Conservation Recommendations for the Proposed Border Infrastructure Projects in Pima and Cochise Counties, Arizona

Recommended Best Management Practices Common to All Species

Coordination

- Coordination with land managers throughout the process is greatly appreciated.

Timing

- **Limit timing of work to daylight hours** to minimize disturbance to nocturnal animal activities.
- **Consider avoiding the migratory bird nesting season (February 1 – August 31)**
- If the migratory bird nesting season (February 1 – August 31) cannot be avoided, locate and identify bird nests before grubbing and clearing activities. Active nests should be avoided to the extent practicable.

Footprint minimization

- **Footprint demarcation**: Use flagging or temporary fencing to clearly demarcate project construction area perimeters, including access roads, with the land management agency. Do not disturb soil or vegetation outside of that perimeter.
- **Minimize ground disturbance**: Use areas already disturbed by past activities for staging, parking, laydown, and equipment storage. If site disturbance is unavoidable, minimize the area of disturbance by scheduling deliveries of materials and equipment to only those items needed for ongoing project implementation.
- **Minimize ground disturbance**: Limit grading or topsoil removal to areas where this activity is absolutely necessary for construction, staging, or maintenance activities.
- **Minimize ground disturbance**: Restrict vegetation removal to the smallest possible project footprint. Limit the removal of trees, cacti, and shrubs to the smallest amount needed to meet the objectives of the project. If vegetation must be removed outside the permanent project footprint, allow natural regeneration of native plants by cutting vegetation with hand tools, mowing, trimming, or using other removal methods that allow root systems to remain intact.

Vegetation

- **Control invasive species** in the project area. Avoid the introduction of exotic, invasive species.
- **Minimize vegetation disturbance**: Stabilize and revegetate with native species, including cottonwood and willow saplings at washes and arroyos, to provide erosion and sedimentation control. Disturbed areas would also be sprayed with a hydroseed mixture to establish an herbaceous cover more rapidly.
- **Maintain vegetation and eliminate lights in washes** to encourage animal passage and connectivity when gates are open.

- **Develop a fire strategy** to minimize wildfire risk from accidental ignitions. Fire starts in low elevation areas could foster the spread of fire-prone nonnative grasses which affect habitat for species, such as the Sonoran desert tortoise.

Trenching and Footings

- Schedule **daily periodic inspections** of active trenches to remove trapped animals before they could succumb to exposure.
- **Provide escape ramps** with a maximum 45 degree angle within trenches with reasonable spacing to allow entrapped animals to escape.

Border Barrier Features

- **Cap bollards**: Immediately cap bollards to prevent bird mortality associated with accessible cavities.
- Ensure that **cement footings are flush with the ground** to allow small animals to move more freely through the bollards.
- **Avoid fencing** in and adjacent to perennial, intermittent, and ephemeral drainages.
    - If fencing must be placed in and adjacent to these drainages, mark the fence (permanent flagging and striping) to prevent bird collisions.
- **Lower fence height**, where feasible, or provide virtual fence in areas important for birds and bats. These include vegetated perennial, intermittent, and ephemeral drainages; and areas with agaves.
- **Increase bollard spacing** to a width greater than 4 inches to allow wildlife passage.
- **Incorporate wildlife gates or open areas for passage**, particularly in areas known to be wildlife corridors for larger mammals, tortoises, and turtles.

Lighting

- **Avoid installation of lights** (lights inhibit wildlife movement for some species and attract flying species that may collide with fence or become disoriented).
- If lights must be installed:
    - **Incorporate red spectrum** instead of LED/white; red/lower temperature lighting is best, diminishing incrementally to white light. Keep under 3000K if feasible.
    - Consider lowest possible luminosity.
    - Focus angle downwards, with cover.
    - Place as far apart as possible.
    - Utilize sensors or dimmers.
    - Turn on only when absolutely necessary.

Hydrology

- **Avoid impacts to groundwater** by obtaining treated water from outside the immediate area for construction use.
- Implement the CBP-approved **Spill Protection Plan** to ensure any contaminants hazardous to the environment are properly handled.
- **Protect hydrological processes:**
    - Design, maintain, and monitor fence to ensure proper water flow
    - Keep water-ways open (this could benefit wildlife movement too)

    - Clear debris around structures after flood events
- **Monitoring hydrological** impacts above and below the border
- **Preserve wildlife corridors** in drainages and wetlands. The Quitobaquito wetland and riparian area is particularly important to many rare species. Learn of its location, and preserve its function as much as possible.

Road Use

- **Ingress/Egress** - ensure **speed limit compliance**; stay on road; and limit the number of trips to reduce the likelihood of causing disturbance to and collisions with wildlife.

Routine BMPs

- Brief all design, construction, and maintenance personnel on **CBPs Best Management Practices**, in addition to those presented here.
- Obtain **gravel or topsoil** (if they are needed) that are clean and acceptable to the land management agency, from existing developed or previously used sources, not from undisturbed areas adjacent to the project area.
- Limit all **equipment maintenance**, staging, laydown, and dispensing of fuel, oil, etc., to designated upland areas, to avoid contaminating natural aquatic and wetland systems with runoff.
- Limit **work within drainages to dry periods** to reduce downstream water quality effects.

Recommended Offsetting Measures

- Restore unauthorized routes.
- Funding for species monitoring and recovery actions, including monitoring species' movements to assess the effects of border barriers in areas with and without border barriers.
- Incorporate openings for species larger than 4" wide (Ex. Cat holes in RGV for ocelots, ground slots for desert tortoises).
- Install additional technology (cameras, sensors, etc.) to the east and west of the fence segments and near other gaps where higher quality habitat exists to deter the entry of illegal pedestrians, particularly into the mountainous regions and larger riparian areas.
- Provide information to the Service on jaguar, ocelot, wolf, and other large carnivores (i.e., mountain lion, bobcat, bear) sightings obtained through remote video surveillance (or any other means like direct observation) along the border to help understand and identify important usage areas.
- Convert any new water wells to wildlife waters as appropriate and in cooperation with land managers.

PIMA COUNTY - 43.6 miles continuously

- Cabeza Prieta National Wildlife Refuge [CPNWR]
- Organ Pipe Cactus National Monument [OPCNM]

***Listed Species*:** Sonoran pronghorn, western yellow-billed cuckoo, Acuna cactus, Sonoyta mud turtle, Quitobaquito pupfish (desert pupfish)

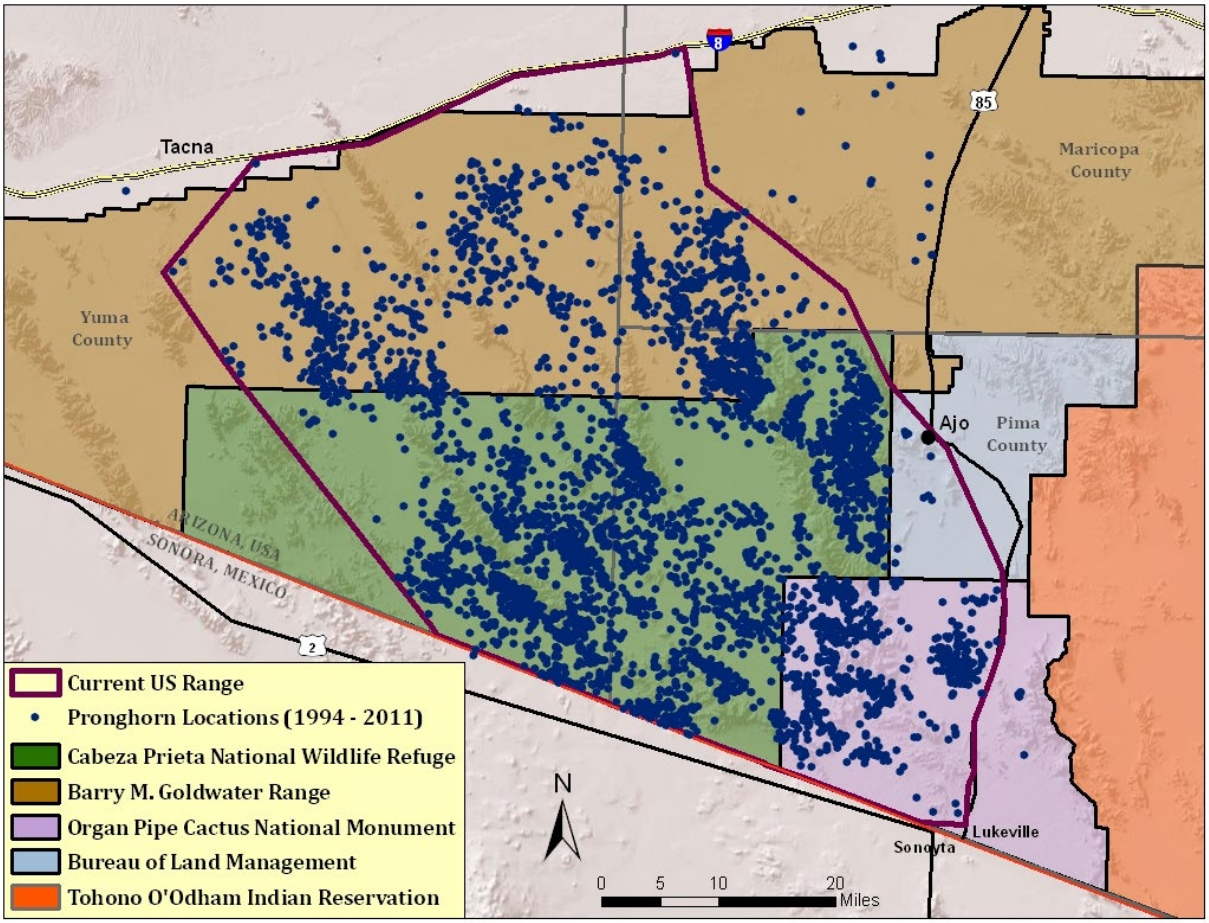
***Species of Concern/Trust Species*:** cactus ferruginous pygmy owl, lesser long-nosed bat, Sonoran desert tortoise, monarch butterfly, 563 species of resident and migratory birds (Arizona Bird Committee 2019).

SONORAN PRONGHORN (*Antilocapra americana sonoriensis*)

Concerns:

- Nearly 70 percent of the border defining the range of the endangered population of Sonoran pronghorn will contain a border barrier with the completion of the proposed project.
- The current vehicle fence is permeable to Sonoran pronghorn movement and pronghorn have been documented crossing the vehicle barrier into Mexico. While the U.S. endangered population is fairly isolated from the Pinacate (Mexico) population due to Mexican Highway 2, Mexico has installed underpasses along Highway 2. A study will be conducted to develop recommendations on improving these passage ways to facilitate movement of Sonoran pronghorn across Highway 2. Replacing the current vehicle fence with pedestrian fence in the range of the Sonoran pronghorn will restrict pronghorn movements and range, and move them in the direction of being entirely dependent on assisted migration for interaction and genetic exchange with the populations in Mexico.
- Sonoran pronghorn are sensitive to human activities and disturbance. A number of studies (Hughes and Smith 1990, Landon et al. 2003, Krausman et al. 2004 and 2005, OPCNM 2013, Christianson 2017) have investigated and documented the effects of human activities (e.g., military aircraft and ground-based activities, vehicle and pedestrian activities) on Sonoran pronghorn. Effects include, but are not limited to, selecting areas with lower noise levels and avoidance of areas with higher noise levels; running away (in some cases running kilometers away) from vehicles and aircraft. Disturbance and flight of ungulates are known to result in a variety of physiological effects that are adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971, Harlow et al. 1987). Frequent disturbance imposes a burden on the energy and nutrient supply of animals (Geist 1971), which may be exacerbated in harsh environments such as those occupied by Sonoran pronghorn.
- Activities associated with constructing, operating (e.g., lights), maintaining, and patrolling the fence are likely to result in disturbance to Sonoran pronghorn, making the southern boundary of the U.S. Sonoran pronghorn range unavailable for use by the species.
- Additionally, with the construction of a pedestrian fence, the Service is concerned that illegal traffic and law enforcement response may shift to areas without a pedestrian fence, such as the Yuma County portion of CBNWR, a key area for Sonoran pronghorn recovery. Shifts in traffic could cause increased disturbance to Sonoran pronghorn and

impacts to their habitat.



Recommendations/Solutions:

- **Footprint demarcation:** Minimize impacts to Sonoran pronghorn and their habitats by using flagging or temporary fencing to clearly demarcate project construction area perimeters, including access roads, with the land management agency. Do not disturb soil or vegetation outside of that perimeter.
- **Ground disturbance**: Minimize impacts to Sonoran pronghorn and their habitat by using areas already disturbed by past activities, or those that will be used later in the construction period, for staging, parking, laydown, and equipment storage. If site disturbance is unavoidable, minimize the area of disturbance by scheduling deliveries of materials and equipment to only those items needed for ongoing project implementation.
- **Speed limits**: Obey all speed limits. If pronghorn are detected along or near the access roads, vehicles should slow to <u>less than 15 mph</u> until vehicles are a safe distance from the pronghorn (a safe distance is generally considered one at which pronghorn are not at risk of being struck by a vehicle or fleeing from a vehicle). If needed to prevent Sonoran pronghorn from fleeing or from being struck by a vehicle, vehicles should <u>stop</u> and allow Sonoran pronghorn to move away on their own volition.
- **Fawning season**: Avoid project construction, ingress, and egress during the Sonoran pronghorn fawning season (March 15 to July 31).

- **Trip minimization**: Minimize the number of construction trips to and from the project site, particularly in important Sonoran pronghorn use areas.
- **Vehicle minimization**: Minimize the number of construction vehicles travelling to and from the project site.
- **Helicopters**: If helicopters must be used in project construction, ensure the ingress, egress, and staging are done outside of the Sonoran pronghorn range.
- **Lights**: Avoid lighting impacts by not using lights during project construction or fence operation. If night lighting is unavoidable: 1) use special bulbs designed to ensure no increase in ambient light conditions, 2) minimize the number of lights used, 3) place lights on poles pointed down toward the ground, with shields on lights to prevent light from going up into sky, or out laterally into landscape, and 4) selectively place lights so they are directed away from all native vegetative communities.
- **Noise**: Minimize noise from construction activities to the greatest extent possible. Additionally, avoid noise impacts during the night by conducting construction during daylight hours only. If construction must occur during non-daylight hours, minimize the duration and frequency of these activities to the greatest extent possible.
- **Sonoran pronghorn coordination:** Coordinate with Arizona Game and Fish Department, CPWNR, and OPCNM to obtain the most recent pronghorn location information in order to plan project activities in a manner to avoid and minimize impacts to Sonoran pronghorn to the greatest degree possible. .
- **Sonoran pronghorn monitor**:
    - Ensure a qualified Sonoran pronghorn monitor is on-site during project construction, ingress, and egress in areas used by Sonoran pronghorn. The qualified monitor will survey for and monitor pronghorn in the project area.
    - If Sonoran pronghorn are detected along ingress and egress routes, follow the Sonoran pronghorn speed limit conservation measure above.
    - If Sonoran pronghorn are detected within one mile of the project site before construction commences for the day, do not commence construction activities until pronghorn have moved farther than one mile from the project site on their own volition.
    - If Sonoran pronghorn are detected within one mile of the project site after construction activities have started, stop activities until pronghorn have moved farther than one mile from the project site on their own volition.
    - The CBP Sonoran pronghorn monitor will have the full authority to delay and stop any project construction activities for the safety of Sonoran pronghorn.
- **Reporting**: Report detections of Sonoran pronghorn via electronic mail to the Service's Arizona Ecological Services Field Office and the corresponding DOI land manager within 48 hours of the detection. The electronic mail will include the following details: a) if known, the coordinates and a description of the location of the where the Sonoran pronghorn was detected, b) the date and time of the detection, c) the method used to make the detection, and d) as available, other pertinent details, such as the behavior of the Sonoran pronghorn (i.e., was it standing, foraging, running, etc.).
- **US Border Patrol Operations**: Work with CPNWR to address potential shifts in illegal traffic into the Sonoran pronghorn range on CPNWR where no pedestrian fence exists. Ensure US Border Patrol activities are conducted in a manner that minimizes adverse effects to Sonoran pronghorn to the greatest extent possible, including conducting

surveillance, deterrence, and interdiction efforts as close to the border as possible and on existing, authorized roads.

WESTERN YELLOW-BILLED CUCKOO (CUCKOO) (*Coccyzus americanus*)
Concerns:

- Both migratory and breeding cuckoos occur in vegetated perennial, intermittent, and ephemeral drainages that cross the border and occur throughout the Tohono O'odham Nation. Human traffic that will be curtailed by the pedestrian fence on CPNWR and OPCNM to the west and Buenos Aires National Wildlife Refuge (BANWR) to the east will now be funneled into the U.S. through the Tohono O'Odham Nation's vegetated perennial, intermittent, and ephemeral drainages occupied by cuckoos. Associated human habitat trampling, accidental or intentional fires, and noise and visual disturbance will increase in these drainages, adversely affecting cuckoos and their habitat.

Recommendations/Solutions:

- Avoid pedestrian fencing in CPNWR and OPCNM that will result in funneling human traffic into perennial, intermittent, and ephemeral drainages on the Tohono O'odham Nation.
- Fund cuckoo protocol surveys (June - September) in perennial, intermittent, and ephemeral drainages intersected by the proposed project.
- Protect all perennial, intermittent, and ephemeral drainages intersected by the proposed project.

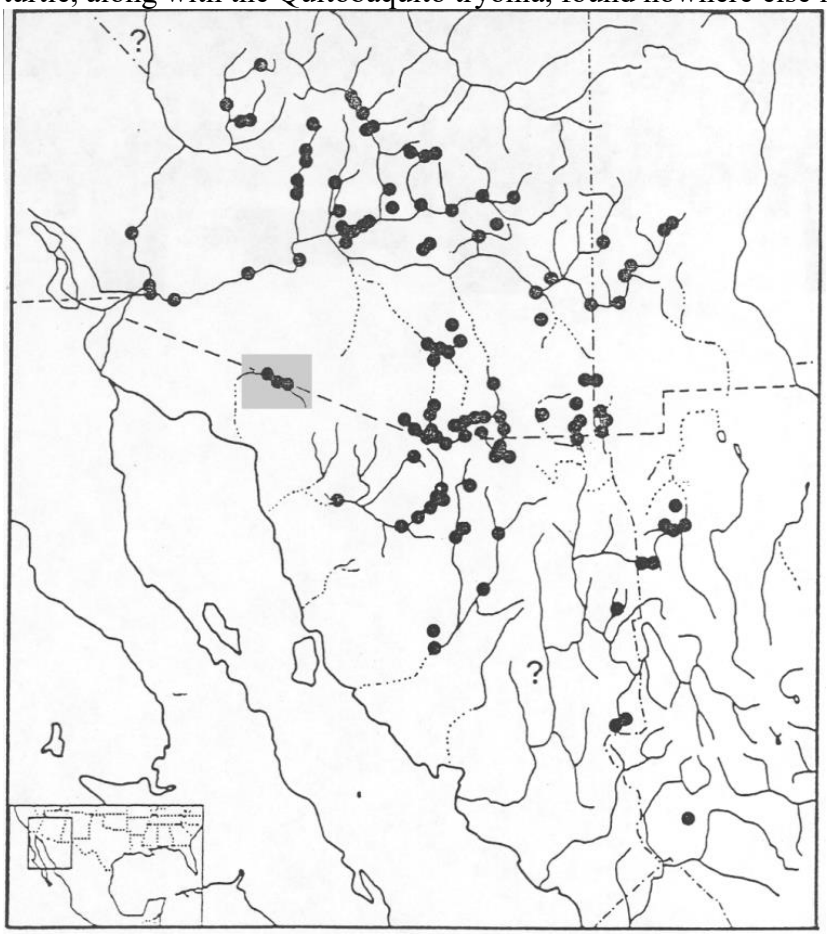
SONOYTA MUD TURTLE (*Kinosternon sonoriense longifemorale*)
Concerns:

- The Sonoyta mud turtle is an isolated endemic mud turtle found in one location in southern Arizona and three current locations in northern Sonora, Mexico. The turtle was listed as Endangered in 2017, and just over 12 acres (approximately 5 hectares) of critical habitat was proposed in 2018. Proposed critical habitat is located in OPCNM, along the border (see map below), in affiliation with the Quitobaquito Springs, Pond, and the surrounding riparian area. Although the turtle can travel over land, the presence of water (for nesting, food, aestivation [similar to hibernation] and prevention of dessication) is critical to the Sonoyta mud turtle. Water with aquatic vegetation is key habitat for their insect prey and to offer shelter from predators.
- Any activity that diminishes, contaminates, or changes hydrology of water in the range of the turtle could be detrimental to the species.
- Because adult Sonoyta mud turtles' shells are typically wider than 4 inches, they will not fit through the proposed wall slots, and the US population will become further separated from any remaining connectivity with the species in northern Sonora.

Recommendations/Solutions:

- Provide fence gaps south of the US population location and north of the Mexican populations (see map) to allow for movement. This can enhance gene flow to promote long-term survival and prevent genetic bottlenecking (a reduction in genetic diversity) to allow resiliency and adaptation to changing conditions.
- Prohibit contamination of Quitobaquito Pond and Springs. Decontaminate all equipment entering the vicinity of these wetlands per decon protocols.

- Do not use herbicides within 0.3 miles within the known range of Sonoyta mud turtles.
- To ensure water levels are stable in Quitobaquito Spring, **do not drill any water wells within 5 miles to the west and 10 miles to the east of Quitobaquito Spring**. This will preserve the Aguajita Wash and its watershed, located to the east of Quitobaquito Spring, that feeds the Spring and pond, which harbors Quitobaquito pupfish and Sonoyta mud turtle, along with the Quitobaquito tryonia, found nowhere else in the world.



Shaded box on Arizona/Mexico border depicts entire currently known range of Sonoyta mud turtle

QUITOBAQUITO PUPFISH (DESERT PUPFISH) (*Cyprinodon eremus*)
Concerns:

- The Quitobaquito pupfish found at Quitobaquito Spring on OPCNM is a desert pupfish restricted to living in this Spring, and in a Sonoyta Creek location in Mexico.
- The pupfish is vulnerable to changes in water quality and quantity (both surface and groundwater), and maintaining adequate, uncontaminated water is critical for this fish.

Recommendations/Solutions:

- Obtain treated water from outside the immediate area for construction use in order to avoid impacts to groundwater.
- To ensure water levels are stable in Quitobaquito Spring, **do not drill any water wells within 5 miles to the west and 10 miles to the east of Quitobaquito Spring**. This will preserve the Aguajita Wash and its watershed, located to the east of Quitobaquito Spring, that feeds the Spring and pond, which harbors Quitobaquito pupfish and Sonoyta mud turtle, along with the Quitobaquito tryonia, found nowhere else in the world.
- Limit any drilling, blasting, or excavation that could cause fractures or bedrock displacement that could allow water to escape from the Quitobaquito system.
- Prevent any contamination of the water and surrounding area that could diminish water quality.
- Do not use herbicides within 0.3 miles within the known range of Sonoyta mud turtles.

ACUÑA CACTUS (*Echinomastus erectocentrus* var. *acunensis*)

Concerns:

- More than 78 percent of the known living acuña cactus individuals occur within 16.5 km (10.25 mi) of the border in either OPCNM or Sonora, Mexico.
- Significant impacts may occur when travel moves off existing roads causing vegetation destruction (e.g. nurse plants, pollinator habitat), soil compaction (e.g. loss of native bee habitat), nonnative plant spread, dusting of plants, and, potentially, direct mortality of the acuña cactus by running over individuals.
- Vehicle tracks and associated articles of clothing from cross-border violators were found within one of the six 20 by 50 m (66 by 164 ft) acuña cactus long-term monitoring plots in OPCNM.
- Within populations, acuña cacti are typically spaced within 3 m (9.8 ft) of each other, and thus vehicle traffic through any population could potentially impact many individuals.
- Many rare cacti of the Sonoran Desert are associated with an assortment of cactus species such as *Opuntia engelmannii* (Engelmann prickly pear), *O. fulgida* (jumping cholla), and *Ferocactus wislizeni* (Arizona barrel cactus), and native bunch grasses. Collectively, cacti within this habitat provide enough pollen to provision nests and support survivorship of their shared pollinator, *Diadasia rinconis* (no common name), which is a cactus specialist bee. Preservation of rare cacti necessarily also requires preservation of pollinator habitat and pollination corridors.
    - Indirect impacts of development include fragmentation of rare plant and associated pollinator populations, which can reduce genetic vigor of the plants and result in degradation and fragmentation of habitat adjacent to development.
- Introduced grasses as *Pennisetum ciliare* (buffelgrass) form continuous mats and remove open bare ground for nesting bees such as *Diadasia* spp. (Buchmann 2007, p. 13). These bees move nesting sites yearly to shed parasites, thereby requiring the continued availability of sandy, well-drained, bare ground available to create nests (Buchmann 2012, pers. comm.).
- Rare plant habitat should be relatively free from perennial grass invaders, as these alter structure, function, dominance, and disturbance regimes, and have been shown to drastically lower species diversity within the Sonoran Desert (Olsson *et al*. 2012, p. 10). Such changes have great potential to impact rare plants and their pollinators.

- Preservation of the mix of species and interspecific interactions they encompass greatly improves the chances for on-site survival of rare species (Tepedino *et al*. 1996, p. 245). Bee nesting habitat, foraging plants, and corridors must be preserved to protect rare species.
- Low numbers of flowers offering little reward can lead to low rates of plants visited by pollinators (Wilcox and Neiland 2002, pp. 272–273).

Recommendations/Solutions:

- **Off road travel by vehicles** within acuña cacti habitat should be done only when absolutely necessary. If unable to avoid the use of vehicles within acuña cacti habitat, routes should be planned utilizing established roads and vehicle paths when available and only conducted after the area has been surveyed and exclusion fencing erected.
- **Dust** may negatively affect plant photosynthesis, respiration, transpiration, water use efficiency, leaf conductance, growth rate, vigor, and gas exchange. In order to minimize fugitive dust generation, vehicle speeds should be limited to 20 mph, or less, on all dirt or gravel roads and project proponents should conduct dust abatement at least once per day with additional applications as vehicle traffic, weight, and speed increases. Dust abatement measures include applying dust suppressants to the substrate, such as water. Water is the preferable medium for dust suppression.
- **Non-native grasses and forbs** compete with acuña cacti for water and nutrients, reduce community composition and structure, and alter fire frequency and intensity. Whenever ground disturbing activities occur that may increase the presence of non-native plants, measures will be taken to reduce the possibility of invasion and spread in accordance with the project's weed management plan or accepted best management practices.
- **Temporary access roads and staging areas** should be restored to pre-construction condition or better. Whenever possible, locally sourced native plant seed mixes and vegetative cacti propagules will be used during restoration. Whenever possible, native plants that will be damaged during construction activities should be salvaged either by the project proponent for replanting following construction, or by a non-profit entity such as the Arizona Sonora Desert Museum or the Cactus and Succulent Society of Arizona for replanting off site.
- **Training**: Acuña cacti can be easily missed and damaged or destroyed during construction and other activities within their habitat. Acuña cacti awareness training will be conducted for all personnel prior to being allowed to enter the project site. Training must be conducted by an individual familiar with the species and able to identify it, as well as other cacti species. Training must include identification of the acuña cactus and all appropriate avoidance measures.
- **Survey**: Prior to any construction or restoration related activity, a survey by a qualified biologists, botanist, or ecologist, should be conducted to identify the location of all acuña cacti within the action area. All location coordinates should be provided to the Arizona Game and Fish Department Heritage Data Management System for population size and range tracking. Biological monitors must be familiar with the species and able to identify it, as well as other cacti species.
- **Transplanting**: While not currently an approved acuña cactus mitigation measure, in order to increase the general knowledge and understanding of transplanting of this taxon, any acuña cactus that are in the direct path of construction, or any of its associated activities, and cannot be avoided, can be transplanted to appropriate habitat and

monitored for a minimum of three years to assess the effectiveness of relocation efforts. Transplanting may only be done by trained professionals holding valid Federal, State, and Tribal permits.

- **Seed collection**: Loss of individuals affects population viability incrementally into the future through the loss of reproductive individuals, productivity, and genetic variability. To reduce this loss, the project proponent can secure, at a minimum, seeds of the individual cacti that will be impacted by the project. These seeds should be placed in a secure seed bank facility such as the Agricultural Research Service National Center for Genetic Resources Preservation in Fort Collins, Colorado for long-term storage and future use in restoration. Care should be taken to ensure that seed collection permits are in place prior to collection and that collection follow the protocols set forth by the Center for Plant Conservation.

CACTUS FERRUGINOUS PYGMY OWL (*Glaucidium brasilianum cactorum*)
Concerns:

- Cactus ferruginous pygmy owls are small owls that typically nests in saguaro or organ pipe cactus cavities and hunt primarily at dawn and dusk. Nesting pairs establish territories, and these are often used for decades by members of the species.
- Although they are capable of flying higher, their average flight height is 4 ½ feet above ground, flights are short and brief, and the owls avoid open spaces (Flesch et al. 2010).
- Border barriers 30 feet or even 18 feet tall are likely to prevent transborder movement of pygmy owls, and could isolate populations from breeding opportunities.

Recommendations/Solutions:

- Consider reducing the height of the fencing to 18 feet or less in areas where cross-border traffic has been controlled and/or where other tools and technology can adequately control cross-border traffic.
- Avoid the removal of any columnar cacti and large trees (>18 feet).
- Within appropriate habitat (Sonoran desert scrub with columnar cacti and dense woodlands), avoid construction from February to August unless surveys indicate that no cactus ferruginous pygmy-owls are nesting within one half mile of the proposed project.
- Minimize the removal of vegetation adjacent to the proposed fencing. Pygmy-owls avoid crossing large open areas. Reducing the area without vegetation adjacent to the fence will reduce effects to the owl.

LESSER LONG-NOSED BAT (*Leptonycteris curasoae yerbabuenae)*
Concerns:

- Although the lesser long-nosed bat was delisted due to recovery in 2018, and we are working with partners to implement the Post Delisting Monitoring Plan, its needs remain the same: suitable roost sites, abundant populations of columnar cacti and agaves from which to forage for nectar and pollen, and opportunities for nocturnal feeding and flying.
- Roosts are critical to protection and successful rearing of the young. At times caves or abandoned mines are also used to shelter illegal immigrants; fires, human activities, and trash in roosts pose a threat to lesser long-nosed bats.

Recommendations/Solutions:

- Eliminate or reduce proposed lighting.
- Limit work on the fence replacement to daylight hours.

- Consider reducing the height of the fencing to 18 feet or less in areas where cross-border traffic has been controlled and/or where other tools and technology can adequately control cross-border traffic.
- Identify any potential bat roosts within one mile of proposed construction activities. If any bat roosts are identified within one mile of the proposed construction activities, project activities should avoid those areas from April to October.
- Offset impacts to bats by enhancing foraging habitat in proximity to disturbed areas. Such enhancement would generally include the planting of forage species such as agaves and columnar cacti (as appropriate) for nectar feeding bats and a diversity of native plant species (as appropriate) for insectivorous bats.
- To the extent practicable, avoid disturbance to agave and other plant species that are used by lesser long-nosed bats for forage. If possible, salvage such cacti and agave and consider replanting.

SONORAN DESERT TORTOISE (*Gopherus morafkaii*)

Concerns:

- The principal concern for Sonoran desert tortoises (SDTs) is maintaining genetic connectivity with populations that occur south of the International Border.
- As a member agency of the Arizona Interagency Desert Tortoise Team, U.S. Customs and Border Protection (CBP) is a signatory of the "Candidate Conservation Agreement for the Sonoran Desert Tortoise (*Gopherus morafkai*) in Arizona" and has pledged to "... provide appropriate direction to CBP operations to facilitate SDT conservation actions on lands managed by other agencies" (AIDTT 2015).
- In adherence to the Candidate Conservation Agreement noted above, we recommend CBP implement any specific conservation guidelines for Sonoran desert tortoise recommended by land managers of OPCNM and CPNWR which may help reduce adverse effects to tortoises from the construction, operations, and wall persistence phases of this proposed action.

Recommendations/Solutions:

- To maintain some level of connectivity, gaps along the ground, regularly spaced (spacing can be refined later in time), with dimensions of 12 inches wide by 8 inches tall, should allow tortoises of most size classes to move through the barrier to maintain territories and allow for dispersal.

MONARCH BUTTERFLY (AND OTHER INSECT POLLINATORS) (*Daneus plexippus plexippus*)

Concerns:

- The Western population of monarch butterfly has declined precipitously since the 1990s, to about 5 percent of its previously measured numbers in 2018. As a species currently under review for federal listing as threatened, the monarch is found in areas of southern Arizona, typically during the spring and fall migratory period. In very warm years, monarch individuals are known to overwinter in southern Arizona instead of migrating to trees along the California coast or to evergreen groves in Michuacan, Mexico.
- The monarch is entirely dependent upon laying eggs and rearing larvae on species of milkweed, which are their host plants. As adults, monarchs require floral nectar as food. While seeking locations to oviposit (lay eggs) and to feed, monarchs typically fly at the

level of their host plants and nectar sources, which occur from the ground level up to the highest blooming flower in the surrounding vegetation. In southern Arizona along the border, the native vegetation is usually under 30 feet high, thus, foraging and oviposition (egg laying) could be interrupted by a border barrier.

- When migrating, monarchs are known to fly at altitudes above 30 feet, so migrating monarchs will likely not be impacted by the proposed border barrier.
- Other insect pollinators also tend to fly at the level of the resources they seek, such as plants, soils, and watering spots for food and shelter, predominantly located below 30 feet high. Many native butterflies are smaller than the size of the monarch butterfly, are year-round residents that do not migrate, and have less developed wing musculature. These tend to fly at lower levels, avoiding heights over about 15 feet. Some are habitat specialists that rarely fly above 10 feet high, and these species are particularly vulnerable to isolation and impediments to connectivity of genetic exchange and plant resources.
- Because butterflies, bees, moths, and many other native pollinating insects are closely aligned with their host plants and native nectar sources for reproduction and survival, any influx of invasive plants that alters the availability of native plant resources could pose a problem to the long-term viability of bee, butterfly, and moth populations.

Recommendations/Solutions:

- Consider alternating proposed border barrier with bollards of lower heights to allow for passage of lower flying monarchs and other pollinating insects, as well as foraging birds.
- Minimize disturbance to native plants to provide food, shelter, and reproductive sites.
- Minimize or avoid the introduction of non-native plants, and rehabilitate areas with only local native seed.

BIRDS (563 species in AZ, including both resident and migratory species)
Concerns:

- Birds forage at heights ranging from the ground to the tree canopy level, searching for invertebrates, fish, frogs, lizards, insects, and seeds. The average height of the canopy along the border is less than 30 feet tall. Birds encountering the fence at foraging height are likely to perceive the fence as a barrier and are unlikely to fly higher than the tree canopy to cross and unlikely to maneuver themselves through the openings. The border fence will cut off part of the home range of any birds along the border. Many migratory birds, including listed species, that do not breed at the border stop to forage at the border on their way to and from their breeding grounds farther north.
- Migrating and dispersing birds that fly lower than 30 feet have a greater probability of colliding with the border fence. For example, brown pelicans have already collided with the existing border fence in at least two different years in the Yuma area near the lower Colorado River. Young dispersing birds and short distance migrants that fly at lower elevations are more likely to collide with the fence than long-distance migrants flying at higher elevations. Many species, including listed species that do not breed along the border, fly through the border area on their way to and from their breeding grounds farther north.
- Human traffic that will be curtailed by the pedestrian fence on CPNWR and OPCNM to the west and BANWR to the east will now be funneled into the U.S. through the Tohono O'Odham Nation's vegetated perennial, intermittent, and ephemeral drainages. Associated human habitat trampling, accidental or intentional fires, and noise and visual

disturbance will increase in these drainages, adversely impacting migratory and breeding birds and their habitat.

Recommendations/Solutions:

- Avoid fencing in and adjacent to perennial, intermittent, and ephemeral drainages because the greatest density of breeding, dispersing, and migratory birds occurs in these corridors. Fencing across and adjacent to drainages impedes bird movement and increases the risk of fatal bird collisions.
- In all habitats that cross the border, retain the existing vehicle fence rather than constructing a pedestrian fence. Although a vehicle fence and adjacent road also fragment the landscape, they are less of a barrier than a pedestrian fence. The taller the fence, the greater the barrier to migrating and foraging birds.
- Avoid fencing in and adjacent to perennial, intermittent, and ephemeral drainages to reduce the probability that a) downstream habitat will be damaged by fence blowouts during storm events and b) habitat will be damaged from debris buildup along the fence and subsequent rerouting of flow.
- Protect perennial, intermittent, and ephemeral drainages intersecting the proposed project.

COCHISE COUNTY - 19.7 miles total

- Coronado National Memorial [CNM; 0.2 mi]
- BLM's San Pedro River Natural Resource Conservation Area [SPRNCA; 0.3 mi]
- San Bernardino National Wildlife Refuge (SBNWR) & adjacent lands [SBNWR; 19.2 mi]

***Listed Species*:** ocelot, jaguar, Mexican gray wolf, southwestern willow flycatcher, western yellow-billed cuckoo, northern Mexican gartersnake, Mexican spotted owl, Huachuca water umbel, possibly Kearney's blue star, Coshise pincushion cactus, Yaqui chub, Yaqui catfish, Beautiful shiner, Yaqui topminnow, San Bernardino springsnail

***Species of Concern/Trust Species*:** lesser long-nosed bat, Tumamoc globeberry, monarch butterfly, 563 species of resident and migratory birds in Arizona (Arizona Bird Committee 2019).

OCELOT (*Leopardus [Felis] pardalis*) [CNM, SPRNCA]

Concerns:

- Direct injury or mortality of ocelots could occur from collisions with vehicles, and remains the primary source of mortality for ocelots in the US.
- Border barrier is proposed to be constructed in areas on the CNM and SPRNCA known to be corridors for ocelots and their prey. Ocelot movement between the US and Mexico has been documented in the area, and is compatible with vehicle fencing, yet not with 4 inch bollard fencing, as proposed.
- Ocelots are sensitive to auditory and visual stimuli arising from multiple components of the construction, maintenance, and existence of the proposed border barrier. Human presence (both pedestrians and vehicles), lights, and noise are associated with border activities.
- Lights are known to cause changes in dispersal and movement patterns, behavior, and habitat use (Beir 1995, Longcore and Rich 2004). Noise impacts can affect wildlife in a number of ways, possibly causing changes in breeding behaviors, home range size and

location, and habitat use, activity, and foraging patterns; increased stress response; and possibly damaged hearing if the noise is loud enough (Pater et al. 2009, NoiseQuest 2013, Gaynor et al. 2018).

- Disturbance to ocelots can result in behavioral changes, increased energetic expenditures, and interference with habitat use, including use of movement corridors, and movement patterns. These could lead to decreased dispersal opportunities; changes in home range size and location; increased inter- and intra-specific competition; increased difficulty meeting energetic needs; etc.
- Because ocelots are primarily nocturnal and crepuscular (i.e., active at night and dawn and dusk, have huge eyes for night vision), activities that occur during dusk, night, and dawn are more likely to disturb ocelots when they are active. Daytime activities are less likely to disturb active ocelots, but could disturb resting ocelots if the activities are close to a den or resting location. Moreover, project activities in more remote areas may have a greater chance disturbing ocelots compared to activities in areas with high baseline levels of human use.
- Ocelots are secretive animals that generally avoid areas of high human use and open exposed areas. They prefer to move through and use areas of dense vegetation for cover, which could be eliminated in areas near the proposed border barrier.

Recommendations/Solutions:

- Design roads to minimize animal collisions and fragmentation of ocelot habitat.
- Conduct construction and maintenance activities during daylight to avoid primary times when ocelots are active.
- Eliminate or reduce use of lighting.
- Retain vehicle fencing in areas known to be corridors.
- Include gaps for ocelot movement, particularly in areas known to be corridors.
- Provide vegetative cover leading up to and adjacent to fence to promote movement across the border through gaps, cat doors.

JAGUAR (*Panthera onca*) [CNM, SPRNCA]

Concerns:

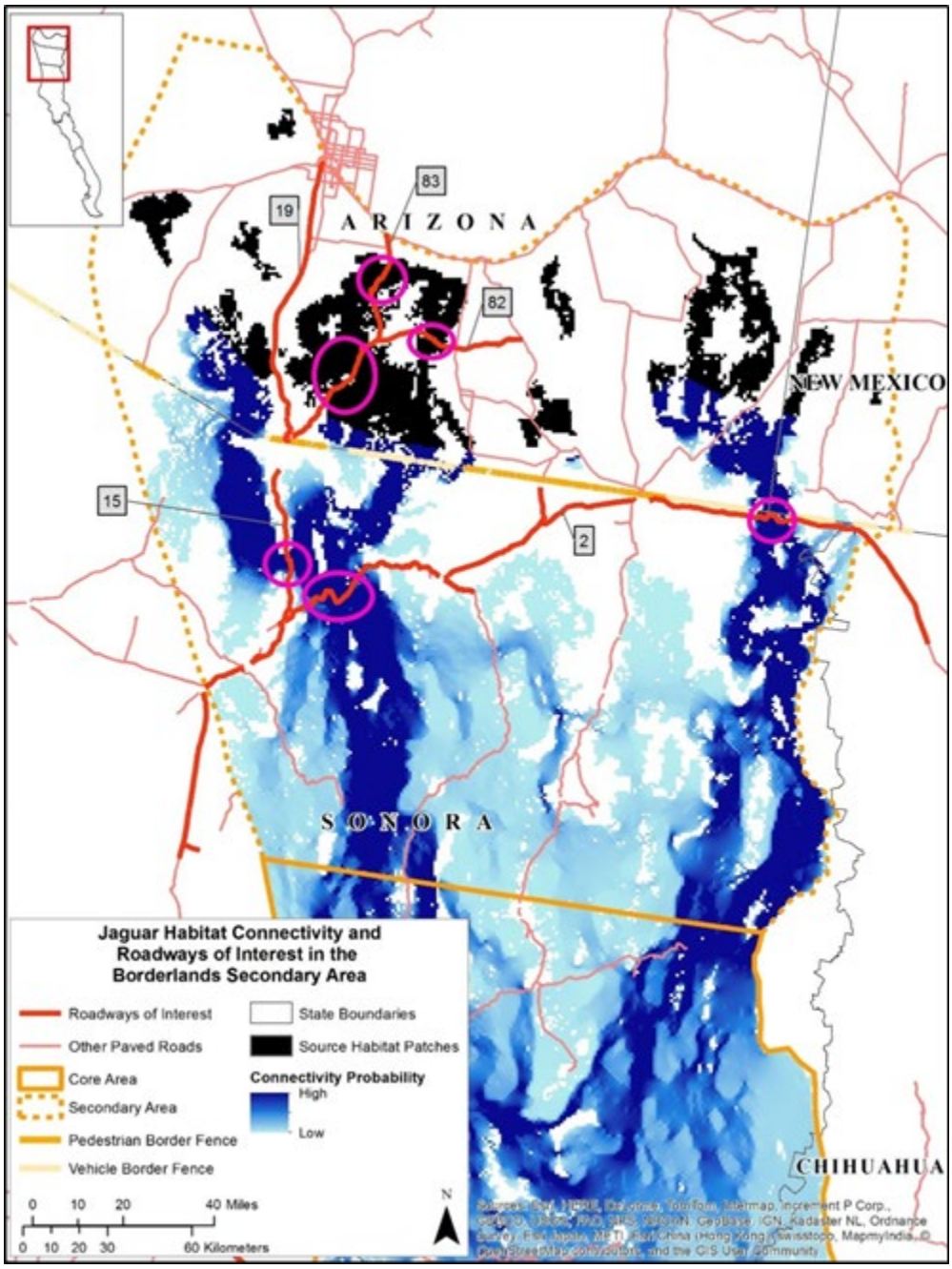
- Border barrier is proposed to be constructed in areas on the CNM and across 19.7 miles in eastern Arizona in and around SBNWR. These areas have been mapped as potential jaguar corridors in the Jaguar Recovery Plan (Figure 4). Additionally, SPRNCA may provide jaguar connectivity between the US and Mexico, as mapped in Figure 6, below, from Culver et al. (2009). Jaguar movement between the US and Mexico likely occurs in these areas and is compatible with vehicle fencing, yet not with 4 inch bollard fencing, as proposed.
- Washes and riparian vegetation provides value as movement corridors for the jaguar. Human activity and elevated noise levels would disturb any jaguar in the immediate area during the construction period, and possibly hinder or impede jaguar movement into the US.
- Jaguars are sensitive to artificial lighting and tend to avoid areas of lights and human activities.
- Pedestrian fences that are designed to prevent illegal pedestrians from entering the US will inherently restrict jaguar movement across the border. Maintaining connectivity between Arizona and Sonora is critical to the continued persistence of jaguars in Arizona

and New Mexico. Should all jaguar movement corridors be compromised, it is possible that the jaguar will become extirpated from the US, as it is believed the existence of jaguars in the US relies on interchange with jaguars in Sonora.

- Unless gaps are provided, the fence will block jaguar movements across the border in the areas it is constructed, as jaguars are unlikely to jump over the 18-foot fence and it will be impossible for them to jump over a 30-foot fence. Also, because the fence will be impermeable to humans, jaguars will also be prevented from going through the fence.
- This additional travel time would require jaguars to expend additional energy and increase the potential for encounters with humans, vehicles, and other stresses.
- At either end of the proposed fence corridors jaguars could move around the ends of the fence, although the extent to which they will do so is unknown. Installation of the fence may cause an increase in illegal traffic and subsequent law enforcement activities at either ends of the fencing; increased illegal and law enforcement activities in these areas may impede jaguar movement across the border and result in general disturbance to jaguars and degradation of their habitat. The increased law enforcement presence is likely to reduce illegal traffic at some later time.
- Vehicle traffic, foot traffic, litter, and presence of illegal entrants can affect habitat by altering composition, structure, and function of wildlife habitats. Vehicle and foot traffic can lead to the destruction of vegetation and degradation of riparian, wetland, and other sensitive habitats. This habitat alteration can lead to alteration of erosion patterns and changes in habitat conditions such as light, temperature, and humidity. Litter and the presence of UDAs can alter the behavior (i.e., foraging, predatory, and plant dispersal behaviors) of sensitive wildlife, such as jaguars. Accidental wildfires caused by UDAs have had devastating effects in native habitats not adapted to a regular fire regime and can encourage the invasion of invasive species that reduce habitat quality.

Recommendations/Solutions:

- Retain vehicle fencing in areas likely to be corridors.
- Include gaps for jaguar movement, particularly in areas likely to be corridors.
- Design roads to minimize animal collisions and fragmentation of jaguar habitat.
- Limit work within drainages to dry periods to reduce downstream water quality effects.
- Stabilize and revegetate any temporarily disturbed soils with native species, including cottonwood and willow saplings at washes and arroyos, to provide erosion and sedimentation control. Spray disturbed areas with a hydroseed mixture to establish an herbaceous cover more rapidly.
- Develop and implement engineering solutions (e.g., box culverts) in arroyos and washes.
- Design solutions to prevent illegal traffic; such traffic would adversely affect habitat and disturb jaguars that might be using the wash. Additionally, maintain vegetation in these washes and do not place lights near such washes.
- Support the Service in jaguar survey and monitoring efforts and conservation and recovery measures.
- Install additional technology (cameras, sensors, etc.) to the east and west of the fence segments and near other gaps where higher quality habitat exists to deter the entry of illegal pedestrians, particularly into the mountainous regions and larger riparian areas (e.g., Peloncillo Mountains, San Pedro River). Provide information to the Service on jaguar and other felid (i.e., mountain lion, ocelot, and bobcat) sightings obtained through remote video surveillance (or any other means like direct observation) along the border.



Map of habitat connectivity and roadways of interest in the Borderlands Secondary Area as modeled by Stoner et al. (2015). These areas in dark blue are good locations for enabling access for jaguars to move between the US and Mexico. Of note are dark blue corridors in the area of the Coronado National Memorial, and possibly on the eastern portion of San Bernadino National Wildlife Refuge in eastern Arizona near the New Mexico border.

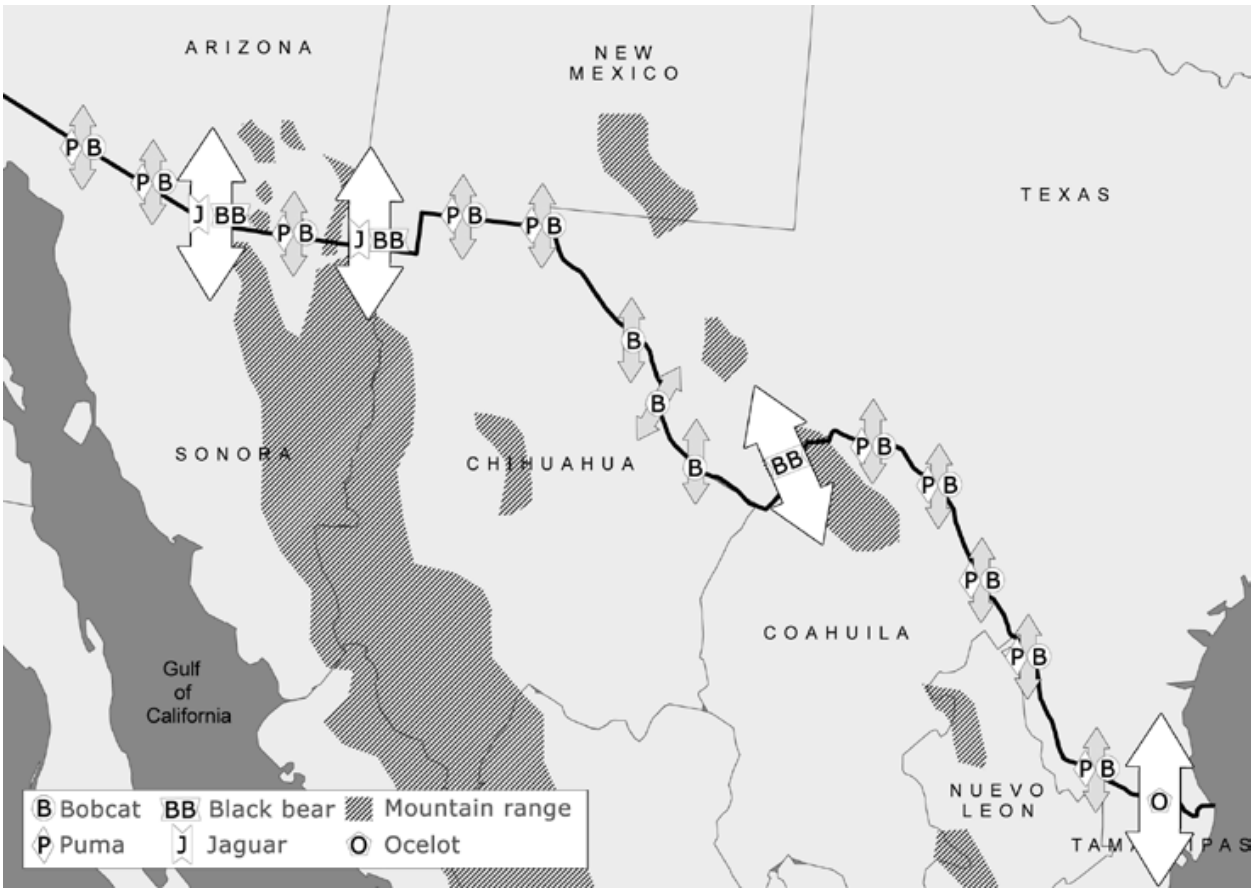


Figure 6.1. from Culver et al. (2009). Map of the transboundary region including mountain ranges, rivers, cities/towns, and political borders. Arrows indicate areas of importance for connectivity of black bear (BB), puma (P), jaguar (J), bobcat (B), and ocelot (O). These areas are important for binational habitat protection. Map drawn by Mickey Reed. *Included with permission from the author.*

MEXICAN GRAY WOLF (*Canis lupis baileyi*) [CNM, SPRNCA, SBNWR]
Concerns:

- Recovery of the Mexican gray wolf is based on the establishment and maintenance of a minimum of two resilient, genetically diverse Mexican wolf populations distributed across ecologically and geographically diverse areas in the subspecies' range in the United States and Mexico (U.S. Fish and Wildlife Service 2017).
- To address the extinction risks of small population size and loss of gene diversity, the binational recovery approach, supported by many partners and with millions of dollars invested annually, involves the dispersal and expansion of the US and Mexico wolf populations to support increased population abundance and recovery in the wild (U.S. Fish and Wildlife Service 2017).
- Similar to jaguars and other large top carnivores, Mexican wolves have large home ranges, and are known to disperse across international boundaries. Based on the mapping of Mexican wolf Recovery Focal Areas, below, areas of possible dispersal and connectivity between the US and Mexico occur where border barriers are proposed to be constructed, which would inhibit chances of recovery.

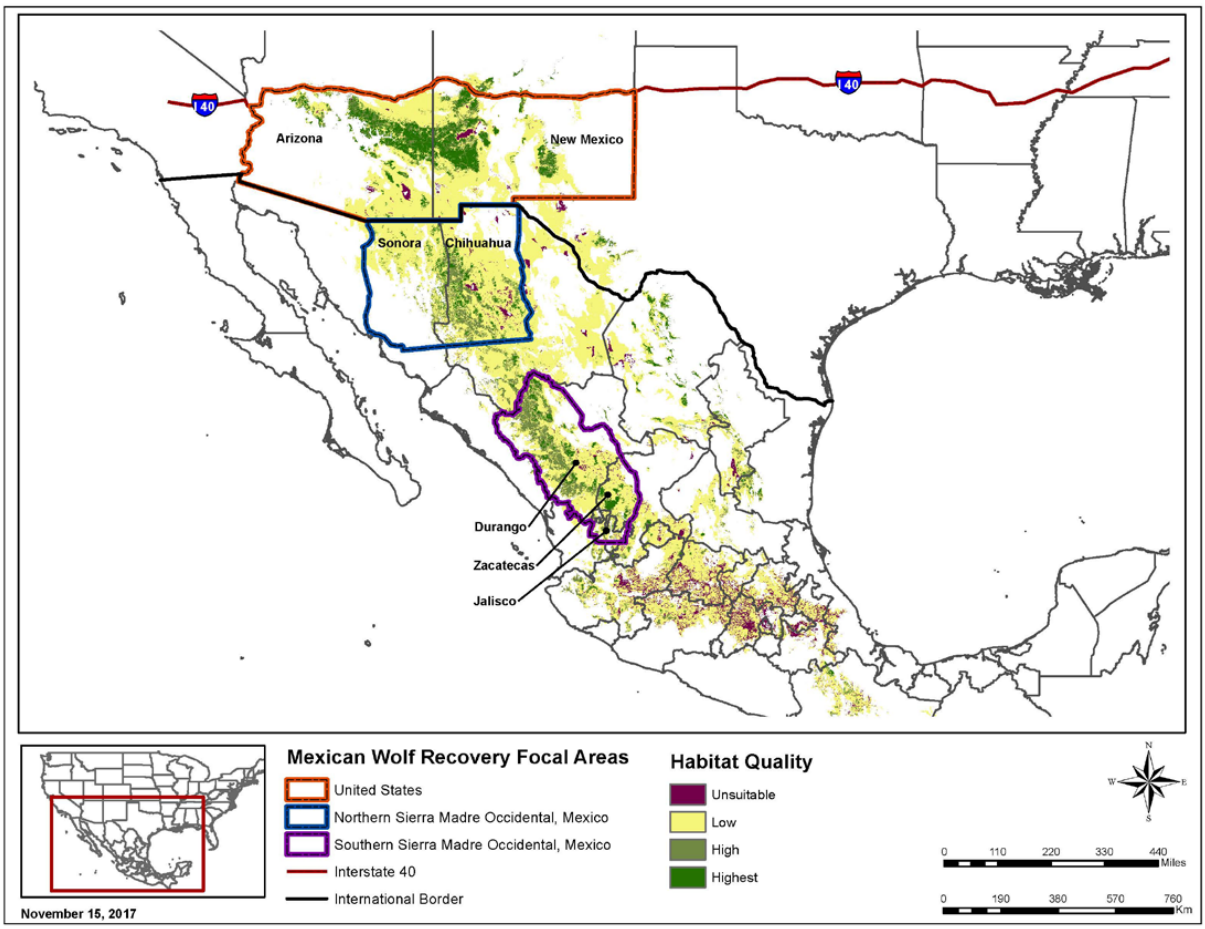


Figure 3. Focal areas for Mexican wolf recovery in the United States and Mexico (USFWS 2017)

Recommendations/Solutions:

- Retain vehicle fencing in areas likely to be corridors (see maps).
- Include gaps for wolf movement, particularly in areas likely to be corridors.
- Design roads to minimize animal collisions.
- Develop and implement engineering solutions (e.g., box culverts) in arroyos and washes.
- Support the Service in Mexican gray wolf survey and monitoring efforts and conservation and recovery measures.
- Install additional technology (cameras, sensors, etc.) to the east and west of the fence segments and near other gaps where higher quality habitat exists to deter the entry of illegal pedestrians, particularly into the mountainous regions and larger riparian areas (e.g., Peloncillo Mountains, San Pedro River). Provide information to the Service on Mexican gray wolf (in addition to other large carnivore) sightings obtained through remote video surveillance (or any other means, like direct observation) along the border.

SOUTHWESTERN WILLOW FLYCATCHER (*Empidonax traillii extimus*) [SBNWR, SPRNCA]

Concerns:

- Southwestern willow flycatchers (SWFL) likely do not breed along the border fence but they do breed nearby occasionally on the San Pedro River. They migrate to and from breeding sites north of the border along the lower Colorado River and San Pedro River and stop to forage on their way. Willow flycatchers forage at heights ranging from the ground to the tree canopy level, searching for insects. Fencing adjacent to or across these rivers likely impedes movement for foraging and migrating willow flycatchers.
- Disturbance to SWFL may occur from both auditory and visual stimulus arising from the construction and maintenance of the proposed border barrier.
- Human presence (both pedestrians and vehicles), lights, and noise can result in increased energetic expenditures due to increased movement rates and probabilities of flight response, habitat avoidance, and interference with habitat use, including during the breeding season. Disturbance can also expose SWFL to increased predation.
- The degree of potential disturbance would depend on the spatial extent, location, timing, frequency, and duration of actions associated with the border barrier. In general, larger (in size), longer (in duration), and/or more frequent projects are more likely to disturb SWFL resulting in adverse behavioral changes. Projects that are smaller, shorter, and/or less frequent are less likely to disturb SWFL.

Recommendations/Solutions:

- Avoid fencing in and adjacent to the San Pedro River because fencing impedes willow flycatcher movement and increases the risk of fatal bird collisions.
- Avoid fencing in and adjacent to perennial, intermittent, and ephemeral drainages to reduce the probability that a) downstream habitat will be damaged by fence blowouts during storm events and b) habitat will be damaged from debris buildup along the fence and subsequent rerouting of flow.

WESTERN YELLOW-BILLED CUCKOO (*Coccyzus americanus*) [SPRNCA, SBNWR]

Concerns:

- Both migratory and breeding cuckoos occur in many vegetated perennial, intermittent, and ephemeral drainages that cross the border including Coronado National Monument, San Pedro River, and Black Draw. Other unsurveyed drainages crossing the border may also support cuckoos.
- Cuckoos forage at heights ranging from the ground to the tree canopy level, searching for large insects, lizards, and frogs. The average height of the canopy along the border is less than 30 feet tall. Cuckoos encountering the fence at foraging height are likely to perceive the fence as a barrier and are unlikely to fly higher than the tree canopy to cross and unlikely to maneuver themselves through the openings.
- Cuckoos have large home ranges and can fly 0.5 miles daily to forage. The border fence will cut off part of the home range of any cuckoos along the border.

Recommendations/Solutions:

- Avoid fencing in and adjacent to perennial, intermittent, and ephemeral drainages because cuckoos forage and breed in these habitats. Fencing across and adjacent to drainages impedes cuckoo movement and increases the risk of fatal bird collisions.

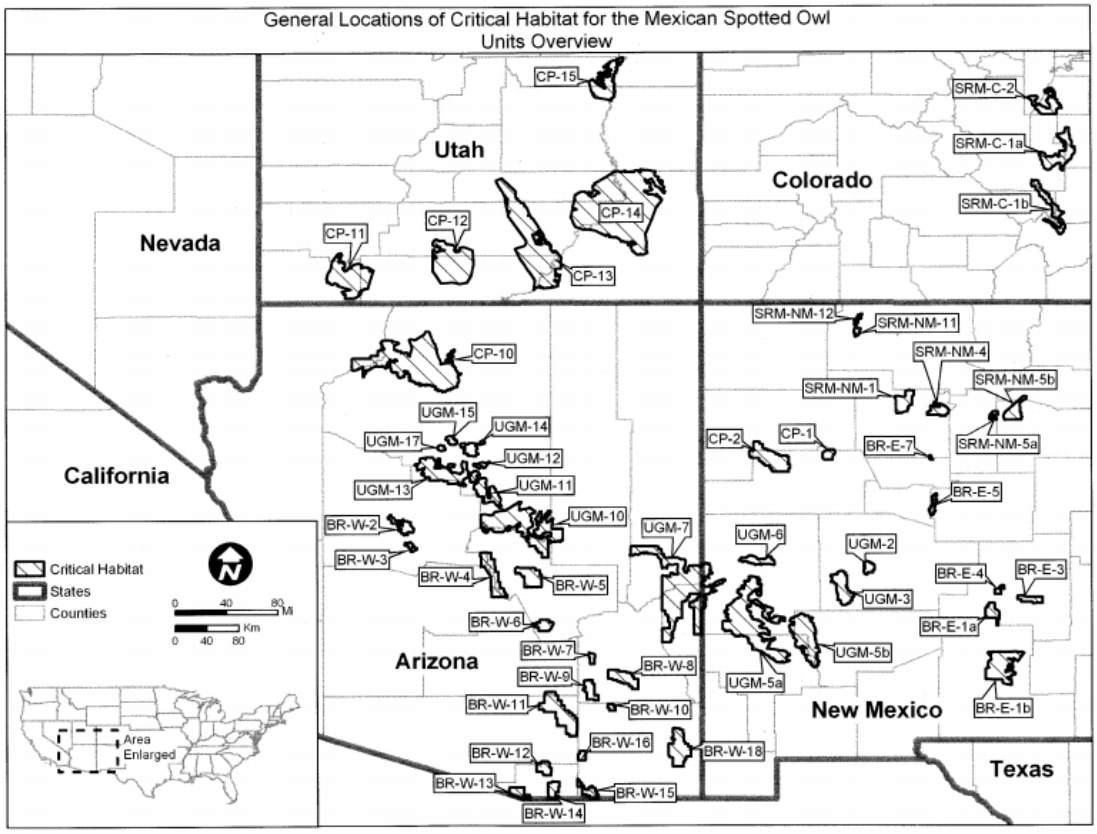
- Avoid fencing in and adjacent to perennial, intermittent, and ephemeral drainages to reduce the probability that a) downstream habitat will be damaged by fence blowouts during storm events and b) habitat will be damaged from debris buildup along the fence and subsequent rerouting of flow.

MEXICAN SPOTTED OWL (S*trix occidentalis lucida*) [CNM]
Concerns:

- Mexican spotted owls (MSOs) inhabit closed-canopy forests (riparian, mixed conifer, pine-oak, and pinyon-juniper woodland) and steep, narrow, entrenched, rocky canyons and cliffs. They are nocturnal and hunt for rodents and other prey at night.
- Critical habitat for MSO is designated within the proposed project area (see map below).
- MSOs exhibit very high nest fidelity, often using the same nesting locations for decades.
- Nesting and breeding season for MSO runs from March 1 - June 30. During this time, MSO pairs tend nests and rear fledglings, and are particularly sensitive to disturbance.

Recommendations/Solutions:

- Avoid border activities during the breeding season, from March 1 - June 30.
- Before any action, a qualified biologist should conduct surveys for MSOs. If a nest is found, no activities or maintenance should be conducted within 1300 feet of the nest until the young have fledged.
- Avoid lights in areas known to have MSOs or nests.



NORTHERN MEXICAN GARTERSNAKE (*Thamnophis rufipunctatus*) [SBNWR, SPRNCA]
Concerns:

- Northern Mexican gartersnakes hunt for aquatic prey in streams and lakes, and move, breed, and rest primarily in terrestrial habitats associated with riparian areas. Northern Mexican gartersnakes could be affected in regions associated with the San Pedro River and intermittent streams draining the Huachuca Mountains as well as in the vicinity of the SBNWR.
- Adverse effects to the gartersnakes, such as injury or death, could occur from the construction (temporary) and enforcement (permanent) phases of the proposed action. During construction, gartersnakes could be injured or killed by vehicles and heavy equipment, or via exposure if entrapped in trenches associated with barrier construction.
- After construction, gartersnakes could be injured or killed by vehicle strikes associated with the higher frequency of vehicular patrols along roads associated with the barrier wall.
- The barrier itself is not anticipated to affect movement between gartersnake populations on either side of the International Border.

Recommendations/Solutions:

- Providing escape ramps at regularly spaced intervals within open trenches will help avoid entrapment of gartersnakes and potential injury or death from exposure.
- Reducing speed limits and providing awareness training to contractors may reduce the likelihood of injury or death from vehicle or machinery strikes.
- Signage, employee awareness training, and mandating slower rates of speed may all help drivers recognize crossing snakes and avoid striking them.

GILA TOPMINNOW (*Poeciliopsis occidentalis occidentalis*) [SPRNCA]
Concerns:

- Predation and competition from non-native fishes have been a major factor in their decline and continue to be a major threat to the remaining populations. The availability of water is critical for the Gila topminnow's survival, making the species vulnerable to over use of local water and groundwater from border activities.
- Gila topminnow are associated with aquatic (open water) habitat on the SPRNCA and impacts to these habitats may result in direct and indirect effects on the species.
- Border activities and construction of the border barrier that overlap with flowing water can produce injury, mortality, and reduced reproductive success.
- Habitat disturbance may cause habitat avoidance or other changes in behavior, increased competition, and habitat modification (e.g., changes in habitat structure, erosion or sedimentation, hydrologic condition alterations, and reduced water quality) and loss.

Recommendations/Solutions:

- Decontaminate equipment to prevent the transfer of invasive aquatic organisms (crayfish, bullfrogs, and other non-native fish species).
- Maintain functioning hydrological conditions and manage for impacts of structures and staging to avoid contamination, degradation, and erosion of aquatic habitats.
- Prevent surface and groundwater withdrawals that could negatively impact native aquatic species.
- If habitat damage occurs, restore wetlands to support fish populations and replenish groundwater recharge.

DESERT PUPFISH (*Cyprinodon macularius*) [SPRNCA]
Concerns:

- Desert pupfish are established at several wild sites at the San Pedro Riparian National Conservation Area, and are dependent on adequate water quantity and quality to persist. Desert pupfish are threatened by competition and predation from non-native aquatic species.
- Border activities and construction of the border barrier that overlap with flowing water can produce injury, mortality, and reduced reproductive success.
- Habitat disturbance may cause habitat avoidance or other changes in behavior, increased competition, and habitat modification (e.g., changes in habitat structure, erosion or sedimentation, hydrologic condition alterations, and reduced water quality) and loss.

Recommendations/Solutions:

- Decontaminate equipment to prevent the transfer of invasive aquatic organisms (crayfish, bullfrogs, and other non-native fish species) or pathogens.
- Maintain functioning hydrological conditions and manage for impacts of structures and staging to avoid contamination, degradation, and erosion of aquatic habitats.
- Prevent surface and groundwater withdrawals that could negatively impact native aquatic species.
- If habitat damage occurs, restore wetlands to support fish populations and replenish groundwater recharge.

YAQUI CHUB, YAQUI CATFISH, YAQUI TOPMINNOW, BEAUTIFUL SHINER (*Gila purpurea, Ictalurus pricei, Poeciliopsis occidentalis sonoriensis, Cyprinella formosa*) [SBNWR]
Concerns:

- These four species are found together in Black Draw and the ponds on SBNWR; these habitats are designated critical habitat for these species.
- Impingement of water flow in Black Draw from border activities and construction could negatively impact their life cycle requirements downstream in Mexico (Black Draw and Rio San Bernardino flow north to south, unlike the San Pedro River).
- These fish species are highly sensitive to water diminishment, contamination, and sedimentation.

Recommendations/Solutions:

- Keep the channel clear to promote natural flow.
- Avoid any impacts of water reduction, contamination, or sedimentation to the ponds on SBNWR or Black Draw, including groundwater withdrawal.
- Decontaminate equipment to prevent the transfer of invasive aquatic organisms (crayfish, bullfrogs, and other non-native fish species) or pathogens.
- Maintain functioning hydrological conditions and manage for impacts of structures and staging to avoid degradation, and erosion of aquatic habitats.
- Prevent surface and groundwater withdrawals that could negatively impact native aquatic species.
- If habitat damage occurs, restore wetlands to support fish populations and replenish groundwater recharge.

HUACHUCA WATER UMBEL (*Lilaeopsis schaffneriana* ssp. *recurva*) [SPRNCA]
Concerns:

- Huachuca water umbel is an aquatic plant restricted to ciénegas, rivers, streams, and springs in permanently wet, muddy, or silty substrates. The umbel grows in a few populations in southern Arizona and northern Sonora, Mexico. The SPRNCA supports a significant population along its banks and contains a critical habitat unit for the umbel.
- Huachuca water umbel is susceptible to direct mortality from trampling by human traffic and vehicles, or the placement of heavy equipment. It would also be impacted by changes in hydrology, as it is intimately linked to water availability. It also can be outcompeted by invasive, non-native plants. Long term threats consist of aquatic habitat degradation, from unsustainable groundwater withdrawal; wildfire and resulting sedimentation and scouring; and the effects of drought and climate change.

Recommendations/Solutions:

- Monitor to recognize if Huachuca water umbel is present near aquatic areas. If present, demarcate and avoid impacts to the plants.
- Maintain a hydrologically stable riparian stream channel and riparian plant community to support the establishment, growth, and reproduction of Huachuca water umbel.
- Avoid introduction of non-native, invasive plants.

COCHISE PINCUSHION CACTUS (*Coryphantha robbinsorum*) [SBNWR]
Concerns:

- The population that grows west of Guadalupe Canyon is the only known population of this very narrow endemic species.
- Protecting the cactus from trampling is critical to its survival.
- Such trampling may occur as traffic is funneled/shifted around the fence to areas with no fence.

Recommendations/Solutions:

- CBP/BP install mobile surveillance along the border (where no pedestrian fence occurs) to prevent damage/trampling to in SBNWR.

BIRDS (563 species in AZ, including both resident and migratory species)
Concerns:

- Birds forage at heights ranging from the ground to the tree canopy level, searching for invertebrates, fish, frogs, lizards, insects, and seeds. The average height of the canopy along the border is less than 30 feet tall. Birds encountering the fence at foraging height are likely to perceive the fence as a barrier and are unlikely to fly higher than the tree canopy to cross and unlikely to maneuver themselves through the openings. The border fence will cut off part of the home range of any birds along the border. Many migratory birds, including listed species, that do not breed at the border stop to forage at the border on their way to and from their breeding grounds farther north.
- Migrating and dispersing birds that fly lower than 30 feet have a greater probability of colliding with the border fence. For example, brown pelicans have already collided with the existing border fence in at least two different years in the Yuma area near the lower Colorado River. Young dispersing birds and short distance migrants that fly at lower elevations are more likely to collide with the fence than long-distance migrants flying at higher elevations. Many species (including listed species) that do not breed along the

border fly through the border area on their way to and from their breeding grounds farther north.

- Human traffic that will be curtailed by the pedestrian fence on CPNWR and OPCNM to the west and BANWR to the east will now be funneled into the U.S. through the Tohono O'Odham Nation's vegetated perennial, intermittent, and ephemeral drainages. Associated human habitat trampling, accidental or intentional fires, and noise and visual disturbance will increase in these drainages, adversely impacting migratory and breeding birds and their habitat.

Recommendations/Solutions:

- Avoid fencing in and adjacent to perennial, intermittent, and ephemeral drainages because the greatest density of breeding, dispersing, and migratory birds occurs in these corridors. Fencing across and adjacent to drainages impedes bird movement and increases the risk of fatal bird collisions.
- In all habitats that cross the border, retain the existing vehicle fence rather than constructing a pedestrian fence. Although a vehicle fence and adjacent road also fragment the landscape, they are less of a barrier than a pedestrian fence. The taller the fence, the greater the barrier to migrating and foraging birds.
- Avoid fencing in and adjacent to perennial, intermittent, and ephemeral drainages to reduce the probability that a) downstream habitat will be damaged by fence blowouts during storm events and b) habitat will be damaged from debris buildup along the fence and subsequent rerouting of flow.
- Protect perennial, intermittent, and ephemeral drainages.

OTHER RARE PLANTS

- These include Bertram's stonecrop (*Graptopetalum bartramii*), beardless chinchweed (*Pectis imberbis*) and *Tumamoca macdougali*i (no common name), which occur in the border region, though we currently do not know of any populations directly along the border area of proposed wall construction. However, if border barriers cause a shift in pedestrian or vehicular traffic, these plants and their habitats could be impacted.
- It is recommended that surveys could be conducted for these species, positive and negative data submitted to the FWS and the HDMS, and any plants located be avoided during construction. In addition, human traffic movement post-wall construction should be considered in relation to known populations of these rare species and impacts from potential increased traffic (e.g. see *Coryphantha robbinsorum* section above).

ADDITIONAL CONCERNS AND ASSOCIATED LITERATURE:

- Temporary disturbance or direct mortality to species during construction; ongoing disturbance for maintenance and operations.
    - It has been well documented that human presence in wildlands can disturb animals, causing them to unnecessarily expend energy avoiding people, thereby potentially reducing reproductive success (e.g., Manville 1983, van Dyke et al. 1986, Goodrich and Berger 1994, Primm 1996; as cited by Kerley et al. 2002, Swaddle et al. 2015, Trouwborst et al. 2016,) or increasing the likelihood of fatal encounters with humans (Kasworm and Manley 1990, Saberwal et al. 1994, Khramtsov 1995, Mattson et al.

1996; as cited by Kerley et al. 2002). Human disturbance can also lead to range abandonment (Jorgenson 1988).

- Overall, increased human presence interrupts wildlife behavior that can lead to changes in movement, foraging, hunting, access to water, mating, and rearing of young, along with changes in circadian rhythm, cell and DNA repair, and other physiological stress reactions, all of which can impact fitness and survival over time (Thompson et al. 1968, Cherkovich and Tatoyan 1973, Moen et al. 1978, Ramirez et al. 2014, Swaddle et al. 2015, Bliss-Ketchum et al. 2016, Longcore and Rich 2016a, Longcore and Rich 2016b, Trouwborst et al. 2016).

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https://www.inaturalist.org/projects/border-bioblitz-2018
For photo and name of each species, see here:
https://www.inaturalist.org/observations?project_id=17162&place_id=any&verifiable=any&captive=any&view=species