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Tubac Borrow Pit Wetland Restoration Plan

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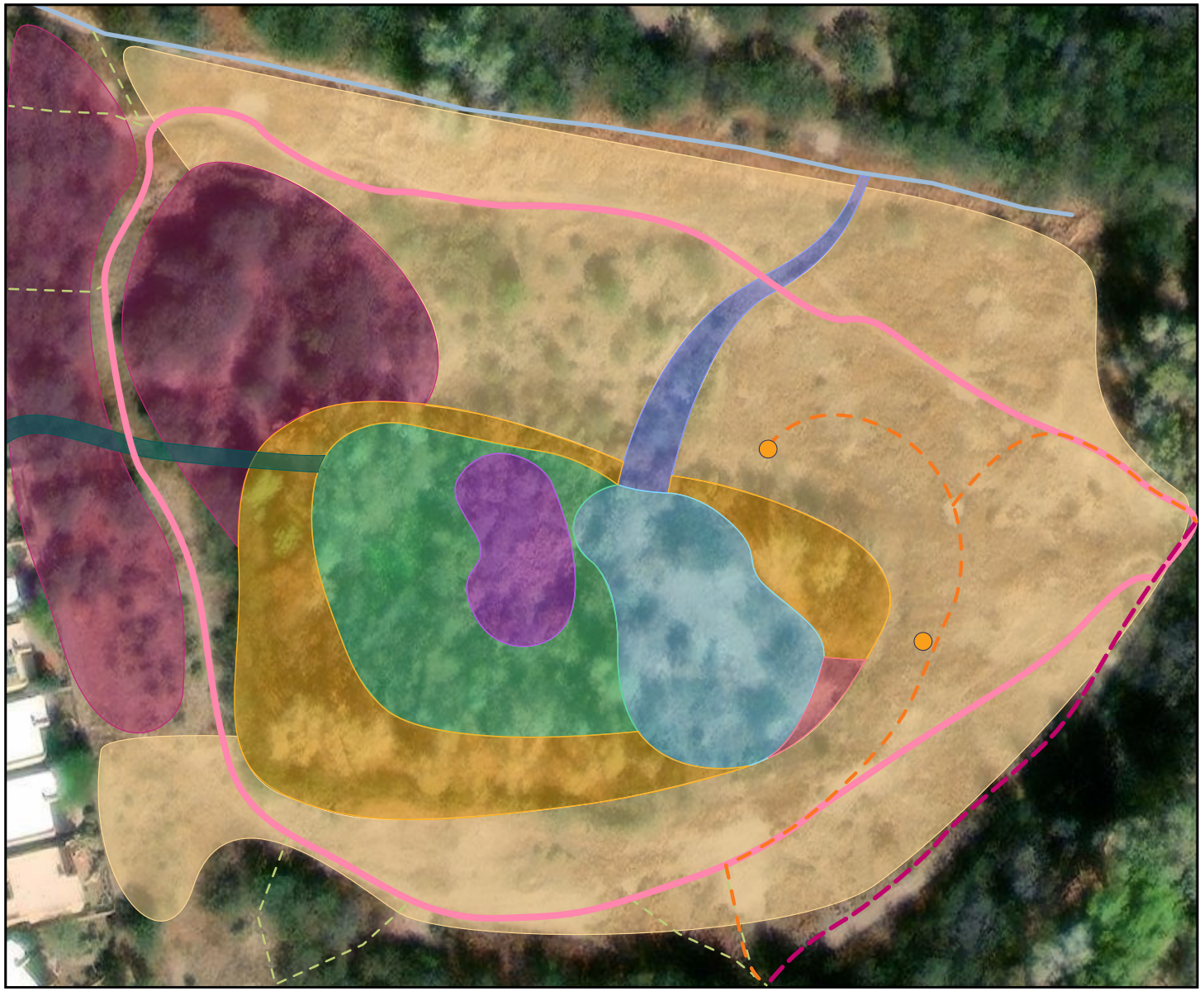
Figure 1: Tubac Borrow Pit Concept Map



Plan Purpose

The retired borrow pit directly south of Ron Morriss County Park functions as a constructed ephemeral wetland that provides a unique habitat along the Santa Cruz River. The wetland has naturally evolved with minimal human influence since the 90s, though locals report that bird species dependent on marsh habitat have nearly disappeared since 2020 leading to mounting concerns that the aquatic habitat is in decline. Tubac Nature Center (TNC), in anticipation of future stewardship along the Santa Cruz River, contracted Tucson Audubon (TA) to draft a Wetland Restoration Plan for the site to improve wetland conditions. Improving marsh habitat through redesign, restoration, and adaptive management is the primary objective of this plan.

Site Assessment

Site History

The borrow pit project site is approximately 1.9 acres or 82,000 sq ft and lies in the immediate floodplain of the Santa Cruz River. Borrow pit excavation started in the 1990s for construction around and in the Tubac Barrio but was abandoned once equipment reached the water table. Since then, the area has functioned as an intermittent wetland with standing surface water the majority of the year and is enjoyed by migrating and resident birds and human visitors alike. The site is currently owned by Baca Float Land Development Ltd.

US Geological Survey (USGS) 1971 aerial imagery shows that prior to construction of the surrounding housing development, the project site was surrounded by an undeveloped floodplain and uplands to the west and by the Santa Cruz River and its riparian area to the east. A ribbon of agricultural land along the river corridor indicates that the borrow pit area and its surroundings were developed or used for human purposes for generations. Interstate 19 was fully completed in 1978, later than when this aerial image was captured, which inevitably led to increased human access and more development opportunities including the Tubac Barrio.

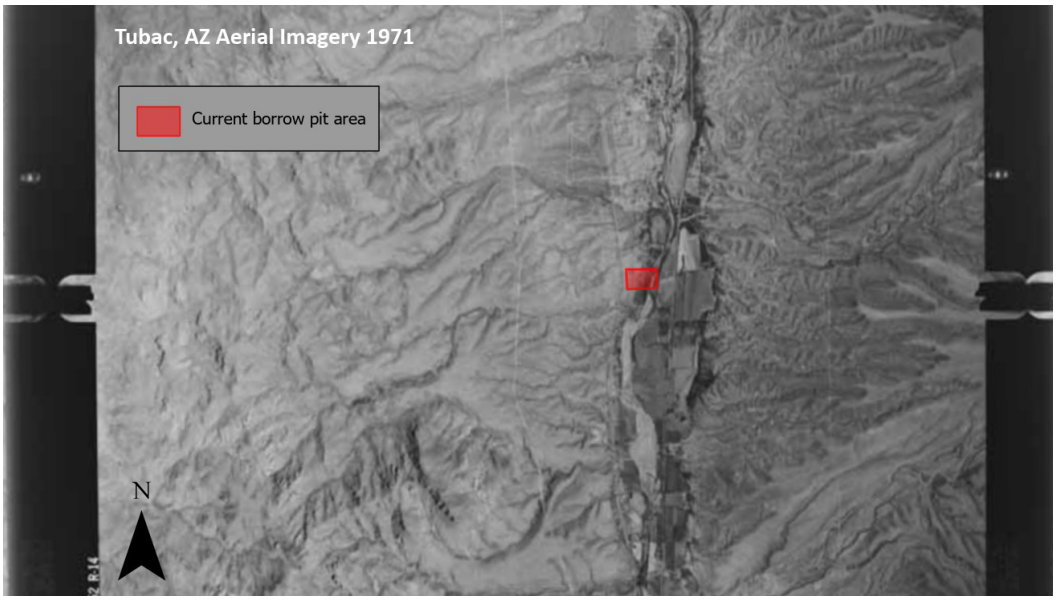


Figure 2: Aerial image of Tubac and surrounding area *US Geological Survey 1971*

Watershed

Tubac is located in the Lower Colorado Basin's Upper Santa Cruz Watershed (HUC15050301). The watershed is a semi-arid area that receives an average of 16 inches of rainfall a year. It is influenced by a unique mix of surface water and groundwater contributions, primarily from the monsoon and winter rain seasons but also from treated human effluent inputs.

Tubac's topography, nestled between the Santa Rita and Tumacacori mountain ranges, influences local drainage and sediment patterns that contribute to the Santa Cruz River. The river also receives effluent discharge from a water treatment and recharge plant in Nogales, contributing to year-round water availability. Additionally, seasonal rain from the Montosa Canyon Basin east of Tubac further supports river flow and groundwater recharge. Groundwater depths in Tubac are anticipated to be similar to those in nearby Tumacácori, averaging around 10 feet with seasonal fluctuations linked to rainfall (Figure 8). This relatively shallow groundwater table supports riparian vegetation and, combined with surface and subsurface water flows, creates favorable conditions for wetland restoration adjacent to the river.

Hydrologic Budget

The primary water source for the wetland is effluent water from the Baca Float Water Company Wastewater Treatment Facility, a short distance to the north of the borrow pit. Discharge varies depending on residents' occupancy, many of which are winter only. The seasonality of residents leads to a significantly greater discharge during the winter months that fluctuates between 15,000 and 20,000 gallons per day. During summer, discharge decreases to between 8,000 and 10,000 gallons a day. The 1.9-acre wetland receives 770,000 gallons or 102,930 cubic feet of rainwater annually. Sheet flow is likely to contribute to increased rainwater to the site but at an unknown quantity. Due to the relatively flat nature of the wetland, the water occupies a large yet shallow footprint. These conditions favor significant water loss due to evaporation and, to a lesser extent, permeation.

Soils

TA conducted soil analyses by both generating a United States Department of Agriculture (USDA) soils report for the project site and performing preliminary field analysis. Through these, TA defined a comprehensive soil profile that site managers can use to inform various restoration actions detailed in this plan. On-site soils are classified as Pima Soils, typical of floodplain areas. For intact soil profiles, clay loam soils comprise the upper 26 inches, transitioning to loam from 26 to 38 inches, and to sandy loam below 38 inches (USDA, 2019). Slopes are under 3%, with low runoff and good drainage. There is no evidence of perpetuating erosion onsite, despite the artificial nature of the borrow pit.

Figure 3: Soil adjacent to standing water in the borrow pit formed into a small bowl that holds water *Kari Hackney*

The borrow pit area was not originally a wetland

but has functioned as an ephemeral wetland naturally and with effluent water inputs for over 30 years. The primary difference between terrestrial and wetland soils is that wetland soils are anaerobic, meaning they have little to no oxygen available for plant uptake. This occurs due to high rates of plant decomposition, which consume oxygen and lead to a transition in soil type. Anaerobic soils therefore decompose organic matter slowly, which can cause root death in non-adapted plants but also fosters unique habitat for wetland-adapted plants with low oxygen demand, reducing bacterial growth and inhibiting the spread of plant diseases.

Anaerobic soil types are better at holding and storing water for longer periods than terrestrial soils. Wetlands with mature anaerobic soil profiles are powerful tools for improving water quality and watershed health since they filter water before it enters the groundwater and can play a vital role in recharge for both groundwater and surface water bodies (Craft & Duey 2022).

The borrow pit's proximity to the Santa Cruz River and its 30-year history of gradually developing wetland soil characteristics make it an ideal candidate for wetland restoration. Preliminary in-field soil analyses conducted by TA assessed soil composition, classifying the lowest wetland zone soil as clay silt. Composed primarily of fine hydrophilic particles, this soil retains and stores water effectively, supporting its role as an ephemeral wetland with effluent inputs.

Anaerobic soils are often identified by color in the field. As aerobic soil transitions to anaerobic, microbial activity reduces, or adds electrons to, iron molecules, changing soil color from red, orange, or yellow to muted gray (Vasilas et al. 2018). Figure 3 shows a soil sample from a saturated area of the borrow pit. While clay content helps retain water, the reddish-brown color indicates that the soil has not yet transitioned from aerobic to anaerobic.

The primary strategy to encourage hypoxic conditions in the borrow pit is to sustain water-logged conditions for extended periods, ideally year-round. The Stormwater Harvesting and Grading Plan sections below outline strategies for site managers to achieve this. Increased organic matter decomposition will further deplete oxygen in the soil, promoting the anaerobic transition. Organic matter will remain available onsite through annual leaf cycling and through added vegetation, as detailed below. If site managers wish to actively expedite soil transition, they could consider amending target areas with organic compost that will increase decomposition. This could be achieved in a streamlined manner by adding compost amendments alongside new marsh and toe-zone plants, further detail below.

Endangered and Sensitive Species

Federally Listed Species

The US Fish and Wildlife Service (USFWS), under the Endangered Species Act (ESA), tracks sensitive species statuses throughout the country and enacts protections for "listed," designated threatened or endangered, species under the act. USFWS maintains a database for entities nationwide to identify which listed species may interact with their land or project area. TA generated an "IPaC" report for the specific borrow pit project area, which identified 11 endangered species and two critical habitats relevant to the project area. Any federal actions, such as a federal grant award, would trigger a review of this project's potential to impact these species and its impacts on bald and

golden eagles and migratory birds. Appendix 4 includes the IPaC report, which lists all relevant eagle and migratory bird species and more information about their probability of occurrence, breeding seasons, and other relevant conservation information (USFWS, 2024). It is important to note that the watermark on each page of the report, reading "not for consultation," means the document would not be an eligible basis for determining which species to include in a NEPA review. If site managers receive federal funding for this project and triggers the need for NEPA, they will have to work alongside a USFWS project manager to obtain an official IPaC report, which may list new species depending on what changes occur in federal listing or in the borrow pit project area by then.

Listed Endangered or Threatened

Jaguar (*Panthera onca*) – Listed endangered
Ocelot (*Leopardus pardalis*) – Listed endangered
Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*) – Listed threatened
Western Yellow-billed Cuckoo (*Coccyzus americanus*) – Listed threatened
Mexican Spotted Owl (*Strix occidentalis lucida*) – Listed threatened
Southwestern Willow Flycatcher (*Empidonax traillii extimus*) – Listed endangered
Chiricahua Leopard Frog (*Rana chiricahuensis*) – Listed threatened
Gila Topminnow (*Poeciliopsis occidentalis*) – Listed endangered
Monarch Butterfly (*Danaus plexippus*) – Candidate for listing
Pima Pineapple Cactus (*Coryphantha scheeri var. robustispina*) – Listed endangered

Monarch Butterfly *Dan Weisz*

Critical Habitat Overlap

The Tubac borrow pit area overlaps with listed critical habitat for two species:

Western Yellow Billed Cuckoo
Southwestern Willow Flycatcher

These species rely on riparian habitats throughout the Southwest for nesting, shelter, and foraging. Efforts to promote and enhance habitat for these and other listed species could be eligible for special funding via the Partners of Fish and Wildlife program or Arizona Heritage Fund Grants—see more information about grant opportunities in the Applicable Grants section below.

State and Other Sensitive Species Designations

The Upper Santa Cruz Watershed is home to many sensitive species beyond those that are federally protected. The Arizona Game and Fish Department (AZGFD) maintains a list of 161 plant, animal, and other species protected throughout the watershed by various governing entities ranging from Arizona's Species of Greatest Conservation Need (SGCN), to ESA listing, tribal protection, and

international listing by the Mexican government. That list is available for review in Appendix 5 and includes many species listed throughout this plan, particularly bird species this plan seeks to improve habitat for. This list can be a reference for identifying species to target in conservation and restoration actions and can provide a framework and narrative for grant applications, especially for opportunities that prefer projects with identified target species. Refer to the Applicable Grants section below for more information on funding opportunities.

Wetland Design

Habitat Zones

The Tubac borrow pit restoration project area hosts three main habitat zones: aquatic/wetland, riparian forest, and an upland zone consisting of mesquite bosque and semi-desert grasslands habitat type. Each of these provides unique challenges but also potential high-value opportunities for restoration. Below are descriptions of each zone, recommended goals for restoration, and desired additional native plants and seeds suitable for each zone to support improved habitat and the community's goals for the site.

Aquatic Zone

The aquatic zone is the main attraction to the wetland for bird and human visitors alike. Divided into two sub-zones, marsh and open water, this zone will provide valuable stopover, nesting, and wintering habitat for birds and other wildlife. It will further support the vital migration corridor along the adjacent Santa Cruz River.

Snowy Egret *Hans Hillewaert*

Marsh Zone

Marshes, or cienegas, are characterized by still or slow-moving shallow water with dense vegetation cover via emergent vegetation around their perimeter and submerged or floating aquatic vegetation where water depths are higher. Marsh habitats are increasingly rare in southern Arizona, largely due to impacts of grazing, groundwater withdrawals, drought, and other human/environmental impacts (AZGFD, 2024).

Year-round moisture is necessary to support vegetation that birds and other aquatic or semi-aquatic wildlife rely on during breeding, migration, and wintering seasons. Many species of birds in Arizona are wetland dependent, including those that rely specifically on a shallow source of water for foraging, such as the American Bittern (*Botaurus lentiginosus*) and the Snowy Egret (*Egretta thula*). Species that do not forage in the water directly but rely on emergent vegetation for nesting include the Common Yellowthroat (*Geothlypis trichas*) and the Marsh Wren (*Cistothorus palustris*).

Cattail (*Typha spp.*) is an emergent vegetative species present in many wetland areas across the country and the Southwest. The cattail in the borrow pit appears to be a non-native species, yet it

still provides essential habitat features including cover and nesting opportunities for marsh birds. Cattle and increased grazing have altered soil nutrient cycles in some regions and increased nutrient availability in wetlands, often resulting in inflated populations of cattail (USGS, 2020). This trend has been observed in many wetlands in southern Arizona and should be a consideration for borrow pit site managers.

Current Conditions:

Marsh habitat is present in the borrow pit at the lowest elevation areas where intermittent shallow surface water occurs. The marsh is dominated by cattail, and no other native marsh species have been observed. The cattail forest currently provides critical cover and nesting opportunities for seven species of observed birds at Tubac, two of which (Sora [*Porzana carolina*] and Red-winged Blackbird [*Agelaius phoeniceus*]) are listed as an SGCN in Arizona (complete bird list available in appendix 1) (AZGFD, "Appendix D…", 2024).

Red-winged Blackbird *Greg Lavaty*

Habitat Recommendations:

To continue to support cattail affiliates while increasing opportunities to diversify habitat, Tucson Audubon recommends that site managers leave a small cattail population intact while managing for encroachment over time. Refer to Figure 4, which shows the existing cattail-dominated areas and TA's recommended area left intact.

Cattail management can be complex and challenging. Some wetland managers opt for prescribed burns or aquatic herbicides to keep populations at bay. Neither solution is suitable for the conditions present in the pit. The surrounding canopy is dense and the site is too near to residences for burning, while the aquatic zone of the site is too ecologically sensitive for repeat herbicide treatments. Therefore, Tucson Audubon recommends physically removing cattails by cutting them below the surface water height in a series of repeated treatments. Research shows that cattail populations can recess using this active management strategy (Apfelbaum, 1985).

After 1-2 rounds of cattail management with observed success and after water levels have stabilized post-regrading, TA recommends planting native aquatic submerged and emergent vegetation throughout the marsh zone. Integrating sedges (*Carex spp.*), rushes (*Juncus spp.*), and bulrushes (*Scirpus californicus, S. maritimus, S. pungens*) will create a more diverse and higher value marsh habitat in the borrow pit than cattail alone. See Appendix 2 for a complete list of recommended species.

Goals:

- Strategically support a small, designated cattail population and manually control excess cattail outside the designated zone
- Establish a native marsh plant community that provides habitat services for marsh birds, amphibians, pollinators and other wildlife

Open Water Zone

Areas of the aquatic zone free of vegetation provide precious habitat resources in the desert southwest, primarily due to their rarity throughout the region. These areas offer unique foraging resources to many species of birds, especially ducks. Perennial water in a wetland or pond system provides a stopover habitat for migrating birds and other wildlife. It can often support a much higher surrounding plant diversity than areas with lower water budgets. In addition to attracting and supporting wildlife, open water zones are also attractive to birders who can easily observe many species of ducks in the same area.

Current Conditions:

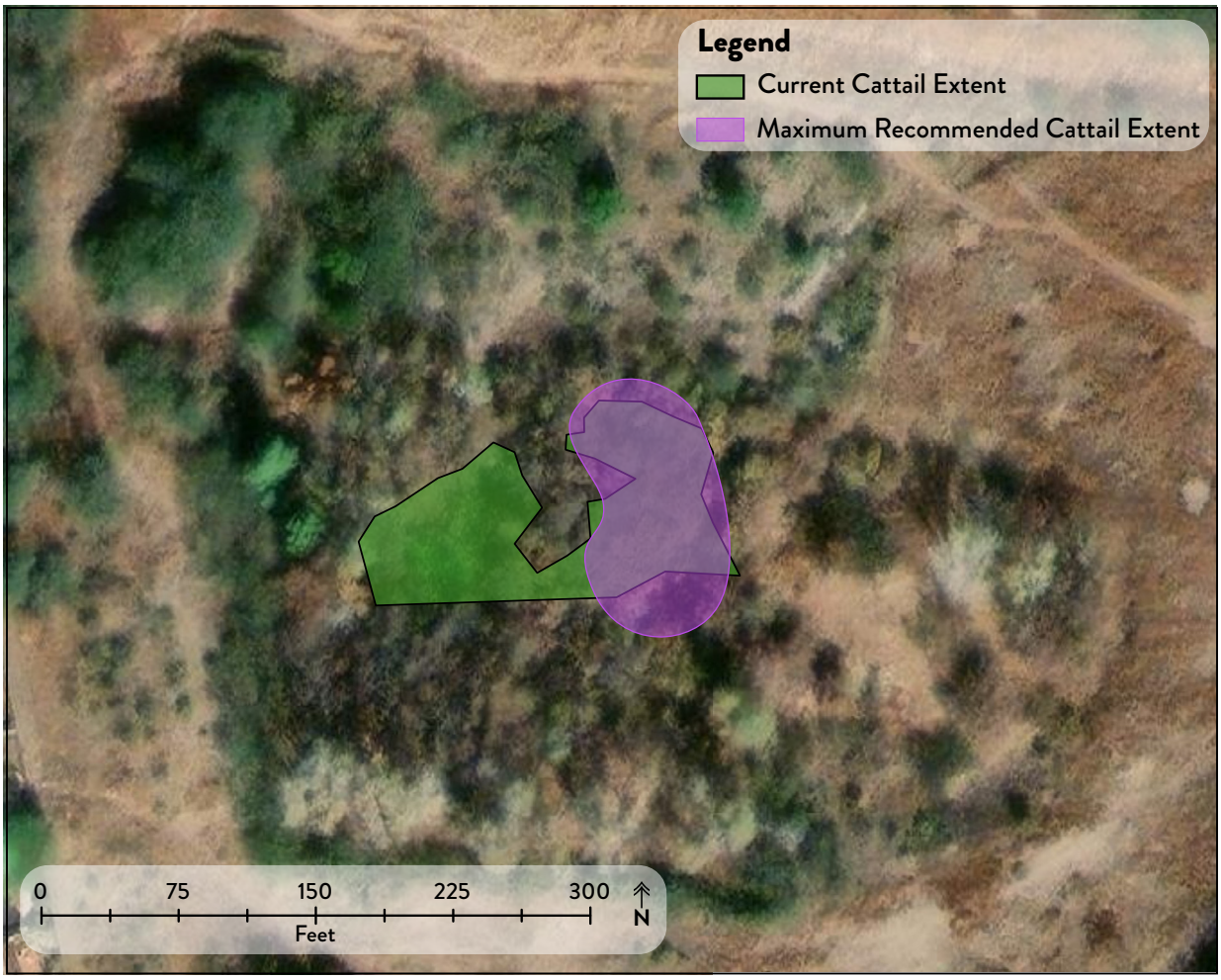


Figure 4: Current and Recommended Cattail Marsh Zone

There is currently very little open water in the borrow pit since areas with standing water are shallow enough to be covered in emergent vegetation. Despite its lack of open water, the borrow pit currently hosts nine bird species that require standing water. Open water is essential for dabbling ducks since they require flooded wetlands 6 - 12 inches deep. Most ducks use this habitat in the winter. Still, it is important to have standing water year-round to support species like Black-bellied Whistling Ducks (*Dendrocygna autumnalis*) who are known to breed in the area in the summer and are listed as an SGCN (see Appendix 1) (AZGFD, "Appendix D…", 2024). This restoration plan hopes to achieve this via strategic regrading in the pit.

Currently, shorebirds are reported very rarely at the borrow pit. However, improved habitat management could increase their presence at this site.

Habitat Recommendations:

Black-bellied Whistling Duck *Alan D. Wilson*

Site managers have the opportunity to enhance habitat value to wildlife by increasing the surface water area present in the borrow pit. The grading plan below details how to achieve both longer standing and increased surface water areas in the borrow pit area. Should the regrading efforts result in a relatively consistent surface water level around the open water and marsh zones, site managers will have the opportunity to plant the toe zone (littoral zone, or the most shallow slope area around the perimeter of a water body) with marsh-adapted native species that will provide transitional habitat between the open water and the adjacent riparian forest. Many species planted here can also be present in the marsh zone to the west of the open water zone, and toe zone planting can be viewed as an extension of marsh planting. Strategic grading (achieving over 4' water depth) will keep toe zone plant life, including cattails, from encroaching into open water areas and will maintain open water for ducks and other waterfowl that are not marsh-adapted.

While open water space is vital for waterfowl, open and unvegetated shore or beach areas adjacent to a water body can provide foraging resources for shorebirds who rely on this habitat during migration. Shorebird habitat is rare in southern Arizona, and there have been very few observations of shorebirds at Tubac borrow pit. Including a shore in this project could provide attractive resources to draw them in; the concept map (Figure 1) details the ideal positioning for the open shore.

Goals:

- Expand total perennial surface water area via strategic grading and invasive tamarisk removal

(see Riparian Forest section below for more information on tamarisk)
- Create an open shore to attract up to 5 new species of shorebirds including Killdeer (*Charadrius vociferus*), Wilson's Snipe (*Gallinago delicata*), and Spotted Sandpiper (*Actitis macularius*), which is listed as an SGCN
- Maintain standing water year round to attract a wider variety of wetland bird species. Maintaining standing water will attract up to 8 new species of ducks during the winter, and create habitat for Black-bellied Whistling Duck (listed as an SCGN) during the breeding season

Spotted Sandpiper *Paul Danese*

Riparian Forest Zone

The riparian forest zone surrounds the aquatic zones of the borrow pit and is dominated by characteristic Fremont cottonwood (*Populus fremontii*) and Goodding's willow (*Salix gooddingii*) trees. Cottonwood-willow gallery forests are one of the most threatened forest types in the United States due to diminishing water resources and other human impacts. The gallery forest often supports a higher diversity of mid and understory plants than the surrounding floodplain and upland zones, including fruit-bearing and other high habitat value plants such as seep willow (*Baccharis salicifolia*), elderberry (*Sambucus nigra*), buckthorn (*Rhamnaceae spp.*), and a host of native annuals which further increases this zone's value to wildlife (Stromberg, 2013).

Since riparian forests occur along vital migratory routes throughout southern Arizona, namely the Santa Cruz and San Pedro Rivers and their tributaries, this forest type is host to myriad wildlife that rely on its large trees for cover, forage, and nesting. Riparian forests are crucial for migratory birds who travel along rivers. The two most notable species that use riparian forests include western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) and Southwestern Willow Flycatcher (*Empidonax traillii extimus*), which are federally listed species that also have critical habitat overlap with the borrow pit area. Other significant riparian-reliant species include Gray Hawk (*Buteo plagiatus*), Western Tanager (*Piranga ludoviciana*), and Yellow-breasted Chat (*Icteria virens*).

In addition to plant and animal diversity, riparian forests traditionally also host diverse age classes of cottonwood and willow trees. Cottonwoods can live for over 150 years, and healthy riparian forests will usually have multiple age classes present, the oldest being further away from the channel or wetland and the youngest being the closest. The presence of multiple age classes creates vertical and horizontal structural diversity in riparian areas and increases their resilience to environmental threats.

Invasive tamarisk (*Tamarix spp.*) have invaded riparian areas throughout the southwest US. Tamarisk has a high water demand and is proven to lower the groundwater table in areas with high populations of the tree. Research also shows that removing adult tamarisk can help recharge the localized water table in an area (Nagler et al., 2021).

Current Conditions:

Gray Hawk *Dan Weisz*

The borrow pit currently has a dense Fremont cottonwood and Goodding's willow dominant riparian forest surrounding it, which, at times, blends into the marsh area. Only one age class of cottonwood trees is present, indicating that flooding patterns in this area may not be conducive to natural cottonwood recruitment. Further, there is a high and codominant presence of mature invasive tamarisk in the riparian forest before treatment in 2024. This depletes the groundwater table and creates a dense canopy cover which likely contributes, in part, to the lack of observed cottonwood recruitment.

Fourteen species of birds currently use the riparian forest zone in the borrow pit. Western Yellow-billed Cuckoos have been documented at Tubac during the breeding season, while Willow Flycatchers use the site during fall migration. These are notable because some of the individuals migrating through may belong to the federally listed southwestern subspecies.

Willow Flycatchers and Yellow-billed Cuckoos rely on cottonwood-willow gallery forests with healthy midstories for habitat, but native midstory and understory are currently absent from the riparian forest zone in the borrow pit. This absence could be attributed to natural flooding and wash-out patterns and may not indicate mismanagement. Nonetheless, site managers have an opportunity to plant and seed this zone heavily and increase habitat value for these endangered birds while also supporting ecosystem resilience and overall habitat value.

Enhancing the quality and resilience of the riparian forest here will not only positively impact at-risk species, but it could also unlock additional funding opportunities. Refer to the applicable grants section below for information on grants and funding opportunities.

Habitat Recommendations:

Tucson Audubon recommends that, over a 5-year project, site managers facilitate the establishment of a new generation of riparian forest species (most notably cottonwood and willow trees) to improve vegetation structure and resilience. This will be helped by the removal and continued suppression of invasive tamarisk trees, subsequent higher water availability, and opened canopy. Along with improving habitat, it will also create a long term pole and whip source for future planting and restoration. Alongside these gallery forest improvements, TA also recommends heavy container planting to improve both structure of and bio-diversity in the riparian zone.

TA expects some senescence of existing cottonwoods and Goodding's willows due to regrading for wetland construction. Some trees may be exposed to prolonged or permanent periods of standing water at their trunk, whereas others could experience less water than they are accustomed to.

This makes facilitated succession all the more critical. Poles and whips can be harvested from existing adult trees onsite or from nearby locations, depending on land ownership and access. One cottonwood tree, which stands alone in the middle of the primary excavation site, will be lost and should be thoroughly harvested for poles in the dormant season before or alongside excavation activities. Poles can be planted immediately or stored with their feet in water for up to 4 weeks before being planted. Both cottonwoods and willow trees have demonstrated high survival rates through dormant-season pole plantings (Rivers Edge West, 2014).

Maintaining a healthy mature stand of cottonwoods and willow trees is essential for nesting Western Yellow-billed Cuckoos, as they prefer canopy heights of 17-100 feet. They also prefer a shrubby understory of 3-20 feet. During migration, Southwestern Willow Flycatchers are found in diverse habitats, including cottonwood and willow canopies. They also will use understories composed of seep willow, coyote willow (*Salix exigua*), and saltbush (*Atriplex spp.*).

Since no healthy midstory or understory is present in the riparian forest, site managers should heavily plant and seed the area with native riparian-adapted plants to maximize its habitat value potential. While the first year of this project should focus on invasive species management and regrading, site managers should begin plant grow-outs and native seed collection arrangements with partner organizations and nurseries during this first phase. Recommended native plants for this zone include Goodding's willow, yew-leaf willow (*Salix taxifolia*), Arizona sycamore (*Platanus wrightii*), western soapberry (*Sapindus saponaria*), seep willow, arrowweed (*Pluchea sericea*), and golden currant (*Ribes aureum*). See a complete list of recommended plants in Appendix 2. Most species recommended can be obtained as container plants, propagated from cuttings from adults, or seeded.

Figure 5: Stand of riparian trees in the borrow pit *Kari Hackney*

While poles and long whips are planted directly into groundwater and do not require irrigation, container plants should be irrigated for one to two years to ensure successful establishment. An irrigation system can likely be built off of the well and tank system in the northeastern corner of the borrow pit site, depending on ownership and ability for automation. The system will require very little human oversight if set up with a timer. Site managers can adjust planting practices to accommodate water use that works for the site - if less irrigation is preferred, focus more heavily on pole plantings; if water is highly available, then heavily employ container plantings in addition to poles, for example. This decision should be made early in the project so site managers can begin an appropriately sized plant grow-out with a partner nursery if desired.

Goals:

- Remove invasive tamarisk and, as a result, facilitate higher groundwater table and increased surface water
- Facilitate cottonwood and willow succession via pole and whip plantings around the perimeter of the surface water and immediately up-slope from existing populations
- Improve vertical biotic structure by adding a midstory and understory to manage for federally listed species such as western Yellow-billed Cuckoo and Southwestern Willow Flycatcher while improving habitat value for many other species that use the site
- Expand the overall area of the riparian forest zone and extend it around most of the perimeter of the new open water zone

Mesquite Bosque/Semi-desert Grassland

Mesquite bosque refers to a habitat zone dominated by mesquite trees (*Prosopis spp.*) mature enough to be single or multi-trunked, as opposed to shrubbed, due to their root systems' access to groundwater. They usually occur in areas with a stable ground water table 5-50 ft below the surface. Mesquite bosque habitat was once widespread in floodplains across the southwest, often spanning widths of 1-2 miles along the lower reaches of southwestern rivers. Habitat fragmentation, human impact and development, and overuse of groundwater throughout the southwest have left mesquite bosques to just remnants of their former population.

Often occurring adjacent to or as an upland continuation of riparian forest zones, mesquite bosques provide similarly important habitat services to migrating and resident wildlife. Mesquite seeds will blanket the ground when they fall in summer, improving soil and providing forage for birds. Bosques often host complex and diverse mid and understories, providing wildlife ample nesting, cover, foraging, and hunting opportunities. Further, mesquite trees are in the legume family, meaning their roots fix nitrogen into the soil, often a limiting nutrient in lentic (non-actively moving) water systems, such as in the borrow pit (Johnson, 2020).

Lucy's Warbler *Joan Gellatly*

Semi-desert grasslands, found in desert regions between 3600' to 4900' elevation, are ecosystems dominated by perennial grasses with scattered groves of trees and shrubs. Historically sustained by wildfire regimes that prevent excessive shrub encroachment, these grasslands face significant threats from human activities and climate impacts, including drought, cattle grazing, invasive species, mesquite intrusion, and soil erosion—factors that often interact to compound habitat degradation. According to Arizona Game and Fish ("Semi-Desert Grasslands," 2024), less than 10% of this habitat type worldwide retains its predominantly native grasses with low shrub density. The Apache Highlands ecoregion, encompassing parts of Arizona, New Mexico, and northern Mexico, contains a critical portion of these grasslands (Gori and Schussman,

2005). These ecologically valuable habitats support diverse plant and animal species uniquely adapted to this environment.

Current Conditions:

The upland or floodplain areas surrounding the borrow pit and riparian forest are currently a mixed habitat of early-succession mesquite bosque and semi-desert grassland. The bosque is dominated by mesquite, graythorn (*Ziziphus obtusifolia*), Acacia (*Senegalia spp., Vachellia spp.*), and desert broom (*Baccharis sarothroides*). Grassland areas boast many valuable native species including grama grasses (*Bouteloua spp.*), spidergrass (*Aristida ternipes*), green sprangletop (*Leptochloa dubia*), and threeawns (*Aristida spp.*), but are also mixed with some non-native invasive grass, predominantly Bermuda grass (*Cynodon dactylon*) and johnsongrass (*Sorghum halepense*). Fortunately neither of these are codominant. Without active restoration, these invasive grasses could continue to spread and increase wildfire threat to the adjacent homes and habitat. Many areas on the uppermost terrace of this site are denuded or barren, and this presents an opportunity for native grassland plant establishment.

The mesquite bosque habitat zone in the borrow pit is currently used year-round by 49 bird species. Trees in this area with a trunk diameter greater than 15 centimeters provide woodpeckers with opportunities to excavate cavities for nesting. Consequently, TA recommends preserving individuals with higher trunk diameters while encouraging growth over time of those with thinner trunks. These woodpecker-created cavities are used by secondary cavity nesters like Lucy's Warbler, Ash-throated Flycatcher, and American Kestrel. Smaller birds that use this habitat type can also become prey for three species of raptors observed at this site. The mesquite bosque is also used by many species as a stopover site during spring and fall migration, including insectivorous and fruit-eating birds. Hence, planting native vegetation that provides foraging items during these times could prove to be high value. Grassland areas surrounding the borrow pit also support a variety of birds, especially sparrows like the Lark Sparrow and Rufous-winged Sparrow, which rely on grasslands for foraging.

Habitat Recommendations:

The early-succession mesquite bosque present on site will be facilitated by predicted increased groundwater availability as a result of actions in this project, including regrading, strategic diversion of effluent water, and removal of invasive tamarisk trees.

The bosque is dominated by native species and is maturing independently. As a result, container planting is unnecessary to achieve a healthy ecosystem. However, additional plants added to the western section of the bosque area (Figure 1) could provide extra privacy to adjacent landowners while also improving the structural diversity of this patch. Plants here need to be irrigated for one to two years until they are established, with the irrigation system for the riparian zone expanded to include this section.

If bosque container planting is preferred, site managers should focus these efforts along the western side of the borrow pit identified in the concept map (Figure 1). While a very early-succession bosque exists beyond that section, that zone is functioning more as a healthy grassland with a diversity of native species present. Instead of container planting, TA recommends that site managers remove non-native invasive grasses while allowing native grasses to populate naturally. Further, if left untouched, young mesquite trees currently present will mature to bosque size in time. Site managers could consider maintaining this area long-term as a grassland by removing encroaching mesquite trees from the grassland area (Figure 1).

Some areas on the upper terrace are barren or denuded, which presents an opportunity for establishing semi-desert grassland that will improve habitat resources in the upland zones while stabilizing soil in barren areas. Giant sacaton (*Sporobolus wrightii*) improves and stabilizes soil, provides wind cover to nearby plants, presents wildlife cover and forage opportunities, and has demonstrated great success with dormant-season splitting and transplanting. TA recommends planting giant sacaton either in dense stands or intermixed with other grassland species, including sixweeks grama (*Bouteloua barbata*), Arizona foldwing (*Dicliptera resupinata*), and vine mesquite (*Panicum obtusum*) in any denuded areas or areas in need of higher vegetation cover.

A recommended plant list is available in Appendix 2 for both bosque and grassland species. The bosque list includes fruit-bearing shrubs such as wolfberry (*Lycium spp.*), graythorn, pigeonberry (*Rivina humilis*), and Mexican elderberry (*Sambucus nigra*), while grassland species include vine mesquite, gramas, milkweeds (*Asclepias spp.*), passionflower (*Passiflora spp.*) and clematis (*Clematis drummondii*). These species will support pollinators and other wildlife while improving habitat resilience.

Hooded Oriole *Dominic Sherony*

Grassland species planted from containers or splits will require irrigation for the first 1-2 years until establishment, which could be achieved by expanding the irrigation system. Many grassland species will germinate successfully from seed, so site managers could seed and rake denuded areas or areas recently treated for invasive grasses with a native seed mix. Seeding before monsoon season may negate the need for irrigating or providing supplemental water to these areas, depending on how much rain the area receives that year.

Goals:

- Maintain mesquite bosque health through continued invasive species management and increased groundwater availability for plants.
- Site managers and landowners have the option to plant dense native mid and understory plants to improve privacy from borrow pit visitors while improving ecosystem health
    - » If bosque planting is pursued, plant fruiting vegetation to increase the quality of fall and spring stopover habitat for migrating birds. This would benefit listed SGCN species such as the Hooded Oriole (*Icterus cucullatus*), the Bullock's Oriole (*Icterus bullockii*), and the Hermit Thrush (*Catharus guttatus*).
- Maintain healthy grassland while establishing native grasses in barren sections.
- Seed wildflowers and other pollinator species to achieve blooms throughout the year.

Figure 6: Sweetwater Wetlands in Tucson, Arizona is a nearby reference site featuring open water, marsh and riparian forest *Kari Hackney*

Stormwater Harvesting

Goal:

- Increase hydrologic budget to lengthen availability of aquatic habitat.

Recommendations:

The wetland's hydrologic budget can be increased by collecting stormwater from the drainage to the north. A swale currently exists in an ideal location for collection and conveyance, but current grading makes it non-functional. The recommended stormwater swale will reduce the frequency and severity of flooding at Valley Verde Ranch by increasing the primary channel's drainage capacity by up to 25%. The drainage originating from the housing development immediately west of the borrow pit is a potential stormwater source to increase the hydrologic budget of the wetland (the "proposed drainage" in fig. 1). Minor grading is needed to redirect the water toward the borrow pit. A rolling dip across the road, in conjunction with excavating a minor swale east of the road, would be effective while still ensuring the access road is suitable for vehicles.

Low Impact Development Standard Details (Skidar, 2022), adopted by the City of Tucson and Pima County, provide construction standards for stormwater harvesting features. Those standards are implemented in the following construction recommendations. Excavate the swale to a depth of

12” lower than the existing channel, with a gradual slope until it reaches the discharge. Given the potential flows of the drainage, lining the channel with 4-6” angular rock will armor the swale against erosion. The swale inlet is currently 22” above channel grade, with the discharge at 10” below the channel. The 200’ long swale should have a grade of 2%, with 3-5% acceptable for short stretches. This requires a drop in grade of 4’ and a finishing elevation of 5’ lower than the drainage elevation. The base of the swale should be 4’ wide with a 3:1 width-to-height ratio for the berm edges, resulting in a swale that widens from 10’-30’ from north to south.

The discharge of the swale is also conveniently located at the discharge for the wastewater. The area is severely eroded and will require reconstruction and armoring to protect against future erosion. A Zuni bowl is an ideal structure for this purpose, and it also provides a splash pad and sediment trap that can be easily maintained by clearing accumulated sediment. Directions for Zuni bowl construction can be found on the Quivira Coalition’s website. A one-rock dam 10 feet downstream of the Zuni bowl will help prevent erosion and reduce the flow rate as water enters the wetland.

Current elevations at the site indicate that the diversion swale will function as an overflow under all but the most extreme (and unlikely) conditions. A secondary overflow may be warranted if monitoring suggests the wetland is reaching capacity. Due to the area’s visitation levels, a subsurface overflow drainage pipe reinforced with rock is preferred. Refer to Figure 7 for the recommended location.

Grading Plan

Goals:

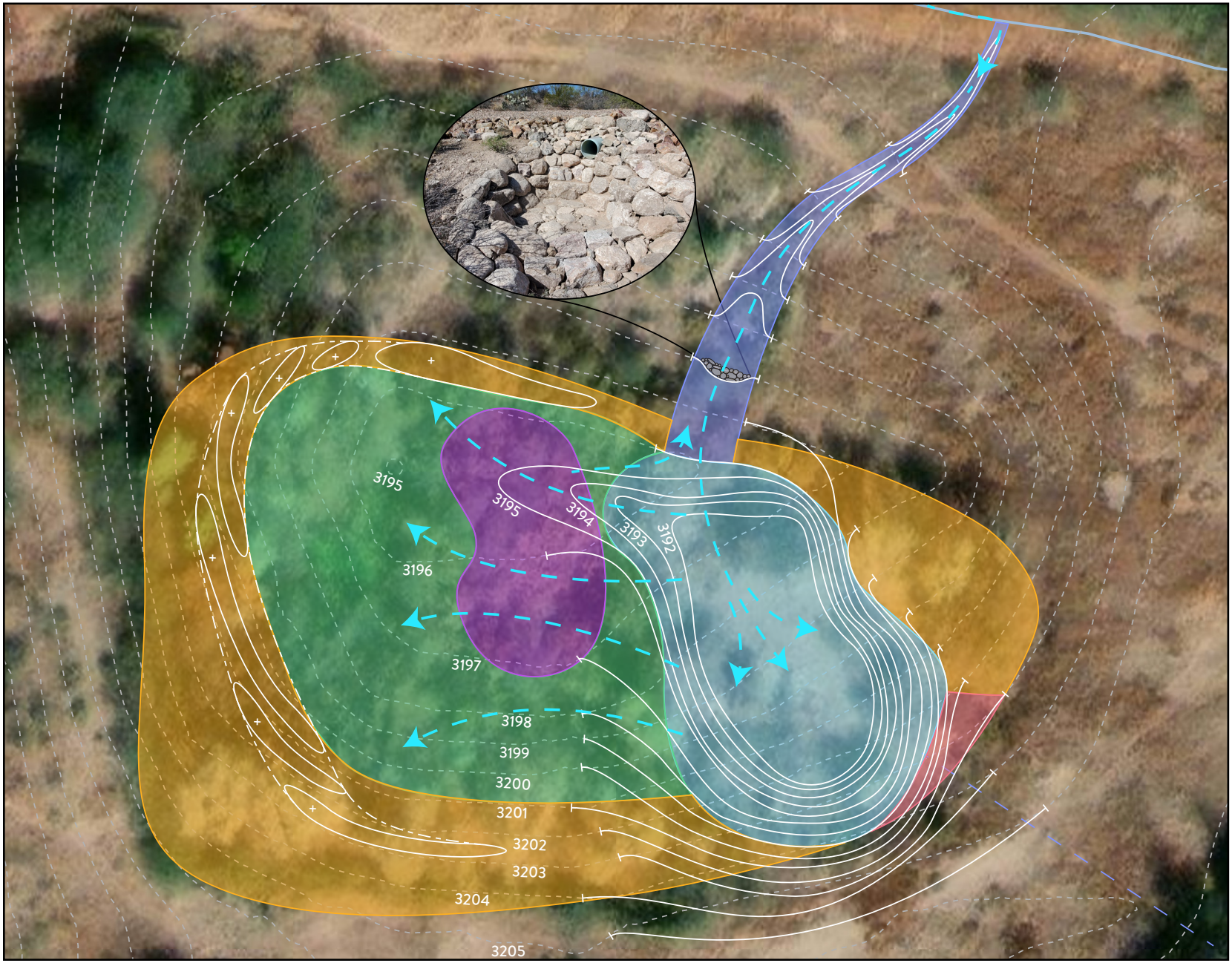
- Establish open water habitat and prioritize the distribution of water resources to this habitat zone
- Protect the viability of the riparian forest habitat by elevating its perimeter to reduce exposure to standing water
- Minimize the high maintenance costs associated with wetland management by limiting the ability of the cattail population to spread

Recommendations:

Thoughtful design of open-water habitats will support additional species at the site and facilitate the management of the existing cattail population. Unknown hydrologic budgets, fluctuating groundwater levels, and uncertain future climatic conditions pose unique challenges in creating the desired wetland state. Utilizing an adaptive management framework and allocating the required long-term management funds will be essential to meeting the borrow pit site managers’ primary stated goals.

Significant cattail infestations are present at nearby reference sites, including Las Lagunas de Anza Wetlands, Sweetwater Wetlands, and El Rio Preserve, with each land manager having varying degrees of success in managing the populations. Cattail populations are most effectively managed by creating an environment in which the species is unable to reproduce. Although cattails primarily spread via rhizomes, their prolific seed production contributes to their invasive nature. Shading out the seeds through deep water is a proactive approach to managing cattails, warranting further

Figure 7: Tubac Borrow Pit Grading Plan



Legend

- Cattail Marsh
- Open Shore
- Riparian Forest
- Diversion Swale
- Marsh
- Open Water
- Wash
- Existing Contour Line
- Contour Changes
- Optional Secondary Overflow
- Water Flow
- Zuni Bowl

0 50 100 150 200 Feet

N

Zuni Bowl photo credit *Kari Hackney*

excavation to deepen the wetland as a primary objective for future cattail management. Literature varies on recommended water depths required, ranging from 3'-8'. Excavating the borrow pit's open water habitat zones to depths of 4' will safeguard against cattail encroachment while ensuring safe conditions for visitors.

The ephemeral nature of current aquatic resources will pose challenges to maintaining 4' depths year round, which would allow cattail encroachment. Additional grading changes throughout the site will minimize the duration of low water levels and increase the overall hydrologic budget through stormwater harvesting. Gentle grading from the primary intake of the wetland, located at the Zuni bowl, to the closest edge of the open water zone, will prioritize water distribution to the open water zone before it overflows into the rest of the site. Prioritizing water to this reduced footprint should extend the duration of the water's presence in the borrow pit, as water loss due to evaporation and permeation will be significantly reduced. Strategically raising the edges of the riparian forest habitat zone by 1' (or greater as needed) will concentrate water in the desired marsh and open water zones while also reducing the exposure of the trees to periods of standing water, thus supporting their long-term health.

Grading adjustments may be necessary as part of an adaptive management strategy (or significant upfront costs can be expended for a hydrological study and civil engineer). Unknown and fluctuating groundwater levels affect site design and restoration strategies. Excavation at the borrow pit was initially halted due to reaching groundwater. Groundwater data for the closest monitoring well, just north of Tumacacori National Historical Park, does not become available until over a decade after the borrow pit excavation. However, available data (Figure 8) shows that levels have been relatively stable over the past two decades, with current groundwater levels fluctuating regularly between 11'-14', occasionally exceeding 14' as the well's data logger does not register data beyond depths of 12.3', relying on quarterly manual readings instead. The water table reliably drops during the summer before monsoon rains arrive, which will need to be an accepted drought period for the wetland.

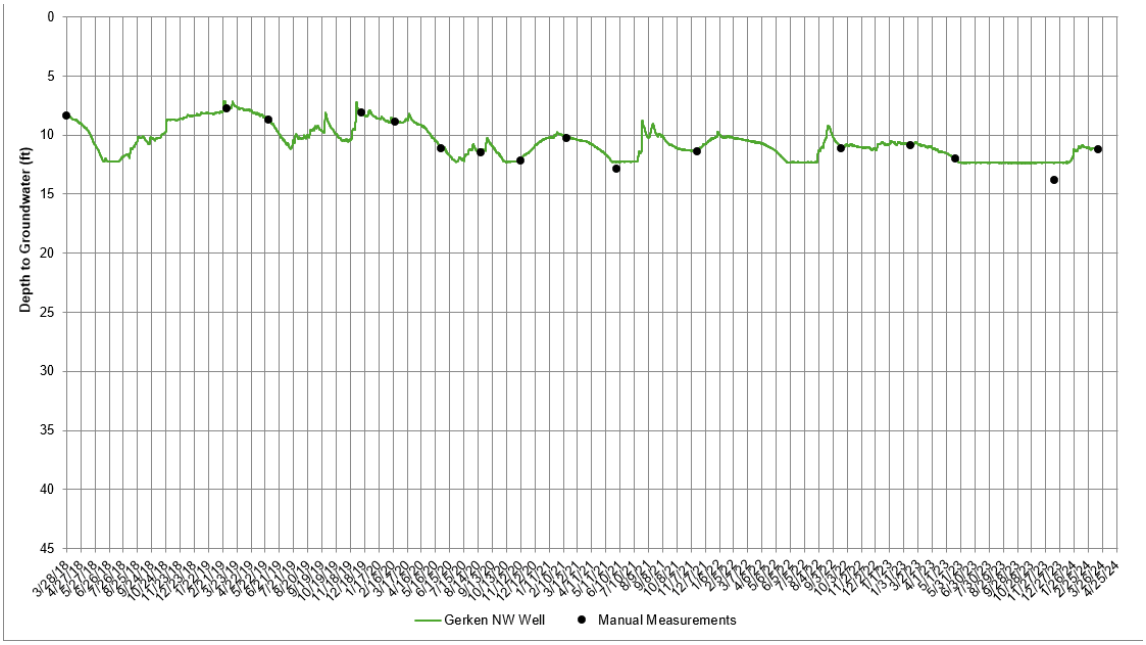


Figure 8: Groundwater Monitoring at Gerken NW Well *Data courtesy of the Sonoran Institute*

Digging test holes with heavy equipment during the dry season will be essential in determining seasonal groundwater availability at the site and deciding if excavation deeper than 4' is warranted to achieve year-round standing water. Test holes were hand-dug during a visit in January 2024, which revealed standing water just inches below dry ground on the east end of the pit. The fluctuating groundwater levels eliminate the feasibility of utilizing a pond liner to lengthen periods of standing water, as this can lead to liner failure.

The grading plan above (Figure 7) is not a surveyed construction plan but rather a guide that should be fit in the field before construction. As designed, the open water zone will require approximately 67 days to fill from the Baca Float discharge alone. Once filled, the daily discharge should be adequate to keep the 4' level despite an estimated 7,000 gallons in daily water loss due to evaporation and permeation. Securing additional aquatic resources will be critical to establishing the marsh habitat.

To minimize disturbance to nearby residents, all site activities involving heavy equipment should be conducted during the dry season and summer when many residents are away, and the residents should be informed in advance of the scope and timing of such activities

Invasive Plant Species Treatment

Overview:

Controlling invasive plant species is essential to maintaining healthy habitats at Tubac borrow pit. Invasive plants can be defined as any plant that is non-native to the ecosystem and is likely to cause economic or environmental harm or harm to human health. Due to their exotic nature, invasive plants do not have natural checks and balances to keep them from spreading. They can easily outcompete native plants, diminishing an area's biodiversity and habitat value. The primary invasive plants documented at Tubac borrow pit by TA fall into two categories:

Woody species (trees):
- African sumac (*Searsia lancea*, formerly *Rhus lancea*)
- Salt cedar (*Tamarix sp.*)

Grasses and Forbs:
- Buffelgrass (*Cenchrus ciliaris*)
- Bermuda grass (*Cynodon dactylon*)
- Johnson grass (*Sorghum halepense*)
- Yellow bluestem (*Bothriochloa ischaemum*)
- Russian thistle, often called tumbleweed (*Salsola tragus*)

Tucson Audubon, along with its partners in the Sonoran Desert Cooperative Weed Management Area (which includes the University of Arizona and multiple federal and local agencies), believes that careful and precise herbicide application is an effective strategy within an integrative pest management approach. Herbicide bypasses the downsides of manual removal, such as prohibitive labor costs, increased soil erosion, and negative impacts on native vegetation, animals, and insects.

For more information on TA's herbicide philosophy, please see the Invasive Plant Management Fact Sheet available on its website.

An Arizona Pest Management Department (AZPMD) Certified Applicator should supervise all herbicide applications.

Woody Species:

All invasive trees should be felled and low-stumped to 1" above the ground. Herbicide cut-stump treatments should be applied to the cambium of the stump within 5 minutes of felling. Treat stumps with Triclopyr at full strength (USDA, 2010; Pleasant Valley Conservancy, 2023). Treatments are most successful in late fall when trees are entering dormancy for peak effectiveness, though follow-up treatments will be inherently necessary over the next 2-3 years.

Grasses and Forbs:

Treat all invasive grasses and forbs using a mix of 4% glyphosate + Activator90.

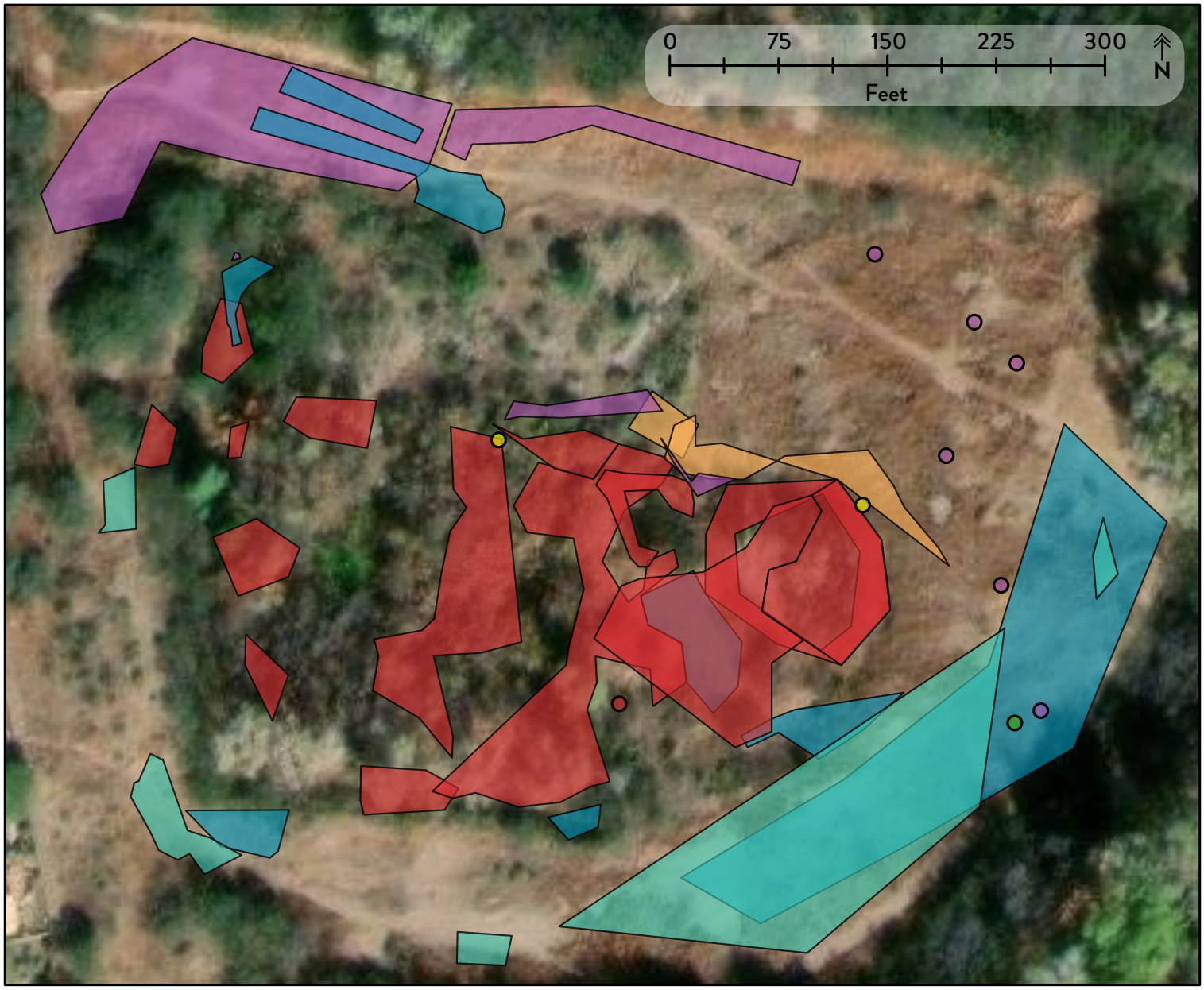
For best results, treat grasses and forbs when green and growing, typically after rainy seasons. Treat all grasses and forbs 3-5 times each growing season to maximize efficacy. Space treatments apart by 2-4 weeks. Five years of treatment are recommended to fully eradicate the existing invasive seed bank.

Due to the abundance of Bermuda grass within the borrow pit area, consider using multiple strategies to manage the population. Prioritizing chemical treatment of high-traffic areas will allow for the most efficient use of funding. High-traffic areas are within 10 feet of the access road or walking paths. Cover Bermuda grass monoculture outside high-traffic areas with cardboard or cellulose fabric. Use large pieces of cardboard or fabric and ensure they fully overlap with no gaps. The coverage prevents photosynthesis, causing the Bermuda grass to die. Cardboard and cellulose will both biodegrade over time (Hentges, 2022).

Monitoring and Maintenance:

Continued monitoring for regrowth and retreatment as necessary is essential to effective invasive plant management. In between chemical treatments, manual removal of buffelgrass, yellow bluestem, and Russian thistle can increase the overall efficacy of the treatments. When manually removing invasive grasses, bag and discard any seed heads to prevent further spread.

Figure 9: Map of Invasive Plants Present at Tubac Borrow Pit



Legend

Large Infestations

- *Cenchrus ciliaris*, Bufflegrass
- *Cynodon dactylon*, Bermuda grass
- *Salsola tragus*, Russian thistle
- *Sorghum halepense*, Johnson grass
- *Tamarix spp*, Salt cedar

Small Infestations

- *Bothriochloa ischaemum*, Yellow bluestem
- *Searsia lancea*, African sumac
- *Sorghum halepense*, Johnson grass
- *Tamarix spp*, Salt cedar

Schedule and Budget for Restoration Activities

Schedule

Year 1

- Invasive species treatment phase 1
  - » woody species (remove and cut-stump treat all trees)
  - » grasses/forbs (3-5 treatments spaced 2-4 weeks apart)
- IPM for Bermuda grass
- Cattail treatment phase 1
- Test dig to determine access to groundwater levels during summer
- Excavate and construct stormwater swale
- Excavate open water pit and raise perimeter elevation of the riparian forest.
- Begin grow-out of desired container plants with partner nursery or organization
- Begin native seed collection process with partner organization

Year 2

- Install fencing around perimeter of wetland to protect efforts from cattle trampling
- Monitor water levels for further grading changes or construction of secondary overflow
- Early year/dormant season cottonwood pole and willow whip planting
- Invasive species treatment phase 2
  - » woody species retreatment
  - » grasses/forbs (3-5 treatments spaced 2-4 weeks apart)
- IPM for Bermuda grass
- Mesquite bosque container planting (if irrigation is possible)
- Cattail treatment phase 2

Year 3

- Monitor water levels for further grading changes or construction of secondary overflow
- Early year/dormant season cottonwood pole and willow whip planting round 2 (as needed)
- Planting – Poles or transplants first depending on schedule/seasonality
- Invasive species treatment phase 3
  - » woody species retreatment (if necessary)
  - » grasses/forbs (3-5 treatments spaced 2-4 weeks apart)
- Container planting round 1
- Seeding round 1
- Adaptive management
- Cattail treatment phase 3

Year 4

- Container planting round 2
- Seeding round 2 (as needed)
- Maintenance and monitoring

- Invasive species treatment phase 4
  - » grasses/forbs (3-5 treatments spaced 2-4 weeks apart)
- Adaptive management
- Cattail treatment phase 4

Year 5

- Invasive species treatment phase 5
  - » grasses/forbs (3-5 treatments spaced 2-4 weeks apart)
- Adaptive management
- Cattail treatment phase 5

Budget

Activity	Materials	Material Cost	Labor Cost	Travel	Total
Invasive Plant Treatment of Grasses & Forbs (5 years)	chemical, PPE	$7,200	$62,210	$1,995	$71,405
Invasive Plant Treatment of Woody Species (3 years)	chemical, PPE, chainsaw supplies	$1,600	$35,200	$1,085	$37,885
Cattail Management	dump fees	$240	$22,080	$700	$23,020
Wetland Construction and Permits	equipment rentals	$33,020	$87,840	$2,175	$123,035
Stormwater Swale Construction	equipment rentals, rock	$16,000	$86,400	$2,130	$104,530
Revegetation & Maintenance	irrigation supplies, plants, seed	$17,920	$60,770	$1,875	$80,565
Fencing	barbless wire, t-posts, fence stays	$2,570	$14,000	$350	$16,920
Optional Adaptive Management	contingency for adaptive management activities	-	-	-	Minimum $15,000
				Project Total	**$472,360**

Compliance

Santa Cruz County Permits:

Land Use and Building Permits: Ensure the project aligns with county zoning regulations and obtain any necessary land use permits. Construction of fencing and new trail systems could trigger the need for a building permit.

Grading Permit: A grading permit is required in Santa Cruz County for any grading exceeding 50 cubic yards.

Floodplain Use Permit: Floodplain Use Permits are required for any excavation at the borrow pit or northern drainage as the area is within a designated floodplain of the Santa Cruz River.
TA recommends inquiring with Santa Cruz County and other local government/compliance offices for additional permit requirements this plan may not have captured.

State Compliance and Permitting:

Arizona Pollutant Discharge Elimination System (AZPDES) Permit: This project could require an AZPDES permit due to its use of effluent and runoff water to supply the wetland. AZPDES permits are required for any project that discharges stormwater runoff into the jurisdictional Waters of the United States (WOTUS).

Arizona State Historic Preservation Office (SHPO) Cultural Resource Consultation: SHPO consultation could be necessary if the project triggers section 106 of the National Historic Preservation Act (NHPA) or the Arizona's State Historic Preservation Act due to its potential to impact areas of historical or cultural significance. Depending on the relevant funding source for a project, it is likely that SHPO consultation will be necessary due to the excavation recommended in this plan.

Federal Compliance and Permitting:

National Environmental Policy Act (NEPA): Environmental Assessment, Environmental Impact Statement, or Categorical Exclusion determination: Will be required to meet one of the three tiers of review depending on the scale and likelihood of significant impact to the environment the relevant federal agency determines the project to be. NEPA can be an expensive and lengthy process and should be considered before pursuing federal funding.

Section 404 Permit (Clean Water Act): Required for activities involving the discharge of dredged or fill material into WOTUS, including wetlands. An additional permit from the Army Corps of Engineers (USACE) may be required under Section 404 of the Clean Water Act. The adjacent Santa Cruz River is designated WOTUS, and the need for a permit will be at the discretion of the USACE but could be jurisdictional due to its proximity to the river. The northern drainage is not designated WOTUS but may fall within the boundary of the Santa Cruz River.

Endangered Species Act (ESA) Compliance: Regardless of the funding source, ensure project activities will not negatively impact any federally listed endangered or threatened species. Due to the presence of federally listed species and critical habitat overlap onsite, site managers will also be required to demonstrate ESA compliance in any NEPA review process.

Migratory Bird Treaty Act Compliance: Any NEPA review process will require a demonstration that this project will not harm or unintentionally 'take' any of more than 800 protected migratory bird species. Further, it is illegal to 'take' migratory birds under the MBTA, no matter the funding source of one's project.

Recreational Trails Program (RTP) Compliance: Relevant if using RTP funds for trail installation, ensure compliance with program requirements and environmental regulations.

Adaptive Management Plan

Invasive/Nuisance Species

Mosquito Management: Wetland restoration that implements habitat considerations for birds, frogs, fish, and aquatic insects rarely results in breeding mosquito populations due to natural predation. Enhancing habitat for these predatory species is a central component of the plan. Prioritizing open water and having an ephemeral wetland will also reduce mosquito breeding habitat. If mosquito populations do establish, more extraordinary measures can be taken to support specific habitat types. Additionally, creating movement in the open water areas with solar-powered aerators will deter mosquitoes from breeding.

Cattail: Cattail will likely need continual management in the borrow pit area into the future. While initial construction will achieve water depths throughout most open water areas that are too deep for cattails to survive, sedimentation over time could result in decreased water depths that are hospitable to cattails and a worsened infestation. Dredging open water areas to achieve depths greater than 4' may become necessary in time or may need to be performed on a schedule into the future. Further, site managers can perform various other control functions, detailed in the above sections, to keep cattail populations at bay. Still, they may have to adapt their approaches based on the unique cattail, funding, and personnel situation in a given year.

Water lettuce: Water lettuce (*Pistia stratiotes*) is an aquatic plant resembling an open head of lettuce which forms thick mats atop bodies of water. While the native range of the plant is unclear, water lettuce is considered invasive in multiple states across the US (USFWS 2015, Texas Invasives 2024). Water lettuce is a popular aquarium plant and is often introduced into new environments when aquarists improperly dispose of aquarium contents into waterways. While water lettuce has not yet been observed at the Tubac borrow pit, it may become problematic once water is present in the borrow pit year-round due to its rapid propagation. Consider installing signage warning borrow pit visitors not to dump pets and plants into the borrow pit area. Water lettuce infestations can be managed using contact herbicides such as Diquat (Texas A&M Extension, 2020). All herbicide treatments should be supervised by an AZPMD Certified Applicator.

Giant reed: Giant reed (*Arundo donax*) is a large, bamboo-like plant in the grass family. It spreads rapidly via rhizomatic growth and is listed as a top 12 invader by the Southwest Vegetation Management Association. Giant reed is highly flammable, creates dense stands which inhibit growth of native plants, and has no documented habitat value for wildlife. While it has not yet been observed at the Tubac borrow pit, giant reed is very common in the Santa Cruz river watershed and is documented within one mile of the site. Giant reed infestations can be controlled with consistent use of a systemic herbicide such as glyphosate (Sonoma Ecology Center, 1999). All herbicide treatments should be supervised by an AZPMD Certified Applicator.

Tree of heaven: Tree of heaven (*Ailanthus altissima*) is an invasive tree originating from Asia. Its common name stems from its rapid growth and tall height (up to 80 feet). Tree of heaven spreads rapidly via seeds, suckers, and root sprouts, outcompeting native vegetation by forming dense stands of clones. Additionally, it produces allelopathic compounds which further inhibit germination of native plants. Tree of heaven has not yet been documented at the borrow pit but is a known invader of the Santa Cruz River watershed. As such, site managers should closely monitor the site for tree of heaven saplings. It is extremely resistant to manual removal methods, rapidly resprouting from stumps and damaged roots. Instead, tree of heaven infestations typically require an integrative pest management approach involving a combination of chemical treatment methods. (USDA, 2014). Should tree of heaven invade Tubac borrow pit, consider developing a multi-faceted treatment plan with an AZPMD Certified Applicator.

American Bullfrog *Simon Pierre Barrette*

Bullfrogs: The American Bullfrog (*Lithobates catesbeianus*) poses a significant threat to native species in Southeast Arizona. While native to the eastern United States, this species is considered invasive in the West. The frogs are known to consume native amphibians, reptiles, and even birds. Bullfrog eradication is costly and warrants immediate action upon detection. A variety of strategies, including netting, spotlighting, and pellet guns, are required to effectively remove populations.

Cattle intrusion: While cattle are not regularly present in the borrow pit area at the time of this writing, they have occasionally entered the area beyond established fencing and could become an issue in the future. Should this occur, site managers may consider building wildlife-friendly (barbless) fencing around areas they wish to protect. This could include fencing around actively managed container and pole planting areas and sensitive semi-desert grassland and mesquite bosque areas they wish to protect. Site managers should ensure cattle fencing does not interfere with desired human use of the site (e.g., impeding trails or viewpoint areas).

Wetland Adaptive Management

Water quality: Annual water quality testing is recommended to monitor nutrient levels, specifically nitrogen and phosphorus. Nutrient loading adversely impacts wetlands by contributing to excessive algae and plant growth. Marsh vegetation plays a critical role in nutrient cycling. If monitoring results

demonstrate high levels of nutrients, a reduction in the open water footprint is warranted to divert water into the marsh habitat zone.

Liner: A liner will eliminate water loss due to infiltration but is not recommended if the water table level exceeds the lowest elevation in the open water habitat. Liners add significant cost to a project but may support the overall goal of having water year-round.

Sedimentation: The stormwater swale will accumulate sediment and require regular maintenance. Monitor sediment levels after winter and monsoon rains to determine if removal is necessary to maintain optimal functionality.

Miscellaneous

Undesired site uses: While the open water area is not intended for use by humans and pets, situations of undesired usage could arise especially in the "open shore" area where access to water will be most open. While open shore provides important habitat services for many waterfowl and other birds, site managers could plant this area to dissuade non-avian users. However, TA does not anticipate this will be a big issue at the site because the designated open shore area is positioned so the bank will be steep and unsuitable for lounging or recreating on (refer to figure 7, grading plan).

Upland habitat zones: Should site managers opt not to pursue planting or seeding activities in the upland zones of the borrow pit (mesquite bosque and semi-desert grasslands), the areas could require long-term adaptive management to ensure each zone's health. If site managers wish to maintain grassland zones in the upper terrace, they could consider mesquite removal via sawing and cut-stump herbicide application to prevent further encroachment. If left untouched mesquite trees will continue to grow and reproduce, expanding the bosque habitat zone, which could be a desired outcome for the site. Mesquite trees in the more mature bosque zones are anticipated to grow and develop singular trunks over time. Still, they should be monitored for any unpredicted changes due to changes in the water regime of the site.

Applicable Grants

National Fish and Wildlife Foundation (NFWF), Five Star and Urban Waters Restoration Grant Program:

- The Five Star and Urban Waters Restoration Grant Program provides funding for projects focusing on a variety of different priority focus areas, including:
    - » "On-the-ground wetland, riparian, in-stream, and/or coastal habitat restoration"
    - » Meaningful education and training activities, either through community outreach, participation, and/or integration with K-12 environmental curriculum
    - » Measurable ecological, educational, and community benefits
    - » Partnerships: Five Star projects should engage diverse community partners to achieve ecological and educational outcomes. (NFWF)
- Details
    - » Funding Range: $20,000 to $50,000
    - » Application Timeline: Opens in November and closes in January; awarded annually.

- » Applicability: High. Supports projects that restore and improve wetlands while engaging and educating the nearby community.

U.S. Fish and Wildlife Service (USFWS), Partners for Fish and Wildlife Program:

- The Partners for Fish and Wildlife program provides technical and financial assistance to private landowners interested in restoring wetlands and other habitats. Activities such as invasive species control and native seeding are eligible for funding. To apply, site managers should identify a federally listed species their project seeks to support (most applicable: Yellow-billed cuckoo, Southwestern Willow Flycatcher, Gila Topminnow) and simply contact the program to set up a meeting or begin the conversation.
  - » "Our staff provides free technical and financial assistance to plan, design, supervise, and monitor customized habitat restoration projects. These projects range in size from a wetland of a few acres to a grassland restoration covering several hundred thousand acres." -Partners for Fish and Wildlife.
- Details
  - » Funding Range: Varies widely; typically up to $25,000 per project.
  - » Application Timeline: Rolling basis; applications accepted year-round.
  - » Applicability: High. Provides support for habitat restoration and invasive species treatment (FWS).

U.S. Fish and Wildlife Service (USFWS), North American Wetlands Conservation Act (NAWCA) Grants:

- The NAWACA Grant program seeks to support goals outlined in NAWCA legislation: "Projects must involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats for the benefit of all wetlands-associated migratory birds." Borrow pit site managers would be a strong candidate for this opportunity if they can demonstrate long-term sustainable funding for and management of the borrow pit site. The project's primary goal of creating wetlands or extending the time when standing water is present on the site would further increase the strength of their application. This program does require a 1:1 match for funding provided, which may not be suitable for site managers.
- Details
  - » Funding Range: Small grants up to $100,000 (most applicable for borrow pit site managers); standard grants range from $100,000 to $1,000,000. Each requires a 1:1 non-federal match.
  - » Application Timeline: Two cycles per year; deadlines typically in February and July.
  - » Applicability: High. Focuses on wetland restoration and enhancement (FWS).

US Forest Service – Urban and Community Forestry Program

- The Urban and Community Forestry Program funds projects that enhance urban forest cover and increase green space accessibility. Projects focus on tree planting, pest and disease mitigation, climate resilience, and equitable access to tree-covered areas, benefiting both wildlife and local communities, most of which is covered in the outlined borrow pit project.

- Details
    - » Funding Range: Minimum of $100,000 with a 1:1 match requirement.
    - » Application Timeline: Applications open annually, typically in the fall.
    - » Applicability: Medium to High. Focused on urban forest resilience, this grant could align with the borrow pit site managers' project if the application highlights the project's adjacency to a neighborhood and its public access (UCFP).

Arizona Water Protection Fund (AWPF)

- The AWPF provides financial assistance for projects aimed at protecting and enhancing Arizona's riparian habitats, including stream restoration, riparian vegetation planting, and water quality improvement. Funding is awarded as 100% reimbursement, making it ideal for projects that can cover upfront costs.
- Details
    - » Funding Range: Up to $300,000, with grants as 100% reimbursements.
    - » Application Timeline: Opens in July and August, with project funding available for up to five years.
    - » Applicability: High. The AWPF fund directly supports riparian habitat restoration and enhancement, aligning well with this project's wetland and riparian restoration elements (AWPF).

Arizona Game and Fish Department, Heritage Fund Grants:

- Funded annually through the Arizona lottery, Heritage Fund Grants provide funding for projects that seek to conserve and protect the state's wildlife and natural resources. Site managers could apply under the Public Access ($50,000/yr total) or the Urban Wildlife and Urban Wildlife Habitat ($130,000/yr total) programs. Since a primary mandate for this program is to protect endangered species, it will be helpful for site managers to apply with a target conservation species for proposed habitat restoration activities. Applicable endangered species include
    - » Critical habitat overlap: Yellow-billed Cuckoo, southwestern Willow Flycatcher - Each relies on and is supported by riparian canopy.
    - » Other birds: Mexican Spotted Owl, Cactus Ferruginous Pygmy-owl
    - » Fish and amphibians: Chiricahua Leopard Frog, Gila topminnow - may require population establishment actions in cooperation with AZGFD
    - » Monarch Butterfly (candidate for federal listing) - pollinator and milkweed planting is easily achieved and has direct positive impacts on monarchs.
- Details
    - » Funding Range: Up to $50,000 per project.
    - » Application Timeline: Typically opens in spring; deadlines in early summer.
    - » Applicability: High. Specifically aimed at habitat restoration, including invasive species treatment and native plantings (AZGFD).

Arizona Game and Fish Department, Habitat Partnership Committee (HPC) Grants:

- The HCP grant program administers funds received from the sale of big game tags in order to

improve game habitat via: Habitat enhancement/restoration, water developments, and other activities less applicable to borrow pit site managers. To qualify for this opportunity, site managers would need to identify a species of big game their restoration activities seek to target and support. The borrow pit's adjacency to the Santa Cruz River, an important and imperiled wildlife corridor, could be a strong argument in support of receiving funding through this program. Applicable big game could include: mule deer, white tail deer, black bears, and mountain lions.

- Details
    - » Funding Range: Varies; typically $10,000 to $50,000.
    - » Application Timeline: Opens in the fall; deadlines in late fall.
    - » Applicability: Medium. It focuses on wildlife habitat improvement but seemingly on more of a landscape scale (AZGFD).

Arizona Department of Forestry and Fire Management (DFFM), Invasive Plant Grant (IPG)

- IPG projects primarily focus on invasive species treatment in areas that will both improve habitat value and/or prevent wildfires. However, projects can have a secondary goal of native planting and habitat restoration and potentially receive sizable funding for such activities alongside invasive species treatment. The Tubac borrow pit project could be partially funded through this opportunity.
- Details
    - » Funding Range: Up to $200,000 per project
    - » Application Timeline: Typically opens in early spring; deadlines are usually in late spring or early summer. Awards are given annually.
    - » Applicability: High. (AZDFFM)

Arizona Department of Forestry and Fire Management, Hazard Fuel Incentives (HFI) Grant

- The HFI Grant aims to reduce wildfire risk by managing hazardous fuels, which can include invasive plant removal and vegetation management. While the primary focus is on wildfire mitigation, this project's invasive species treatment and habitat restoration efforts may qualify, especially if site managers can demonstrate a reduction in wildfire risk broadly, and in a Wild-Urban Interface (WUI). Despite being located in a direct WUI area, the scope for the borrow pit project may be too small to qualify for this opportunity - site managers could consider combining borrow pit project components with nearby Santa Cruz River invasive species work if pursuing this. This opportunity likely will not fund habitat restoration activities beyond invasive species management.

- Details
    - » Funding Range: $60,000-500,000 per project
    - » Application Timeline: Opens in the fall, with deadlines typically in late fall or early winter. Awards are given annually.
    - » Applicability: Medium. There is a strong chance that an IPG proposal will get deferred to this funding source. However, it is not the most applicable grant for a habitat restoration-forward project.

Arizona State Parks and Trails – Recreational Trails Program (RTP)

- The RTP is a federal program administered by Arizona State Parks that funds the creation, maintenance, and accessibility improvements for recreational trails. Eligible projects include trail development, accessibility upgrades, and recreational infrastructure on public lands. The borrow pit's accessibility to the public makes it a qualified candidate for funding to support and enhance visitor experience at the site.
- Details
    - » Funding Range: Up to $150,000 per project. $10,000 for education projects.
    - » Application Timeline: Applications are accepted year-round; funding availability starts in July of the following year if applied after June.
    - » Applicability: High. Supports development and maintenance of recreational trails, aligning well with any plans for accessible paths or recreational improvements within the borrow pit area (RTP).

Sonoran Joint Venture (SJV) Awards Program

- The SJV Awards Program provides competitive funding for projects that contribute to bird conservation and habitat preservation within the Sonoran Joint Venture region. Ideal for smaller-scale habitat restoration efforts, the program focuses on improving habitat for migratory and resident bird species.
- Details
    - » Funding Range: $5,000 to $15,000 per project.
    - » Application Timeline: Opens annually, typically in early fall with a rolling deadline.
    - » Applicability: High. Supports conservation of bird habitats within the SJV region, making it well-suited for projects that include wetland restoration benefiting bird populations (SJV).

Appendices

Appendix 1: Bird Species at Tubac Borrow Pit

Bird species that regularly use Tubac Borrow Pit, organized by habitat type. Includes Protected status if applicable from the Arizona Game and Fish Department's Species of Greatest Conservation Need List, where the lower tiers indicate greater conservation need. If the protected status applies to a certain subspecies of the species, it is indicated.

Open Water
Black-bellied Whistling Duck (Tier 2)
Blue-winged Teal
Cinnamon Teal
Northern Shoveler
American Wigeon
Mallard
Mexican Duck
Green-winged Teal
American Coot

Cattail Marsh
Sora (Tier 3)
Great Blue Heron
Red-winged Blackbird (Tier 2)
Common Yellowthroat
Song Sparrow
Lincoln's Sparrow
Abert's Towhee

Mesquite Bosque
Sharp-shinned Hawk
Cooper's Hawk
Red-naped Sapsucker
Ladder-backed Woodpecker
American Kestrel (Tier 2)
Bell's Vireo
Hutton's Vireo
Cassin's Vireo
Plumbeous Vireo
Ruby-crowned Kinglet
Blue-gray Gnatcatcher
Pine Siskin
Rufous-winged Sparrow (Tier 2)
Hooded Oriole (Tier 2)
Orange-crowned Warbler
Lucy's Warbler
Nashville Warbler
MacGilivray's Warbler (Tier 2)
Black-throated Gray Warbler (Tier 2)
Wilson's Warbler
Black-headed Grosbeak
Blue Grosbeak
Lazuli Bunting (Tier 3)
Northern Beardless-Tyrannulet
Black Phoebe
Bridled Titmouse
Gambel's Quail
Wild Turkey
Inca Dove (Tier 2)
Greater Roadrunner
Swainson's Hawk (Tier 2)
Zone-tailed Hawk
Gila Woodpecker (Tier 2)
Say's Phoebe
Vermilion Flycatcher
Ash-throated Flycatcher
Brown-crested Flycatcher
Tropical Kingbird
Cassin's Kingbird
Western Kingbird
Verdin (Tier 2)
Northern Mockingbird
Phainopepla
Brewer's Sparrow
Lark Sparrow
Vesper Sparrow (Tier 2)
Green-tailed Towhee
Pyrrhuloxia (Tier 2)
Northern Cardinal

Cottonwood Riparian
Common Ground Dove (Tier 3)
Yellow-billed Cuckoo (Western subspecies, Tier 1)

Gray Hawk
Willow Flycatcher (Southwestern subspecies, Tier 1)
Hammond's Flycatcher
Gray Flycatcher
Warbling Vireo
Hermit Thrush (Tier 2)
Yellow-breasted Chat
Bullock's Oriole (Tier 2)
Yellow Warbler
Summer Tanager
Western Tanager
White-breasted Nuthatch

Generalists
White-winged Dove
Mourning Dove
Black-chinned Hummingbird
Anna's Hummingbird
Broad-billed Hummingbird
Red-tailed Hawk
Great-horned Owl
Northern Flicker
Western Wood-Pewee
Common Raven
Northern Rough-winged Swallow
Barn Swallow
House Wren
Bewick's Wren
American Robin
House Finch
Lesser Goldfinch
Chipping Sparrow (Tier 3)
White-crowned Sparrow (Mountain West subspecies Tier 2)
Brown-headed Cowbird
Brewer's Blackbird (Tier 2)
Great-tailed Grackle
Yellow-rumped Warbler

Appendix 2: Plant Recommendations for Tubac Borrow Pit

Uplands/floodplain

Goals
Plant fruit-bearing shrubs and other species that provide privacy to land owners

Upper story

Whitethorn acacia	*Acacia constricta*
Desert willow	*Chilopsis linearis*
Arizona walnut	*Juglans major*
Velvet mesquite	*Prosopis velutina*
Catclaw acacia	*Senegalia greggii*

Midstory

Desert honeysuckle	*Anisacanthus thurberi*
Fourwing saltbush	*Atriplex canescens*
Buttonbush	*Cephalanthus occidentalis*
Common Sunflower	*Helianthus annuus*
Wolfberry	*Lycium fremontii*
Graythorn	*Ziziphus obtusifolia*

Grasslands/understory

Woollypod Milkweed	*Asclepias eriocarpa*
Pine-needle milkweed	*Asclepias linaria*
Sixweeks gramma	*Bouteloua barbata*
Arizona foldwing	*Dicliptera resupinata*
Vine Mesquite	*Panicum obtusum*
Western Wheatgrass	*Pascopyrum smithii*
Pigeonberry	*Rivina humilis*
Wild petunia	*Ruellia nudiflora*
Alkali sacaton	*Sporobolus airoides*
Giant sacaton	*Sporobolus wrightii*

Riparian/water adjacent

Goals
Establish a native midstory; plant fall-fruiting plants to support stopover birds

Upper story

Arizona Alder	*Alnus oblongifolia*
Velvet ash	*Fraxinus velutina*
Arizona walnut	*Juglans major*
Fremont Cottonwood	*Populus Fremontii*
Goodding's willow	*Salix gooddingii*

Midstory

Netleaf hackberry	*Celtis reticulata*
Arrowweed	*Pluchea sericea*
Coyote willow	*Salix exigua*
Mexican elderberry	*Sambucus nigra*
Western soapberry	*Sapindus saponaria*

Understory

Yellow columbine	*Aquilegia chrysantha*
Arizona Milkweed	*Asclepias angustifolia*
Seep willow	*Baccharis salicifolia*
Tall flatsedge	*Cyperus eragrostis*
Cardinal Flower	*Lobelia cardinalis*
Golden currant	*Ribes aureum*

Aquatic

Goals

Establish native codominant species alongside cattail

Marsh/toe zone

Yerba mansa	*Anemopsis californica*
Swamp Milkweed	*Asclepias incarnata*
Yellow nutsedge	*Cyperus esculentus*
Fragrant flatsedge	*Cyperus odoratus*
Sand Spike-Rush	*Eleocharis montevidensis*
Tall scouring-rush	*Equisetum hyemale*
Smooth horsetail	*Equisetum laevigatum*
Common Monkey Flower	*Mimulus guttatus*
American three square bullrush	*Schoenoplectus americanus*
Floating Marsh Pennywort	*Hydrocotyle ranunculoides*
Hardstem bulrush	*Schoenoplectus acutus*
California Bullrush	*Schoenoplectus californicus*

Appendix 3: Existing Topography at Tubac Borrow Pit

Legend

Existing Contour Line

0 75 150 225 300

Feet

N

TUCSON AUDUBON SOCIETY

conservation
education
recreation

Appendix 4: US Fish and Wildlife IPaC Resource List

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Santa Cruz County, Arizona

Local office

Arizona Ecological Services Field Office

(602) 242-0210
(602) 242-2513

9828 North 31st Ave

#c3
Phoenix, AZ 85051-2517

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Jaguar Panthera onca Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3944	Endangered
Ocelot Leopardus (=Felis) pardalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4474	Endangered
Sonoran Pronghorn Antilocapra americana sonoriensis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4750	EXPN

Birds

NAME	STATUS
Cactus Ferruginous Pygmy-owl Glaucidium brasilianum cactorum Wherever found There is **final** critical habitat for this species. https://ecos.fws.gov/ecp/species/1225	Threatened
Mexican Spotted Owl Strix occidentalis lucida Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/8196	Threatened
Southwestern Willow Flycatcher Empidonax traillii extimus Wherever found There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/6749	Endangered

Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Amphibians

NAME	STATUS
Chiricahua Leopard Frog Rana chiricahuensis Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/1516	Threatened

Fishes

NAME	STATUS
Gila Topminnow (incl. Yaqui) Poeciliopsis occidentalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1116	Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Pima Pineapple Cactus Coryphantha scheeri var. robustispina Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4919	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Southwestern Willow Flycatcher Empidonax traillii extimus https://ecos.fws.gov/ecp/species/6749#crithab	Final
Yellow-billed Cuckoo Coccyzus americanus https://ecos.fws.gov/ecp/species/3911#crithab	Final

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

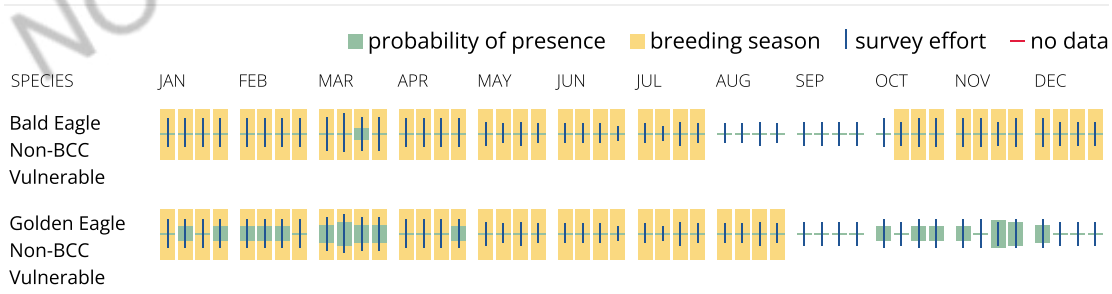
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project

intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Arizona Woodpecker Dryobates arizonae This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 10 to Jun 30
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31
Bendire's Thrasher Toxostoma bendirei This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9435	Breeds Mar 15 to Jul 31

Black-chinned Sparrow Spizella atrogularis — Breeds Apr 15 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9447

Black-throated Gray Warbler Setophaga nigrescens — Breeds May 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Broad-tailed Hummingbird Selasphorus platycercus — Breeds May 25 to Aug 21
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Cordilleran Flycatcher Empidonax occidentalis — Breeds Apr 25 to Jul 25
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Elegant Trogon Trogon elegans — Breeds Apr 1 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Evening Grosbeak Coccothraustes vespertinus — Breeds May 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Long-eared Owl asio otus — Breeds Mar 1 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3631

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Phainopepla Phainopepla nitens lepida — Breeds Mar 1 to Aug 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Plumbeous Vireo Vireo plumbeus — Breeds May 10 to Aug 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Scott's Oriole Icterus parisorum — Breeds May 21 to Aug 15
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Varied Bunting Passerina versicolor — Breeds Apr 25 to Sep 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Virginia's Warbler Leiothlypis virginiae — Breeds May 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9441

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

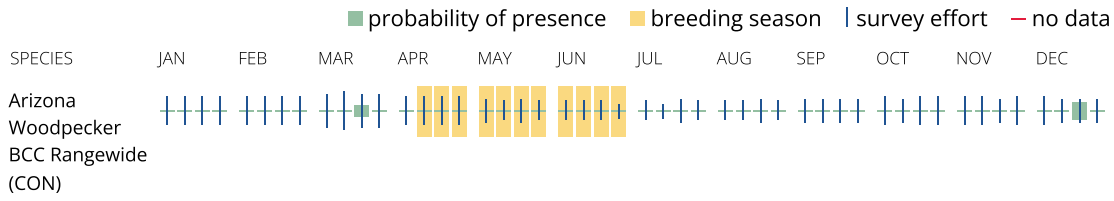
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

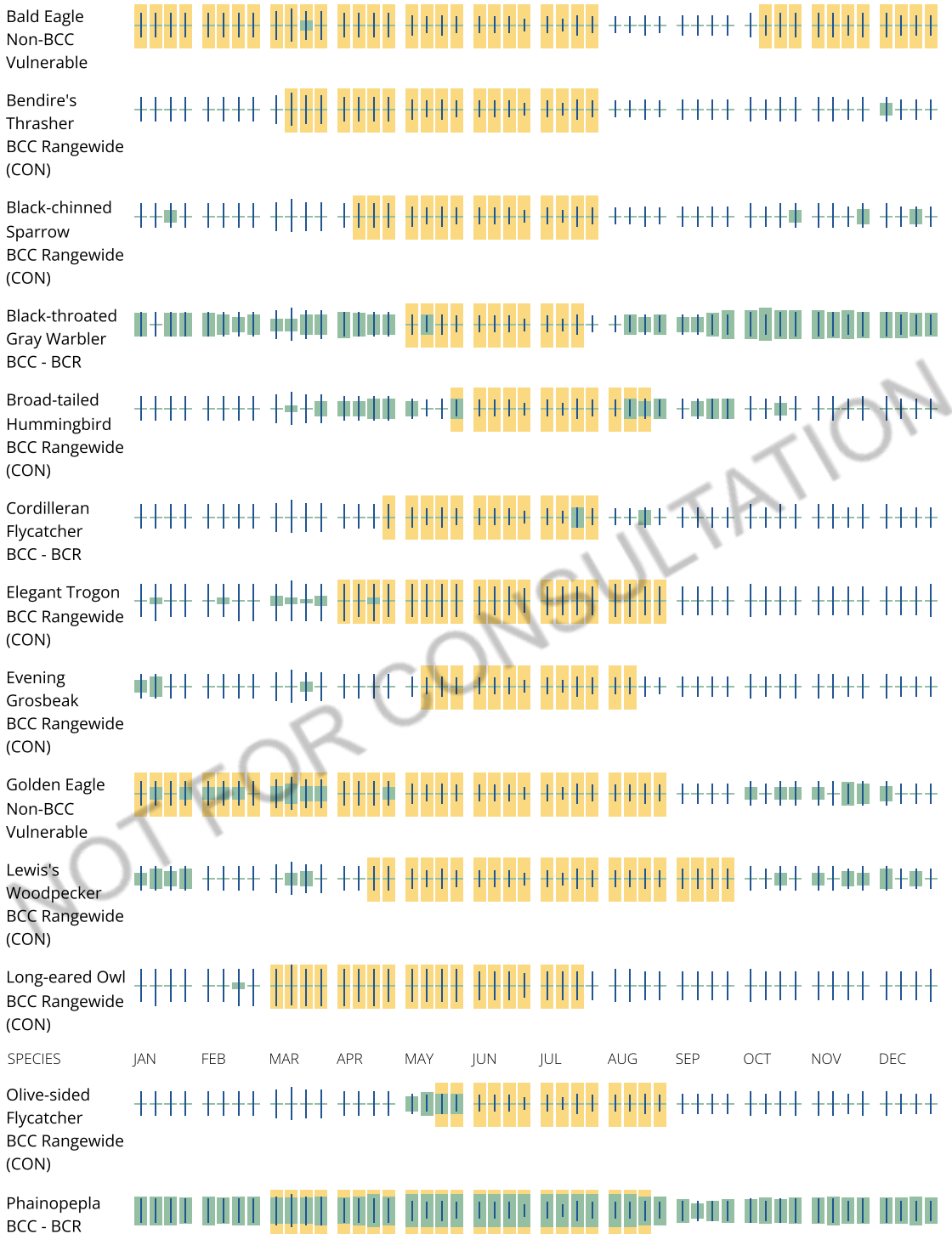
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

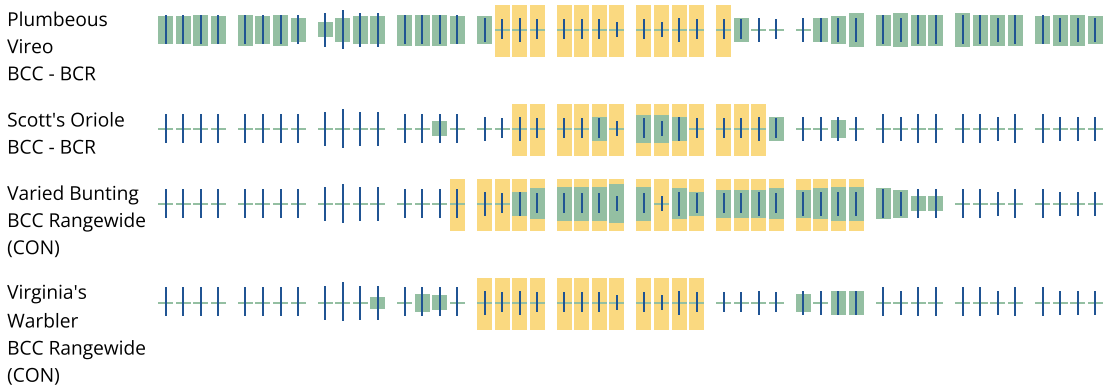
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.







Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

PFO1/SS1C

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and

nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix 5: Special Status Species - Upper Santa Cruz Watershed

Special Status Species listed in ascending order by Watershed Code, Taxon, Scientific Name
Arizona Game and Fish Department, Heritage Data Management System
Updated: 4/12/2023

CODE	WATERSHED	TAXON	SCIENTIFIC_NAME	COMMON NAME	ELCODE	BLM	USFS	NESL	MEXFED	SGCN	NPL	ESA	SRANK	GRANK
15050203	Lower San Pedro	Plant	Packera neomexicana var. toumeyi	Toumey Groundsel	PDAST8H274		S						S2	G5T2
15050203	Lower San Pedro	Plant	Graptopetalum bartramii	Bartram Stonecrop	PDCRA06010	S	S				SR	LT	S2	G2
15050203	Lower San Pedro	Plant	Stevia lemmonii	Lemmon's Stevia	PDAST8V010		S						S2	G3G4
15050203	Lower San Pedro	Plant	Penstemon discolor	Catalina Beardtongue	PDSCR1L210		S				HS		S2	G2
15050203	Lower San Pedro	Plant	Thelypteris puberula var. sonorensis	Aravaipa Woodfern	PPTHE05192	S	S						S2	G5T3
15050203	Lower San Pedro	Plant	Zephyranthes longifolia	Copper Zephyr Lily	PMLIL27060						SR		S3	G4?
15050203	Lower San Pedro	Plant	Carex ultra	Cochise Sedge	PMCYP03E50	S	S						S2S3	G3
15050203	Lower San Pedro	Plant	Eriogonum capillare	San Carlos Wild-buckwheat	PDPGN08100						SR	SC	S4	G4
15050203	Lower San Pedro	Plant	Salvia amissa	Aravaipa Sage	PDLAM1S020	S	S					SC	S2	G2
15050203	Lower San Pedro	Plant	Notholaena lemmonii	Lemmon Cloak Fern	PPADI0G0D0							SC	S1S2	G3?
15050203	Lower San Pedro	Plant	Sisyrinchium cernuum	Nodding Blue-eyed Grass	PMIRI0D0B0		S						S2	G5
15050203	Lower San Pedro	Plant	Allium rhizomatum	Redflower Onion	PMLIL02320						SR		S1	G3?Q
15050203	Lower San Pedro	Plant	Opuntia versicolor	Stag-horn Cholla	PDCAC0D1K0						SR		S2S3	G4
15050203	Lower San Pedro	Plant	Heuchera glomerulata	Chiricahua Mountain Alumroot	PDSAX0E0F0		S						S3	G3
15050203	Lower San Pedro	Reptile	Aspidoscelis stictogramma	Giant Spotted Whiptail	ARACJ02011		S			2		SC	S2	G4
15050203	Lower San Pedro	Reptile	Xantusia bezyi	Bezy's Night Lizard	ARACK01060		S			2			S2	G2
15050203	Lower San Pedro	Reptile	Terrapene ornata luteola	Desert Box Turtle	ARAAD08021	S			PR				S2S3	G5T4
15050203	Lower San Pedro	Reptile	Heloderma suspectum	Gila Monster	ARACE01010				A	1			S4	G4
15050203	Lower San Pedro	Reptile	Hypsiglena sp. nov.	Hooded Nightsnake	ARADB18050					2			S4	G4
15050203	Lower San Pedro	Reptile	Gopherus morafkai	Sonoran Desert Tortoise	ARAAF01013	S	S		A	1		CCA	S4	G4
15050301	Upper Santa Cruz	Amphibian	Rana tarahumarae	Tarahumara Frog	AAABH01210		S			1		SC	SX,S1	G1G3
15050301	Upper Santa Cruz	Amphibian	Ambystoma mavortium stebbinsi	Sonoran Tiger Salamander	AAAAA01145					1		LE	S1	G5T1
15050301	Upper Santa Cruz	Amphibian	Craugastor augusti cactorum	Western Barking Frog	AAABD04171		S						S2	G5T5
15050301	Upper Santa Cruz	Amphibian	Hyla wrightorum	Arizona Treefrog	AAABC02080					3			S3S4	G3G4
15050301	Upper Santa Cruz	Amphibian	Anaxyrus retiformis	Sonoran Green Toad	AAABB01140	S			PR	2			S3	G4
15050301	Upper Santa Cruz	Amphibian	Rana chiricahuensis	Chiricahua Leopard Frog	AAABH01080				A	1		LT	S2S3	G3?
15050301	Upper Santa Cruz	Amphibian	Rana yavapaiensis	Lowland Leopard Frog	AAABH01250	S	S		PR	1		SC	S2S3	G4
15050301	Upper Santa Cruz	Amphibian	Gastrophryne mazatlanensis	Sinoloan Narrow-mouthed Toad	AAABE01030	S				2			S3	G4
15050301	Upper Santa Cruz	Bird	Falco peregrinus anatum	American Peregrine Falcon	ABNKD06071	S	S	4	PR	1		SC	S4	G4T4
15050301	Upper Santa Cruz	Bird	Ammodramus savannarum ammolegus	Arizona grasshopper sparrow	ABPBXA0021	S	S			2			S1S2	G5TU
15050301	Upper Santa Cruz	Bird	Tyrannus crassirostris	Thick-billed Kingbird	ABPAE52040		S			2			S2	G5
15050301	Upper Santa Cruz	Bird	Polioptila nigriceps	Black-capped Gnatcatcher	ABPBJ08040					2			S1	G5
15050301	Upper Santa Cruz	Bird	Anthus spragueii	Sprague's Pipit	ABPBM02060					2		SC	S2N	G3G4
15050301	Upper Santa Cruz	Bird	Catharus ustulatus	Swainson's Thrush	ABPBJ18100					2			S1B	G5
15050301	Upper Santa Cruz	Bird	Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy-owl	ABNSB08041	S	S			1		PT	S1S2	G5T2
15050301	Upper Santa Cruz	Bird	Cynanthus latirostris	Broad-billed Hummingbird	ABNUC19020		S			2			S3	G5
15050301	Upper Santa Cruz	Bird	Haliaeetus leucocephalus (wintering pop.)	Bald Eagle - Winter Population	ABNKC10015	S	S	2	P			SC	S4N	G5TNRQ
15050301	Upper Santa Cruz	Bird	Empidonax fulvifrons pygmaeus	Northern Buff-breasted Flycatcher	ABPAE33141		S			2		SC	S1	G5T5
15050301	Upper Santa Cruz	Bird	Buteo plagiatus	Gray Hawk	ABNKC19150							SC	S3	G5
15050301	Upper Santa Cruz	Bird	Strix occidentalis lucida	Mexican Spotted Owl	ABNSB12012	S		3	A	1		LT	S3	G3G4T3T4
15050301	Upper Santa Cruz	Bird	Antrostomus ridgwayi	Buff-collared Nightjar	ABNTA07060		S			2			S2S3	G5
15050301	Upper Santa Cruz	Bird	Peucaea carpalis	Rufous-winged Sparrow	ABPBX91080					2			S4	G4
15050301	Upper Santa Cruz	Bird	Pachyramphus aglaiae	Rose-throated Becard	ABPAE53070		S			2			S1	G4G5
15050301	Upper Santa Cruz	Bird	Calothorax lucifer	Lucifer Hummingbird	ABNUC44010		S			3			S2	G5
15050301	Upper Santa Cruz	Bird	Sialia sialis fulva	Azure Bluebird	ABPBJ15012					2			S3	G5TU
15050301	Upper Santa Cruz	Bird	Centronyx bairdii	Baird's Sparrow	ABPBXA0010		S			2		SC	S2N	G4
15050301	Upper Santa Cruz	Bird	Athene cunicularia hypugaea	Western Burrowing Owl	ABNSB10012	S	S	4	PR	2		SC	S3	G4T4
15050301	Upper Santa Cruz	Bird	Megascops trichopsis	Whiskered Screech-owl	ABNSB01070		S			2			S3	G5
15050301	Upper Santa Cruz	Bird	Trogon elegans	Elegant Trogon	ABNWA02070		S			2			S3	G5
15050301	Upper Santa Cruz	Bird	Camptostoma imberbe	Northern Beardless-Tyrannulet	ABPAE04010		S			2			S4	G5
15050301	Upper Santa Cruz	Bird	Lampornis clemenciae	Blue-throated Mountain-gem	ABNUC34040					2			S2B	G5
15050301	Upper Santa Cruz	Bird	Empidonax traillii extimus	Southwestern Willow Flycatcher	ABPAE33043	S		2	E	1		LE	S2S3B	G5T2
15050301	Upper Santa Cruz	Bird	Ramosomyia violiceps	Violet-crowned Hummingbird	ABNUC29150		S			2			S3	G5
15050301	Upper Santa Cruz	Bird	Aquila chrysaetos	Golden Eagle	ABNKC22010	S		3	A	2			S4	G5
15050301	Upper Santa Cruz	Bird	Dendrocygna bicolor	Fulvous Whistling-Duck	ABNJB01010							SC	SAN	G5
15050301	Upper Santa Cruz	Bird	Coccyzus americanus	Yellow-billed Cuckoo (Western DPS)	ABNRB02020	S	S	2		1		LT	S3	G5

Special Status Species listed in ascending order by Watershed Code, Taxon, Scientific Name
Arizona Game and Fish Department, Heritage Data Management System
Updated: 4/12/2023

CODE	WATERSHED	TAXON	SCIENTIFIC_NAME	COMMON NAME	ELCODE	BLM	USFS	NESL	MEXFED	SGCN	NPL	ESA	SRANK	GRANK
15050301	Upper Santa Cruz	Bird	Accipiter gentilis	Northern Goshawk	ABNKC12060	S	S	4	A	2		SC	S3	G5
15050301	Upper Santa Cruz	Bird	Amphispiza quinquestriata	Five-striped Sparrow	ABPBX97030					2			S2	G4
15050301	Upper Santa Cruz	Fish	Rhinichthys osculus	Speckled Dace	AFCJB37050	S			E			SC	S3S4	G5
15050301	Upper Santa Cruz	Fish	Gila intermedia	Gila Chub	AFCJB13160	S			P	1		LE	S2	G2
15050301	Upper Santa Cruz	Fish	Catostomus insignis	Sonora Sucker	AFCJC02100	S	S		P	2		SC	S3	G3G4
15050301	Upper Santa Cruz	Fish	Agosia chrysogaster chrysogaster	Gila Longfin Dace	AFCJB37151	S			A	2		SC	S3S4	G4T3T4
15050301	Upper Santa Cruz	Fish	Poeciliopsis occidentalis occidentalis	Gila Topminnow	AFCNC05021	S			A	1		LE	S1S2	G3
15050301	Upper Santa Cruz	Fish	Catostomus clarkii	Desert Sucker	AFCJC02040	S	S			2		SC	S3S4	G3G4
15050301	Upper Santa Cruz	Fish	Cyprinodon macularius	Desert Pupfish	AFCNB02060	S			P	1		LE	S1	G1
15050301	Upper Santa Cruz	Invertebrate	Sonorella eremita	San Xavier Talussnail	IMGASC9240					1		CCA	S1	G1
15050301	Upper Santa Cruz	Invertebrate	Gastrocopta dalliana	Shortneck Snaggletooth	IMGAS15080					1		CCA	S1	G2G4
15050301	Upper Santa Cruz	Invertebrate	Agathymus evansi	Huachuca Giant-skipper	IILEP87110		S						S1	G1G3
15050301	Upper Santa Cruz	Invertebrate	Danaus plexippus	Monarch	IILEPP2010	S			PR			C	S2S4N	G4
15050301	Upper Santa Cruz	Invertebrate	Argia sabino	Sabino Canyon Dancer	IIODO68100		S					SC	S2	G2
15050301	Upper Santa Cruz	Invertebrate	Sonorella papagorum	Black Mountain Talussnail	IMGASC9480					2			S1	G1
15050301	Upper Santa Cruz	Invertebrate	Pyrgulopsis thompsoni	Huachuca Springsnail	IMGASJ0230		S			1		CCA	S2	G2
15050301	Upper Santa Cruz	Invertebrate	Sonorella magdalenensis	Sonoran Talussnail	IMGASC9370	S	S			3		UR	S1S2	G2
15050301	Upper Santa Cruz	Invertebrate	Stygobromus arizonensis	Arizona Cave Amphipod	ICMAL05360	S				3		SC	S1	G1
15050301	Upper Santa Cruz	Mammal	Myotis velifer	Cave Myotis	AMACC01050	S				2		SC	S3S4	G4G5
15050301	Upper Santa Cruz	Mammal	Lasiurus xanthinus	Western Yellow Bat	AMACC05070		S			2			S2S3	G4G5
15050301	Upper Santa Cruz	Mammal	Sigmodon ochrognathus	Yellow-nosed Cotton Rat	AMAFF07040					3		SC	S4	G4G5
15050301	Upper Santa Cruz	Mammal	Eumops perotis californicus	Greater Western Bonneted Bat	AMACD02011	S				2		SC	S2S3	G4G5T4
15050301	Upper Santa Cruz	Mammal	Choeronycteris mexicana	Mexican Long-tongued Bat	AMACB02010	S	S		A	2		SC	S2	G3G4
15050301	Upper Santa Cruz	Mammal	Myotis thysanodes	Fringed Myotis	AMACC01090					2		SC	S3S4	G4
15050301	Upper Santa Cruz	Mammal	Sciurus arizonensis	Arizona Gray Squirrel	AMAFB07060				A	2			S4	G4
15050301	Upper Santa Cruz	Mammal	Tadarida brasiliensis	Brazilian Free-tailed Bat	AMACD01010					2			S3S4	G5
15050301	Upper Santa Cruz	Mammal	Lepus alleni	Antelope Jackrabbit	AMAEB03070				|	2			S3	G5
15050301	Upper Santa Cruz	Mammal	Nyctinomops femorosaccus	Pocketed Free-tailed Bat	AMACD04010					2			S3S4	G5
15050301	Upper Santa Cruz	Mammal	Sorex arizonae	Arizona Shrew	AMABA01240		S		P	2		SC	S2	G3
15050301	Upper Santa Cruz	Mammal	Baiomys taylori	Northern Pygmy Mouse	AMAFF05010		S						S3	G4G5
15050301	Upper Santa Cruz	Mammal	Macrotus californicus	California Leaf-nosed Bat	AMACB01010	S				2		SC	S3	G3G4
15050301	Upper Santa Cruz	Mammal	Leopardus pardalis	Ocelot	AMAJH05010	S			P	1		LE	S1	G4
15050301	Upper Santa Cruz	Mammal	Panthera onca	Jaguar	AMAJH02010	S			P	1		LE	S1	G3
15050301	Upper Santa Cruz	Mammal	Leptonycteris yerbabuenae	Lesser Long-nosed Bat	AMACB03030				Pr	1		SC	S2S3	G3
15050301	Upper Santa Cruz	Mammal	Lasiurus blossevillii	Western Red Bat	AMACC05060		S			2			S3	G4
15050301	Upper Santa Cruz	Mammal	Myotis volans	Long-legged Myotis	AMACC01110							SC	S3S4	G4G5
15050301	Upper Santa Cruz	Mammal	Thomomys umbrinus intermedius	Southern Pocket Gopher	AMAFC01013					2			S3	G5T3
15050301	Upper Santa Cruz	Mammal	Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	AMACC08014	S	S	4		1		SC	S3S4	G4T3T4
15050301	Upper Santa Cruz	Plant	Lobelia fenestralis	Leafy Lobelia	PDCAM0E0H0						SR		S1	G4
15050301	Upper Santa Cruz	Plant	Samolus vagans	Chiricahua Mountain Brookweed	PDPRI09040		S						S2	GUQ
15050301	Upper Santa Cruz	Plant	Echinocactus horizonthalonius var. nicholii	Nichol Turk's Head Cactus	PDCAC05022	S					HS	LE	S2	G4T2
15050301	Upper Santa Cruz	Plant	Asclepias uncialis	Greene Milkweed	PDASC022L0		S					SC	S1	G2
15050301	Upper Santa Cruz	Plant	Notholaena lemmonii	Lemmon Cloak Fern	PPADI0G0D0							SC	S1S2	G3?
15050301	Upper Santa Cruz	Plant	Amoreuxia gonzalezii	Saiya	PDBIX01010		S				HS	SC	S1	G1
15050301	Upper Santa Cruz	Plant	Erigeron lemmonii	Lemmon Fleabane	PDAST3M2A0						HS	SC	S1	G1
15050301	Upper Santa Cruz	Plant	Muhlenbergia elongata	Sycamore Muhly	PMPOA48360		S						S3	G3G5
15050301	Upper Santa Cruz	Plant	Penstemon discolor	Catalina Beardtongue	PDSCR1L210		S				HS		S2	G2
15050301	Upper Santa Cruz	Plant	Choisya mollis	Santa Cruz Star Leaf	PDRUT02022		S					SC	S2	G2
15050301	Upper Santa Cruz	Plant	Allium gooddingii	Goodding Onion	PMLIL02120		S	3			HS	CCA	S2	G2
15050301	Upper Santa Cruz	Plant	Phemeranthus marginatus	Tepic Flameflower	PDPOR080N0		S				SR	SC	S1S2	G2
15050301	Upper Santa Cruz	Plant	Echinocereus santaritensis	Santa Rita Hedgehog Cactus	PDCAC060U0						SR		S3	GNR
15050301	Upper Santa Cruz	Plant	Zephyranthes longifolia	Copper Zephyr Lily	PMLIL27060						SR		S3	G4?
15050301	Upper Santa Cruz	Plant	Spiranthes delitescens	Canelo Hills Ladies'-tresses	PMORC2B140						HS	LE	S1	G1
15050301	Upper Santa Cruz	Plant	Sisyrinchium cernuum	Nodding Blue-eyed Grass	PMIRI0D0B0		S						S2	G5
15050301	Upper Santa Cruz	Plant	Tragia laciniata	Sonoita Noseburn	PDEUP1D060		S						S3	G4
15050301	Upper Santa Cruz	Plant	Viola umbraticola	Ponderosa Violet	PDVIO042E0		S						S2	G3G4

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15050301	Upper Santa Cruz	Plant	Allium rhizomatum	Redflower Onion	PMLIL02320						SR		S1	G3?Q
15050301	Upper Santa Cruz	Plant	Abutilon parishii	Pima Indian Mallow	PDMAL020E0	S	S				SR	SC	S3S4	G3
15050301	Upper Santa Cruz	Plant	Metastelma mexicanum	Wiggins Milkweed Vine	PDASC050P0		S					SC	S1S2	G3G4
15050301	Upper Santa Cruz	Plant	Hieracium pringlei	Pringle Hawkweed	PDAST4W170							SC	S1	G4
15050301	Upper Santa Cruz	Plant	Amsonia grandiflora	Large-flowered Blue Star	PDAPO03060		S					SC	S2	G2
15050301	Upper Santa Cruz	Plant	Schiedeella arizonica	Fallen Ladies'-tresses	PMORC67020						SR		S4	G4
15050301	Upper Santa Cruz	Plant	Pennellia tricornuta	Chiricahua Rock Cress	PDBRA06200		S						S2	G1G2
15050301	Upper Santa Cruz	Plant	Carex ultra	Cochise Sedge	PMCYP03E50	S	S						S2S3	G3
15050301	Upper Santa Cruz	Plant	Echinomastus erectocentrus var. erectocentrus	Needle-spined Pineapple Cactus	PDCAC0J0E2						SR	SC	S3	G3QT3Q
15050301	Upper Santa Cruz	Plant	Desmodium metcalfei	Metcalfe's Tick-trefoil	PDFAB1D0V0		S						S3	G3?
15050301	Upper Santa Cruz	Plant	Potentilla albiflora	White-flowered Cinquefoil	PDROS1B010		S						S2	G2
15050301	Upper Santa Cruz	Plant	Lilium parryi	Lemon Lily	PMLIL1A0J0		S				SR	SC	S2	G3
15050301	Upper Santa Cruz	Plant	Pectis imberbis	Beardless Cinchweed	PDAST6W0A0		S					LE	S1	G3
15050301	Upper Santa Cruz	Plant	Echinocereus fasciculatus	Magenta-flower Hedgehog-cactus	PDCAC06065						SR		S3	G4G5T4T5
15050301	Upper Santa Cruz	Plant	Mammillaria wrightii var. wilcoxii	Wilcox Fishhook Cactus	PDCAC0A0E1						SR		S4	G4T4
15050301	Upper Santa Cruz	Plant	Lotus alamosanus	Sonoran Bird's-foot Trefoil	PDFAB2A020		S						S1	G3G4
15050301	Upper Santa Cruz	Plant	Graptopetalum bartramii	Bartram Stonecrop	PDCRA06010	S	S				SR	LT	S2	G2
15050301	Upper Santa Cruz	Plant	Heterotheca rutteri	Huachuca Golden Aster	PDAST4V0J0	S	S					SC	S2	G2
15050301	Upper Santa Cruz	Plant	Hypoxis mexicana	Yellow Star Grass	PMLIL16030						SR		S1	G5
15050301	Upper Santa Cruz	Plant	Echinomastus intertextus	White Fishhook Cactus	PDCAC0J0G0						SR		S2	G4
15050301	Upper Santa Cruz	Plant	Coursetia glabella	Smooth Baby-bonnets	PDFAB140B0		S					SC	S1	G3
15050301	Upper Santa Cruz	Plant	Hexalectris arizonica	Arizona Crested coral-root	PMORC1C041		S				SR		S2	G5T3
15050301	Upper Santa Cruz	Plant	Dichromanthus michuacanus	Michoacan Ladies'-tresses	PMORC2B0L0						SR		S3	G4
15050301	Upper Santa Cruz	Plant	Psilactis gentryi	Mexican Tansyaster	PDASTE7010		S						S2	G3
15050301	Upper Santa Cruz	Plant	Coryphantha recurvata	Santa Cruz Beehive Cactus	PDCAC04090		S				HS		S3	G3
15050301	Upper Santa Cruz	Plant	Lupinus huachucanus	Huachuca Mountain Lupine	PDFAB2B210		S						S2	G2
15050301	Upper Santa Cruz	Plant	Malaxis corymbosa	Madrean Adder's Mouth	PMORC1R020						SR		S3	G4
15050301	Upper Santa Cruz	Plant	Conioselinum mexicanum	Mexican Hemlock Parsley	PDAPI0P030		S					SC	S1	G2?
15050301	Upper Santa Cruz	Plant	Capsicum annuum var. glabriusculum	Chiltepin	PDSOL06012		S						S2	G5T5
15050301	Upper Santa Cruz	Plant	Senecio multidentatus var. huachucanus	Huachuca Groundsel	PDAST8H411		S				HS		S2	G2G4T2
15050301	Upper Santa Cruz	Plant	Lilaeopsis schaffneriana ssp. recurva	Huachuca Water-umbel	PDAPI19051	S					HS	LE	S2	G4T2
15050301	Upper Santa Cruz	Plant	Coryphantha scheeri var. robustispina	Pima Pineapple Cactus	PDCAC040C1	S					HS	LE	S2	G4T2Q
15050301	Upper Santa Cruz	Plant	Agave schottii var. treleasei	Trelease Agave	PMAGA010N2		S				HS	SC	S1	G5T1Q
15050301	Upper Santa Cruz	Plant	Carex chihuahuensis	Chihuahuan Sedge	PMCYP032T0		S						S3	G3G4
15050301	Upper Santa Cruz	Plant	Tumamoca macdougalii	Tumamoc Globeberry	PDCUC0S010	S	S				SR	SC	S3	G4
15050301	Upper Santa Cruz	Plant	Opuntia versicolor	Stag-horn Cholla	PDCAC0D1K0						SR		S2S3	G4
15050301	Upper Santa Cruz	Plant	Muhlenbergia palmeri	Palmer's Muhly	PMPOA48350		S						S2	G2
15050301	Upper Santa Cruz	Plant	Agave parviflora ssp. parviflora	Santa Cruz Striped Agave	PMAGA010L2		S		A		HS	SC	S3	G3T3
15050301	Upper Santa Cruz	Plant	Passiflora arizonica	Arizona Passionflower	PDPAS01073		S						S2	G5T3T5
15050301	Upper Santa Cruz	Plant	Astragalus hypoxylus	Huachuca Milkvetch	PDFAB0F470	S	S				SR	SC	S1	G1
15050301	Upper Santa Cruz	Plant	Thelypteris puberula var. sonorensis	Aravaipa Woodfern	PPTHE05192	S	S						S2	G5T3
15050301	Upper Santa Cruz	Plant	Asclepias lemmonii	Lemmon Milkweed	PDASC020Z0		S						S2	G4?
15050301	Upper Santa Cruz	Plant	Manihot davisiae	Arizona Manihot	PDEUP0Z010		S						S2	G4
15050301	Upper Santa Cruz	Plant	Erigeron arisolius	Arid Throne Fleabane	PDAST3M510		S						S2	G2?
15050301	Upper Santa Cruz	Plant	Euphorbia macropus	Woodland Spurge	PDEUP0Q2U0						SR	SC	S2	G4
15050301	Upper Santa Cruz	Plant	Stevia lemmonii	Lemmon's Stevia	PDAST8V010		S						S2	G3G4
15050301	Upper Santa Cruz	Plant	Macroptilium supinum	Supine Bean	PDFAB330L0		S				SR	SC	S1	G2
15050301	Upper Santa Cruz	Plant	Phemeranthus humilis	Pinos Altos Flameflower	PDPOR080A0		S				SR	SC	S1	G2
15050301	Upper Santa Cruz	Plant	Pseudabutilon thurberi	Thurber Indian Mallow	PDMAL020P0						SR		S1	G2G3
15050301	Upper Santa Cruz	Plant	Malaxis abieticola	Slender-flowered Malaxis	PMORC1R090						SR		S1	G4
15050301	Upper Santa Cruz	Plant	Ayenia jaliscana	Ayenia	PDSTE010C0		S						S1	GNR
15050301	Upper Santa Cruz	Reptile	Sceloporus slevini	Slevin's Bunchgrass Lizard	ARACF14180	S	S			2			S2	G4
15050301	Upper Santa Cruz	Reptile	Tantilla yaquia	Yaqui Black-headed Snake	ARADB35130		S			2			S2	G4
15050301	Upper Santa Cruz	Reptile	Tantilla wilcoxi	Chihuahuan Black-headed Snake	ARADB35120		S			2			S1	G4
15050301	Upper Santa Cruz	Reptile	Senticolis triaspis intermedia	Northern Green Ratsnake	ARADB44011		S						S3	G5T4
15050301	Upper Santa Cruz	Reptile	Hypsiglena sp. nov.	Hooded Nightsnake	ARADB18050					2			S4	G4

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15050301	Upper Santa Cruz	Reptile	Plestiodon callicephalus	Mountain Skink	ARACH01030		S			2			S2	G4G5
15050301	Upper Santa Cruz	Reptile	Terrapene ornata luteola	Desert Box Turtle	ARAAD08021	S			PR				S2S3	G5T4
15050301	Upper Santa Cruz	Reptile	Oxybelis aeneus	Brown Vinesnake	ARADB24010		S			2			S2	G5
15050301	Upper Santa Cruz	Reptile	Aspidoscelis xanthonota	Red-backed Whiptail	ARACJ02012		S			2		SC	S2	G3
15050301	Upper Santa Cruz	Reptile	Lampropeltis nigrita	Mexican Black Kingsnake	ARADB19120				A				S2	GNR
15050301	Upper Santa Cruz	Reptile	Crotalus lepidus klauberi	Banded Rock Rattlesnake	ARADE02051				PR				S3	G5T5
15050301	Upper Santa Cruz	Reptile	Crotalus willardi willardi	Arizona Ridge-nosed Rattlesnake	ARADE02132		S		PR	1			S1S2	G5T4
15050301	Upper Santa Cruz	Reptile	Thamnophis eques megalops	Northern Mexican Gartersnake	ARADB36061		S		A			LT	S2	G4T3
15050301	Upper Santa Cruz	Reptile	Crotalus pricei	Twin-spotted Rattlesnake	ARADE02080		S		PR	1			S2	G5
15050301	Upper Santa Cruz	Reptile	Heloderma suspectum	Gila Monster	ARACE01010				A	1			S4	G4
15050301	Upper Santa Cruz	Reptile	Aspidoscelis stictogramma	Giant Spotted Whiptail	ARACJ02011		S			2		SC	S2	G4
15050301	Upper Santa Cruz	Reptile	Gyalopion quadrangulare	Thornscrub Hook-nosed Snake	ARADB16020		S		PR	2			S1	G4
15050301	Upper Santa Cruz	Reptile	Gopherus morafkai	Sonoran Desert Tortoise	ARAAF01013	S	S		A	1		CCA	S4	G4
15050302	Rillito	Amphibian	Rana tarahumarae	Tarahumara Frog	AAABH01210		S			1		SC	SX,S1	G1G3
15050302	Rillito	Amphibian	Rana chiricahuensis	Chiricahua Leopard Frog	AAABH01080				A	1		LT	S2S3	G3?
15050302	Rillito	Amphibian	Rana yavapaiensis	Lowland Leopard Frog	AAABH01250	S	S		PR	1		SC	S2S3	G4
15050302	Rillito	Bird	Trogon elegans	Elegant Trogon	ABNWA02070		S			2			S3	G5
15050302	Rillito	Bird	Accipiter gentilis	Northern Goshawk	ABNKC12060	S	S	4	A	2		SC	S3	G5
15050302	Rillito	Bird	Sialia sialis fulva	Azure Bluebird	ABPBJ15012					2			S3	G5TU
15050302	Rillito	Bird	Empidonax fulvifrons pygmaeus	Northern Buff-breasted Flycatcher	ABPAE33141		S			2		SC	S1	G5T5
15050302	Rillito	Bird	Cynanthus latirostris	Broad-billed Hummingbird	ABNUC19020		S			2			S3	G5
15050302	Rillito	Bird	Empidonax traillii extimus	Southwestern Willow Flycatcher	ABPAE33043	S		2	E	1		LE	S2S3B	G5T2
15050302	Rillito	Bird	Coccyzus americanus	Yellow-billed Cuckoo (Western DPS)	ABNRB02020	S	S	2		1		LT	S3	G5
15050302	Rillito	Bird	Peucaea botterii arizonae	Arizona Botteri's Sparrow	ABPBX91063	S				2			S3?B,S1N	G4T4
15050302	Rillito	Bird	Buteo plagiatus	Gray Hawk	ABNKC19150							SC	S3	G5
15050302	Rillito	Bird	Aquila chrysaetos	Golden Eagle	ABNKC22010	S		3	A	2			S4	G5
15050302	Rillito	Bird	Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy-owl	ABNSB08041	S	S			1		PT	S1S2	G5T2
15050302	Rillito	Bird	Ammodramus savannarum ammolegus	Arizona grasshopper sparrow	ABPBXA0021	S	S			2			S1S2	G5TU
15050302	Rillito	Bird	Peucaea carpalis	Rufous-winged Sparrow	ABPBX91080					2			S4	G4
15050302	Rillito	Bird	Camptostoma imberbe	Northern Beardless-Tyrannulet	ABPAE04010		S			2			S4	G5
15050302	Rillito	Bird	Athene cunicularia hypugaea	Western Burrowing Owl	ABNSB10012	S	S	4	PR	2		SC	S3	G4T4
15050302	Rillito	Bird	Antrostomus ridgwayi	Buff-collared Nightjar	ABNTA07060		S			2			S2S3	G5
15050302	Rillito	Bird	Strix occidentalis lucida	Mexican Spotted Owl	ABNSB12012	S		3	A	1		LT	S3	G3G4T3T4
15050302	Rillito	Bird	Falco peregrinus anatum	American Peregrine Falcon	ABNKD06071	S	S	4	PR	1		SC	S4	G4T4
15050302	Rillito	Bird	Centronyx bairdii	Baird's Sparrow	ABPBXA0010		S			2		SC	S2N	G4
15050302	Rillito	Fish	Gila intermedia	Gila Chub	AFCJB13160	S			P	1		LE	S2	G2
15050302	Rillito	Fish	Poeciliopsis occidentalis occidentalis	Gila Topminnow	AFCNC05021	S			A	1		LE	S1S2	G3
15050302	Rillito	Fish	Agosia chrysogaster chrysogaster	Gila Longfin Dace	AFCJB37151	S			A	2		SC	S3S4	G4T3T4
15050302	Rillito	Invertebrate	Argia sabino	Sabino Canyon Dancer	IIODO68100		S					SC	S2	G2
15050302	Rillito	Invertebrate	Danaus plexippus	Monarch	IILEPP2010	S			PR			C	S2S4N	G4
15050302	Rillito	Invertebrate	Tuberochernes ubicki	A Cave Obligate Pseudoscorpion	ILARAD3020		S						S1	G1
15050302	Rillito	Mammal	Myotis thysanodes	Fringed Myotis	AMACC01090					2		SC	S3S4	G4
15050302	Rillito	Mammal	Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	AMACC08014	S	S	4		1		SC	S3S4	G4T3T4
15050302	Rillito	Mammal	Sciurus arizonensis	Arizona Gray Squirrel	AMAFB07060				A	2			S4	G4
15050302	Rillito	Mammal	Leptonycteris yerbabuenae	Lesser Long-nosed Bat	AMACB03030				Pr	1		SC	S2S3	G3
15050302	Rillito	Mammal	Myotis velifer	Cave Myotis	AMACC01050	S				2		SC	S3S4	G4G5
15050302	Rillito	Mammal	Lasiurus blossevillii	Western Red Bat	AMACC05060		S			2			S3	G4
15050302	Rillito	Mammal	Macrotus californicus	California Leaf-nosed Bat	AMACB01010	S				2		SC	S3	G3G4
15050302	Rillito	Mammal	Choeronycteris mexicana	Mexican Long-tongued Bat	AMACB02010	S	S		A	2		SC	S2	G3G4
15050302	Rillito	Mammal	Lasiurus xanthinus	Western Yellow Bat	AMACC05070		S			2			S2S3	G4G5
15050302	Rillito	Mammal	Baiomys taylori	Northern Pygmy Mouse	AMAFF05010		S						S3	G4G5
15050302	Rillito	Mammal	Cynomys ludovicianus	Black-tailed Prairie Dog	AMAFB06010	S			P	1		CCA	SX,S1	G4
15050302	Rillito	Mammal	Nyctinomops femorosaccus	Pocketed Free-tailed Bat	AMACD04010					2			S3S4	G5
15050302	Rillito	Mammal	Eumops perotis californicus	Greater Western Bonneted Bat	AMACD02011	S				2		SC	S2S3	G4G5T4
15050302	Rillito	Mammal	Sigmodon ochrognathus	Yellow-nosed Cotton Rat	AMAFF07040					3		SC	S4	G4G5
15050302	Rillito	Mammal	Nyctinomops macrotis	Big Free-tailed Bat	AMACD04020					2		SC	S3S4	G5

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