treleasei (Coult.) Toumey

Opuntia bigelovii Engelm.-Teddy-bear cholla

Opuntia campii ined.

Opuntia canada Griffiths (O. phaeacantha Engelm. var. laevis X major and O. gilvescens Griffiths).

Opuntia chlorotica Engelm. & Bigel.-Pancake prickly-pear

Opuntia clavata Engelm.-Club cholla

Opuntia curvospina Griffiths

Opuntia echinocarpa Engelm. & Bigel-Silver cholla

Opuntia emoryi Engelm.-Devil cholla
Syn.: Opuntia stanlyi Engelm. ex B. D. Jackson var. stanlyi

Opuntia engelmannii Salm-Dyck ex Engelm. var. engelmannii-Engelmann's prickly-pear
Syn.: Opuntia phaeacantha Engelm. var. discata (Griffiths) Benson & Walkington

Opuntia engelmannii Salm-Dyck ex Engelm. var. flavospina (L.Benson) Parfitt & Pinkava
Syn.: Opuntia phaeacantha Engelm. var. flavispina L. Benson

Opuntia erinacea Engelm. & Bigel. var. erinacea-Mohave prickly-pear

Opuntia erinacea Engelm. & Bigel. var. hystricina (Engelm. & Bigel.) L. Benson
Syn.: Opuntia hystricina Engelm. & Bigel.

Opuntia erinacea Engelm. & Bigel. var. ursina (Weber) Parish-Grizzly bear prickly-pear
Syn.: Opuntia ursina Weber

Opuntia erinacea Engelm. & Bigel. var. utahensis (Engelm.) L. Benson
Syn.: Opuntia rhodantha Schum.

Opuntia fragilis Nutt. var. brachyarthra (Engelm. & Bigel.) Coult.

Opuntia fragilis Nutt. var. fragilis-Little prickly-pear

Opuntia fulgida Engelm. var. fulgida-Jumping chain-fruit cholla

Opuntia fulgida Engelm. var. mammillata (Schott) Coult.

Opuntia imbricata (Haw.) DC.-Tree cholla

Opuntia X kelvinensis V. & K. Grant pro sp.
Syn.: Opuntia kelvinensis V. & K. Grant

Opuntia kleiniae DC. var. tetracantha (Toumey) W. T. Marshall
Syn.: Opuntia tetrancistra Toumey

Opuntia kunzei Rose.
Syn.: Opuntia stanlyi Engelm. ex B. D. Jackson var. kunzei (Rose) L. Benson; Opuntia kunzei Rose var. wrightiana (E. M. Baxter) Peebles; Opuntia wrightiana E. M. Baxter

Opuntia leptocaulis DC.-Desert Christmas cactus, Pencil cholla

Opuntia littoralis (Engelm.) Cockl. var. vaseyi (Coult.) Benson & Walkington

Opuntia macrocentra Engelm.-Purple prickly-pear
Syn.: Opuntia violacea Engelm. ex B. D. Jackson var. macrocentra (Engelm.) L. Benson; Opuntia violacea Engelm. ex B. D. Jackson var. violacea

Opuntia macrorhiza Engelm. var. macrorhiza-Plains prickly-pear
Syn.: Opuntia plumbea Rose

Opuntia macrorhiza Engelm. var. pottsii (Salm-Dyck) L. Benson

Opuntia martiniana (L. Benson) Parfitt
Syn.: Opuntia littoralis (Engelm.) Cockerell var. martiniana (L. Benson) L. Benson; Opuntia macrocentra Engelm. var. martiniana L. Benson

Opuntia nicholii L. Benson-Navajo Bridge prickly-pear

Opuntia parishii Orcutt.
Syn.: Opuntia stanlyi Engelm. ex B. D. Jackson var. parishii (Orcutt) L. Benson

Opuntia phaeacantha Engelm. var. laevis (Coult.) L. Benson
Syn.: Opuntia laevis Coult.

Opuntia phaeacantha Engelm. var. major Engelm.

Opuntia phaeacantha Engelm. var. phaeacantha

Opuntia phaeacantha Engelm. var. superbospina (Griffiths) L. Benson

Opuntia polyacantha Haw. var. juniperina (Engelm.) L. Benson

Opuntia polyacantha Haw. var. rufispina (Engelm.) L. Benson

Opuntia polyacantha Haw. var. trichophora (Engelm. & Bigel.) L. Benson

Opuntia pulchella Engelm.-Sand cholla

Opuntia ramosissima Engelm.-Diamond cholla

Opuntia santa-rita (Griffiths & Hare) Rose-Santa Rita prickly-pear
Syn.: Opuntia violacea Engelm. ex B. D. Jackson var. santa-rita (Griffiths & Hare) L. Benson

Opuntia spinosior (Engelm.) Toumey-Cane cholla

Opuntia versicolor Engelm.-Staghorn cholla

Opuntia vivipara Engelm

Opuntia whipplei Engelm. & Bigel. var. multigeniculata (Clokey) L. Benson

Opuntia whipplei Engelm. & Bigel. var. whipplei-Whipple cholla

Opuntia wigginsii L. Benson

Pediocactus papyracanthus (Engelm.) L. Benson Grama grass cactus
Syn.: Toumeya papyracanthus (Engelm.) Britt. & Rose

Pediocactus simpsonii (Engelm.) Britt & Rose var. simpsonii

Peniocereus greggii (Engelm.) Britt. & Rose var. greggii-Night-blooming cereus
Syn.: Cereus greggii Engelm.

Peniocereus greggii (Engelm.) Britt & Rose var. transmontanus-Queen-of-the-Night

Peniocereus striatus (Brandegee) Buxbaum.
Syn.: Neoevansia striata (Brandegee) Sanchez-Mejorada; Cereus striatus Brandegee; Wilcoxia diguetii (Webber) Peebles

Sclerocactus parviflorus Clover & Jotter var. intermedius (Peebles) Woodruff & L. Benson
Syn.: Sclerocactus intermedius Peebles

Sclerocactus parviflorus Clover & Jotter var. parviflorus
Syn.: Sclerocactus whipplei (Engelm. & Bigel.) Britt. & Rose var. roseus (Clover) L. Benson

Sclerocactus pubispinus (Engelm.) L. Peebles

Sclerocactus spinosior (Engelm.) Woodruff & L. Benson
Syn.: Sclerocactus pubispinus (Engelm.) L. Benson var. sileri L. Benson

Sclerocactus whipplei (Engelm. & Bigel.) Britt. & Rose

Stenocereus thurberi (Engelm.) F. Buxbaum-Organ pipe cactus
Syn.: Cereus thurberi Engelm.; Lemaireocereus thurberi (Engelm.) Britt. & Rose

CAMPANULACEAE Bellflower Family

Lobelia cardinalis L. ssp. graminea (Lam.) McVaugh-Cardinal flower

Lobelia fenestralis Cav.-Leafy lobelia

Lobelia laxiflora H. B. K. var. angustifolia A. DC.

CAPPARACEAE Cappar Family [=Capparidaceae]

Cleome multicaulis DC.-Playa spiderflower

CHENOPODIACEAE Goosefoot Family

Atriplex hymenelytra (Torr.) Wats.

CRASSULACEAE Stonecrop Family

Dudleya arizonica (Nutt.) Britt. & Rose
Syn.: Echeveria pulverulenta Nutt. ssp. arizonica (Rose) Clokey

Dudleya saxosa (M.E. Jones) Britt. & Rose ssp. collomiae (Rose) Moran
Syn.: Echeveria collomiae (Rose) Kearney & Peebles

Graptopetalum bartramii Rose
Syn.: Echevaria bartramii (Rose) K. & P.

Graptopetalum bartramii Rose-Bartram's stonecrop, Bartram's live-forever
Syn.: Echeveria bartramii (Rose) Kearney & Peebles

Graptopetalum rusbyi (Greene) Rose
Syn.: Echeveria rusbyi (Greene) Nels. & Macbr.

Sedum cockerellii Britt.

Sedum griffithsii Rose

Sedum lanceolatum Torr.
Syn.: Sedum stenopetalum Pursh

Sedum rhodanthum Gray

Sedum stelliforme Wats.

CROSSOSOMATACEAE Crossosoma Family

Apacheria chiricahuensis C. T. Mason-Chiricahua rock flower

CUCURBITACEAE Gourd Family

Dichelostemma pulchellum (Salisb) Heller var. pauciflorum (Torr.) Hoover

Disporum trachycarpum (Wats.) Benth. & Hook. var. subglabrum Kelso

Disporum trachycarpum (Wats.) Benth. & Hook. var. trachycarpum

Echeandia flavescens (Schultes & Schultes) Cruden
Syn.: Anthericum torreyi Baker

Eremocrinum albomarginatum Jones

Fritillaria atropurpurea Nutt.

Hesperocallis undulata Gray-Ajo lily

Lilium parryi Wats.-Lemon lily

Lilium umbellatum Pursh

Maianthemum racemosum (L.) Link. ssp. amplexicaule (Nutt.) LaFrankie
Syn.: Smilacina racemosa (L.) Desf. var. amplexicaulis (Nutt.) Wats.

Maianthemum racemosum (L.) Link ssp. racemosum-False Solomon's seal
Syn.: Smilacina racemosa (L.) Desf. var. racemosa; Smilacina racemosa (L.) Desf. var. cylindrata Fern.

Maianthemum stellatum (L.) Link
Syn.: Smilacina stellata (L.) Desf.-Starflower

Milla biflora Cav.-Mexican star

Nothoscordum texanum Jones

Polygonatum cobrense (Woot. & Standl.) Gates

Streptopus amplexifolius (L.) DC.-Twisted stalk

Triteleia lemmonae (Wats.) Greene

Triteleiopsis palmeri (Wats.) Hoover

Veratrum californicum Durand.-False hellebore

Zephyranthes longifolia Hemsl.-Plains rain lily

Zigadenus elegans Pursh-White camas, alkali-grass

Zigadenus paniculatus (Nutt.) Wats.-Sand-corn

Zigadenus virescens (H. B. K.) Macbr.

MALVACEAE Mallow Family

Abutilon parishii Wats.-Tucson Indian mallow

Abutilon thurberi Gray-Baboquivari Indian mallow

ONAGRACEAE Evening Primrose Family

Camissonia exilis (Raven) Raven

ORCHIDACEAE Orchid Family

Calypso bulbosa (L.) Oakes var. americana (R. Br.) Luer

Coeloglossum viride (L.) Hartmann var. virescens (Muhl.) Luer
Syn.: Habenaria viridis (L.) R. Br. var. bracteata (Muhl.) Gray

Corallorhiza maculata Raf.-Spotted coral root

Corallorhiza striata Lindl.-Striped coral root

Corallorhiza wisteriana Conrad-Spring coral root

Epipactis gigantea Douglas ex Hook.-Giant helleborine

Goodyera oblongifolia Raf.

Goodyera repens (L.) R. Br.

Hexalectris spicata (Walt.) Barnhart-Crested coral root

Listera convallarioides (Swartz) Nutt.-Broad-leaved twayblade

Malaxis corymbosa (S. Wats.) Kuntze

Malaxis ehrenbergii (Reichb. f.) Kuntze

Malaxis macrostachya (Lexarza) Kuntze-Mountain malaxia
Syn.: Malaxis soulei L. O. Williams

Malaxis tenuis (S. Wats.) Ames

Platanthera hyperborea (L.) Lindley var. gracilis (Lindley) Luer
Syn.: Habenaria sparsiflora Wats. var. laxiflora (Rydb.) Correll

Platanthera hyperborea (L.) Lindley var. hyperborea-Northern green orchid
Syn.: Habenaria hyperborea (L.) R. Br.

Platanthera limosa Lindl.-Thurber's bog orchid
Syn.: Habenaria limosa (Lindley) Hemsley

Platanthera sparsiflora (Wats.) Schlechter var. ensifolia (Rydb.) Luer

Platanthera sparsiflora (Wats.) var. laxiflora (Rydb.) Correll

Platanthera sparsiflora (Wats.) Schlechter var. sparsiflora-Sparsely-flowered bog orchid
Syn.: Habenaria sparsiflora Wats.

Platanthera stricta Lindl.-Slender bog orchid
Syn.: Habenaria saccata Greene; Platanthera saccata (Greene) Hulten

Platanthera viridis (L.) R. Br. var. bracteata (Muhl.) Gray-Long-bracted habenaria

Spiranthes michaucana (La Llave & Lex.) Hemsl.

Spiranthes parasitica A. Rich. & Gal.

Spiranthes romanzoffiana Cham.-Hooded ladies tresses

PAPAVERACEAE Poppy Family

Arctomecon californica Torr. & Frém.-Golden-bear poppy, Yellow-flowered desert poppy

PINACEAE Pine Family

Pinus aristata Engelm.-Bristlecone pine

POLYGONACEAE Buckwheat Family

Eriogonum apachense Reveal

Eriogonum capillare Small

Eriogonum mortonianum Reveal-Morton's buckwheat

Eriogonum ripleyi J. T. Howell-Ripley's wild buckwheat, Frazier's Well buckwheat

Eriogonum thompsonae Wats. var. atwoodii Reveal-Atwood's buckwheat

PORTULACEAE Purslane Family

Talinum humile Greene-Pinos Altos flame flower

Talinum marginatum Greene

Talinum validulum Greene-Tusayan flame flower

PRIMULACEAE Primrose Family

Dodecatheon alpinum (Gray) Greene ssp. majus H. J. Thompson

Dodecatheon dentatum Hook. ssp. ellisiae (Standl.) H. J. Thompson

Dodecatheon pulchellum (Raf.) Merrill

Primula hunnewellii Fern.

Primula rusbyi Greene

Primula specuicola Rydb.

RANUNCULACEAE Buttercup Family

Aquilegia caerulea James ssp. pinetorum (Tidest.) Payson-Rocky Mountain Columbine

Aquilegia chrysantha Gray

Aquilegia desertorum (Jones) Ckll.-Desert columbine, Mogollon columbine

Aquilegia elegantula Greene

Aquilegia longissima Gray-Long Spur Columbine

Aquilegia micrantha Eastw.

Aquilegia triternata Payson

ROSACEAE Rose Family

Rosa stellata Woot.-ssp. abyssa A. Phillips Grand Canyon rose

Vauquelinia californica (Torr.) Sarg. ssp. pauciflora (Standl.) Hess & Henrickson-Few-flowered Arizona rosewood

SCROPHULARIACEAE Figwort Family

Castilleja mogollonica Pennell

Penstemon albomarginatus Jones

Penstemon bicolor (Brandeg.) Clokey & Keck ssp. roseus Clokey & Keck

Penstemon clutei A. Nels.

Penstemon distans N. Holmgren-Mt. Trumbull beardtongue

Penstemon linarioides spp. maguirei

SIMAROUBACEAE Simarouba Family

Castela emoryi (Gray) Moran & Felger-Crucifixion thorn

Syn.: Holacantha emoryi Gray

STERCULIACEAE Cacao Family

Fremontodendron californicum (Torr.) Coville-Flannel

Tumamoca macdougalii Rose-Tumamoc globeberry

EUPHORBIACEAE Spurge Family

Euphorbia plummerae Wats.-Woodland spurge

Sapium biloculare (Wats.) Pax-Mexican jumping-bean

FABACEAE Pea Family [=Leguminosae]

Astragalus corbrensis Gray var. maguirei Kearney

Astragalus cremnophylax Barneby var. myriorraphis Barneby-Cliff milk-vetch

Astragalus hypoxylus Wats.-Huachuca milk-vetch

Astragalus nutriosensis Sanderson-Nutrioso milk-vetch

Astragalus xiphoides (Barneby) Barneby-Gladiator milk-vetch

Cercis occidentalis Torr.-California redbud

Errazurizia rotundata (Woot.) Barneby
Syn.: Parryella rotundata Woot.

Lysiloma microphylla Benth. var. thornberi (Britt. & Rose) Isely-Feather bush
Syn.: Lysiloma thornberi Britt. & Rose

Phaseolus supinus Wiggins & Rollins

FOUQUIERIACEAE Ocotillo Family

Fouquieria splendens Engelm.-Ocotillo, coach-whip, monkey-tail

GENTIANACEAE Gentian Family

Gentianella wislizenii (Engelm.) J. Gillett
Syn.: Gentiana wislizenii Engelm.

LAMIACEAE Mint Family

Hedeoma diffusum Green-Flagstaff pennyroyal

Salvia dorrii ssp. mearnsii

Trichostema micranthum Gray

LILIACEAE Lily Family

Allium acuminatum Hook.

Allium bigelovii Wats.

Allium biseptrum Wats. var. palmeri (Wats.) Cronq.
Syn.: Allium palmeri Wats.

Allium cernuum Roth. var. neomexicanum (Rydb.) Macbr.-Nodding onion

Allium cernuum Roth. var. obtusum Ckll.

Allium geyeri Wats. var. geyeri

Allium geyeri Wats. var. tenerum Jones

Allium kunthii Don

Allium macropetalum Rydb.

Allium nevadense Wats. var. cristatum (Wats.) Ownbey

Allium nevadense Wats. var. nevadense

Allium parishii Wats.

Allium plummerae Wats.

Allium rhizomatum Woot. & Standl. Incl.: Allium glandulosum Link & Otto sensu Kearney & Peebles

Androstephium breviflorum Wats.-Funnel-lily

Calochortus ambiguus (Jones) Ownbey

Calochortus aureus Wats.
Syn.: Calochortus nuttallii Torr. & Gray var. aureus (Wats.) Ownbey

Calochortus flexuosus Wats.-Straggling mariposa

Calochortus gunnisonii Wats.

Calochortus kennedyi Porter var. kennedyi-Desert mariposa

Calochortus kennedyi Porter var. munzii Jeps.

Dichelostemma pulchellum (Salisb) Heller var. pauciflorum (Torr.) Hoover

Disporum trachycarpum (Wats.) Benth. & Hook. var. subglabrum Kelso

Disporum trachycarpum (Wats.) Benth. & Hook. var. trachycarpum

Echeandia flavescens (Schultes & Schultes) Cruden
Syn.: Anthericum torreyi Baker

Eremocrinum albomarginatum Jones

Fritillaria atropurpurea Nutt.

Hesperocallis undulata Gray-Ajo lily

Lilium parryi Wats.-Lemon lily

Lilium umbellatum Pursh

Maianthemum racemosum (L.) Link. ssp. amplexicaule (Nutt.) LaFrankie
Syn.: Smilacina racemosa (L.) Desf. var. amplexicaulis (Nutt.) Wats.

Maianthemum racemosum (L.) Link ssp. racemosum-False Solomon's seal
Syn.: Smilacina racemosa (L.) Desf. var. racemosa; Smilacina racemosa (L.) Desf. var. cylindrata Fern.

Maianthemum stellatum (L.) Link
Syn.: Smilacina stellata (L.) Desf.-Starflower

Milla biflora Cav.-Mexican star

Nothoscordum texanum Jones

Polygonatum cobrense (Woot. & Standl.) Gates

Streptopus amplexifolius (L.) DC.-Twisted stalk

Triteleia lemmonae (Wats.) Greene

Triteleiopsis palmeri (Wats.) Hoover

Veratrum californicum Durand.-False hellebore

Zephyranthes longifolia Hemsl.-Plains rain lily

Zigadenus elegans Pursh-White camas, alkali-grass

Zigadenus paniculatus (Nutt.) Wats.-Sand-corn

Zigadenus virescens (H. B. K.) Macbr.

MALVACEAE Mallow Family

Abutilon parishii Wats.-Tucson Indian mallow

Abutilon thurberi Gray-Baboquivari Indian mallow

ONAGRACEAE Evening Primrose Family

Camissonia exilis (Raven) Raven

ORCHIDACEAE Orchid Family

Calypso bulbosa (L.) Oakes var. americana (R. Br.) Luer

Coeloglossum viride (L.) Hartmann var. virescens (Muhl.) Luer
Syn.: Habenaria viridis (L.) R. Br. var. bracteata (Muhl.) Gray

Corallorhiza maculata Raf.-Spotted coral root

Corallorhiza striata Lindl.-Striped coral root

Corallorhiza wisteriana Conrad-Spring coral root

Epipactis gigantea Douglas ex Hook.-Giant helleborine

Goodyera oblongifolia Raf.

Goodyera repens (L.) R. Br.

Hexalectris spicata (Walt.) Barnhart-Crested coral root

Listera convallarioides (Swartz) Nutt.-Broad-leaved twayblade

Malaxis corymbosa (S. Wats.) Kuntze

Malaxis ehrenbergii (Reichb. f.) Kuntze

Malaxis macrostachya (Lexarza) Kuntze-Mountain malaxia
Syn.: Malaxis soulei L. O. Williams

Malaxis tenuis (S. Wats.) Ames

Platanthera hyperborea (L.) Lindley var. gracilis (Lindley) Luer
Syn.: Habenaria sparsiflora Wats. var. laxiflora (Rydb.) Correll

Platanthera hyperborea (L.) Lindley var. hyperborea-Northern green orchid
Syn.: Habenaria hyperborea (L.) R. Br.

Platanthera limosa Lindl.-Thurber's bog orchid
Syn.: Habenaria limosa (Lindley) Hemsley

Platanthera sparsiflora (Wats.) Schlechter var. ensifolia (Rydb.) Luer

Platanthera sparsiflora (Wats.) var. laxiflora (Rydb.) Correll

Platanthera sparsiflora (Wats.) Schlechter var. sparsiflora-Sparsely-flowered bog orchid
Syn.: Habenaria sparsiflora Wats.

Platanthera stricta Lindl.-Slender bog orchid
Syn.: Habenaria saccata Greene; Platanthera saccata (Greene) Hulten

Platanthera viridis (L.) R. Br. var. bracteata (Muhl.) Gray-Long-bracted habenaria

Spiranthes michaucana (La Llave & Lex.) Hemsl.

Spiranthes parasitica A. Rich. & Gal.

Spiranthes romanzoffiana Cham.-Hooded ladies tresses

PAPAVERACEAE Poppy Family

Arctomecon californica Torr. & Frém.-Golden-bear poppy, Yellow-flowered desert poppy

PINACEAE Pine Family

Pinus aristata Engelm.-Bristlecone pine

POLYGONACEAE Buckwheat Family

Eriogonum apachense Reveal

Eriogonum capillare Small

Eriogonum mortonianum Reveal-Morton's buckwheat

Eriogonum ripleyi J. T. Howell-Ripley's wild buckwheat, Frazier's Well buckwheat

Eriogonum thompsonae Wats. var. atwoodii Reveal-Atwood's buckwheat

PORTULACEAE Purslane Family

Talinum humile Greene-Pinos Altos flame flower

Talinum marginatum Greene

Talinum validulum Greene-Tusayan flame flower

PRIMULACEAE Primrose Family

Dodecatheon alpinum (Gray) Greene ssp. majus H. J. Thompson

Dodecatheon dentatum Hook. ssp. ellisiae (Standl.) H. J. Thompson

Dodecatheon pulchellum (Raf.) Merrill

Primula hunnewellii Fern.

Primula rusbyi Greene

Primula specuicola Rydb.

RANUNCULACEAE Buttercup Family

Aquilegia caerulea James ssp. pinetorum (Tidest.) Payson-Rocky Mountain Columbine

Aquilegia chrysantha Gray

Aquilegia desertorum (Jones) Ckll.-Desert columbine, Mogollon columbine

Aquilegia elegantula Greene

Aquilegia longissima Gray-Long Spur Columbine

Aquilegia micrantha Eastw.

Aquilegia triternata Payson

ROSACEAE Rose Family

Rosa stellata Woot.-ssp. abyssa A. Phillips Grand Canyon rose

Vauquelinia californica (Torr.) Sarg. ssp. pauciflora (Standl.) Hess & Henrickson-Few-flowered Arizona rosewood

SCROPHULARIACEAE Figwort Family

Castilleja mogollonica Pennell

Penstemon albomarginatus Jones

Penstemon bicolor (Brandeg.) Clokey & Keck ssp. roseus Clokey & Keck

Penstemon clutei A. Nels.

Penstemon distans N. Holmgren-Mt. Trumbull beardtongue

Penstemon linarioides spp. maguirei

SIMAROUBACEAE Simarouba Family

Castela emoryi (Gray) Moran & Felger-Crucifixion thorn

Syn.: Holacantha emoryi Gray

STERCULIACEAE Cacao Family

Fremontodendron californicum (Torr.) Coville-Flannel bush

C. Salvage Assessed Protected Native Plants

The following list includes those species of 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.

BIGNONIACEAE Bignonia Family

Chilopsis linearis (Cav.) Sweet var. arcuata Fosberg-Desert-willow

Chilopsis linearis (Cav.) Sweet var. glutinosa (Engelm.) Fosberg

FABACEAE Pea Family [=Leguminosae]

Cercidium floridum Benth.-Blue palo verde

Cercidium microphyllum (Torr.) Rose & Johnst.-Foothill palo verde

Olneya tesota Gray-Desert ironwood

Prosopis glandulosa Torr. var. glandulosa-Honey mesquite
Syn.: Prosopis juliflora (Swartz) DC. var. glandulosa (Torr.) Ckll.

Prosopis glandulosa Torr. var. torreyana (Benson) M. C. Johnst.-Western honey mesquite
Syn.: Prosopis juliflora (Swartz) DC. var. torreyana Benson

Prosopis pubescens Benth.-Screwbean mesquite

Prosopis velutina Woot.-Velvet mesquite
Syn.: Prosopis juliflora (Swartz) DC. var. velutina (Woot.) Sarg.

Psorothamnus spinosus (Gray) Barneby-Smoke tree.
Syn.: Dalea spinosa Gray

D. Harvest Restricted Protected Native Plants

The following list includes those species of native plants that are not included in the highly safeguarded category but are subject to excessive harvesting or overcutting because of their intrinsic value.

AGAVACEAE Agave Family (including Nolinaceae)

Nolina bigelovii (Torr.) Wats.-Bigelow's nolina

Nolina microcarpa Wats.-Beargrass, sacahuista

Nolina parryi Wats.-Parry's nolina

Nolina texana Wats. var. compacta (Trel.) Johnst.-
Bunchgrass

Yucca baccata Torr. var. baccata-Banana yucca

Yucca schidigera Roezl.-Mohave yucca, Spanish dagger

FABACEAE Pea Family [=Leguminosae]

Olneya tesota Gray-Desert ironwood

Prosopis glandulosa Torr. var. glandulosa-Honey mesquite
Syn.: Prosopis juliflora (Swartz) DC. var. glandulosa (Torr.) Ckll.

Prosopis glandulosa Torr. var. torreyana (Benson) M. C. Johnst.-Western honey mesquite
Syn.: Prosopis juliflora (Swartz) DC. var. torreyana Benson

Prosopis pubescens Benth.-Screwbean mesquite

Prosopis velutina Woot.-Velvet mesquite
Syn.: Prosopis juliflora (Swartz) DC. var. velutina (Woot.) Sarg.

Arizona Department of Agriculture (ADA)
Licensing and Registration Section
1688 West Adams, Phoenix, Arizona 85007
Phone: (602) 364-0935
Fax: (602) 542-0466

Notice of Intent to Clear Land — ARS § 3-904

Pursuant to A.R.S. § 3-904 the undersigned, as Owner of the Property described herein, gives this Notice of Intent to Clear Land of protected native plants.

1. **Owner/landowner's agent.** The owner or landowner's agent of the Property upon which protected native plants will be affected:

   Owner's Name ____________________ Phone ____________

   Address ____________________

   Agent's Name ____________________ Phone ____________

   Address ____________________

2. **Property.** The description and location of the Property upon which protected native plants will be affected:

   County

   Name of Property/Project ____________________

   Address ____________________

   Physical Location (attach map) ____________________

   (Note: Map must also show surrounding land for 1/2 mile in each direction)

   Tax Parcel ID Nos. ____________________

   Legal Description (or attach copy) ____________________

   Number of Acres to be Cleared ____________________

3. **Owner's Intent.** Landowner's intentions when clearing private land of protected native plants.

   ☐ Owner intends to allow salvage of the plants, and agrees to be contacted by native plant salvagers.

   ☐ Owner intends to transplant the plants onto the same property, or to another property he also owns.

   ☐ Owner has already arranged for salvage of the plants.

   ☐ Owner does not intend to allow salvage of the plants.

   ☐ Other ____________________

4. **Approximate starting date.** ____________________

   (See notice period listed on reverse side)

   The information contained in this application is true and accurate to the best of my knowledge. I understand that providing false information is a felony in Arizona

Signature ____________________ **Date** ____________

Notice to salvagers: Consent of the landowner is required before entering any lands described in this notice.

Explanation Of This Form

1. **Notice of Intent to Clear Land.**
   The majority of the desert plants fall into one of four groups specially protected from theft, vandalism or unnecessary destruction. They include all of the cacti, the unique plants like Ocotillo, and trees like Ironwood, Palo Verde and Mesquite. In most cases the destruction of these protected plants may be avoided if the private landowner gives prior notice to the Arizona Department of Agriculture.
2. **Notice Period.**
   When properly completed, this form is to be sent to the Department within the time periods described below. Landowners/ developers are encouraged to salvage protected native plants whenever possible.
3. **Information to Interested Parties.**
   The information in this notice will be posted in the applicable state office of the Department and mailed to those parties (salvage operators, revegetation experts) who have an interest in these plants and may approach the landowner with the possibility of saving the plant(s) from unnecessary destruction.

Notice to Landowner:

1. The owner may not begin destruction of protected native plants until he receives confirmation from the Arizona Department of Agriculture and the time prescribed below has elapsed. The "Confirmed" stamp only verifies that the Notice has been filed.

<u>Size of area over which the Destruction of Plants will occur</u>	<u>Length of Notice Period</u>
Less than one acre	20 days, oral or written
One acre or more, but less than 40 acres	30 days, written
40 acres or more	60 days, written

2. If you are clearing land over an area of less than one acre, oral notice may be given by calling the applicable state office at the telephone number given below.
3. If the land clearing or plant salvage does not occur within one year, a new Notice is required.
4. This Notice must be sent to the applicable state office of the Department of Agriculture at the address given below:

Phoenix Office
1688 W. Adams
Phoenix, AZ 85007
(602) 364-0935

Tucson Office
400 W. Congress Ste.124
Tucson, AZ 85701
(520) 628-6317
M-F 8a.m.-11:30a.m.

Notice to salvagers: Consent of the landowner is required before entering any lands described in this notice.

05/07

Arizona Department of Agriculture (ADA)
Licensing and Registration Section
1688 West Adams, Phoenix, Arizona 85007
Phone: (602) 364-0935
Fax: (602) 542-0466

Application for Arizona Protected Native Plants And Wood Removal

Read both sides carefully before completing application.
In order for a permit to be issued, all information requested must be completely filled out and is subject to verification. All entries must be in ink or typed. It is unlawful to falsify any application, which gives any person permission to obtain a permit to take protected native plants. **Never sign a blank application.** Permits will expire within one year from the date designated by the landowner. *

I HEREBY CERTIFY that I am the owner of certain lands located in ______________________ County Arizona

Tax Parcel Identification ______________________ Total Acres ________

Sec _____ Twn _____ Rng _____ Location within Section ______________________

Physical location ______________________

Note: **If property has been purchased within the last 18 months, copies of tax assessment or deed records must be presented with this application.**

I FURTHER CERTIFY that I have granted permission to

____

Name of Applicant Company Name

____

Address Telephone No.

to remove the following named plants, which are protected under A.R.S. Title 3.

Destination of Plants:

____

For the purpose of: ☐ Commercial ☐ Personal Use ☐ Municipality

No. of Plants/cords	Name of Plants	No. of Plants/cords	Name of Plants

This application was completed by: ☐ Owner ☐ Agent ☐ Applicant

DECLARATION: I hereby certify and declare that I have read and understand the instructions. I further certify to the accuracy of the statements appearing on this application under penalty of perjury. If property is jointly owned, both signatures required.

Signature of Property Owner ______________________ Date ________

Signature of Property Co-Owner ______________________ Date ________

Print Name (s) ______________________

Address ______________________ Telephone # ________

____

Signature of Applicant Agents Title or Position

An agent must submit documentation of his authority to act on behalf of the landowner.

As a landowner, you have the right to destroy or remove any plant growing from your land, but if you are going to destroy these plants, you must notify the Arizona Department of Agriculture before you plan to initiate this action. You also have the right to sell or give away any plant growing on your land. However, no person may legally transport protected native plants from any land without first obtaining a permit from the Arizona Department of Agriculture.

State and Federal land leased to you does not give you the authority to remove and transport protected plants unless written permission is given by the land management agency.

UNLESS COMPLETE LEGAL DESCRIPTION IS GIVEN, THIS PERMIT WILL BE REFUSED. (Tax parcel I.D. number and locations within section are very important).

Native plant permits are priced at $5.00. Tags are priced as follows:

Saguaro	$6.00
Other protected native plants and trees	$4.00
Wood, per cord	$4.00
Pincushion, Coryphantha and Mammillaria (Under 8 inches)	$ .50

Please add $5.00 for shipping if we are mailing the tags back to you.

Example:	**Saguaro:**	**$ 6.00**
	Permit:	**$ 5.00**
	Postage:	**$ 5.00**
	Total:	**$ 16.00**

The following is a partial list of some of the generally accepted common names of Arizona protected native plants. Please list the plants as accurately as possible. Be sure that the protected native plants that you plan to remove are actually on the land described on this application.

CACTUS:	Barrel	Night-blooming Cereus	Cholla	Coryphantha
	Hedgehog	Prickly Pear	Mammillaria	Saguaro
OTHER PLANTS:	Agave (Century Plant)	Jerusalem Thorn	Palo Verde	Crucifixion Thorn
	Joshua Tree	Smoke Tree	Desert Spoon (Sotol)	Mesquite
	Yucca	Ironwood Tree	Ocotillo	

Permits Can Be Obtained From The Following Offices:

Phoenix Office
1688 W. Adams
Phoenix, AZ 8507
(602) 364-0935

Tucson Office
400 W. Congress, Ste. 124
Tucson, AZ 85701
(520) 628-6317
Hours M&F ONLY
8:00 a.m. - 11:30 a.m.

Arizona Department of Agriculture (ADA)
Licensing and Registration Section
1688 West Adams, Phoenix, Arizona 85007
Phone: (602) 364-0935
Fax: (602) 542-0466

Application for Blue Seal Permit

Read both sides before completing this application. In order for a permit to be issued, all information requested must be completely filled out and is subject to verification. All entries must be in ink or typed. It is unlawful to falsify any application, which grants permission to obtain a permit to remove native plants. **Never sign a blank application.**

NOTE: **If property has been purchased within the last 18 months, a copy of the tax assessment or deed records must be presented with this application.**

☐ I hereby certify that the plants listed on this application are in my cultivated or landscaped yard and are not from their original or natural growing site.

Tax Parcel Identification Number ______

Owner's Name ______

Address (Plant's Location) ______

County ______ Telephone ______

Receiver's Name ______

Address ______

Telephone ______

Carrier's Name ______

Address ______

Telephone ______

Number of Plants To Be Removed—attach additional sheets if necessary.

Saguaro ______ Height ______ No. of Arms ______ | ______ Height ______ No. of Arms ______

______ Height ______ No. of Arms ______ | ______ Height ______ No. of Arms ______

______ Height ______ No. of Arms ______ | ______ Height ______ No. of Arms ______

______ Height ______ No. of Arms ______ | ______ Height ______ No. of Arms ______

Organpipe ______ No. Of Branches ______ Senita ______ No. Of Branches ______

Barrel ______ Cholla ______ Hedgehog ______ Prickly Pear ______

Agave ______ Ocotillo ______ Yucca ______ Pincushion ______ Sotol ______

Other ______

Each property owner shall declare: I hereby certify and declare that I have read and understand the instructions. I further certify to the accuracy of the statements appearing on this application under penalty of perjury.

Signature of Property Owner ______ Date ______
Signature of Property Co-Owner ______ Date ______

The intended receiver must pick up the seals and string at one of the offices listed on the back of this form.

I acknowledge that I have received the following number of seals and string:

______ Seals ______ String

Signature ______ Date ______

rev. 12/03

Recently the Arizona State Legislature amended Arizona State Law Chapter 7 Article 1 (3-906 B) to read as follows:

In addition to the requirements prescribed by this section, a person who moves or salvages a saguaro cactus (cereus giganteus) that is more than four feet tall, from other than its original growing location, must purchase a permit, tag and seal from the department. A person may move a saguaro cactus without obtaining a permit, tag and seal only if the person maintains documentation of a previous legal movement or if the department has record of a previous legal movement of the cactus by the person. Saguaro cacti that are propagated by humans are exempt from the requirements of this subsection.

As a home owner, you have the right to remove, sell or give way any native plant growing on your property. However, any Saguaro over four (4) feet tall must have a movement permit obtained from the Arizona Department of Agriculture.

Native plants, other than the Saguaro, that have had prior movement permits do not require a new permit. If requested the Arizona Department of Agriculture will issue a blue seal permit for native plants (except Saguaro) that have had prior movement permits. The cost would be a permit fee of $5.00 and $.10 for each seal.

The following is a partial list of some of the generally accepted common names of Arizona native plants. Please use these names as accurately as possible. Be sure that the native plants that you plan to remove are actually on the land described on this application.

Cactus

Barrel	Cholla	Hedgehog	Mammillaria	Night-blooming Cereus
Coryphantha	Prickly Pear	Saguaro		

Other Plants

Agave (Century Plant)	Desert Spoon (Sotol)	Ironwood Tree
Joshua Tree	Mesquite	Ocotillo
Palo Verde	Yucca	

Permits Can Be Obtained From The Following Offices:

Phoenix Office
1688 W. Adams
Phoenix, AZ 85007
(602) 364 – 0935
M-F 8:00 TO 4:30 p.m.

Tucson Office
400 W. Congress Ste.124
Tucson, AZ 85701
(520) 628-6317
M & F(ONLY) 8:00 TO 11:30 a.m.

BIOLOGICAL SURVEY
ATTACHMENT C

DESCRIPTION OF FEDERALLY LISTED SPECIES

Razorback Sucker (*Xyrauchen texanus*)

The razorback sucker was designated as a federally endangered species on October 23, 1991.

Distribution:

This species formerly occurred throughout the Colorado River basin, from Wyoming and Colorado to Sonora and Baja California. Now it is much reduced in range and abundance. The largest extant population occurs in Lake Mohave (lower Colorado River); small numbers occur in Lake Mead, Lake Havasu, and the Grand Canyon (transitory in Grand Canyon; Douglas and Marsh 1998). Major known spawning areas in Lake Mohave include Cottonwood Cove, Arizona Bay, Six-mile Cove, and Eldorado Canyon (Minckley et al. 1991). An ongoing stocking program is attempting to enhance the number of suckers that reach maturity in Lake Mohave where few young fish escape predation by nonnative fishes. Since the late 1980s, the Arizona Game and Fish Department has attempted to establish populations in the Verde and Salt rivers through stocking, but few fish survive. In the Upper Colorado River basin, adults and larvae are widely distributed in the Green River basin, especially in the upper basin from the mouth of the Duchesne River upstream to the lower 4 miles of the Yampa River, rarely occurring upstream as far as the Little Snake River. Spawning has been documented in the lower Yampa River near confluence with the Green River and in the upper Green River (Tyus and Karp 1989). A small reproducing population exists in the lower Green River. In the upper Colorado River, most suckers occur in the Grand Valley (mainstem Colorado River and Gunnison River, Colorado). A reproducing population occurs in an off-channel pond in the Colorado River near Grand Junction. A few have been found in the San Juan River above Lake Powell, and adults have been found in the San Juan and Colorado river arms of the lake (USFWS 1997). The species is currently considered extant in New Mexico, based on ongoing reintroduction efforts in the San Juan River basin (D.L. Propst, pers. comm., 26 October 2000). The Project started in 1995 and New Mexico Game and Fish documented reproduction in 1998 and 1999. Adults overwinter in the Echo Park area of Dinosaur National Monument (Tyus and Karp 1989). Razorback suckers were recorded in the late 1980s along the south shore of Lake Powell near the concrete boat ramp at Piute Farms Marina and near Bluff, Utah; the Lake Powell record apparently represented a spawning aggregation or staging prior to spawning elsewhere (Platania et al. 1991).

Natural History:

Habitat. Habitats include slow areas, backwaters, and eddies of medium to large rivers and their impoundments (three of the four remaining populations of greater than 100 individuals are in reservoirs). Flooded lowlands and lower portions of tributary streams presumably served as resting/feeding areas during breeding season in the Green River basin (Tyus and Karp 1990). This fish is often associated with sand, mud, and rock substrate in areas with sparse aquatic vegetation, where temperatures are moderate to warm (Sigler and Miller 1963).

It has been collected in flooded gravel pits along the Colorado River, Colorado, and from irrigation canals along lower Colorado River (juveniles, Marsh and Minckley 1989). In the nonbreeding season, adults were most common in shoreline runs and along mid-channel sand bars in the mainstream Green River, with average water depth of less than 2.0 meters and average velocity of less than 0.5 meters per second (Tyus and Karp 1989). Radio-tagged suckers reintroduced into the Gila River, Arizona, used both sand-bottomed, flat-water, main-channel habitats and quieter pools and eddies adjacent to stronger currents (see Minckley et al. 1991). Hatchery-reared suckers released into the San Juan River inflow of Lake Powell most often used shallowly flooded stands of salt cedar and, in some cases, cobbled shorelines (Karp and Mueller 2002). Limited data indicate that young tend to remain along shorelines, in embayments along sandbars, or in tributary mouths (see Minckley et al. 1991). In Lake Mohave, individuals were associated with inshore habitats, except during the hotter months when they moved offshore, possibly to avoid warmer water temperatures (Mueller et al. 2000).

Spawning. Occurs most commonly near shore in streams over silty sand, gravel, or rock substrate at depths of up to about 6.0 meters (often in water less than 0.6 meters deep); known and suspected spawning sites in the Green and other upper-basin rivers all are in broad, flat-water segments (Minckley et al. 1991). Ripe individuals often have been taken near or over coarse sand, or gravel, or cobble bars, in flowing water. In reservoirs, spawning occurs on gravel bars swept clean by wave action; also along shorelines over mixed substrates ranging from silt to cobble (Federal Register, March 21, 1994). Spawning has been observed downstream from major impoundments, below Davis Dam and Hoover Dam (Mueller 1989). Larvae appear to remain in gravel until swim-up (see USFWS 1990); apparently they prefer the shallow littoral zone for a few weeks after hatching, then disperse to deeper waters (see Federal Register, March 21, 1994, p. 13375). Seasonally inundated floodplains provide favorable feeding areas for young. Spawning groups can include hundreds of individuals (Mueller et al. 2000). Spawns mainly late January–April (rarely to May or June) in the lower Colorado River basin (reservoirs), at temperatures of about 11-21 C (USFWS 1990; Federal Register, March 21, 1994); this is earlier, and the spawning season is longer, than in riverine habitat (Mueller et al. 2000). Spawns when water level rising or peak and water warming. Ripe females have been captured from mid-April to mid-June in northeastern Utah and northwestern Colorado. During spawning, 1 female may be attended by 2–12 males. Sexually mature as early as the second year (males), or third year (females), under conditions at Dexter NFH, or in fifth or sixth year under other captive regimes (Minckley et al. 1991). Many individuals survive for several decades.

Diet. Eats algae, planktonic crustaceans, and aquatic insect larvae; plantivorous and also benthic feeder. In Lake Mohave, Arizona-Nevada, diet of adults was dominated by planktonic crustaceans, diatoms, filamentous algae, and detritus (Marsh 1987).

Threats. This species is threatened by interactions with nonnative fishes and by human alteration of riverine habitat. Recruitment is very low (or absent) despite spawning and hatched larvae (e.g., in upper Green River basin). For example, no recruitment to reservoir populations was detected between 1963 and 1990 in the lower Colorado River basin, despite collecting with appropriate equipment (Minckley et al. 1991). Low recruitment results primarily from predation on larvae and juveniles by introduced fishes (Marsh et al. 2003). Competition with and predation by exotic crayfish may also be a problem in some areas (Lenon et al. 2002). Habitat changes resulting primarily from dam operations has greatly restricted the amount of suitable habitat; these detrimental changes include high winter flows, reduced high spring flows, altered river temperatures (Clarkson and Childs 2000), and reduced flooding (USFWS 1990). Natural recovery is limited by a paucity of spawning adults. Hybridization with other suckers is a potential problem in some locations (Tyus and Karp 1990, Minckley et al. 1991). See USFWS (1990) for many details on habitat changes that have affected this species.

Management:

Stewardship Overview. Population maintenance depends on ongoing stocking of juveniles that are large enough to avoid predation by nonnative fishes. Natural recruitment might be enhanced by appropriate management of floodplains that serve as important nursery areas.

Management Requirements. Juveniles reintroduced into Gila River suffered intensive predation from nonnative catfish; it was suggested that cold-weather planting of large suckers may enhance post-stocking survival (Marsh and Brooks 1989). Based on survival and persistence of released, hatchery-reared individuals, suboptimal habitat such as the San Juan River inflow of Lake Powell should be considered to be useable habitat for razorback sucker reintroduction efforts (Karp and Mueller 2002). Large populations of crayfish in ponds used for rearing razorback suckers negatively affect razorback survival through predation and competition for food (Lenon et al. 2002). Because juvenile bonytail may reduce numbers of small crayfish, integration of rearing programs for these two endangered fishes could benefit both species (Lenon et al. 2002). See recovery plan (USFWS 1998).

Monitoring Requirements. Electrofishing could adversely affect populations by injuring adults and reducing their reproductive success (Muth and Ruppert 1996). Otoliths can be used to estimate hatching dates for larvae and juveniles; this information facilitates appropriate management of river flows and critical floodplain habitat (Bundy and Bestgen 2001).

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Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The southwestern willow flycatcher was designated as a federally endangered species on February 27, 1995.

Distribution:

Breeds in southwestern U.S. (southern California north to Independence, Arizona; southwestern New Mexico; southern Utah; and at least formerly, southern Nevada) and possibly northern Baja California and Sonora (very rare if present). Sedgwick (2001) studied distributional limits using distinctive song types of E.T. Extimus and E.T. Adastus, and found intergradation or overlap in southwestern Colorado and northwestern New Mexico. In areas of intergradation, there was some sorting of song types by elevation; birds with songs attributable to E.T. Extimus were found as far north as 37 deg N at low elevation, whereas birds attributable to E.T. Adastus were found as far south as 33.7 deg N at high elevation. The latter population occurred at over 2,400 meters in eastern Arizona. Occurred at least formerly in western Texas (current status uncertain) and northern Sonora. Some isolated remnant populations in southern California were allocated to subspecies Extimus by Unitt (1987), but not by Phillips (1948). Population along the lower Colorado River now limited to about 20 pairs at Havasu National Wildlife Refuge (M. Romich, pers. comm. 2003). Formerly widespread in Arizona; now persist only in several small, widely scattered locations. Unitt (1987) noted that there was little recent information from Nevada and Utah. Unitt (1987) and USFWS (1993, 1995) included populations in areas of intergradation in the range of E.T. Extimus. Winters: probably central Mexico to northwestern Colombia (Stiles and Skutch 1989). Migrates: in southern California, migrates through desert regions and sometimes along the coast and onto the Channel Islands (Biosystems Analysis 1989).

Natural History:

Habitat. Thickets, scrubby and brushy areas, open second growth, swamps, and open woodland (AOU 1983). Restricted to riparian habitat in Arizona (Brown 1988). Nests primarily in swampy thickets, especially of willow, sometimes buttonbush (Phillips et al. 1964, AOU 1983), tamarisk (Brown 1988), vines, or other plants, where vegetation is 4.0 meters to 7.0 meters or more in height. Tamarisk is commonly used in the eastern part of the range. Habitat patches as small as 0.5 ha can support one or two nesting pairs (see USFWS 1995). Nests in fork or on horizontal limb of small tree, shrub, or vine, at height of 0.6 meter to 6.4 meters (mean usually about 2.0 m–3.0 m) (Harris 1991), with dense vegetation above and around the nest.

Breeding. Nesting occurs usually from early June through the end of July, peak in mid-June (Unitt 1987); sometimes may lay eggs as early as late May. In Grand Canyon, Arizona, breeds from early June to mid-July or perhaps early August (Brown 1988). Clutch size usually is 3–4 (2–3 along Colorado River). Incubation lasts 12–15 days, by female. Young are tended by both parents, leave nest at 12–15 days, usually in early to mid-July. Typically raises one brood per year. May incur a high rate of cowbird parasitism, especially in low elevation populations (e.g., Harris 1991, Brown 1988). Sometimes polygynous. Breeding territories are about 1.5 acres. Densities may be on the order of 9–14 pairs/100 acres.

Diet. Eats mainly insects caught in flight, sometimes gleans insects from foliage; occasionally eats berries. In breeding range, forages within and occasionally above dense riparian vegetation.

Threats. Decline is due primarily to destruction and degradation of cottonwood-willow and structurally similar riparian habitats. The causes of habitat loss and change are water impoundment, water diversion and groundwater pumping, channelization and bank stabilization, riparian vegetation control, livestock grazing, off-road vehicle and other recreational uses, increased fires, urban and agricultural development, and hydrological changes resulting from these and other land uses. Tamarisk has replaced native riparian vegetation in many areas, with varying effects on flycatcher populations. Native riparian plant communities probably have a greater recovery value for flycatchers, but currently occupied and suitable tamarisk habitat should be maintained (USFWS 2002). Increased irrigated agriculture and livestock grazing have also resulted in increased range and abundance of brown-headed cowbirds; and in some areas, heavy brood parasitism by cowbirds has contributed to the decline (Harris 1991, Brown 1988). Proposed reservoirs threaten the habitat of some populations. Wintering habitat limitations are unknown, but the amount of lowland wet habitat within its wintering range has declined substantially in the last century (Koronkiewicz et al. 1998). See USFWS (1995, 2002) for further details on threats. This flycatcher exists in small, fragmented populations, with only 10 or so populations having greater than 10 nesting pairs. The persistence of the smaller populations is dependent on immigration from nearby populations and their isolated nature increases the risk of local extirpation (USFWS 2002). The vulnerability of the few relatively large populations (e.g., to fire, inundation) makes the above threats particularly acute (USFWS 2002). Also of concern is the intensive use of pesticides, both in agricultural areas adjacent to nesting grounds and on the migrating and wintering grounds (USFWS 2002).

Management:

Management Requirements. In Oregon, willow flycatcher populations increased after reduction in cattle grazing and cessation of poisoning and removal of riparian willows (Taylor and Littlefield 1986). Harris (1991) recommended habitat restoration and reduction in grazing as the best long-term management strategies for reducing the rate of cowbird parisitism; trapping cowbirds or removal of cowbird eggs may be useful short-term strategies to provide immediate relief to critical populations. Brown (1988) cautioned against activities that would reduce or eliminate tamarisk (nesting habitat) in Grand Canyon, Arizona, and recommended that water releases from Glen Canyon dam be managed in a way that would minimize streambank erosion and consequent reduction in riparian breeding habitat. See USFWS (1995) for further information.

Monitoring Requirements. Those doing field surveys should be aware that subspecies Brewsteri is present (in migration) in the range of Extimus during most of the latter's breeding season; surveys should encompass the period June 20 to July 15 and include repeated visits to verify that observed birds are resident and territorial (Unitt 1987).

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Cactus Ferruginous Pygmy Owl
(*Glaucidium brasilianum cactorum*)

The cactus ferruginous pygmy owl was designated as a federally endangered species in 1997; it was delisted in 2006.

Distribution:

There is some confusion as to the geographic boundaries of G.B. CACTORUM and G.B. RIDGWAYI; some authors include the Texas and northeastern Mexican populations in the latter taxon (Konig et al. 1999, cited in Proudfoot and Johnson 2000). However, following USFWS (1994) and AOU (1957): RESIDENT: south-central Arizona south through northwestern Mexico to Michoacán; southern Texas south to Nuevo Leon and Tamaulipas; apparently there is a hiatus in central Mexico separating the western and eastern segments of the population. Now very sparse in Arizona and virtually extirpated from the lower Rio Grande Valley in Texas, but persisting in oak associations on the coastal plain north of the valley. Elevational range: sea level to usually below about 1,200 meters in western areas of Mexico, to at least 300 meters in eastern areas (Johnsgard 1988).

Natural History:

Habitat. Arizona: at present mainly associated with Sonoran desertscrub, especially along washes with dense xeroriparian mesquite, paloverde, desert ironwood, desert hackberry, and catclaw acacia; in Tucson area in low density residential areas dominated by saguaro and foothill paloverde, ironwood, and velvet mesquite, and augmented by irrigation and exotic vegetation. Formerly, more common in riparian cottonwood-willow forests intermixed with mesquite bosques (Cartron et al. 2000). Northwestern Mexico: Sonoran desertscrub, Sinaloan thornscrub, Sinaloan deciduous forest, riverbottom woodlands, cactus forest, and thornforest (see USFWS 1994). Texas: Formerly common in coastal plain oak associations and Tamaulipan thornscrub of the lower Rio Grande valley region (mesquite, hackberry, oak, Texas ebony). Now the largest population is in coastal sand plains dominated by mixed live oak and honey mesquite forest (Wauer et al. 1993). Northeastern Mexico: lowland thickets, thornscrub communities, riparian woodlands, and second-growth forest.

Breeding. Egg dates: mainly May in Texas (eggs collected as early as late March); mainly April-May in Mexico; sometimes late March or June. Clutch size is 2–5, usually 3–4. Incubation lasts about 28–30 days (also reported as 22 days), by female. Young are tended by both parents, can fly at about 27–30 days. Occurs singly or in pairs, except when caring for dependent young. Nests usually in natural tree or columnar cactus cavity or abandoned woodpecker hole; reported sites 3.3 meters to 9.o meters above ground. May re-use old nest site. Has used fabricated nest boxes (Proudfoot et al. 2000).

Diet. Diet includes lizards, large insects, scorpions, small birds and mammals, and other small animals (Terres 1980). May attack animals as large as or larger than itself.

Threats: Decline in the U.S. is probably primarily the result of destruction and modification of riparian and thornscrub habitats via urban and agricultural encroachment, wood cutting, water diversion, channelization, livestock overgrazing, groundwater pumping, and hydrological changes resulting from various land-use practices (see USFWS 1994 for details); the same may be true in northern Mexico (Proudfoot and Johnson 2000).

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Bald Eagle, wintering population (*Haliaeetus leucocephalus*)

The bald eagle was listed as federally threatened in Arizona, the population was last reviewed on March 11, 2005.

Distribution:

Most eagles that breed in Canada and the northern U.S. move south for the winter. Migrates widely over most of North America (AOU 1983); moves generally east-southeast across Canada and the Great Lakes region to the northeast coast of the U.S. In the northern Chesapeake Bay region, radio-tagged northern migrants arrived in late fall (mean date December 21) and departed in early spring (mean date March 27); radio-tagged southern migrants arrived throughout April-August and departed June–October (Buehler et al. 1991). See Palmer (1988) for fairly detailed review of seasonal movements in various regions. Defended territories are relatively small; 14 in Alaska varied from 11–45 hectares and averaged 23 ha (Hensel and Troyer 1964), and territory radius around active nests averaged 0.6 km in Minnesota (Mahaffy and Frenzel 1987). Feeding home ranges surrounding active nests are undoubtedly much larger, depending on proximity to food sources and abundance of food. Minimum home range of breeding birds in Saskatchewan was 7 k^2 (Gerrard et al. 1992); on the Columbia River, Oregon, breeding home ranges averaged 21.6 k^2 (Garrett et al. 1993). Winter home ranges can be very large, especially for nonbreeding birds. An immature wintered in Arizona over an area of >40,000 k^2 and spent the summer in the Northwest Territories over a summer range of >55,000 k^2 (Grubb et al. 1994). Maximum distance between feeding area and night roost site was less than 16 km in winter in Missouri (Griffin et al. 1982). In north-central Arizona, February–April home range of immatures averaged 400 k^2; birds moved frequently and roosted singly or in small groups (Grubb et al. 1989).

Natural History:

Habitat. Breeding habitat most commonly includes areas close to (within 4.0 km) coastal areas, bays, rivers, lakes, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, and seabirds (Andrew and Mosher 1982, Green 1985, Campbell et al. 1990). Preferentially roosts in conifers or other sheltered sites in winter in some areas; typically selects the larger, more accessible trees (Buehler et al. 1991, 1992). Perching in deciduous and coniferous trees is equally common in other areas (e.g., Bowerman et al. 1993). Communal roost sites used by two or more eagles are common, and some may be used by 100 or more eagles during periods of high use. Winter roost sites vary in their proximity to food resources (up to 33 km) and may be determined to some extent by a preference for a warmer microclimate at these sites. Available data indicate that energy conservation may or may not be an important factor in roost-site selection (Buehler et al. 1991). In Saskatchewan lakes, density was positively correlated with abundance of large fishes (Dzus and Gerrard 1993). In winter, may associate with waterfowl concentrations or congregate in areas with abundant dead fish (Griffin et al.

1982); often roosts communally at night in trees that are used in successive years. Wintering areas are commonly associated with open water though in some areas eagles use habitats with little or no open water if other food resources (e.g., rabbit or deer carrion) are readily available. Avoids areas with nearby human activity (boat traffic, pedestrians) and development (buildings) (Buehler et al. 1991). Bald eagles usually nest in tall trees or on cliffs near water. Nest trees include pines, spruce, firs, cottonwoods, oaks, poplars, and beech. Ground nesting has been reported on the Aleutian Islands in Alaska, in Canada's Northwest Territories, and in Ohio, Michigan, and Texas. Nests located on cliffs and rock pinnacles have been reported historically in California, Kansas, Nevada, New Mexico, and Utah, but currently are known to occur only in Alaska and Arizona. Same nest may be used year after year, or may alternate between two nest sites in successive years. In British Columbia, nests with overhead canopy of foliage were most successful (Palmer 1988). See Livingston et al. (1990) for model of nesting habitat in Maine, Wood et al. (1989) for characteristics of nesting habitat in Florida (most nests in live pine trees). In Oregon, most nests were within 1.6 km of water, usually in largest tree in stand (Anthony and Isaacs 1989). In Colorado and Wyoming, forest stands containing nest trees varied from old-growth ponderosa pine to narrow strips of riparian vegetation surrounded by rangeland (Kralovec et al. 1992).

Breeding. Breeds in central Alaska, northern Yukon, northwestern and southern Mackenzie, northern Saskatchewan, northern Manitoba, central Ontario, central Quebec, Labrador, and Newfoundland, south locally to the Commander and Aleutian islands, southern Alaska, Baja California (both coasts), Sonora (Brown et al. 1988), New Mexico, Arizona, Texas Gulf Coast, and Florida (including the Keys); very local in Great Basin and prairie and plains regions in interior North America, where breeding range recently has expanded to include Nebraska and Kansas. NON-BREEDING: generally throughout the breeding range, except in the far north (AOU 1983, Sibley and Monroe 1990), most commonly from southern Alaska and southern Canada southward. The Chilkat Bald Eagle Preserve, Alaska, supports the largest wintering population anywhere (Ehrlich et al. 1992). Winter concentrations occur in British Columbia-northwestern Washington, along the Missouri and Mississippi rivers, and in northern Arkansas. One of the largest fall (mid-October to mid-December) migrant concentrations (200–300 birds at any one time, close to a thousand individuals through the season) occurs at Hauser Lake near Helena, Montana.

Diet. Feeds opportunistically on fishes, injured waterfowl and seabirds, various mammals, and carrion (Terres 1980). See Haywood and Ohmart (1986), Kralovec et al. (1992), Brown (1993), and Grubb (1995) for diet of inland breeding populations in Arizona, Colorado, and Wyoming. Hunts live prey, scavenges, and pirates food from other birds (e.g., osprey) and, in Alaska, sea otter (Watt et al. 1995, Condor 97:588-590). See Palmer (1988) for further information on hunting methods. In the Columbia River estuary, tidal flats and water less than 4.0 meters deep were important foraging habitats (Watson et al. 1991). See Caton et al. (1992) for information on foraging perches used in

Montana. Sheep carcasses were significant food sources in winter in Oregon (Marr et al. 1995, Wilson Bulletin 107:251-257).

Threats. Major threats include habitat loss, disturbance by humans, biocide contamination, decreasing food supply, and illegal shooting (Evans 1982, Green 1985, Herkert 1992). In 1992, many died in northern Utah after eating poisoned bait set out by ranchers. Breeding success still is being affected by environmental contaminants in the diet along Lake Superior in Wisconsin (Kozie and Anderson 1991). Greatest potential threats in Florida include urban development and commercial timber harvest (Wood et al. 1989). The Chilkat Bald Eagle Preserve, Alaska, which supports the largest wintering population anywhere, was threatened by a proposed copper mine in the early 1990s (Ehrlich et al. 1992). See Witmer and O'Neil (1990) for information on estimating cumulative impacts of multiple hydroelectric development and logging activities in Washington. See Montopoli and Anderson (1991) for a model used to evaluate the cumulative effects of selected forms of human disturbance in the Greater Yellowstone ecosystem. As of the mid-1990s, the population in the southwestern U.S. continued to face threats and required intensive management to maintain current population levels (1994 End. Sp. Tech. Bull. 19(5):18). Generally susceptible to human intrusion, but “show a high degree of adaptability and tolerance if the human activity is not directed toward them” (Beebe 1974). However, chronic disturbance results in disuse of areas by eagles (Fraser 1985).

Management:

Management Requirements. Recovery has been assisted by intensive management that included systematic monitoring, enhanced protection, captive breeding, relocation of wild birds, and publicity (Matthews and Moseley 1990). Knight and Knight (1984) recommended a 450 meter buffer between a human in a canoe and a feeding eagle. For northern Chesapeake Bay, Buehler et al. (1991) recommended a 1,360-meter-wide shoreline management zone that extends 1,400 meters inland to encompass nonbreeding roost sites and provide a buffer from human disturbance. Another study recommended a 250-meter buffer between a human on land and an eagle in a shoreline tree. A 500-meter buffer around the nest may be adequate (see Fraser et al. 1985). In Michigan, 75 percent of all alert and flight responses to human activity occurred when activity was within 500 meters and 200 meters, respectively; vehicles and pedestrians elicited the highest response frequencies. Anthony and Isaacs (1989) made recommendations for Oregon: size of areas for nest-site management should be 50–250 ha, with size and shape depending on surrounding vegetation, topography, and eagle behavior; human activities within 800 meters of nests should be restricted from January 1 to August 31; clearcut logging, road building, hiking trails, and boat launch facilities should not be allowed within 400 meters of nests. In Arizona, pedestrians were the most disturbing human activity; eagles were more often flushed from perches than from nests and were most easily disturbed when foraging; eagle response to disturbance frequencies were 64 percent at distances less than 216 meters, 45 percent at 216 meters to 583 meters, and 24 percent at distances greater than 583 meters (Grubb and King 1991). Along northern Chesapeake Bay, flush distances because of approaching boats averaged 204 meters in winter, 176 meters in summer (Buehler et al. 1991, see for further information on the effects of human activity). In the Columbia River estuary, management of eagle foraging habitats should emphasize protection and enhancement of tidal flats (Watson et al. 1991). See Busch (1988) for a discussion of management activities in the southwestern U.S., Lefranc and Glinski (1988) for management recommendations. Supplemental feeding can be used in efforts to replace diminished supplies of natural foods, provide food free of environmental contaminants, provide essential nutrients, enhance survival of subadults, manipulate distribution of populations, increase nesting success, support released captive-bred birds, and/or afford opportunities for public viewing and education; potential disadvantages of supplemental feeding include prohibitive costs, the loss of natural and cautious behavior, dependence on these food supplies, which may alter migration patterns, and increased potential for disease transmission (Knight and Anderson 1990). See Grubb (1980) for information on construction and use of an artificial nest structure.

Monitoring Requirements. See Fraser et al. (1983) for information on scheduling reproductive surveys. See Britten et al. (1995) for information on satellite telemetry.

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Yuma Clapper Rail (Rallus longirostris yumanensis)

The Yuma clapper rail was designated as a federally endangered species on March 11, 1967.

Distribution:

Lower Colorado River from California and Arizona into Mexico; also Salton Sea, Imperial County, California (California Department of Fish and Game 1990). Distributed over an area defined by the Colorado River Delta (Mexico), Salton Sea (California), Topock Marsh (Arizona), and Gila River to near Tacna (Arizona) (Matthews and Moseley 1990). In California, nests in along the lower Colorado River, in wetlands surrounding the Coachella Canal, the Imperial Valley, and the upper end of the Salton Sea at the Whitewater River delta and Salt Creek (Biosystems Analysis 1989). It is thought that this rail was not distributed along the Colorado River until suitable habitat was created through dam construction (Matthews and Moseley 1990). Also, habitat was expanded through the creation of the Salton Sea in the early 1900s. Some U.S. breeders may winter along the coasts of Sonora, Sinaloa, and Nayarit (Eddleman et al. 1988). Banks and Tomlinson (1974) reported late winter specimens in freshwater and salt water habitats in Sinaloa and Puebla.

Natural History:

Habitat. Freshwater marshes containing dense stands of cattails (*Typhalatifolia*) and bulrushes (*Scirpus acutus*) (California Department of Fish and Game 1990). Prefers mature stands along margins of shallow ponds with stable water levels (Matthews and Moseley 1990). Generally in freshwater and alkali marshes dominated by stands of emergent vegetation interspersed with areas of open water and drier, upland benches (Biosystems Analysis 1989). In Mexico, prefers brackish marshes dominated by dense stands of tall *Tamarix* with an understory of *Allenrolfia occidentalis* (Matthews and Moseley 1990).

Breeding. Nests probably on dry hummocks or in small shrubs among dense cattails or bulrushes along the edges of shallow ponds in freshwater marshes with stable water levels (Ehrlich et al. 1992).

Diet. Eats crayfish, small fishes, clams, isopods, and various insects. Probably probes in mud or sand in or near shallow water or picks items off substrate (Ehrlich et al. 1992).

Threats. Threatened by loss of habitat due to human-caused river flooding, so-called reclamation Projects, and mosquito abatement activities (California DF&G 1990). Principle threats include habitat loss caused by dredging, riprapping of streambanks, and high water flows on the Colorado River (Eddleman et al. 1988). Mitigation Projects have negatively impacted some marsh habitats (Eddleman et al. 1988).

Management:

Management Requirements. Remove exotic vegetation from rail habitat. Create and enhance rail habitat on state and federal refuges. Implement other recommendations in the 1989 report by the Bureau of Reclamation (California Department of Fish and Game 1990). See also Recovery Plan (1984). Most U.S. habitat is in national wildlife refuges and state wildlife management areas that are subject to water management practices of the U.S. Bureau of Reclamation (Eddleman et al. 1988). Havasu, Cibola, and Imperial national wildlife refuges offer potential management opportunities (Eddleman et al. 1988). Fire may destroy residual mats of vegetation used for nesting and this impact may last several years; thus fire must be used with caution as a habitat management tool (Eddleman et al. 1988).

Monitoring Requirements. Monitoring needs include regular assessment of populations in the U.S. and Mexico (California Department of Fish and Game 1990). Development and use of a standardized call-count survey is needed (Eddleman et al. 1988).

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Sonoran Pronghorn (Antilocapra americana sonoriensis)

The Sonoran pronghorn was designated as a federally endangered species on October 28, 1986.

Distribution:

Formerly throughout southern Arizona and in Mexico south to Guaymas, Sonora; presently in Yuma, Pima, and Maricopa counties, south of the Bill Williams River and west of the Baboquivari Mountains, southwestern Arizona, and in northwestern Sonora (Matthews and Moseley 1990, Hoffmeister 1986). See Hoffmeister (1986) for specific records of occurrence in Arizona.

Natural History:

Habitat. Broad alluvial valleys separated by granite mountains and mesas; areas with small-leaf trees (foothill paloverde, mesquite, catclaw, crucifixion thorn, smoketree) and numerous species of cacti (saguaro, barrel cactus, etc.) scattered over rocky hills and coarse-soiled slopes; triangle-leaf bursage or brittle bush almost always present (Matthews and Moseley 1990). Habitat in southwestern Arizona: vegetation includes big galleta grass, six-week three-awn, six weeks grama, creosote bush, bursage, and saltbush, similar to habitat in Sonora, where pronghorns occupy areas of stable sand dunes that have meadowlike conditions within or adjacent to them (Hoffmeister 1986). In the U.S., occurs in creosote bush-bursage habitat throughout the year, and utilizes areas containing paloverde-mixed cacti plant associations in spring and summer (Federal Register, 7 September 1994, p. 46266). Availability of free water reportedly is a critical factor (Hoffmeister 1986), but this has not been verified (Federal Register, 7 September 1994). A study of habitat utilization in southwestern Arizona recently was completed by Keith Hughes, University of Arizona (USFWS 1990).

Breeding. Breeds in summer and early fall (around late July to early October), probably mainly in late summer. Gestation probably lasts around 210–225 days. Births occur in mid-spring. Females give birth usually to twins (single fawns mainly from young females). Young are weaned by four months, but continue to follow mother during first winter. Some begin breeding at 1 year.

Diet. Eats various grasses and forbs, browses on shrubs.

Threats. Low population size probably is due to loss of essential habitat though water diversions and dams, livestock grazing, and agriculture; in Mexico, poaching is one of the suspected causes of decline (Matthews and Moseley 1990).

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Lesser Long-nosed Bat (*Leptonycteris curasoe*)

The lesser long-nosed bat was designated as a federally endangered species on September 30, 1988.

Distribution:

Central California (Constantine 1998), southern Arizona (e.g., Sidner and Davis 1988), and New Mexico to Honduras and El Salvador (Simmons, in Wilson and Reeder 2005). U.S. populations apparently winter in Mexico.

Natural History:

Habitat. The habitat in Mexico is primarily tropical deciduous forest and thorn forest (Arita 1991). In the United States, this bat roosts in old mines and caves at the base of mountains near alluvial fans vegetated with agave, yucca, saguaro, and organ pipe cactus (Barbour and Davis 1969). Young are born in maternity colonies in caves and mines.

Diet. Frugivore, Nectarivore

Threats. USFWS (1987, 1989) stated that the species was threatened by disturbance of roosts, loss of food sources through land clearing and human exploitation, and direct killing by humans. Overall, however, this species does not appear to be very threatened.

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BIOLOGICAL SURVEY
ATTACHMENT D

GIS PRODUCTS

GIS PRODUCTS

- GIS Interactive File
- Access Database for PF225
- GIS Layer: Vegetation Database
- Maps Including Vegetation Layer
- Field Photographs

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BIOLOGICAL SURVEY
ATTACHMENT E

WELLTON STATION SAGUARO CACTUS SUMMARY TABLE AND DATABASE

BIOLOGICAL SURVEY
ATTACHMENT F

WELLTON STATION WILDLIFE SPECIES LISTS

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS				
Blackbirds, Orioles				
Emberizidae				
Agelaius phoeniceus	Red-winged blackbird	G5/S5	—	—
Euphagus carolinus	Rusty blackbird	G4/?	—	—
Euphagus cyanocephalus	Brewer's blackbird	G5/S5	—	—
Icterus bullockii	Bullock's oriole	G5/SNRB	—	—
Icterus cucullatus	Hooded oriole	G5/S5	—	—
Icterus parisorum	Scott's oriole	G5/S5	—	—
Molothrus aeneus	Bronzed cowbird	G5/S5	—	—
Molothrus ater	Brown-headed cowbird	G5/S5	—	—
Quiscalus mexicanus	Great-tailed grackle	G5/S5	—	—
Sturnella neglecta	Western meadowlark	G5/S5	—	—
Xanthocephalus xanthocephalus	Yellow-headed blackbird	G5/S5	—	—
Caracaras, Falcons				
Falconidae				
Caracara cheriway	Crested caracara	G5/S1S2	—	—
Falco columbarius	Merlin	G5/S4N	—	—
Falco mexicanus	Prairie falcon	G5/S4	—	—
Falco peregrinus	Peregrine falcon	G4T4/S4	SC	WSC
Falco sparverius	American kestrel	G5/S5	—	—
Crows and Jays				
Corvidae				
Aphelocoma californica	Western scrub jay	G5/S5	—	—
Corvus corax	Common raven	G5/S5	—	—
Cyanocitta stelleri	Steller's jay	G5/S5	—	—
Gymnorhinus cyanocephalus	Pinyon jay	G5/S5	—	—
Nucifraga columbiana	Clark's nutcracker	G5/S5	—	—
Cuckoos				
Cuculidae				
Geococcyx californianus	Greater roadrunner	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Doves and Pigeons				
Columbidae				
Columba fasciata	Band-tailed pigeon	G4/S5	—	—
Columbina inca	Inca dove	G5/S5	—	—
Columbina passerina	Common ground-dove	G5/S4	—	—
Zenaida asiatica	White-winged dove	G5/S5	—	—
Zenaida macroura	Mourning dove	G5/S5	—	—
Ducks, Geese, Swans				
Anatidae				
Anas acuta	Northern pintail	G5/S2B,S5N	—	—
Anas americana	American wigeon	G5/S1B,S5N	—	—
Anas clypeata	Northern shoveler	G5/S1B,S5N	—	—
Anas crecca	Green-winged teal	G5/S3B,S5N	—	—
Anas cyanoptera	Cinnamon teal	G5/S5	—	—
Anas platyrhynchos	Mallard	G5/S5	—	—
Anas strepera	Gadwall	G5/S5	—	—
Aythya affinis	Lesser scaup	G5/S5N	—	—
Aythya americana	Redhead	G5/S4	—	—
Branta canadensis	Canada goose	G5/S1B,S4N	—	—
Bucephala albeola	Bufflehead	G5/S5N	—	—
Bucephala clangula	Common goldeneye	G5/S5N	—	—
Chen caerulescens	Snow goose	G5/S3N	—	—
Mergus merganser	Common merganser	G5/S3S4	—	—
Mergus serrator	Red-breasted merganser	G5/S3N	—	—
Oxyura jamaicensis	Ruddy duck	G5/S5	—	—
Finches				
Fringillidae				
Carduelis lawrencei	Lawrence's goldfinch	G3G4/S1,S3N	—	—
Carduelis pinus	Pine siskin	G5/S5	—	—
Carduelis psaltria	Lesser goldfinch	G5/S5	—	—
Carduelis tristis	American goldfinch	G5/S1B,S5N	—	—
Carpodacus cassinii	Cassin's finch	G5/S4	—	—
Carpodacus mexicanus	House finch	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Frigatebirds				
Fregatidae				
Fregata magnificens	Magnificent frigate bird	G5/?	—	—
Gnatcatchers				
Muscicapidae				
Polioptila caerulea	Blue-gray gnatcatcher	G5/S5	—	—
Polioptila melanura	Black-tailed gnatcatcher	G5/S5	—	—
Goatsuckers				
Caprimulgidae				
Chordeiles acutipennis	Lesser nighthawk	G5/S5	—	—
Phalaenoptilus nuttallii	Common poorwill	G5/S5	—	—
Grebes				
Podicipedidae				
Podiceps nigricollis	Eared grebe	G5/S3B,S5N	—	—
Podilymbus podiceps	Pied-billed grebe	G5/S5	—	—
Grosbeaks, Cardinals, and Buntings				
Emberizidae				
Cardinalis cardinalis	Northern cardinal	G5/S5	—	—
Cardinalis sinuatus	Pyrrhuloxia	G5/S5	—	—
Guiraca caerulea	Blue grosbeak	G5/S5	—	—
Passerina amoena	Lazuli bunting	G5/S4	—	—
Passerina cyanea	Indigo bunting	G5/S3	—	—
Passerina versicolor	Varied bunting	G5/S3	—	—
Pheucticus melanocephalus	Black-headed grosbeak	G5/S5	—	—
Gulls, Terns				
Laridae				
Chlidonias niger	Black tern	G4/S3,S4M	—	—
Larus delawarensis	Ring-billed gull	G5/S5N	—	—
Hawks, Kites, Eagles				
Accipitridae				
Accipiter cooperi	Cooper’s hawk	G5/S4	—	—
Accipiter striatus	Sharp-shinned hawk	G5/S4	—	—
Aquila chrysaetos	Golden eagle	G5/S4	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Buteo jamaicensis	Red-tailed hawk	G5/S5	—	—
Buteo regalis	Ferruginous hawk	G5/S3	—	—
Buteo swainsoni	Swainson's hawk	G5/S3	—	—
Circus cyaneus	Northern harrier	G5/S1S2B,S5N	—	—
Elanus leucurus	White-tailed kite	G5/S2B,S2S3N	—	—
Pandion haliaetus	Osprey	G5/S2B,S4N	—	—
Parabuteo unicinctus	Harris's hawk	G5/S5	—	—
Herons, Egrets, Allies				
Ardeidae				
Ardea herodias	Great blue heron	G5/S5	—	—
Butorides striatus	Green-backed heron	G5/S4	—	—
Casmerodius albus	Great egret	G5/S1B,S4N	—	WSC
Egretta thula	Snowy egret	G5/S1B,S4N	—	WSC
Nycticorax nycticorax	Black-crowned night-heron	G5/S3	—	—
Hummingbirds				
Trochilidae				
Archilochus alexandri	Black-chinned hummingbird	G5/S5	—	—
Calypte anna	Anna's hummingbird	G5/S5	—	—
Calypte costae	Costa's hummingbird	G5/S5	—	—
Selasphorus rufus	Rufous hummingbird	G5/S5M	—	—
Selasphorus sasin	Allen's hummingbird	G5/S2S3M	—	—
Stellula calliope	Calliope hummingbird	G5/S4M	—	—
Kingfishers				
Alcedinidae				
Ceryle alcyon	Belted kingfisher	G5/S2B,S5N	—	—
Kinglets and Thrushes				
Muscicapidae				
Catharus guttatus	Hermit thrush	G5/S5	—	—
Catharus ustulatus	Swainson's thrush	G5/S1	—	—
Myadestes townsendi	Townsend's solitaire	G5/S5	—	—
Regulus calendula	Ruby-crowned kinglet	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Regulus satrapa	Golden-crowned kinglet	G5/S3	—	—
Sialia currucoides	Mountain bluebird	G5/S5	—	—
Sialia mexicana	Western bluebird	G5/S5	—	—
Turdus migratorius	American robin	G5/S5	—	—
Larks				
Alaudidae				
Eremophila alpestris	Horned lark	G5/S5	—	—
Mockingbirds and Thrashers				
Mimidae				
Mimus polyglottos	Northern mockingbird	G5/S5	—	—
Oreoscoptes montanus	Sage thrasher	G5/S5	—	—
Toxostoma bendirei	Bendire's thrasher	G4G5/S4	—	—
Toxostoma curvirostre	Curve-billed thrasher	G5/S5	—	—
Toxostoma dorsale	Crissal thrasher	G5/S5	—	—
Toxostoma lecontei	LeConte's thrasher	G5/S1N	—	—
Nuthatches				
Sittidae				
Sitta canadensis	Red-breasted nuthatch	G5/S5	—	—
Owls				
Strigidae				
Asio flammeus	Short-eared owl	G5/SNRN	—	—
Asio otus	Long-eared owl	G5/S2B,S3S4N	—	—
Athene cunicularia	Burrowing owl	G4T4/S3	SC	—
Bubo virginianus	Great horned owl	G5/S5	—	—
Glaucidium brasilianum	Ferruginous pygmy-owl	G5/S1	SC	WSC
Micrathene whitneyi	Elf owl	G5/S5	—	—
Otus kennicottii	Western screech owl	G4/S4	—	—
Tytonidae				
Tyto alba	Common barn owl	G5TNR/?	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Pelicans				
Pelicanidae				
Pelecanus erythrorhynchos	American white pelican	G3/S3N	—	—
Pelecanus occidentalis	Brown pelican	G4/S1N	—	—
Pipits				
Motacillidae				
Anthus spinoletta	American pipit	G5/S2B,S5N	—	—
Anthus spragueii	Sprague's pipit	G4/S2N	—	—
Plovers				
Charadriidae				
Charadrius vociferus	Killdeer	G5/S5	—	—
Quail, New World				
Phasianidae				
Callipepla gambelii	Gambel's quail	G5/S5	—	—
Rails, Gallinules, Coots				
Rallidae				
Fulica americana	American coot	G5/S5	—	—
Porzana carolina	Sora	G5/S4	—	—
Rallus limicola	Virginia rail	G5/S4	—	—
Sandpipers, Phalaropes				
Scolopacidae				
Actitis macularius	Spotted sandpiper	G5/S3S4	—	—
Calidris bairdii	Baird's sandpiper	G5/S4M	—	—
Calidris mauri	Western sandpiper	G5/S1N	—	—
Calidris minutilla	Least sandpiper	G5/S5N	—	—
Calidris melanotos	Pectoral sandpiper	G5/S2M	—	—
Catoptrophorus semipalmatus	Willet	G5/S4M	—	—
Gallinago gallinago	Wilson's snipe	G5/S1B,S4N	—	—
Limnodromus scolopaceus	Long-billed dowitcher	G5/S3S4N	—	—
Numenius americanus	Long-billed curlew	G5/S1B,S3S4N	—	—
Phalaropus tricolor	Wilson's phalarope	G5/S1B,S5N	—	—
Tringa melanoleuca	Greater yellowlegs	G5/S3N	—	—
Tringa solitaria	Solitary sandpiper	G5/S3M	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Shrikes				
Laniidae				
Lanius ludovicianus	Loggerhead shrike	G4/S4	SC	—
Silky Flycatchers				
Ptilogonatidae				
Phainopepla nitens	Phainopepla	G5/S5	—	—
Sparrows, New World				
Emberizidae				
Aimophila cassinii	Cassin's sparrow	G5/S4	—	—
Ammodramus savannarum	Grasshopper sparrow	G5/S3	—	—
Amphispiza belli	Sage sparrow	G5/S4	—	—
Amphispiza bilineata	Black-throated sparrow	G5/S5	—	—
Calamospiza melanocorys	Lark bunting	G5/S1B,S5N	—	—
Calcarius ornatus	Chestnut-collared longspur	G5/S3N	—	—
Chondestes grammacus	Lark sparrow	G5/S5	—	—
Junco hyemalis	Dark-eyed junco	G5/S5		
Melospiza lincolnii	Lincoln's sparrow	G5/S3B,S5N	—	—
Passerculus sandwichensis	Savannah sparrow	G5/S5	—	—
Passerella iliaca	Fox sparrow	G5/S2N	—	—
Pipilo chlorurus	Green-tailed towhee	G5/S3B,S4N	—	—
Pipilo fuscus	Canyon towhee	G5/S5	—	—
Pipilo maculatus	Spotted towhee	G5/S5	—	—
Pooecetes gramineus	Vesper sparrow	G5/S5	—	—
Spizella atrogularis	Black-chinned sparrow	G5/S5	—	—
Spizella breweri	Brewer's sparrow	G5/S5	—	—
Spizella passerina	Chipping sparrow	G5/S5	—	—
Zonotrichia leucophrys	White-crowned sparrow	G5/S1B,S5N	—	—
Sparrows, Old World				
Passeridae				
Passer domesticus	House sparrow	G5/SNA	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Starlings				
Sturnidae				
Sturnus vulgaris	European starling	G5/SNA	—	—
Stilts, Avocets				
Recurvirostridae				
Himantopus mexicanus	Black-necked stilt	G5/S2	—	—
Recurvirostra americana	American avocet	G5/S2	—	—
Storks				
Ciconiidae				
Mycteria americana	Wood stork	G4/S1N	—	—
Swallows				
Hirundinidae				
Hirundo pyrrhonota	Cliff swallow	G5/S5	—	—
Hirundo rustica	Barn swallow	G5/S5	—	—
Progne subis	Purple martin	G5/S4	—	—
Riparia riparia	Bank swallow	G5/S4M	—	—
Stelgidopteryx serripennis	Northern rough-winged swallow	G5/S5	—	—
Tachycineta bicolor	Tree swallow	G5/S3	—	—
Tachycineta thalassina	Violet-green swallow	G5/S5	—	—
Swifts				
Apodidae				
Aeronautes saxatilis	White-throated swift	G5/S5	—	—
Chaetura vauxi	Vaux’s swift	G5/S4M	—	—
Tanagers				
Emberizidae				
Piranga ludoviciana	Western tanager	G5/S5	—	—
Piranga rubra	Summer tanager	G5/S4	—	—
Tyrant Flycatchers				
Tyrannidae				
Contopus cooperi	Olive-sided flycatcher	G4/S4	—	—
Contopus sordidulus	Western wood-peewee	G5/S5	—	—
Empidonax difficilis	Pacific-slope flycatcher	G5/S4M	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Emidonax hammondii	Hammond's flycatcher	G5/S1B,S2S3N	—	—
Empidonax minimus	Least flycatcher	G5/?	—	—
Empidonax oberholseri	Dusky flycatcher	G5/S4	—	—
Empidonax traillii	Willow flycatcher	G5/S1	—	—
Empidonax wrightii	Gray flycatcher	G5/S5	—	—
Myiarchus cinerascens	Ash-throated flycatcher	G5/S5	—	—
Myiarchus tyrannulus	Brown-crested flycatcher	G5/S4	—	—
Pyrocephalus rubinus	Vermilion flycatcher	G5/S5	—	—
Sayornis nigricans	Black phoebe	G5/S5	—	—
Sayornis saya	Say's phoebe	G5/S5	—	—
Tyrannus melancholicus	Tropical kingbird	G5/S3	—	WSC
Tyrannus verticalis	Western kingbird	G5/S5	—	—
Verdins				
Remizidae				
Auriparus flaviceps	Verdin	G5/S5	—	—
Vireos				
Vireonidae				
Vireo bellii	Bell's vireo	G5/S4	—	—
Vireo flavifrons	Yellow-throated vireo	G5/?	—	—
Vireo gilvus	Warbling vireo	G5/S5	—	—
Vireo plumbeus	Plumbeous vireo	G5/S5	—	—
Vireo vicinior	Gray vireo	G5/?	—	—
Vultures, New World				
Cathartidae				
Cathartes aura	Turkey vulture	G5/S5	—	—
Coragyps atratus	Black vulture	G5/S1S2	—	—
Waxwings				
Bombycillidae				
Bombycilla cedrorum	Cedar waxwing	G5/S3S4N	—	—
Woodpeckers				
Picidae				
Colaptes chrysoides	Gilded flicker	G5/S5	—	—
Melanerpes uropygialis	Gila woodpecker	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
BIRDS (continued)				
Picoides scalaris	Ladder-backed woodpecker	G5/S5	—	—
Sphyrapicus nuchalis	Red-naped sapsucker	G5/S4	—	—
Wood-Warblers				
Emberizidae				
Dendroica coronata	Yellow-rumped warbler	G5/S5	—	—
Dendroica nigrescens	Black-throated gray warbler	G5/S5	—	—
Dendroica occidentalis	Hermit warbler	G4G5/S4M	—	—
Dendroica petechia	Yellow warbler	G5/S4	—	—
Dendroica striata	Blackpoll warbler	G5/?	—	—
Dendroica townsendii	Townsend's warbler	G5/S4M,S1S2N	—	—
Geothlypis trichas	Common yellowthroat	G5/S4	—	—
Icteria virens	Yellow-breasted chat	G5/S4	—	—
Oporornis tolmiei	MacGillivray's warbler	G5/S4	—	—
Setophaga ruticilla	American redstart	G5/S1	—	—
Vermivora celata	Orange-crowned warbler	G5/S3B,S5N	—	—
Vermivora luciae	Lucy's warbler	G5/S5	—	—
Vermivora ruficapilla	Nashville warbler	G5/S4S5M	—	—
Wilsonia pusilla	Wilson's warbler	G5/S5M	—	—
Wrens				
Troglodytidae				
Campylorhynchus brunneicapillus	Cactus wren	G5/S5	—	—
Catherpes mexicanus	Canyon wren	G5/S2B,S3S4N	—	—
Salpinctes obsoletus	Rock wren	G5/S5	—	—
Thryomanes bewickii	Bewick's wren	G5/S5	—	—
Troglodytes aedon	House wren	G5/S5	—	—
MAMMALS				
Bats, Free-tailed				
Molossidae				
Eumops underwoodi	Underwood's mastiff bat	G4/S1	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
MAMMALS (continued)				
Nyctinomops femorosaccus	Pocketed free-tailed bat	G4/S2S3	S	—
Nyctinomops macrotis	Big free-tailed bat	G5/S2S3	—	—
Tadarida brasiliensis mexicana	Mexican free-tailed bat	G5/S3S4	—	---
Bats, Leaf-nose				
Phyllostomidae				
Leptonycteris curasoae yerbabuenae	Lesser long-nosed bat	G4/S2	LE	WSC
Macrotis californicus	California leaf-nosed bat	G5/S2S3	SC	WSC
Bats, Plain-nose				
Vespertilionidae				
Antrozous pallidus pallidus	Pallid bat	G5/S4S5	—	—
Eptesicus fuscus pallidus	Big brown bat	G5/S4S5	—	—
Lasionycteris noctivagans	Silver-haired bat	G5/S3S4	—	—
Lasiurus cinereus	Hoary bat	G5/S4	—	—
Myotis californicus stephensi	California myotis	G5/S4S5	—	—
Pipistrellus Hesperus hesperus	Western pipistrelle	G5/S5	—	—
Plecotus townsendii	Townsend's big-eared bat	G4/S3S4	—	—
Badgers				
Mustelidae				
Taxidea taxus berlandieri	American badger	G5/S5	—	—
Cats				
Felidae				
Felis rufus baileyi	Bobcat	G5/S5	—	—
Puma concolor	Mountain lion	G5/S4	—	—
Coyotes and Foxes				
Canidae				
Canis latrans mearnsi	Coyote	G5/S5	—	—
Urocyon cineroargenteus	Gray fox	G5/S5	—	—
Vulpes macrotis macrotis	Kit fox	G4/S4	—	—
Deer				
Cervidae				
Odocoileus hemionus crooki	Mule deer	G5/S5	—	—
Odocoileus virginianus couesi	White-tailed deer	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
MAMMALS (continued)				
Javelina				
Tayassuidae				
Tayassu tajacu	Collared peccary	G5/S5	—	—
Pocket Gophers				
Geomyidae				
Thomomys bottae growlerensis	Botta's pocket gopher	G5/S5	—	—
Thomomys bottae phasma	Botta's pocket gopher	G5/S5	—	—
Thomomys bottae pusillus	Botta's pocket gopher	G5/S5	—	—
Pocket Mice and Kangaroo Rats				
Heteromyidae				
Perognathus amplus taylori	Arizona pocket mouse	G5/S5	—	—
Perognathus baileyi baileyi	Bailey pocket mouse	G5/S5	—	—
Perognathus intermedius phasma	Rock pocket mouse	G5/S5	—	—
Perognathus longimembris	Little pocket mouse	G5/S5	—	—
Perognathus penicillatus pricei	Desert pocket mouse	G5/S5	—	—
Dipodomys deserti arizonae	Desert kangaroo rat	G5/S5	—	—
Dipodomys merriami merriami	Merriam's kangaroo rat	G5/S5	—	—
Pronghorns				
Antilocapridae				
Antilocapra americana sonoriensis	Sonoran pronghorn	G5T1/S1	LE	WSC
Rabbits and Hares				
Leporidae				
Lepus alleni alleni	Antelope jackrabbit	G5/S4	—	—
Lepus californicus eremicus	Black-tailed jackrabbit	G5/S5	—	—
Sylvilagus audubonii arizonae	Desert cottontail	G5/S5	—	—
Raccoons and Relatives				
Procyonidae				
Bassariscus astutus yumanensis	Ringtail	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
MAMMALS (continued)				
Rats and Mice				
Muridae				
Neotoma albigula mearnsi	White-throated woodrat	G5/S5	—	—
Neotoma lepida auripila	Desert woodrat	G5/S5	—	—
Onychomys torridus torridus	Southern grasshopper mouse	G5/S5	—	—
Peromyscus crinitus disparilis	Canyon mouse	G5/S4	—	—
Peromyscus eremicus eremicus	Cactus mouse	G5/S5	—	—
Peromyscus eremicus papagensis	Pinacate cactus mouse	G5T5/S5	—	—
Sheep				
Ovidae				
Ovis canadensis mexicana	Desert bighorn	G4T3T4Q/S3S4	—	—
Skunks				
Mephitidae				
Spilogale gracilis leucoparia	Western spotted skunk	G5/S5	—	—
Squirrels				
Sciuridae				
Ammospermophilus harrisii	Yuma antelope squirrel	G5/S5	—	—
Spermophilus tereticaudus neglectus	Round-tailed ground squirrel	G5/S5	—	—
Spermophilus variegatus grammurus	Rock squirrel	G5/S5	—	—
REPTILES				
Turtles				
Testudinidae				
Gopherus agassizii	Desert tortoise	G4/S4	SC	WSC
Beaded Lizards				
Helodermatidae				
Heloderma suspectum	Gila monster	G4/S4	—	—
Collared and Leopard Lizards				
Crotaphytidae				
Crotaphytus collaris	Collared lizard	G5/S5	—	—
Gambelia wislizenii	Long-nosed leopard lizard	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
REPTILES (continued)				
Geckos				
Gekkonidae				
Coleonyx variegatus	Desert banded gecko	G5T5/SNR	—	—
Iguanid Lizards				
Iguanidae				
Dipsosaurus dorsalis	Desert iguana	G5/S5	—	—
Sauromalus obesus	Chuckwalla	G5/S4	—	—
Phrynosomatidae				
Callisaurus draconoides	Zebra-tailed lizard	G5/S5	—	—
Phrynosoma m'callii	Flat-tailed horned lizard	G3/S2S3	SC	WSC
Phrynosoma platyrhinos	Desert horned lizard	G5/S5	—	—
Phrynosoma solare	Regal horned lizard	G5/S5	—	—
Sceloporus clarkii	Clark's spiny lizard	G5/S5	—	—
Sceloporus magister	Desert spiny lizard	G5/S5	—	—
Uma notata	Colorado Desert fringe-toed lizard	G3/S2S3	—	—
Urosaurus graciosus	Long-tailed brush lizard	G5/S5	—	—
Urosaurus ornatus	Ornate tree lizard	G5/S5	—	—
Uta stansburiana	Side-blotched lizard	G5/S5	—	—
Night Lizards				
Xantusidae				
Xantusia vigilis	Desert night lizard	G5/S4	—	—
Whiptail Lizards				
Teiidae				
Cnemidophorus burti xanthonotus	Red-backed whiptail	G4T2/S2	—	—
Cnemidophorus sonorae	Sonoran spotted whiptail	G5/S5	—	—
Cnemidophorus tigris	Great Basin whiptail	G5T5/S1S2	—	—
Cnemidophorus uniparens	Desert grassland whiptail	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
REPTILES (continued)				
Colubrid Snakes				
Colubridae				
Arizona elegans	Glossy snake	G5/S5	—	—
Chionactis occipitalis	Western shovel-nosed snake	G5/S5	—	—
Hypsiglena torquata	Spotted nightsnake	G5/S5	—	—
Lampropeltis getula californiae	California kingsnake	G5T5/S5	—	—
Leptotyphlops humilus	Blind snake	G5/S5	—	—
Masticophis bilineatus	Sonoran whipsnake	G5/S5	—	—
Masticophis flagellum	Coachwhip	G5/S5	—	—
Phyllorhynchus browni	Saddled leaf-nosed snake	G5/S5	—	—
Phyllorhynchus decurtatus	Spotted leaf-nosed snake	G5/S5	—	—
Pituophis catenifer	Gopher snake	G5/S5	—	—
Rhinocheilus lecontei	Long-nosed snake	G5/S5	—	—
Salvadora hexalepis	Western patch-nosed snake	G5/S5	—	—
Trimorphodon biscutatus lambda	Arizona lyre snake	G5T5/S5	—	—
Constrictor Snakes				
Boidae				
Lichanura trivirgata	Rosy boa	G4G5/S3	SC	—
Coral Snakes				
Elapidae				
Micruroides euryxanthus	Sonoran coral snake	G5/S5	—	—
Rattlesnakes				
Viperidae				
Crotalus atrox	Western diamondback rattlesnake	G5/S5	—	—
Crotalus cerastes	Sidewinder	G5/S5	—	—
Crotalus mitchellii	Speckled rattlesnake	G5/S5	—	—
Crotalus molossus	Black-tailed rattlesnake	G5/S5	—	—
Crotalus scutulatus	Mojave rattlesnake	G5/S5	—	—
Crotalus tigris	Tiger rattlesnake	G5/S5	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
AMPHIBIANS				
Spadefoot Toads				
Pelobatidae				
Scaphiopus couchii	Couch's spadefoot	G5/S5	—	—
Scaphiopus hammondii	Western spadefoot	G3/?	—	—
Toads				
Bufonidae				
Bufo alvarius	Colorado River toad	G5/S5	—	—
Bufo cognatus	Great Plains toad	G5/S5	—	—
Bufo punctatus	Red-spotted toad	G5/S5	—	—
Bufo retiformis	Sonoran green toad	G3G4/S3	—	—
Bufo woodhousii australis	Woodhouse's toad	G5/S5	—	—
Tree Frogs				
Hylidae				
Hyla arenicolor	Canyon tree frog	G5/S5	—	—
Pternohyla fodiens	Burrowing tree frog	G4/S1S2	—	—
ARTHROPODS				
Bees, Flies, Wasps				
Agapostemon texanum	Sweat bee	—	—	—
Megachile sp.	Leaf-cutter bee	—	—	—
Pepsis formosa	Tarantula hawk wasp	—	—	—
Volucella isabellina	Syrphid fly	—	—	—
Volucella mexicana	Hover fly	—	—	—
Xylocopa californica	Carpenter bee	—	—	—
Bugs, Beetles				
Melanopterus belfragei	Seed bug	—	—	—
Moneilema gigas	Cactus longhorn beetle	—	—	—
Oncopeltus fasciatus	Milkweed bug	—	—	—
Butterflies, Skippers				
Adelpha bredowii	Arizona sister	G5/SNR	—	—
Agathymus baueri	Bauer's giant skipper	G4/SNR	—	—
Agathymus polingi	Poling's giant skipper	G4/SNR	—	—
Agraulis vanillae	Gulf fritillary	G5/SNR	—	—
Amblyscirtes nysa	Nysa skipper	G5/SNR	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
ARTHROPODS (continued)				
Amblyscirtes prenda	Prenda's skipper	—	—	—
Anaea aidea	Aidea leafwing	—	—	—
Anthanassa texana	Texas crescent	G5/SNR	—	—
Anthocharis cethura	Cethura orange-tip	G4G5/SNR	—	—
Anthocharis sara	Sara orange-tip	G5/---	—	—
Appias drusilla	Drusilla white	G5/SNR	—	—
Apodemia mormo	Mormo metal-mark	G5/SNR	—	—
Apodemia palmeri	Palmer's metal-mark	G5/SNR	—	—
Ascia howarthi	Howarth's white	—	—	—
Ascia monuste	Monuste white	G5/SNR	—	—
Asterocampa celtis	Hackberry butterfly	G5/SNR	—	—
Asterocampa leilia	Leilia blackberry butterfly	G5/SNR	—	—
Atalopedes campestris	Campestris skipper	G5/SNR	—	—
Atlides halesus	Great purple hairstreak	G5/SNR	—	—
Atrytonopsis edwardsi	Edwards' skipper	G3G4/SNR	—	—
Battus philenor	Pipevine swallowtail	G5/SNR	—	—
Brephidium exile	Pygmy blue	G5/SNR	—	—
Calephelis nemesis	Nemesis metal-mark	G5/SNR	—	—
Cbiomara asychis	Asychis skipper	—	—	—
Celestrina argiolus	Common blue	—	—	—
Chioides albofasciatus	Albofasciatus long-tail	G5/---	—	—
Chlorostymon simaethis	Simaethis hairstreak	—	—	—
Chlosyne californica	California checkerspot	G5/SNR	—	—
Chlosyne lacinia	Lacinia checkerspot	G5/SNR	—	—
Chrysopa sp.	Green lacewing	—	—	—
Cogia hippalus	Hippalus skipper	G5/SNR	—	—
Colias eurytheme	Orange sulphur	G5/SNR	—	—
Copaeodes aurantiacus	Aurantiacus skipperling	—	—	—
Danaus gilippus	Queen	G5/SNR	—	—
Danaus plexippus	Monarch	G5/SNR	—	—
Dymasia dymas	Dymas checkerspot	G5/SNR	—	—
Erynnis brizo	Brizo duskywing	G5/SNR	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
ARTHROPODS (continued)				
Erynnis tristis	Funeratis duskywing	G5/SNR	—	—
Euchloe hyantis	Hyantis marble	G3G4/---	—	—
Euphilotes battoides	Battoides blue	G5/SNR	—	—
Euphydryas chalcedona	Chalcedona checkerspot	G5/SNR	—	—
Euptoieta claudia	Variegated fritillary	G5/SNR	—	—
Euptoieta hegesia	Hegesia fritillary	—	—	—
Eurema mexicanum	Mexican sulphur	G5/SNR	—	—
Eurema nicippe	Nicippe sulphur	—	—	—
Eurema nise	Nise sulphur	—	—	—
Eurema proterpia	Proterpia sulphur	—	—	—
Heliopetes domicella	Domicella skipper	—	—	—
Heliopetes ericetorum	Ericetorum skipper	G4/SNR	—	—
Heliopetes lavianus	Lavianus skipper	G5/SNR	—	—
Hemiargus ceraunus	Ceraunas blue	G5/SNR	—	—
Hemiargus isola	Isola blue	—	—	—
Hesperopsis alpheus	Alpheus skipper	G4/SNR	—	—
Hesperopsis libya	Libya skipper	G5/SNR	—	—
Hylephila phyleus	Phyleus skipper	G5/SNR	—	—
Hypostrymon critola	Critola hairstreak	—	—	—
Icarica acmon	Acmon blue	—	—	—
Junonia coenia	Buckeye	G5/SNR	—	—
Junonia nigrosuffusa	Black buckeye	G5T3T4/SNR	—	—
Kricogonia lyside	Lyside sulphur	G5/SNR	—	—
Leptotes marina	Marina blue	G5/SNR	—	—
Lerodea arabus	Arabus skipper	G5/SNR	—	—
Lerodea eufala	Eufala skipper	G5/SNR	—	—
Libytheana bachmanii	Snout bunerny	G5/SNR	—	—
Marpesia petreus	Petreus dagger-wing	G5/SNR	—	—
Mestra amymone	Amymone mestra	G5/SNR	—	—
Ministrymon leda	Leda hairstreak	G5/SNR	—	—
Mitoura siva	Siva hairstreak	G5T5/SNR	—	—
Myscelia cyananthe	Cyananthe myscelia	—	—	—
Nathalis iole	Dainty sulphur	G5/SNR	—	—
Nyctelius nyctelius	Nyctelius skipper	—	—	—
Nymphalis antiopa	Mourning cloak	G5/SNR	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
ARTHROPODS (continued)				
Papilio cresphontes	Giant swallowtail	G5/SNR	—	—
Papilio multicaudatus	Two-tailed swallowtail	G5/SNR	—	—
Papilio polyxenes	Black swallowtail	G5/SNR	—	—
Phaeostrymon alcestis	Alcestis hairstreak	G5/SNR	—	—
Phoebis agarithe	Agarithe sulphur	G5/SNR	—	—
Phoebis sennae	Sennae sulphur	G5/SNR	—	—
Pholisora catullus	Catullus skipper	G5/SNR	—	—
Pieris beckerii	Becker's white	—	—	—
Pieris protodice	Checkered white	—	—	—
Pieris sisymbrii	Sisymbrii white	—	—	—
Polygonus leo	Leo skipper	—	—	—
Pyrgus albescens	Albescens checkered skipper	G5/SNR	—	—
Pyrgus philetas	Scriptura checkered skipper	G5/SNR	—	—
Staphylus ceos	Ceos skipper	G5/SNR	—	—
Strymon columella	Columella hairstreak	—	—	—
Strymon melinus	Melinus hairstreak	G5/SNR	—	—
Systasea zampa	Zampa skipper	G5/SNR	—	—
Texola elada	Elada checkerspot	G5/SNR	—	—
Thessalia fulvia	Fulvia checkerspot	G5/SNR	—	—
Thorybes drusius	Drusius cloudywing	G4/SNR	—	—
Urbanus dorantes	Dorantes long-tail	G4/SNR	—	—
Vanessa annabella	West coast lady	G5/SNR	—	—
Vanessa atalanta	Red admiral	G5/SNR	—	—
Vanessa cardui	Painted lady	G5/SNR	—	—
Vanessa virginiensis	Painted beauty	G5/SNR	—	—
Xamia xami	Xami hairstreak	G4/S2?	—	—
Zerene cesonia	Southern dogface	G5/SNR	—	—
Centipedes, Millipedes				
Orthoperus ornatus	Desert millipede	—	—	—
Scolopendra heros	Giant desert centipede	—	—	—
Scolopendra polymorpha	Common desert centipede	—	—	—

Group / Family / Scientific Name	Common Name	Global and State Rank	State Status	Federal Status
ARTHROPODS (continued)				
Scorpions				
Centruroides exilcauda	Bark scorpion	—	—	—
Hadrurus arizonensis	Giant scorpion	—	—	—
Paraphrynus spp.	Tailless whipscorpion	—	—	—
Superstitionia donensis	Superstition Mountain scorpion	—	—	—
Vaejovis spinigerus	Striped tail scorpion	—	—	—
Spiders				
Aphonopelma chalcodes	Desert tarantula	—	—	—
Calilena arizonica	Funnel-web spider	—	—	—
Eremobates spp.	Sun spiders	—	—	—
Hogna carolinensis	Wolf spider	GNR	—	—
Hololena hola	Funnel-web spider	—	—	—
Kukulcania hibernalis	Southern house spider	—	—	—
Latrodectus hesperus	Black widow	—	—	—
Loxosceles spp.	Brown recluse	—	—	—
Metepeira arizonica	Labyrinth spider	—	—	—
Novalena lutzi	Funnel-web spider	—	—	—
Olios giganteus	Giant crab spider	—	—	—
Peucetia viridans	Green lynx spider	—	—	—
Ummidia spp.	Trapdoor spiders	—	—	—

Source: USFWS 2006.

Cabeza Prieta National Wildlife Refuge Wildlife List. Global and State Rank from NatureServe 2008.

Federal and State Status from AGFD 2007.

APPENDIX F

Biological Resources Plan

BIOLOGICAL RESOURCES PLAN

FOR

VEHICLE FENCE AND SUPPORTING INFRASTRUCTURE

FOR

YUMA SECTOR, ARIZONA

YUMA AND WELLTON STATIONS

U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. CUSTOMS AND BORDER PROTECTION
U.S. BORDER PATROL YUMA SECTOR

Prepared by

DECEMBER 2008

R T S R Y S

AOR	Area of Responsibility
BMGR	Barry M. Goldwater Range
BMP	Best Management Practice
BRP	Biological Resources Plan
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
cm	centimeter
CPNWR	Cabeza Prieta National Wildlife Refuge
dBA	Decibel (A-weighted)
DHS	U.S. Department of Homeland Security
GIS	Geographic Information System
GPS	Global Positioning System
IIRIRA	Illegal Immigration Reform and Immigrant Responsibility Act
km	kilometers
LWC	low water crossing
mph	miles per hour
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USFWS	U.S. Fish and Wildlife Service

X UT SU RY

The U.S. Department of Homeland Security (DHS), Customs and Border Protection (CBP), U.S. Border Patrol (USBP) plans to construct, operate, and maintain approximately 5 miles of tactical infrastructure on federally owned lands in Section CV-1A and approximately 9 miles of tactical infrastructure in four discrete sections within Section CV-2 in the USBP Yuma Sector. Tactical infrastructure consists of primary vehicle fence, and access roads along the U.S./Mexico international border in Yuma County, Arizona. Nine federally listed species are known to occur, or could occur, within or adjacent to the Project area (see **Table ES-1**).

On April 1, 2008, the Secretary of the DHS, pursuant to his authority under Section 102(c) of Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), exercised his authority to waive certain environmental and other laws in order to ensure the expeditious construction of tactical infrastructure along the U.S./Mexico border. The tactical infrastructure described in Biological Resources Plan (BRP) is covered by the Secretary's April 1, 2008, waiver (73 *Federal Register* 65, pp. 18293-24). Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary committed DHS to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment. CBP will continue to work in a collaborative manner with local governments, state, and Federal land managers, and the interested public to identify environmentally sensitive resources and develop appropriate Best Management Practices (BMPs) to avoid or minimize adverse impacts resulting from the installation of tactical infrastructure.

Table ES-1. Federally Listed Species and Designated Critical Habitats Known to Occur or with Potential to Occur Within Proposed Project Area in Yuma County, Arizona, and the Determination of Effects

Species	Project Segment	Listing Status, Critical Habitat	Effect Determination
Fish			
Razorback sucker, *Xyrauchen texanus*	CV-1A	Endangered	No effect
Razorback sucker Critical Habitat	CV-1A	Critical Habitat upstream of the Project area	No effect
Reptiles			
Flat-tailed horned lizard, *Phrynosoma mcallii*	CV-2	Conservation Agreement Species*	No effect
Birds			
Bald eagle (wintering population), *Haliaeetus leucocephalus*	CV-1A	Threatened**	No effect
California brown pelican, *Pelecanus occidentalis californicus*	CV-1A	Threatened, Proposed delisted	No effect
Southwestern willow flycatcher, *Empidonax traillii extimus*	CV-1A	Endangered	Not likely to adversely affect
Yellow-billed cuckoo, *Coccyzus americanus*	CV-1A	Candidate	Not likely to adversely affect
Yuma clapper rail, *Rallus longirostris yumanensis*	CV-1A	Endangered	No effect
Mammals			
Lesser long-nosed bat, *Leptonycteris curasoae*	CV-2	Endangered	Not likely to adversely affect
Sonoran pronghorn, *Antilocapra americana sonoriensis*	CV-2	Endangered	Not likely to adversely affect

Source: USFWS 2008

Notes:

* This species is not federally-listed; however, the USFWS participates in the Flat-tailed Horned Lizard Rangewide Management Strategy which has been prepared to provide guidance for the conservation and management of sufficient habitat to maintain extant populations of flat-tailed horned lizards.

**Once endangered, this species was downlisted to threatened on August 11, 1995, and delisted August 8, 2007. Threatened status was reinstated for desert nesting bald eagles.

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The U.S. Department of Homeland Security (DHS), Customs and Border Protection (CBP), U.S. Border Patrol (USBP) will construct, operate, and maintain 300 miles of vehicle fence (i.e., the VF 300 Project) along the U.S./Mexico international border, with construction expected to be completed by December 31, 2008.

On April 1, 2008, the Secretary of the DHS, pursuant to his authority under Section 102(c) of Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), exercised his authority to waive certain environmental and other laws in order to ensure the expeditious construction of tactical infrastructure along the U.S./Mexico border. The tactical infrastructure described in Biological Resources Plan (BRP) is covered by the Secretary's April 1, 2008, waiver (73 *Federal Register* 65, pp. 18293-24). Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary committed DHS to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment. CBP will continue to work in a collaborative manner with local governments, state, and Federal land managers, and the interested public to identify environmentally sensitive resources and develop appropriate Best Management Practices (BMPs) to avoid or minimize adverse impacts resulting from the installation of tactical infrastructure.

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CBP will construct and maintain vehicle fence, and construct, maintain, and operate access roads and patrol roads along the U.S./Mexico border in the USBP Yuma Sector, Arizona. : Section CV-1A includes 5 miles of tactical infrastructure on federally owned lands in the USBP Yuma Station Area of Responsibility (AOR). Section CV-2 includes approximately 9 miles of tactical infrastructure in four discrete sections within the USBP Wellton Station AOR (see **Figure 1-1**). Tactical infrastructure consists of vehicle fence and access roads along the U.S./Mexico international border in Yuma County, Arizona. Vehicle fence includes post-on-rail-style fence (Fence Type VF-1) and Normandy-style fence (Fence Type VF-2) (see **Figures 1-2** and **1-3**).

Section CV-1A. The Section CV-1A vehicle fence will be constructed in one section approximately 5 miles in length along the U.S./Mexico international border within USBP's Yuma Sector in Yuma County, Arizona. Section CV-1A, which roughly parallels the Colorado River, is presented in **Figure 1-4**. Section CV-1A will extend approximately 50 feet east from Morelos Dam. At this point, Section CV-1A will extend approximately 5 miles south to West County 13th Street, approximately 0.4 miles east of the U.S./Mexico border in southern Yuma County, Arizona.

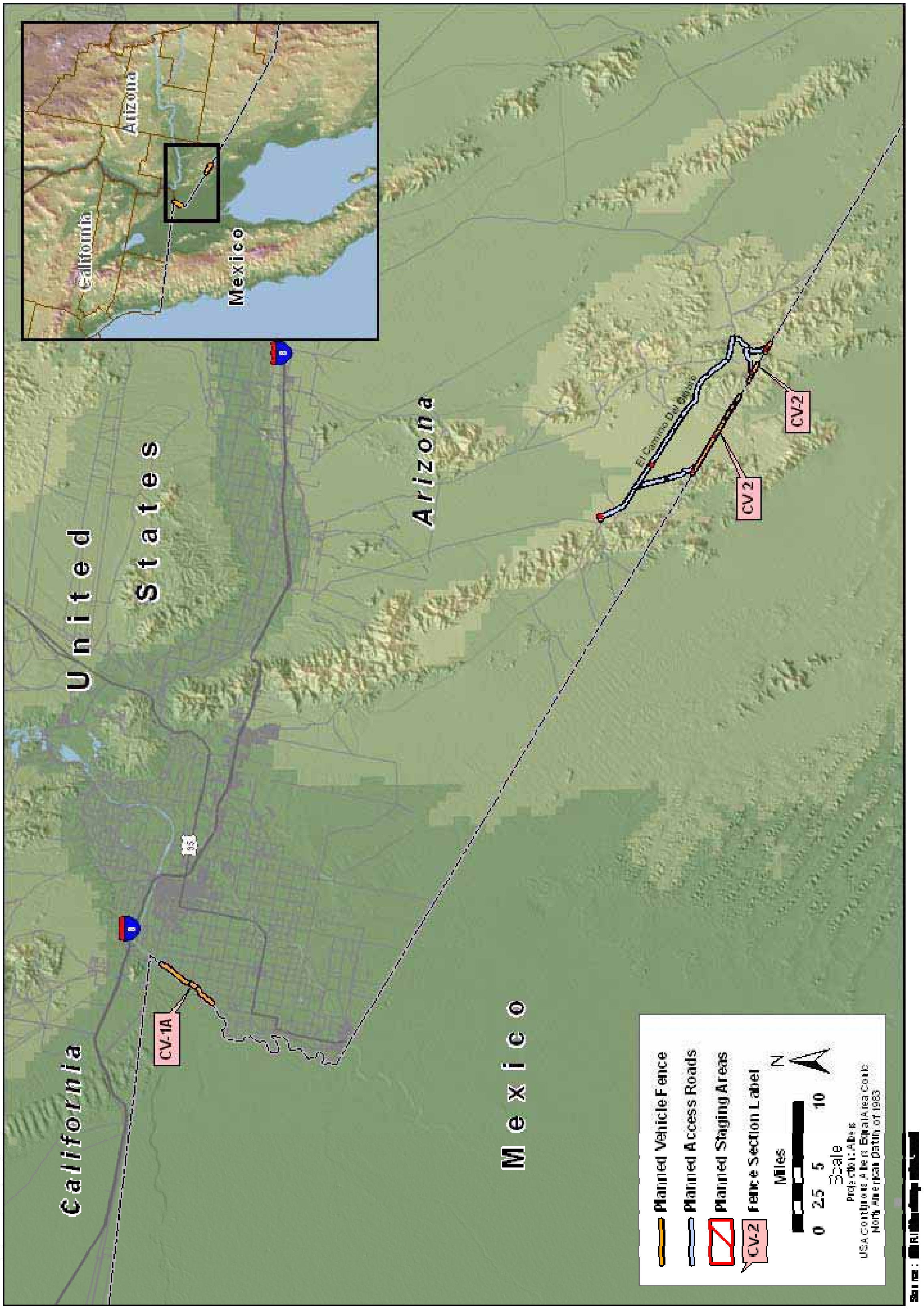

Figure 1-1. General Location of the Project in Yuma County, Arizona

Figure 1-2. Post-on-Rail-Style Vehicle Fence (Fence Type VF-1)

Figure 1-3. Normandy-Style Vehicle Fence (Fence Type VF-2)

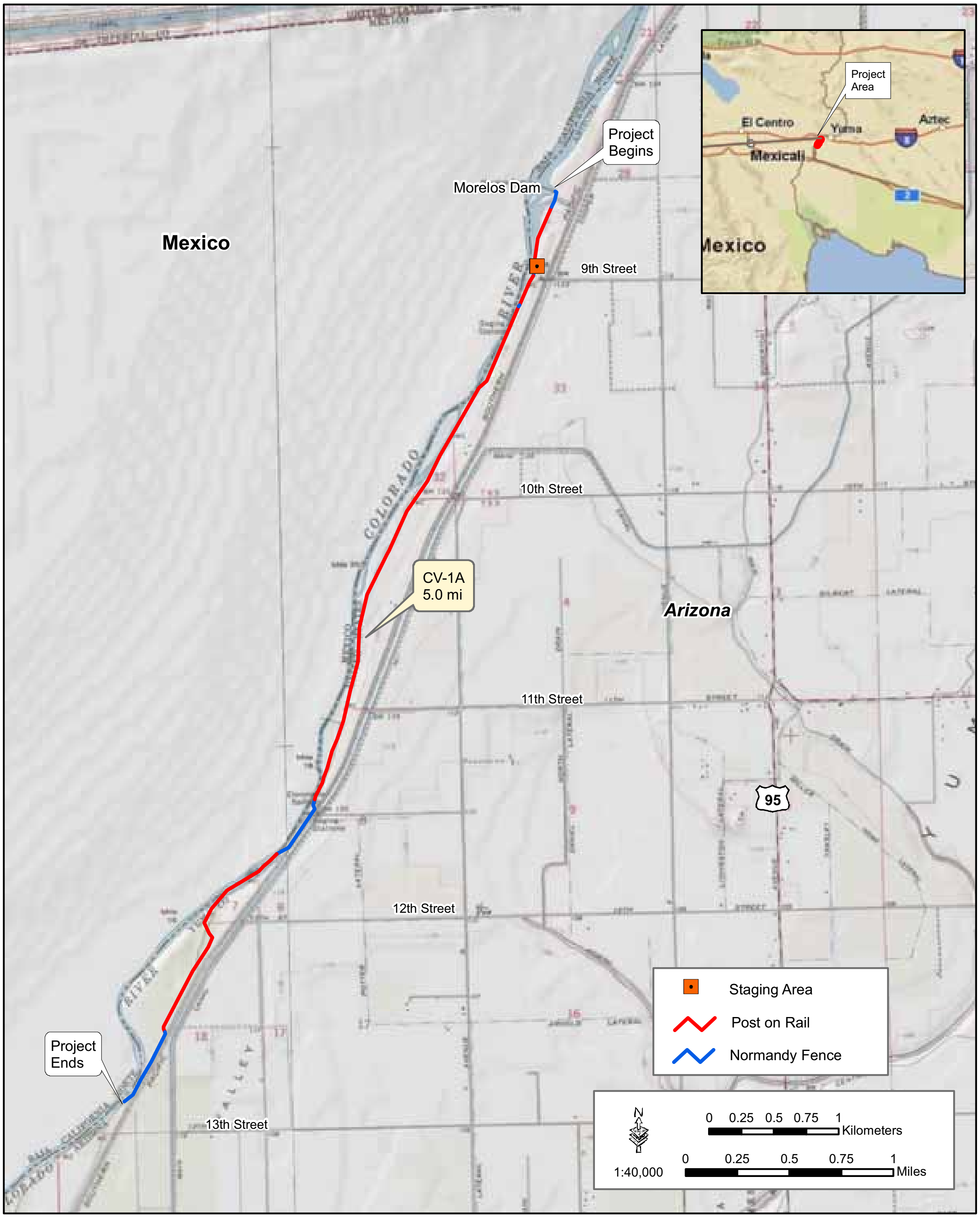

Figure 1-4. Map of the Section CV-1A Project Area, Yuma County, Arizona

Section CV-2. The Section CV-2 vehicle fence will be constructed in four distinct sections that total approximately 9 miles along the U.S./Mexico international border within USBP Yuma Sector in Yuma County, Arizona. These four sections of vehicle fence range from approximately 0.17 miles to 6.92 miles in length and are collectively designated as Section CV-2 in **Figure 1-5**.

All four sections of the Section CV-2 vehicle fence are wholly contained within the Roosevelt Reservation and Cabeza Prieta National Wildlife Refuge (CPNWR). The Roosevelt Reservation is an area of land President Theodore Roosevelt reserved from entry in 1907 and set apart as a public reservation all public lands within 60 feet of the international boundary between the United States and Mexico within the State of California and the Territories of Arizona and New Mexico. This land withdrawal was found "necessary for the public welfare...as a protection against the smuggling of goods." The proclamation excepted from the reservation all lands, which, as of its date, were (1) embraced in any legal entry; (2) covered by any lawful filing, selection, or rights-of-way duly recorded in the proper U.S. Land Office; (3) validly settled pursuant to law; or (4) within any withdrawal or reservation for any use or purpose inconsistent with its purposes (CRS 2006).

Access to the construction area will require the improvement or construction of access roads on refuge lands designated as Wilderness. Additional access will also be provided from the western north-south access road on the adjacent Barry M. Goldwater Range (BMGR) property to the west. Staging areas will be placed within the BMGR and CPNWR properties. Additional detail on the Roosevelt Reservation, CPNWR, and BMGR is provided in **Section 3.4.2 of the ESP**. Consistent with Federal mandates, USBP has identified these areas of the border as locations where vehicle fence will contribute significantly to its priority homeland security mission.

STRU T R T T

The Project will consist of the following components: (1) installing, operating, and maintaining a vehicle fence; (2) improving existing roads to improve access for construction; (3) developing temporary construction staging areas; and (4) constructing new access roads. Construction of the tactical infrastructure will begin in October 2008 and continue through December 2008.

The Project corridors will include vehicle fences and construction access roads. Access roads to the fence construction corridor will be narrow to minimize impacts on designated wilderness, and construction staging areas will be placed in previously disturbed areas to the extent possible.

The alignment of the vehicle fences and roads for the Project was identified by the USBP Yuma Sector as meeting its operational requirements and was developed through coordination with Federal and state agencies, and tribes. The alignment continues to meet current operational requirements and will be

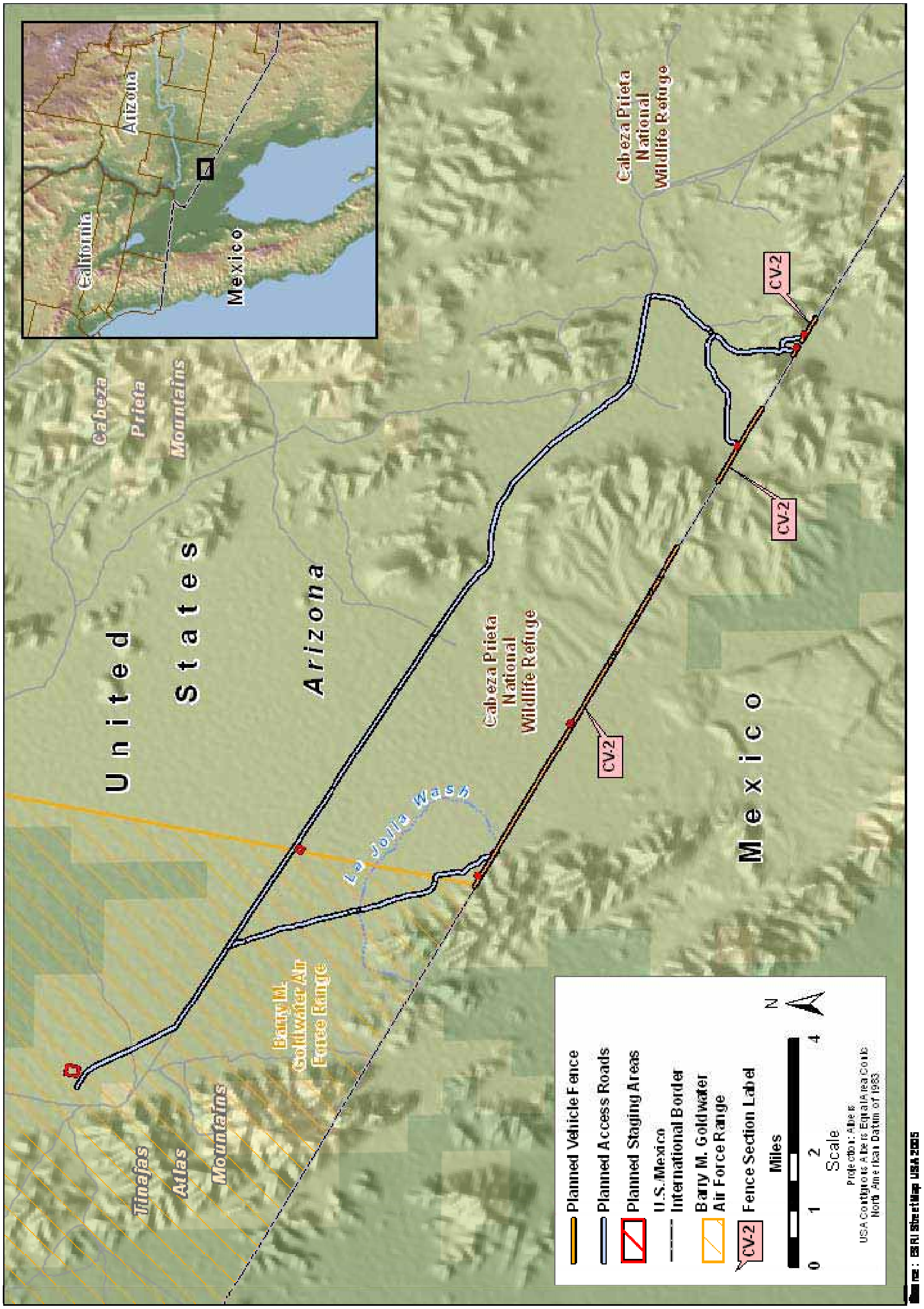

Figure 1-5. Map of the Section CV-2 Project Area, Yuma County, Arizona

constructed with the objective of having the least environmental impacts that are practicable.

Section CV-1A. In Section CV-1A the fence will be installed on the western edge of the existing levee/access road, where practicable; the corridor will vary as there is no Roosevelt Reservation in that area. **Figure 1-6** shows a typical schematic of temporary and permanent impact areas for vehicle fence and roads in Section CV-1A. A large portion of the Project will be built on the existing river trail. Riparian vegetation will be affected along the portion of the Project constructed along the river trail. Temporary barriers are proposed in some of the floodplain areas. The area permanently impacted during construction will be approximately 36 acres.

Section CV-2. **Figure 1-7** shows a typical schematic of the Project corridor for vehicle fence and roads in Section CV-2. The area permanently impacted during construction within the four sections will total approximately 275 acres. Due to the remote nature of the area and the travel time required to access the site, a campsite will be developed on CPNWR lands in coordination with CPNWR personnel. Vegetation will be cleared and grading would occur if needed. Permanent and temporary vegetative impacts associated with Section CV-2 are presented in **Table 1-1**. Wherever possible, existing roads will be used for construction access.

Table 1-1. Permanent and Temporary Vegetative Impacts Associated with Section CV-2

Vegetation Type	Permanent Impacts (acres)	Temporary Impacts (acres)
Grassland	30	1
Tall Shrubland	2	0
Short Shrubland	195	37
Wooded Shrubland	36	3
Unvegetated Desert Washes	2	1
Total	**265**	**42**

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It is anticipated that the vehicle fence that will be employed will be primarily post-on-rail-style fence (see **Figure 1-2**) for the majority of the length, with Normandy-style fence (see **Figure 1-3**) utilized in areas of washes and steeper grades in Sections CV-1A and CV-2.

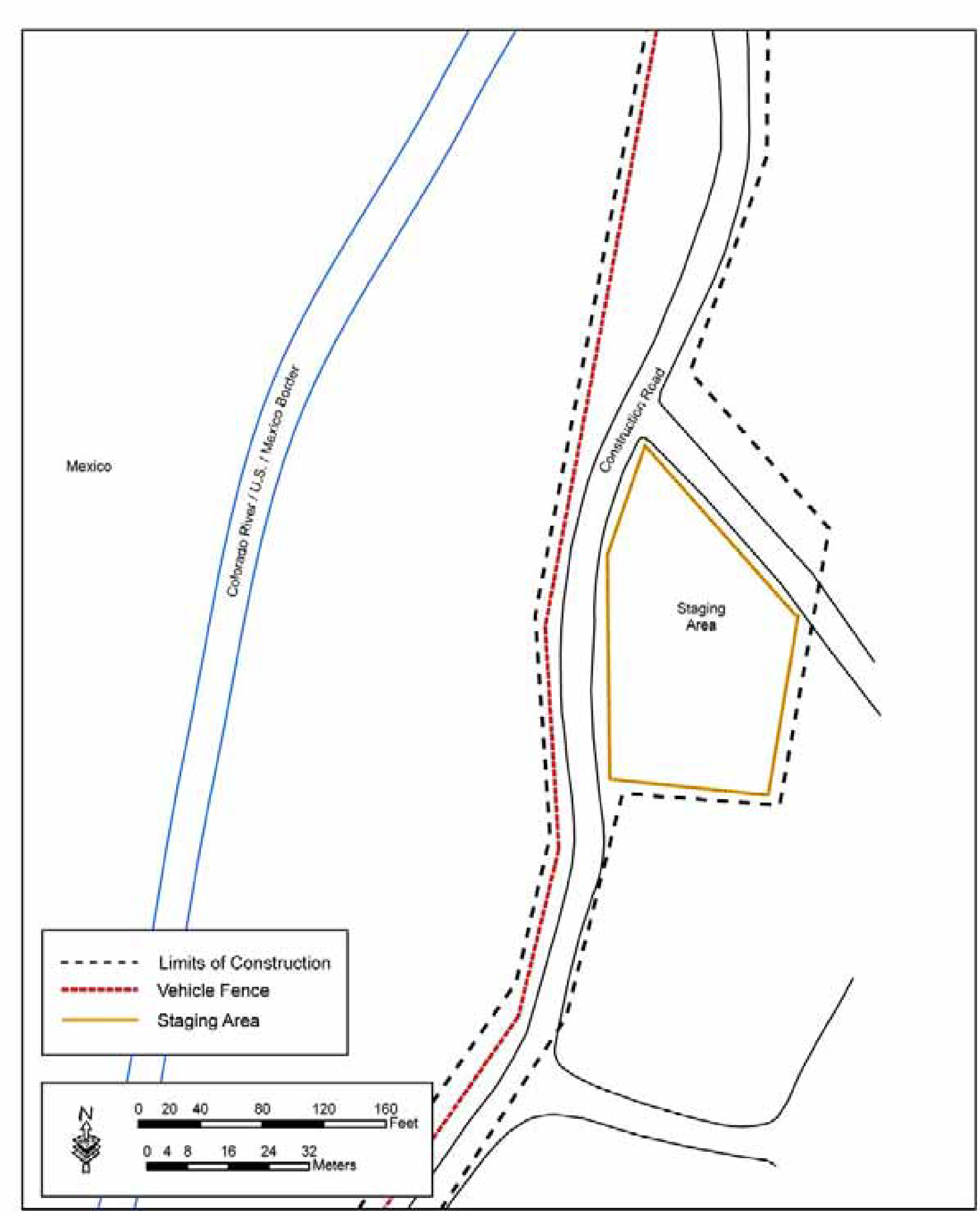

Figure 1-6. Schematic of the Section CV-1A Project Corridor

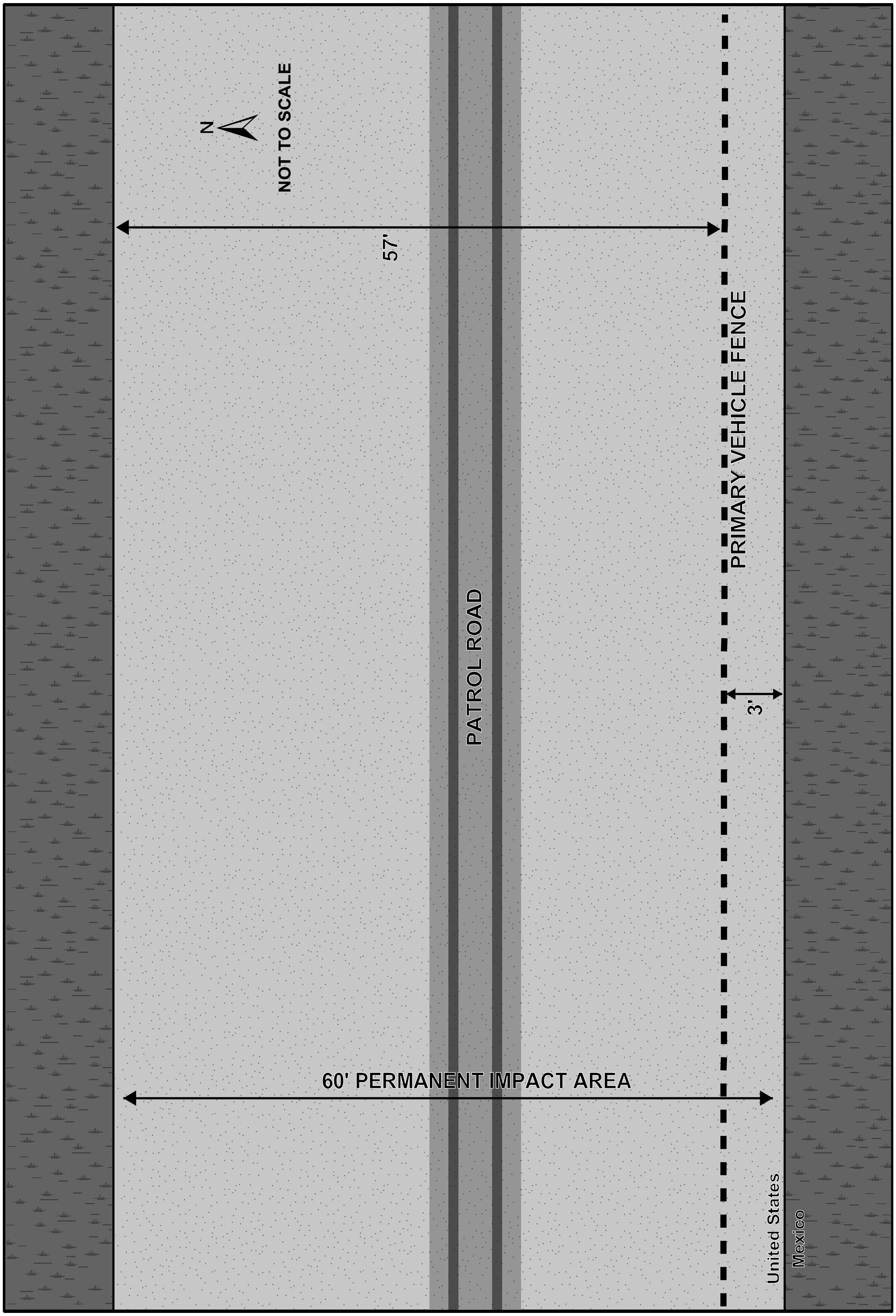

Figure 1-7. Schematic of the Section CV-2 Project Corridor

Vehicle fence will be transported to the site by small trucks with lowboy trailers. Depending on the soil type encountered, post-on-rail-style fence sections will be permanently installed using a small truck with an auger. No pile driving or trenching will be required for construction of either fence type.

In Section CV-1A, the fence will be installed on the western edge of the existing road, to the extent practicable. In Section CV-2, the fence will be installed a few feet north of the international border. The primary project corridor is the area where the majority of construction and maintenance activities will occur.

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Section CV-1A. It is anticipated that 4.5 miles of existing access roads will be used to gain access to the CV-1A construction corridor. Additionally, four new road segments, totaling 0.5 miles will need to be constructed.

The construction roads will also include the construction of new drainage structures or low water crossings (LWCs), as appropriate. Drainage structures will consist of corrugated pipe or concrete box culverts, while LWCs will consist of concrete slabs designed with suitable approach angles. Culverts can also be incorporated into the design of LWCs, as appropriate. The size and number of culverts required will depend upon the width of the drainage and the expected flood flow volumes and velocities at each of the drainage crossings. Each drainage structure will be designed to ensure that flows are not impeded, thus avoiding creation of backwater areas.

***Section CV-2*.** . It is anticipated that approximately 28.7 miles of access road will be used to gain access to the border construction corridor, where an additional 8.82 miles of road will be constructed to support fence installation.

The primary access road will be an old historic route named the Camino del Diablo. This route runs west to east approximately 3.5 miles from, and parallel to, the U.S./Mexico international border. At both the west and east ends of the general Project area, ancillary access roads will branch from Camino del Diablo, south to the border. The western north-south access road will service the 6.7-mile fence and will be located mostly located on BMGR property, crossing into the CPNWR just north of the border. The eastern north-south road is entirely within the CPNWR, and will branch at two locations to service all three of the smaller fence sections. In all instances where access roads currently exist, improvements will be required to support construction equipment. Any necessary aggregate or fill material will be clean material obtained by construction contractors that will not pose an adverse impact on biological or cultural resources.

S a n reas

Staging areas are needed to accommodate construction equipment and stockpile materials. All vegetation within these staging areas will be cleared. Following completion of construction, staging areas will be restored to a vegetated state (see **Section 1.3**). Staging areas will be placed in previously disturbed areas to the extent practicable.

Section CV-1A. Section CV-1A includes one staging area, temporarily impacting 0.4 acres.

Section CV-2. Section CV-2 includes 4 staging areas, temporarily impacting 42 acres. Staging areas will be placed within the BMGR and CPNWR properties. Temporary impacts associated with Section CV-2 are presented in **Table 1-1**.

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There will be no significant change in overall USBP Sector operations resulting from the Project.

The fences will be made from nonreflective steel. No painting will be required. Fence maintenance will include removing any accumulated debris on the fence after a rain. Sand that builds up against the fence and brush will also be removed as needed. Brush removal could include mowing, removal of small trees, and application of herbicide if needed. To the extent practicable, and as operational schedule permits, CBP personnel will report fence conditions requiring maintenance. Any destruction or breaches of the fence will be repaired, as needed.

ST T R T S

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The following BMPs should be implemented to avoid or minimize impacts associated with the Project. These represent Project objectives for implementation to the extent practicable and will be incorporated into construction and monitoring contracts.

1. The perimeter of all areas to be disturbed during construction or maintenance activities will be clearly demarcated using flagging or temporary construction fence, and no disturbance outside that perimeter will be authorized. This includes designated access routes, vehicle turnaround locations, and staging areas.
2. CBP will develop (in coordination with the U.S. Fish and Wildlife Service [USFWS]) a training plan regarding Trust Resources for construction personnel. At a minimum, the program will include the following topics: occurrence of the listed and sensitive species in the area, their general ecology, sensitivity of the species to human activities, project features designed to reduce the impacts on these species and promote continued successful occupation of the Project area environments by the species. Included in this program will be color photos of the listed species, which will be shown to the employees. Following the education program, the

photos will be posted in the office of the contractor and resident engineer, where they will remain throughout the duration of the project. The selected construction manager will be responsible for ensuring that employees are aware of the listed species. This BMP does not apply to Border Patrol operations.

3. Project Reports. For fence construction, within 3 months of project completion, a Project Report will be developed that details the BMPs that were implemented, identifies how well the BMPs worked, discusses ways that BMPs could be improved for either protection of species and habitats or implementation efficiency, and reports on any federally listed species observed at or near the Project site. If site restoration was included as part of the Project, the implementation of that restoration and any follow-up monitoring will be included. Annual reports could be required for some longer-term projects. The Project and any annual reports will be made available to the USFWS.
4. Biological surveys will be conducted prior to fence construction.
5. Relocation of individuals of federally listed plants found in the Project area is generally not a suitable activity. Relocation of aquatic species is not appropriate. Relocation of small cacti has not been very successful, and is not recommended. Survival rates of translocated plants are usually very low; however, translocation can be considered where there are no other alternatives. For particular actions, the USFWS will advise CBP regarding the relocation of plants.
6. Individual federally listed animals found in the Project area will be relocated by a qualified biologist to a nearby safe location in accordance with accepted species-handling protocols, if appropriate, and to the extent practicable. This includes flat-tailed horned lizards, but does not include Sonoran pronghorns (see species specific BMPs for Sonoran pronghorn below). All construction and maintenance projects in federally listed habitats should have a designated biological monitor on site during the work. The biological monitor should document implementation of construction-related BMPs as designed for the Project to reduce the potential for adverse effects on the species or their habitats. Reports from the biological monitor should be used for developing the Project Report.
7. Where, based on species location maps or results of surveys, individuals of a federally listed species could be present on or near the Project site, a designated biological monitor will be present during the activity to protect individual federally listed species from harm. Duties of the designated biological monitor will include ensuring that activities stay within designated Project areas, evaluating the response of individuals of federally listed species that come near the Project site, and ensuring implementation of the appropriate BMPs. The designated biological monitor will notify the construction manager of any activities that could harm or harass an individual of a federally listed species. Upon such

notification, the construction manager will temporarily suspend activities in the vicinity of the federally listed species and notify the Contracting Officer, the Administrative Contracting Officer, and the Contracting Officer's Representative of the suspension so that the key U.S. Army Corps of Engineers (USACE) personnel can be notified and apprised of the situation for resolution. CBP will ensure that the USFWS Tucson Field Office and the refuge manager at CPNWR is notified in the event any federally listed species may be directly impacted during construction activities and BMPs implemented to avoid or minimize the impact.

8. Where a project could be located within 1 mile of occupied species habitats but the individuals of the species are not likely to move into the project area, a biological monitor is not needed. However, the construction monitor will be aware of the species location and ensure that BMPs designed to minimize habitat impacts are implemented and maintained as planned. This category includes the following species: lesser long-nosed bat, Mexican long-nosed bat, and all aquatic threatened and endangered species.
9. Particular importance is given to proper design and location of roads so that the potential for road bed erosion into federally listed species habitat will be avoided or minimized.
10. Particular importance is given to proper design and location of roads so that the potential for entrapment of surface flows within the roadbed due to grading will be avoided or minimized. Depth of any pits created will be minimized so animals do not become trapped.
11. Particular importance is given to proper design and location of roads so that the widening of existing or created road bed beyond the design parameters due to improper maintenance and use will be avoided or minimized.
12. Particular importance is given to proper design and location of roads so that excessive use of unimproved roads for construction purposes that results in their deterioration that affects the surrounding federally listed species habitat areas will be minimized. Road construction and road use for construction will be monitored and documented in the Project Report.
13. Particular importance is given to proper design and location of roads so that the fewest roads needed for construction will be developed and that these are maintained to proper standards. Roads no longer needed by the government should be closed and restored to natural surface and topography using appropriate techniques. The Global Positioning System (GPS) coordinates of roads that are thus closed should be recorded and integrated into the CBP Geographic Information System (GIS) database. A record of acreage or miles of roads taken out of use, restored, and revegetated will be maintained.
14. The width of all roads that are created or maintained by CBP for construction purposes will be measured and recorded using GPS

coordinates and integrated into the CBP GIS database. Maintenance actions should not increase the width of the road bed or the amount of disturbed area beyond the roadbed.

15. Construction equipment will be cleaned prior to entering and departing the Project corridor to minimize the spread and establishment of nonnative invasive plant species.
16. Surface water from untreated sources, including water used for irrigation purposes, will not be used for construction or maintenance projects located within 1 mile of aquatic habitat for federally listed aquatic species. Groundwater or surface water from a treated municipal source will be used when close to such habitats. This is to prevent the transfer of invasive animals or disease pathogens between habitats if water on the construction site was to reach the federally listed species habitats.
17. Materials such as gravel or topsoil will be obtained from existing developed or previously used sources, not from undisturbed areas adjacent to the project area.
18. If new access is needed or existing access requires improvements to be usable for the Project, related road construction and maintenance BMPs will be incorporated into the access design and implementation.
19. When available, areas already disturbed by past activities or those that will be used later in the construction period will be used for staging, parking, and equipment storage, where practicable.
20. Within the designated disturbance area, grading or topsoil removal will be limited to areas where this activity is needed to provide the ground conditions needed for construction or maintenance activities. Minimizing disturbance to soils will enhance the ability to restore the disturbed area after the project is complete.
21. Removal of trees and brush in habitats of federally listed species will be limited to the smallest amount needed to meet the objectives of the project. This type of clearing is likely to be a permanent impact on habitat.
22. Water for construction use will be from wells or irrigation water sources at the discretion of the landowner (depending on water rights). If local groundwater pumping is determined by the biological monitor to be an adverse environmental effect on aquatic, marsh, or riparian dwelling federally protected species, treated water from outside the immediate area will be utilized by the Contractor.
23. Surface water from aquatic or marsh habitats will not be used for construction purposes if that site supports aquatic federally protected species or if it contains nonnative invasive species or disease vectors and there is any opportunity to contaminate a federally protected species habitat through use of the water at the Project site.

24. Water tankers that convey untreated surface water will not discard unused water where it has the potential to enter any aquatic or marsh habitat.
25. Water storage on the Project area will be in closed on-ground containers located on upland areas, not in washes.
26. Pumps, hoses, tanks, and other water storage devices will be cleaned and disinfected with a 10 percent bleach solution at an appropriate facility before use at another site, if untreated surface water was used (this water is not to enter any surface water area). If a new water source is used that is not from a treated or groundwater source, the equipment will require additional cleaning. This is important to kill any residual disease organisms or early life stages of invasive species that could affect local populations of federally listed species.
27. CBP will develop and implement storm water management plans for every project.
28. All construction will follow DHS Management Directive 5110.1 for waste management.
29. A CBP-approved spill protection plan will be developed and implemented at construction and maintenance sites to ensure that any toxic substances are properly handled and that escape into the environment is prevented. Agency standard protocols will be used. Drip pans underneath equipment, containment zones used when refueling vehicles or equipment, and other measures are to be included.
30. Nonhazardous waste materials and other discarded materials, such as construction waste, will be contained until removed from the construction site. This will assist in keeping the Project area and surroundings free of litter and reduce the amount of disturbed area needed for waste storage.
31. To prevent attracting predators of protected animals, all food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed daily from the Project site.
32. Waste water is water used for project purposes that is contaminated with construction materials, or was used for cleaning equipment and thus carries oils or other toxic materials or other contaminants in accordance with state regulations. Waste water will be stored in closed containers on site until removed for disposal. Concrete wash water will not be dumped on the ground, but is to be collected and moved offsite for disposal. This wash water is toxic to aquatic life.
33. If an individual of a federally listed species is found in the designated Project area, work will cease in the area of the species until either a qualified biological monitor can safely remove the individual, or it moves away on its own, to the extent practicable and construction schedule permitting. Such occurrences will be documented by the biological monitor.

34. Construction speed limits will not exceed 35 miles per hour (mph) on major unpaved roads (graded with ditches on both sides) and 25 mph on all other unpaved roads. Nighttime travel speeds will not exceed 25 mph and might be less based on visibility and other safety considerations. Construction at night will be minimized.

35. No pets owned or under the care of the construction contractor or construction workers will be permitted inside the Project's construction boundaries, adjacent native habitats, or other associated work areas. This BMP does not apply to any animals under service to the USBP (such as canine and horse patrols).

36. If construction or maintenance activities continue at night, all lights will be shielded to direct light only onto the area required for worker safety and productivity. The minimum wattage needed will be used and the number of lights will be minimized.

37. Light poles and other pole-like structures will be designed to discourage roosting by birds, particularly ravens or raptors that might use the poles for hunting perches.

38. Noise levels for day or night construction and maintenance will be minimized. All generators will be in baffle boxes (i.e., a sound-resistant box that is placed over or around a generator), have an attached muffler, or use other noise-abatement methods in accordance with industry standards.

39. Materials used for onsite erosion control in uninfested native habitats will be free of nonnative plant seeds and other plant parts to limit potential for infestation. Since natural materials cannot be certified as completely weed-free, if such materials are used, there will be follow-up monitoring to document establishment of nonnative plants, and appropriate control measures will be implemented for a period of time to be determined in the site restoration plan.

40. Fill material brought in from outside the Project area will be identified by its source location and will be weed-free to the extent practicable.

41. For purpose of construction, infrastructure sites will only be accessed using designated roads. Parking will be in designated areas. This will limit the development of multiple trails to such sites and reduce the effects to federally listed habitats in the vicinity.

42. For temporarily disturbed areas (e.g., staging areas), appropriate techniques to restore the original grade, replace soils, and restore proper drainage will be implemented.

43. In temporarily disturbed areas, a site restoration plan for federally listed species and habitat will be developed during Project planning. The restoration plan pertains only to activities up to and including reseeding. If seeding with native plants is identified as appropriate, seeding will take place at the proper season and with seeds from nearby stocks, to the

extent practicable. It is understood that some sites cannot be restored, and the Project planning documents should acknowledge this.

44. Site restoration of temporarily disturbed areas such as staging areas and construction access routes will be monitored as appropriate.
45. In Section CV-2, during follow-up monitoring and during maintenance activities, invasive plants that appear on the site will be removed. Mechanical removal will be done in ways that eliminate the entire plant and remove all plant parts to a disposal area. All chemical applications on refuges must be used in coordination with the refuge or land manager. Herbicides will be used according to label directions. If herbicides are used, the treated plants will be left in place. The monitoring period will be defined in the site restoration plan. Training to identify nonnative invasive plants will be provided for CBP contractor personnel or contractors, as necessary.
46. Maintenance activities will not increase the existing disturbed areas. Use of existing roads and trails will be maximized in areas of suitable habitat for cactus and agaves. Protection of the cactus will be stressed in environmental education for contractors involved in construction or maintenance of facilities.
47. To prevent entrapment of wildlife species during the construction of the project, all excavated, steep-walled holes or trenches will either be covered at the close of each working day by plywood or provided with one or more escape ramps constructed of earth fill or wooden planks. The ramps will be located at no greater than 1,000-foot intervals and will be sloped less than 45 degrees. Each morning before the start of construction and before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. Any animals so discovered will be allowed to escape voluntarily (by escape ramps or temporary structures), without harassment, before construction activities resume, or removed from the trench or hole by the biological monitor and allowed to escape unimpeded.
48. To prevent entrapment of wildlife species during the emplacement of vertical posts/bollards, all vertical fence posts/bollards that are hollow (i.e., those that will be filled with a reinforcing material such as concrete), will be covered so as to prevent wildlife from entrapment. Covers will be deployed from the time the posts or hollow bollards are erected to the time they are filled with reinforcing material.
49. All equipment maintenance, laydown, and dispensing of fuel, oil, or any other such activities, will occur in staging areas identified for use in the Project description. The designated staging areas will be located in such a manner as to prevent any runoff from entering waters of the United States, including wetlands.
50. All access routes into and out of the Project disturbance area will be flagged, and no construction travel outside those areas will be authorized.

No off-road vehicle activity will occur outside of the Project footprint by the Project workers, and Project contractors.

S ec es S ec f c s

So h es ern o ca cher Sec on

1. Whenever practicable, road construction and maintenance will not improve or create new available access to flycatcher habitats.
2. In planning for roads and fences that will require land clearing, placement of these facilities in riparian vegetation communities will be avoided to the extent practicable. Since these areas could also be in flood-prone areas, this avoidance might also contribute to reduced maintenance requirements.
3. Removal of dense understory or midstory vegetation from breeding or migration habitat will be avoided to the extent practicable. Removal compromises the ability of the habitat to support flycatcher use.
4. Actions will be taken to avoid transporting salt cedar leaf beetles (biocontrols used to eradicate salt cedar in some areas) to areas occupied by flycatchers. Actions will include inspection of vehicles and equipment and subsequent beetle removal, or equipment cleaning if the equipment was used in areas where leaf beetles have been released to eradicate salt cedar.
5. Maintenance activities for facilities can occur at any time; however, for major work on roads or fences where significant amount of equipment will be required, the October to April period is preferred.

esser on ose a Sec on

1. Activities should be planned to avoid areas containing columnar cacti (saguaro, organ pipe) or agaves that provide the forage base for the bat. If they cannot be avoided, appropriate mitigation will be performed for any columnar cacti and agaves that are affected. Any restoration (e.g., planting of cacti or agaves raised off-site or purchased) will be a compensation measure (see Compensation below).

Sonoran ron horn Sec on

1. To the extent practicable, the number of vehicle trips related to construction per day to and from the Project site should be minimized to reduce the likelihood of disturbing pronghorn in the area or injuring an animal on the road. The use of vehicle convoys, multi-passenger vehicles, and other methods are appropriate.
2. During fence construction, if a pronghorn is seen within 1 mile of the activity, any construction work that could disturb the pronghorn should cease. For vehicle operations, this should entail stopping the vehicle until

the pronghorn moves away. Vehicles may continue on at reduced speeds (10 to 15 miles per hour) once the pronghorn has moved away. The biological monitor should request that work cease until the pronghorn moves out of the area. As the schedule permits, construction crews will wait up to 3 hours from the initial sighting for the pronghorn to move beyond 1 mile away from the Project activity or vehicle. Should the pronghorn not leave, project personnel may retreat from the area in the direction from which they came. During maintenance activities and to the extent practicable, appropriately trained staff will suspend maintenance activities until the pronghorn move away.

3. During the fawning season (March 1 to July 15), it is especially important to avoid disturbance to females and fawns. Vehicle activity related to construction should be restricted to the extent practicable during those times in areas where there are fawns present.
4. During construction and maintenance, the minimum amount of personnel and equipment should be used to reduce the amount of activity. This may be adjusted if additional personnel and equipment will complete the work faster and thus reduce the time the disturbance is in effect.

o ensa on an a on

It is CBP's policy to reduce impacts through the sequence of avoidance, minimization, mitigation, and, finally, compensation, if appropriate. Current estimates of impacts for each habitat type are presented in **Table 1-2**. Using funds contributed to the compensation pool by CBP, USFWS may offset permanent direct and indirect impacts on habitat used by federally listed species. USFWS may use these monies to fund conservation actions benefitting these species.

Table 1-2. Summary of Permanent Impacts of the Project on Habitat

Habitat Type	Section	Estimated Acres of Permanent Impact
Colorado River Riparian (habitat for southwestern willow flycatcher and includes approximately 1 acre of overlapping yellow-billed cuckoo habitat)	CV-1A	14
Saguaro / Creosotebush – White Bursage Wooded Shrubland (habitat for lesser long-nosed bat)	CV-2	9
	Total =	**23 acres**

So h es ern o ca cher Sec on

1. Using funds from the mitigation pool established by CBP, USFWS may undertake restoration of riparian areas at the site of the disturbance to

restore the acreage lost. If this is not possible, funding from the mitigation pool may be used to replace riparian areas in a protected area or to restore and manage flycatcher habitat within the planning unit.

esser on ose a Sec on

1. If columnar cacti (saguaro and organ pipe) and agaves cannot be avoided, CBP will conduct appropriate mitigation. USFWS or relevant land management agencies may use funds from the mitigation pool established by CBP to conduct restoration for columnar cacti and agaves. Planting should be done in accordance with a restoration plan that includes success criteria and monitoring.

S R T S S T R T T

This section summarizes information regarding species and habitats that may be affected by the Project. Some listed species are not included here because they do not occur in the project area or the implementation of the agreed-upon BMPs and conservation measures are anticipated to provide conditions that avoid adverse effect. For more complete information and supporting citations regarding species' descriptions, distribution and abundance, habitat needs, life history, and population ecology, the local USFWS office can be contacted.

S UT ST R Y T R

The southwestern willow flycatcher (*Empidonax traillii extimus*) was listed as Endangered on February 27, 1995 (60 *Federal Register* 10694) with critical habitat designated in 50 Code of Federal Regulations [CFR] 60886 on October 19, 2005.

Critical habitat was finalized and designated in southern California, southwestern Utah, Arizona, and New Mexico on October 19, 2005.

S ec es escr on

The southwestern willow flycatcher is a migratory bird about 15 centimeters (cm) (6 inches) long, with grayish-green back and wings, a white throat, a light gray-olive breast, and a pale yellowish belly. Two wingbars are visible and the eye ring is faint or absent. The species is best identified by vocalizations. While perched, it characteristically flicks its tail slightly upward (USFWS 2004).

s r on an n ance

The historical range includes southern California, southern Nevada, southern Utah, Arizona, New Mexico, western Texas, southwestern Colorado, and extreme northwestern Mexico (USFWS 2004).

As of the end of the 2005 breeding season, slightly more than 1,200 breeding territories were estimated to occur across its range. Since listing, breeding territories have been detected in all states of its historical range, with the exception of western Texas. In Arizona, since listing, breeding territories have been detected on the Agua Fria, Gila, Little Colorado, Salt, San Pedro, Colorado, San Francisco, Hassayampa, Verde, Big Sandy, Santa Maria, Virgin and Bill Williams rivers, and Pinal, Tonto and Cienega creeks. Most birds likely winter in Mexico, Central America, and possibly northern South America (USFWS 2004).

a a

The species nests and forages in dense riparian habitats along streams, rivers, lakesides, and other wetlands. Some of the more common plant species used for nesting are willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, and mesquite. Nests are found in dense thickets of these and other plant species that are about 4 to 7 meters (13 to 23 feet) in height. Migration habitat is believed to primarily occur along riparian corridors. Habitat occurs at elevations below 8,500 feet (2,590 meters) (USFWS 2004).

Threa s

The species is endangered primarily due to riparian habitat reduction, degradation, and elimination as a result of agricultural and urban development. Other naturally occurring reasons for the decline/vulnerability of the flycatcher include the fragmented distribution and low numbers of the current population; predation; brood parasitism by cowbirds; and other events (e.g., fires and floods) that are more frequent and intensified by exotic vegetation and degraded watersheds (USFWS 2004).

Y U

USFWS announced a 12-month finding for a petition to list the yellow-billed cuckoo (*Coccyzus americanus*) in the western continental United States on July 25, 2001 (50 CFR 38611).

S ec es escr on

The yellow-billed cuckoo is a medium-sized bird with a slender, long-tailed profile, and a slightly down-curved bill, which is blue-black with yellow on the lower half. Plumage is grayish-brown above and white below, with rufous primary flight feathers (USFWS 2007).

s r on an n ance

Yellow-billed cuckoos are a neotropical migrant, wintering primarily in South America and breeding primarily in the United States (but also in southern Canada and northern Mexico). As a migrant it is rarely detected, but can occur outside of riparian areas. Cuckoos are found nesting statewide in Arizona below 7,000 feet in elevation, but are mostly found below 5,000 feet in central, western, and southeastern Arizona. Nesting cuckoos are associated with relatively dense wooded streamside riparian habitat, with varying combinations of Fremont cotttonwood, willow, velvet ash, Arizona walnut, mesquite, and tamarisk. Some cuckoos have also been detected nesting in velvet mesquite, netleaf hackberry, Arizona sycamore, Arizona alder, and some exotic neighborhood shade trees (USFWS 2007).

a a

Habitat consists of large blocks of riparian woodlands (e.g., cottonwood, willow, or tamarisk galleries).

Western cuckoos breed in large blocks of riparian habitats (particularly woodlands with cottonwoods (*Populus fremontii*) and willows (*Salix* sp.), while eastern cuckoos breed in a wider range of habitats, including deciduous woodlands and parks. Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California (USFWS 2007).

The lower Colorado River, on the California-Arizona border, supported an estimated 180 to 240 pairs in 1976 to 1977, a number that had declined by an estimated 80 to 90 percent in 1986. Arizona probably contains the largest remaining cuckoo population among states west of the Rocky Mountains. The species was historically widespread and locally common. Losses of riparian habitats from historic levels have been substantial in Arizona (USFWS 2007).

Losses have been greatest at lower elevations (below about 3,000 feet) along the Lower Colorado River and its major tributaries, which have been strongly affected by upstream dams, flow alterations, channel modification, and clearing of land for agriculture. Recent surveys for the species in Arizona along the Gila and Salt rivers near Phoenix found yellow-billed cuckoos only in areas which had dense willow and cottonwood cover, and some areas where yellow-billed cuckoos have been found in the past had no detections. Other surveys in the Prescott National Forest, north of Phoenix, were only able to confirm a single nesting pair of yellow-billed cuckoo (USFWS 2007).

A total of 168 cuckoo pairs and 80 single birds were located in Arizona in 1999, based on preliminary results from a statewide survey which covered 265 miles (426 kilometers (km)) of river and creek bottoms. From these results, it is evident that cuckoo numbers in 1999 are substantially less than some previous estimates for Arizona, including a 1976 estimate of 846 pairs for the lower Colorado River and five major tributaries 1976 (USFWS 2007).

Threa s

The primary threat to yellow-billed cuckoos is alteration of its nesting and foraging habitat. Principal causes of riparian habitat losses are conversion to agricultural and other uses, dams and river flow management, stream channelization and stabilization, and livestock grazing. Available breeding habitats for cuckoos have also been substantially reduced in area and quality by groundwater pumping and the replacement of native riparian habitats by invasive nonnative plants, particularly tamarisk (USFWS 2007).

SS R S T

The lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) was listed as endangered on September 30, 1988 (53 *Federal Register* 38456) without critical habitat.

S ec es escr on

The lesser long-nosed bat is a yellow-brown or cinnamon-gray bat, with a total head and body measurement of approximately 3 inches (7.62 cm). It is distinguished by its elongated muzzle, small noseleaf, long tongue, and minute tail that appears to be missing. Known to roost in caves and abandoned tunnels below 6,000 feet (1,830 meters) above mean sea level, it forages at night on nectar, pollen, and fruit of agaves and columnar cacti.

s r on an n ance

The species historically ranged from central Arizona and southwestern New Mexico through much of Mexico to El Salvador. Records exist for occurrences in the southern Peloncillo Mountains of New Mexico.

The current range is similar to its historic range; however, the number of occupied roost sites and the number of individuals per colony have recently declined drastically. These bats are seasonal (April to September) residents of southeastern Arizona, and possibly extreme western Arizona (i.e., Cochise, Pima, Santa Cruz, Graham, Pinal and Maricopa counties, Arizona).

A single young is born in mid-May. When the young are able to fly, adults and young move to higher elevations to feed on agave nectar. Although there is controversy among bat experts, the recovery plan suggests there may be as many as 60,000 individuals that reside and feed in the southwestern United States, primarily in Arizona and New Mexico (USFWS 2006).

The maternity roost at CPNWR is one of three known major maternity roosts in the United States. The refuge installed a steel fence ranging from 2.5 to 3 meters (8 to 10 feet) high around the roost entrance to discourage human entry. CPNWR staff periodically monitors the entrance to the roost to assess bat use and document damage caused by unauthorized human use. A few lesser long-nosed bats have also been found inhabiting smaller roost sites at the CPNWR (USFWS 2006).

The lesser long-nosed bat appears to use two migration routes. An early spring route connects maternity colonies in coastal Sonora and southwestern Arizona and Jalisco via the west coast of Mexico. The route used later in the season connects transitory roosts in southeastern Arizona with winter range via a path along the foothills of the Sierra Madre (USFWS 2006).

a a

Habitat for the species includes mainly desert scrub habitat in the U.S. portion of its range. After breeding in the desert, lesser long-nosed bats move east into the mountains and valleys of southeastern Arizona, which are a combination of forested lands, grasslands, and desert scrub. In Mexico, the species occurs up into high elevation pine-oak and ponderosa pine forests. Altitudinal range is from 1,600 to 11,500 feet (480 to 3,450 meters) above mean sea level.

Critical resources include suitable day roost sites and nearby extensive populations of columnar cacti and agaves. Roosting occurs in caves, abandoned mines, and unoccupied buildings at the base of mountains where agave, saguaro, and organ pipe cacti are present. Criteria for suitable maternity roosts have not been identified as the conditions vary. Maternity roosts are usually warm and poorly ventilated (USFWS 2006).

The species is highly mobile. It forages long distances for up to 6 hours a night and can visit more than 100 flowers per night. Lesser long-nosed bats are the major pollinators of columnar cacti and paniculate agaves and a potential seed disperser of columnar cacti, which are distinctive elements of the flora of the Sonoran Desert (USFWS 2006).

Threa s

Considerable evidence exists for the interdependence of *Leptonycteris* bat species and certain agaves and cacti. Excess harvest of agaves in Mexico, the collection of cacti in the United States, and the conversion of habitat for agricultural uses, livestock grazing, wood-cutting, and other development could contribute to the decline of long-nosed bat populations. These bats are particularly vulnerable due to many individuals using only a small number of communal roosts.

S R R R

The Sonoran pronghorn (*Antilocapra americana sonoriensis*) was listed as endangered on March 11, 1967 (32 *Federal Register* 4001) without critical habitat.

S ec es escr on

Pronghorn are long-legged, small-bodied artiodactyls (i.e., hoofed mammals with an even number of toes on each foot). Upper parts are tan; the underpart, rump, and two bands across the neck are white. The male has two black cheek patches. Both sexes have horns, although they are larger in males. Males weigh 100 to 130 pounds, while females weigh 75 to 100 pounds (USFWS 2002a).

The five recognized subspecies are American pronghorn (*A.a.americana*), Oregon pronghorn (*A.a.oregona*), Mexican pronghorn (*A.a.mexicana*), Sonoran pronghorn (*A.a.sonoriensis*), and peninsular pronghorn (*A.a.peninsularis*). The Sonoran pronghorn is the smallest and palest subspecies of *Antilocapra americana* (USFWS 2002a).

s r on an n ance

The U.S. subpopulation currently occupies approximately 2,500 square miles (6,500 square km) of Federal lands in southwestern Arizona, including portions of the BMGR, CPNWR, Organ Pipe Cactus National Monument, and a small area of Bureau of Land Management lands east of the CPNWR and west of Highway 85. The CPNWR lies at the heart of the Sonoran pronghorn range in Arizona and connects locations used on the BMGR and Organ Pipe Cactus National Monument (USFWS 2006). Although Section CV-2 will occupy part of the historical range for Sonoran pronghorn, the Project is outside the current range of the species.

In 2004, the population estimate was 58 individuals and the trend has generally been downward since 1992. In 2002, extreme drought resulted in the loss of 85 percent of the U.S. Sonoran pronghorn herd.

a a

All Sonoran pronghorn populations occur in Sonoran desert scrub vegetation communities. Creosote (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) compose the major vegetation in the Lower Colorado River Valley subdivision. Plant species along major water courses include ironwood (*Olneya tesota*), blue palo verde (*Parkinsonia floridum*), and mesquite (*Prosopis velutina* and *P. glandulosa*). Species in the Arizona Upland include foothill palo verde (*Parkinsonia microphyllum*), catclaw acacia (*Acacia greggii*), chain fruit cholla, teddy bear cholla (*Cylindorpuntia bigelovii*), buckhorn cholla (*C. acanthocarpa*), and staghorn cholla (*C. versicolor*). Typical habitat ranges in elevation from 2,000 to 4,000 feet (610 to 1,219 meters) above mean sea level (USFWS 2002a).

Sonoran pronghorns inhabit sites with good visiability and escape opportunities (e.g., the alluvial fans and plains) but will use higher elevation alluvial fans and hills with less visability where vegetation is more abundant. Their preferred forage is annual forbs, but they also use the shrubs and trees of desert washes and hills as the forbs dry. Vegetation associated with desert washes provide important thermal cover. Sonoran pronghorns use free-standing water when it is available and also rely on moisture from vegetation in addition to metabolic water (e^2M 2008).

Threa s

The lack of newborns entering the population, insufficient forage or water, drought coupled with predation, barriers to movement, illegal hunting, habitat degradation from livestock grazing, diminishing size and loss of access to the Gila and Sonoita rivers, and human encroachment are considered contributing factors in the population decline of Sonoran pronghorn (USFWS 2006). Conversion of habitat to other uses and barriers to movement caused by roads, canals, train tracks, and fences are the primary causes of the decline of the Sonoran pronghorn (USFWS 2002a).

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T R

The action area consists of those lands that will be directly and indirectly impacted by the Project and are known to be occupied or potentially occupied by federally listed species. The action area is defined by a corridor that extends approximately 300 feet from construction access routes, staging areas, and construction sites. This is the area directly affected by the Project. The extension of 300 feet represents the approximate distance that Project-related noise is estimated to attenuate from approximately 80 A-weighted decibels (dBA) to approximately ambient noise levels of around 55 dBA. The action area includes primary vehicle fence and access road construction activities, construction access roads, and construction staging areas.

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TS T R T

The following is an analysis of the effects of the Project. Implementation of the Project may affect, but is not likely to adversely affect, the southwestern willow flycatcher (*Empidonax traillii extimus*) and yellow-billed cuckoo (*Coccyzus americanus*) in CV-1A. The Project may affect, but is not likely to adversely affect, the Sonoran pronghorn (*Antilocapra americana sonoriensis*) and the lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) in Section CV-2. Potentially suitable habitat exists within the Project corridor for the species listed above. The vegetation alliances that will be impacted by construction activities in Section CV-2 and the species with habitat in those vegetation alliances are presented in **Table 4-1**. Implementing general and species-specific BMPs will help to avoid impacts on these species and their habitats (see **Section 1.3**).

S UT ST R Y T R

The Project may affect, but is not likely to adversely affect, the southwestern willow flycatcher throughout the impact areas in Sections CV-1A. NatureServe data indicate that the southwestern willow flycatcher occurs immediately west of the Section CV-1A Project corridor (NatureServe 2008). Southwestern willow flycatchers are only expected to occur in the Project area from April until mid-September (USFWS 2002b). Because construction will occur from October through December 2008, southwestern willow flycatchers are not expected to be present during construction. The Project will result in the loss of approximately 14 acres of suitable willow flycatcher habitat. The impact of this loss will be negligible compared to the available habitat in the Project area and along the Colorado River. Additionally, the Project corridor is disturbed and is in close proximity to agricultural development, further reducing the effects associated with loss of habitat. However, BMPs will help to reduce or avoid these impacts (see **Section 1.3**).

Y U

The Project may affect, but is not likely to adversely affect, the yellow-billed cuckoo throughout the impact areas in Sections CV-1A. NatureServe data indicate that yellow-billed cuckoo occurs in Section CV-1A within the Project corridor (NatureServe 2008). Yellow-billed cuckoos are only expected to occur in the Project area from late May until late August (Wiggins 2005). Because construction will occur from October through December 2008, yellow-billed cuckoos are not expected to be present during construction. The Project will result in the loss of approximately 1 acre of yellow-billed cuckoo habitat. The impact of this loss will be negligible compared to the available habitat in the Project area and along the Colorado River. Additionally, the Project corridor is disturbed and is in close proximity to agricultural development, further reducing the effects associated with loss of habitat. However, BMPs will help to reduce or avoid these impacts (see **Section 1.3**).

Table 4-1. Vegetation Alliances Impacted by Construction Activities in Section CV-2

Vegetation Alliance	Access Road (acres)	Fence Corridor (acres)	Staging Areas (acres)	Species with Habitat in Vegetation Alliance
Grassland				
Annual Herbaceous Vegetation/ Barrens	24.81	5.56	0.82	--
Total Herbaceous	**24.81**	**5.56**	**0.82**	
Tall Shrubland				
Smoketree – Catclaw Acacia Desert Wash Shrubland	1.3	0.5	--	--
Total Tall Shrubland	**1.3**	**0.5**	--	--
Short Shrubland				
Brittlebush – Creosotebush Volcanic Cobble Shrubland	--	0.48	--	--
Creosotebush / Annual Herbaceous Vegetation Shrubland	5.67	--	5.47	--
Creosotebush – Brittlebush – Teddy Bear Cholla Volcanic Cobble Shrubland	3.46	3.58	--	--
Creosotebush – Brittlebush – White Bursage Shrubland	38.52	2.39	20.26	--
Creosotebush – Limberbush – White Bursage Shrubland	8.34	4.58	5.53	--
Creosotebush – Ocotillo Volcanic Cobble Shrubland	0.27	13.17	0.47	--
Creosotebush – White Bursage Shrubland	80.3	20.98	5.33	--
Creosotebush – White Bursage Volcanic Cobble Shrubland	0.98	3.09	--	--
Creosotebush – White Bursage – Four-wing Saltbush Shrubland	5.16	0.19	--	--
Four-wing Saltbush – Catclaw Acacia Desert Wash Shrubland	3.41	--	--	--
Rock Outcrop Sparse Shrubland	0.25	--	--	--
Total Short Shrubland	**146.36**	**48.46**	**37.06**	--

Vegetation Alliance	Access Road (acres)	Fence Corridor (acres)	Staging Areas (acres)	Species with Habitat in Vegetation Alliance
Wooded Shrubland				
Ironwood / Brittlebush Desert Wash Wooded Shrubland	4.07	0.3	2.19	--
Paloverde – Ironwood / Mixed Shrub Desert Wash Wooded Shrubland	5.11	5.77		--
Honey Mesquite / Mixed Shrubs Riparian Wooded Shrubland	5.08	0.71	0.28	--
Saguaro / Creosotebush – White Bursage Wooded Shrubland	8.73	--	--	Lesser long-nosed bat
Paloverde – Ocotillo – Creosotebush Mountain Slope Wooded Shrubland	1.7	4.32	0.1	--
Total Wooded Shrubland	**24.69**	**11.1**	**2.57**	
Miscellaneous				
Unvegetated Desert Wash Channels	0.93	0.62	0.31	--

SS R S T

The Project may affect, but is not likely to adversely affect, the lesser long-nosed bat in Section CV-2. Lesser long-nosed bats use roost sites within CPNWR, including one of three maternity roosts in the United States (e^{2}M 2008). However, at its closest point the maternity roost is approximately 15 miles from the project corridor. There are no known occurrences of this species within or immediately adjacent to the Project corridor (NatureServe 2008). Effects could occur through the direct loss of forage habitat. Based on the known forage distances of up to 40 miles for lesser long-nosed bats, it is likely that this species forages throughout portions of the CPNWR, where flowers and fruit of saguaro, organ pipe, prickly pear, and agave are available (USFWS 2006, USFWS 2007).

A total of 8.73 acres of suitable lesser long-nosed bat forage habitat (saguaro/creosotebush – white bursage wooded shrubland) will be permanently impacted by construction of tactical infrastructure in Section CV-2. Approximately 260 saguaros occur in the Project corridor, which serve as a forage plant for lesser long-nosed bat. This potential loss of lesser long-nosed bat habitat is small compared to the suitable forage habitat available to the lesser long-nosed bat throughout the action area. Additionally, sensitive or protected plant species will be avoided when possible and when it is not possible to avoid saguaros, CBP will conduct appropriate mitigation to lessen the impact of the

Project. Therefore, the Project might affect, but is not likely to adversely affect, the lesser long-nosed bat.

S R R R

The Project may affect, but is not likely to adversely affect the Sonoran pronghorn throughout the impact areas in Section CV-2. Sonoran pronghorns occur within the proposed project region within BMGR and CPNWR, with the CPNWR being central to its distributional range (USFWS 2006). Sonoran pronghorns most frequently use the valleys and hills of Pinta Sands, Mohawk Valley, San Cristobal Valley, and Growler Valley east of the proposed Project area (e^{2}M 2008). Arizona Game and Fish Department documented an individual radiotagged Sonoran pronghorn that crossed the Section CV-2 project corridor and joined a herd in Mexico (Young 2008). This is perceived to be an extralimital occurrence, based on the species' current range and the fact that this was an individual pronghorn. Although Section CV-2 will occupy part of the historical range for Sonoran pronghorn, the Project is outside the current range of the species. Additionally, because of the lack of water sources, the Project area is considered only marginal seasonal habitat (e^{2}M 2008). Therefore, no direct effect on Sonoran pronghorn or its habitat are expected.

As stated above threats to Sonoran pronghorn include barriers to movement caused by roads, canals, train tracks, and fences (USFWS 2002a). However, pronghorn (*Antilocapra americana*) have been documented to cross under barbed wire fences with a clearance of 22 inches, with a low aversion rate (Karhu and Anderson 2003) and post on rail type ("buck and pole") fences with a clearance of 18 inches (NDGFD 2006). The clearance under a post on rail fence associated with the Project is 36 inches high and the clearance under a Normandy style vehicle fence is 32.5 inches.

Improvements to the Camino del Diablo could increase vehicle and recreational use in Sonoran pronghorn habitat. However, these increases are likely to be negligible. Camino del Diablo is currently open to permitted four-wheel-drive traffic and this will not change as a result of the Project. Increased human disturbance of Sonoran pronghorn in adjacent habitat, associated with construction could occur. Increased human disturbance could result in physiological effects, such as elevated heart rate or the additional energy expended in moving away from perceived danger. Studies of captive pronghorn, other than the Sonoran subspecies, have shown that they are sensitive to disturbance such as human presence and vehicular noise. Human and vehicular traffic caused an increased heart-rate response in American pronghorn in half-acre holding pens. During times of drought, disturbances that cause pronghorns to startle and run energetically will have a more significant effect. Such expenditures of energy, particularly during times of stress, could lead to lower reproductive output or reduced survival for individual animals (USFWS 2006). However, impacts are expected to be negligible since construction will be focused outside the current range of the species.

A beneficial effect is anticipated from the Project is the reduction of illegal traffic and other illegal human activities on habitat for this species. In one area, illegal traffic has created a 38-mile road since 1999 that traverses pronghorn habitat. In addition, there are hundreds of additional miles of single vehicle tracks laid down across the otherwise undisturbed desert by cross-border violators. These activities undoubtedly result in adverse effects due to the reduction of habitat quantity and quality available to Sonoran pronghorns (USFWS 2006) and through direct disturbance of individuals. The expected reduction and potential cessation of these illegal activities in this area could result in short- and long-term, minor to major, beneficial effects on this species through improvement of the habitat north of the Project such that pronghorn might once again inhabit the area in the future.

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T R T T

Table 5-1 summarizes the federally listed species and habitats that are known to occur within 25 miles of the U.S./Mexico international border in Yuma County.

There are nine federally listed species that are known to occur, or have the potential to occur, within or adjacent to the project area. Additionally, one of the listed species has designated critical habitat near the Project area. The Project may affect, but is not likely to adversely affect, the southwestern willow flycatcher (*Empidonax traillii extimus*) and yellow-billed cuckoo (*Coccyzus americanus*) in Section CV-1A. The Project may affect, but is not likely to adversely affect, the Sonoran pronghorn (*Antilocapra americana sonoriensis*) and the lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) in Section CV-2. The Project will have no effect on the razorback sucker (*Xyrauchen texanus)* or its critical habitat, the wintering population of bald eagle (*Haliaeetus leucocephalus),* California brown pelican (*Pelecanus occidentalis californicus*), and Yuma clapper rail (*Rallus longirostris yumanensis)* in CV-1A and flat-tailed horned lizard (*Phrynosoma mcallii*) in CV-2. The reasons for the no effect determinations are detailed below.

Razorback Sucker. There are no known occurrences of this species within or immediately adjacent to the Project corridor (NatureServe 2008). Additionally, the Project corridor does not contain suitable habitat for the razorback sucker (GSRC 2008). The only portion of the Section CV-1A that will occur within the floodplain of the Colorado River is a section of Normandy-style fence that will connect to the Morelos Dam. No changes to hydrology are expected as a result of the Project. Therefore, no impacts on the razorback sucker are anticipated.

Razorback Sucker Critical Habitat. Razorback sucker critical habitat does not occur within the Project corridor.

Bald eagle. Once endangered, the bald eagle was downlisted to threatened on August 11, 1995, and delisted August 8, 2007. Threatened status was reinstated for desert nesting bald eagles, and the species is being monitored in several counties by USFWS. However, Yuma County is not one of those counties, and no bald eagle nests are known in the area of the Project (Driscoll et al. 2006). There are no known occurrences of this species within or immediately adjacent to the project corridor (NatureServe 2008). Additionally, suitable nesting habitat, which is composed of large trees or cliffs near water (e.g., reservoirs, rivers, and streams) with abundant prey, does not exist within the Project corridor (USFWS 2008).

California brown pelican. This subspecies is found on the Pacific Coast and is an uncommon transient in Arizona on lakes and rivers. Individuals wander up from Mexico in summer and fall. There are no known occurrences of this species within or immediately adjacent to the project corridor (NatureServe 2008). There

Table 5-1. Federally Listed Species and Designated Critical Habitats Known to Occur or with Potential to Occur Within Project Area in Yuma County, Arizona, and the Determination of Effects

Species	Project Segment	Listing Status, Critical Habitat	Effect Determination
Fish			
Razorback sucker, *Xyrauchen texanus*	CV-1A	Endangered	No effect
Razorback sucker Critical Habitat	CV-1A	Critical Habitat upstream of the Project area	No effect
Reptiles			
Flat-tailed horned lizard, *Phrynosoma mcallii*	CV-2	Conservation Agreement Species*	No effect
Birds			
Bald eagle (wintering population), *Haliaeetus leucocephalus*	CV-1A	Threatened**	No effect
California brown pelican, *Pelecanus occidentalis californicus*	CV-1A	Threatened , Proposed delisted	No effect
Southwestern willow flycatcher, *Empidonax traillii extimus*	CV-1A	Endangered	Not likely to adversely affect
Yellow-billed cuckoo, *Coccyzus americanus*	CV-1A	Candidate	Not likely to adversely affect
Yuma clapper rail, *Rallus longirostris yumanensis*	CV-1A	Endangered	No effect
Mammals			
Lesser long-nosed bat, *Leptonycteris curasoae*	CV-2	Endangered	Not likely to adversely affect
Sonoran pronghorn, *Antilocapra americana sonoriensis*	CV-2	Endangered	Not likely to adversely affect

Source: USFWS 2008

Notes:

* This species is not federally-listed; however, the USFWS participates in the Flat-tailed Horned Lizard Rangewide Management Strategy which has been prepared to provide guidance for the conservation and management of sufficient habitat to maintain extant populations of flat-tailed horned lizards.

**Once endangered, this species was downlisted to threatened on August 11, 1995, and delisted August 8, 2007. Threatened status was reinstated for desert nesting bald eagles.

are no breeding records of this species in Arizona. Suitable habitat, which is composed of coastal land and islands, and around Arizona lakes and rivers, does not exist within the Project corridor (USFWS 2008).

Yuma clapper rail. NatureServe data indicate that Yuma clapper rail occurs in Section CV-1A within the Project corridor (NatureServe 2008). Yuma clapper rail is associated with dense riparian and marsh vegetation. It requires a wet substrate, such as a mudflat, sandbar, or slough bottom, that supports cattail and bulrush stands of moderate to high density adjacent to shorelines (USFWS 2002c). However, suitable habitat for Yuma clapper rail will not be affected by the Project (GSRC 2008). Therefore, impacts on individuals associated with construction will not be expected.

Flat-tailed Horned Lizard. There are no known occurrences of this species within or immediately adjacent to the Project corridor (NatureServe 2008). The flat-tailed horned lizard is adapted to active sand dunes and flats and could occur in the Pinta Sands area east of the proposed Project corridor (USFWS 2006). Suitable habitat for the flat-tailed horned lizard does not occur within the Project corridor (e^2M 2008).

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R R S

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USFWS 2007	USFWS. 2007. Species Assessment and Listing Priority Assignment Form: Yellow-billed Cuckoo, Western United States Distinct Population Segment. July 25, 2007.
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APPENDIX G

Air Quality Calculations and Emissions Calculations

Summary	Summarizes total emissions by calendar year.
Combustion	Estimates emissions from non-road equipment exhaust as well as painting.
Fugitive	Estimates fine particulate emissions from earthmoving, vehicle traffic, and windblown dust
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions
Generators	Estimates emissions from diesel-powered generators used during Project implementation.
Operations and Maintenance	Estimates emissions from maintenance equipment and from operational use of roads
AQCR Tier Report	Summarizes total emissions for the Mohave-Yuma Intrastate AQCR Tier Reports for 2001, to be used to compare project to regional emissions.

Air Quality Emissions from Proposed Action

		NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	$PM_{2.5}$ (ton)	CO_2 (ton)
CY2008	Construction Combustion	3.373	0.209	1.273	0.067	0.206	0.200	400.264
	Construction Fugitive Dust	-	-	-	-	83.194	8.319	-
	Construction Generators	6.030	0.492	1.299	0.397	0.424	0.397	224.245
	TOTAL CY2008	***9.403***	***0.701***	***2.571***	***0.464***	***83.824***	***8.916***	***624.509***

Note: Total CY2008 $PM_{10}/_{2.5}$ fugitive dust emissions are assuming USEPA 50% control efficiencies.

		NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	$PM_{2.5}$ (ton)	CO_2 (ton)
CY2009	Operations & Maintenance	0.308	0.039	0.285	0.0003	0.011	0.010	35.353
	TOTAL CY2009	***0.308***	***0.039***	***0.285***	***0.0003***	***0.011***	***0.010***	***35.353***

Since future year budgets were not readily available, actual 2001 air emissions inventories for the counties were used as an approximation of the regional inventory. Because the Proposed Action is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

Mohave-Yuma Intrastate Air Quality Control Region

	Point and Area Sources Combined					
Year	**NO_x (tpy)**	**VOC (tpy)**	**CO (tpy)**	**SO_2 (tpy)**	**PM_{10} (tpy)**	**$PM_{2.5}$ (tpy)**
2001	22,973	21,200	143,134	1,241	20,173	5,876

Source: USEPA-AirData NET Tier Report (http://www.epa.gov/air/data/geosel.html). Site visited on 8 July 2008.

Determination Significance (Significance Threshold = 10%)

CY2008	Point and Area Sources Combined					
	NO_x (tpy)	**VOC (tpy)**	**CO (tpy)**	**SO_2 (tpy)**	**PM_{10} (tpy)**	**$PM_{2.5}$ (tpy)**
Regional Emissions	22,973	21,200	143,134	1,241	20,173	5,876
CY2008 Emissions (Highest Year)	9.4029	0.7010	2.5715	0.4640	83.8241	8.916
CY2008 %	**0.0409%**	**0.0033%**	**0.0018%**	**0.0374%**	**0.4155%**	**0.1517%**

Determination Significance (Significance Threshold = 10%)

CY2009	Point and Area Sources Combined					
	NO_x (tpy)	**VOC (tpy)**	**CO (tpy)**	**SO_2 (tpy)**	**PM_{10} (tpy)**	**$PM_{2.5}$ (tpy)**
Regional Emissions	22,973	21,200	143,134	1,241	20,173	5,876
CY2009 and beyond Emissions	0.3080	0.0390	0.2850	0.0003	0.0110	0.0100
CY2009 %	**0.0013%**	**0.0002%**	**0.0002%**	**0.00003%**	**0.0001%**	**0.0002%**

Combustion Emissions for CY 2008

Combustion Emissions of VOC, NO_x, SO_2, CO, $PM_{2.5}$, PM_{10}, and CO_2 due to Construction

Includes:
Assumption: Constuction corridor for access road improvements is 19.09 miles long by 60 feet wide.
Assumption: Constuction corridor for new access road construction is 9.56 miles long by 60 feet wide.
Assumption: Construction corridor for vehicle fence and new access road is 9.04 miles long by 60 feet wide.

All Construction for vehicle fence and roads 11,940,192 ft^2 274.11 acres

Total Disturbed Area: 11,940,192 ft^2
Construction Duration: 2 months
Annual Construction Activity: 60 days/yr

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0
Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.
Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	0.83	2.55	2.47	4941.53

a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
c) The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO2 emissions by more than a factor of two.
d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO_x	VOC	CO	SO_2**	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	27	1124.313	69.579	424.167	22.486	68.729	66.667	133421.211

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NOx = (Total Grading NOx per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft^2)	Total Area (acres)	Total Days
Grading:	11,940,192	274.11	6

(from "CY2008 Grading" worksheet)

Total Project Emissions by Activity (lbs)

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	6,745.88	417.47	2,545.00	134.92	412.37	400.00	800,527
Total Emissions (lbs):	**6,745.88**	**417.47**	**2,545.00**	**134.92**	**412.37**	**400.00**	**800,527**

Results: Total Project Annual Emission Rates

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Total Project Emissions (lbs)	6,745.88	417.47	2,545.00	134.92	412.37	400.00	800,527
Total Project Emissions (tons)	3.3729	0.2087	1.2725	0.0675	0.2062	0.2000	400.2636

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
General Construction Activities	0.19	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006
$PM_{2.5}$ Emissions			
$PM_{2.5}$ Multiplier	0.10	(10% of PM_{10} emissions assumed to be $PM_{2.5}$)	EPA 2001; EPA 2006
Control Efficiency	0.50	(assume 50% control efficiency for PM_{10} and $PM_{2.5}$ emissions)	EPA 2001; EPA 2006

Conversion Factors

0.00002296	acres per square feet (ft^2)
5,280	feet per mile

Project Assumptions

Road Improvements (0.19 ton PM_{10}/acre-month)

Duration of Construction Project	2	months
Length	19.09	miles
Length (converted)	100,795	feet
Width	60	feet
Area	139	acres

Assumes road improvements are required for the existing 19 miles of primary access road, Camino del Diablo.

Fence and New Road Construction (0.42 ton PM_{10}/acre-month)

Duration of Construction Project	2	months
Length	18.6	miles
Length (converted)	98,208	feet
Width	60	feet
Area	135.3	acres

Assumes new road construction for the 9.56 miles of access roads running south from Camino del Diablo and the 9.04 miles of new road and fence construction along the border.

	Project Emissions (tons/year)			
	PM_{10} uncontrolled	**PM_{10} controlled**	**$PM_{2.5}$ uncontrolled**	**$PM_{2.5}$ controlled**
Road Improvements	52.76	26.38	5.28	2.64
Fence and New Road Construction	113.63	56.81	11.36	5.68
Total	**166.39**	**83.19**	**16.64**	**8.32**

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM_{10}/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM_{10}/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM_{10}/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM_{10}/acre-month) and 75% of the average emission factor (0.11 ton PM_{10}/acre-month). The 0.19 ton PM_{10}/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM_{10}/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM10/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

$PM_{2.5}$ Multiplier **0.10**

$PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.10 to PM_{10} emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM_{10} and $PM_{2.5}$ **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule for CY 2008

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 274.11 acres/yr (from Combustion Worksheet)

Qty Equipment: 83.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.
An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.
200 hp bulldozers are used for site clearing.
300 hp bulldozers are used for stripping, excavation, and backfill.
Vibratory drum rollers are used for compacting.
Stripping, Excavation, Backfill and Compaction require an average of two passes each.
Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project-specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	274.11	34.26
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	274.11	134.01
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	137.05	138.20
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	137.05	56.70
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	274.11	96.14
TOTAL								459.30

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 459.30
Qty Equipment: 83.00
Grading days/yr: 5.53

Emissions from Diesel Powered Generators for Construction Equipment & Portable Lights

Diesel Powered Generator Emission Factors

NO_x	4.41	lb/MMBtu
VOC	0.36	lb/MMBtu
CO	0.95	lb/MMBtu
SO_x	0.29	lb/MMBtu
PM_{10}	0.31	lb/MMBtu
$PM_{2.5}$	0.29	lb/MMBtu
CO_2	164	lb/MMBtu

Note: Generators horsepower output capacity is only 0.363 percent efficient (AP-42 Chapter 3.3).

Source: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)
As per Appendix A of SCAQMD's "Final Methodology to Calculate PM2.5 and PM2.5 Significance Thresholds" (October 2006),
the PM2.5/PM10 fraction for gasoline combustion is assumed to be 0.920 for off-road diesel equipment.

Emissions from Generators for Construction Equipment

The Proposed Action would require six diesel powered generators to power construction equipment. These generators would operate approximately 8 hours per day for 60 working days.

Number of Generators	6	
Maximum Hours of Operation	8	hrs/day
Number of Construction Days	60	
Total Generator Capacity	75	hp
Hourly Rate	0.5262	MMBtu/hr
Annual Use	1,515	MMBtu/yr

Example: 1hp=0.002546966 MMBtu/Hr
Hourly Rate (MMBtu) = (75 Hp/0.363)*(0.002546699 MMBtu/hr) =0.5262 MMBtu/hr
Annual Use (MMBtu) = (Number of Generators * Hours Operation/Day * Number of Construction Days) = (6*8*60*0.5262) = 1,515 MMBtu/yr

Emissions (Diesel)

NO_x	3.341	tpy
VOC	0.273	tpy
CO	0.720	tpy
SO_x	0.220	tpy
PM_{10}	0.235	tpy
$PM_{2.5}$	0.220	tpy
CO_2	124.262	tpy

Example: Total NOx Emissions = (Annual MMBtu/year*(EF)/2000 = (1,515*4.41)/2000 = 3.341 tpy

Emissions from Generators for Portable Lights

To be conservative, it was assumed that up to 30 portable light units would be needed for construction. These portable lights are powered by a 6-kilowatt self-contained diesel generators. Portable lights would generally operate continuously every night (approximately 12 hours) 60 days per year.

Number of Generators	30	
Maximum Hours of Operation	12	hrs/day
Number of Operational Days	60	

Total Generator Capacity	8	hp
Hourly Rate	0.0564	MMBtu/hr
Annual Use	1,219	MMBtu/yr

Example: 1hp=0.002546966 MMBtu/Hr
Hourly Rate (MMBtu) = (8 Hp/0.363)*(0.002546699 MMBtu/hr) = 0.0564 MMBtu/hr
Annual Use (MMBtu) = (Number of Generators * Hours Operation/Day * Number of Operational Days) = (30*12*60*0.0564) = 1,219 MMBtu/yr

Emissions (Diesel)

NO_x	2.689	tpy
VOC	0.219	tpy
CO	0.579	tpy
SO_x	0.177	tpy
PM_{10}	0.189	tpy
$PM_{2.5}$	0.177	tpy
CO_2	99.983	tpy

Example: Total NOx Emissions = (Annual MMBtu/year*(EF)/2000 = (1,219*4.41)/2000 = 2.689 tpy

Operations & Maintenance

Following completion of construction activities at the end of CY 2008, border patrol operations along the proposed fence sections would occur. The combined total of all proposed fence sections, once contructed, would total approximately 8.82 miles. It is anticipated that operations would be similar to ongoing operations in the El Centro Sector.

Project Assumptions:

5 maintenance vehicles operate per day
100 miles traveled per vehicle per workday, round trip
52 workdays per year
>8,500 Largest class of maintenance vehicle used

Annual Vehicle Miles Traveled (VMT): **26,000 miles/year**
VMT in miles/year = (5 vehicles) * (100 miles/vehicle/day) * (365 days/year)

Vehicle Class: >8,500 pounds
Vehicle Year: 2008

Emissions Factors (in pounds/mile)						
NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
2.37E-02	2.99E-03	2.19E-02	2.56E-05	8.56E-04	7.39E-04	2.72E+00

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated November 9, 2007. Available online: <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>. Accessed January 23, 2008.

Note: Assumed that ROG = VOC, for purposes of analysis.

Estimated Air Pollutant Emissions Associated with Operations & Maintenance Activities (2009 and beyond):

Proposed Emissions (in tons per year)						
NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
0.308	0.039	0.285	0.0003	0.011	0.010	35.353

Emissions in tons/year = (Vehicle miles/year) * (Emissions Factor in pounds/mile) * (1 ton/2000 pounds)

Mohave-Yuma Intrastate Air Quality Control Region

			Area Source Emissions						Point Source Emissions					
Row # SORT	State	County	CO	NOx	PM10	PM2.5	SO2	VOC	CO	NOx	PM10	PM2.5	SO2	VOC
1	AZ	Mohave County	87,638	11,935	8,777	3,206	688	12,697	240	756	79.2	68.4	7.19	119
2	AZ	Yuma Co	55,153	9,698	11,217	2,520	526	8,320	103	584	100	81.3	19.6	64.1
Grand Total			142,791	21,633	19,994	5,726	1,214	21,017	343	1,340	179	150	27	183

SOURCE:
http://www.epa.gov/air/data/geosel.html
USEPA - AirData NET Tier Report
*Net Air pollution sources (area and point) in tons per year (2001)
Site visited on 20 June 2008.

Mohave-Yuma Intrastate AQCR (40 CFR 81.268): Mohave County, Yuma County, AZ