Tubac Nature Preserve

Conceptual Master Plan Recommendations Report – Phase 1 area

Tubac, Arizona
June 2023

Acknowledgements

Rivers, Trails, and Conservation Assistance

Through a request from the Tubac Nature Center, the National Park Service provided support and planning assistance to project partners. The National Park Service - Rivers, Trails and Conservation Assistance Program assists communities in developing or restoring parks, conservation areas, rivers, and wildlife habitats, as well as creating outdoor recreation opportunities and programs that engage future generations in the outdoors.

Developing a conceptual master plan for the nature preserve involved collaboration between many people over the course of several months. This publication would not be possible without the dedication of a group of citizen volunteers representing partner organizations, a team of students and faculty from The University of Arizona, School of Landscape Architecture, guidance from the National Park Service – Rivers, Trails, and Conservation Assistance program, and participation by the community.

Tubac Nature Preserve Partners Committee:

Participants	Representing Partner Organizations
Jim Karp	Tubac Nature Center
Michael Dunn	Tubac Nature Center
Carolyn Fowler	Tubac Nature Center
Mary Dahl	Santa Cruz Valley Heritage Alliance/Tubac Presidio State Historic Park
Bill Lisowsky	Barrio de Tubac Neighborhood
Sheila Slaughter	Friends of the Santa Cruz River
Rich Kiker	Anza Trail Coalition / Tubac Community Garden
Jonathan Horst	Tucson Audubon Society
Kari Hackney	Tucson Audubon Society
Mike Shaw	HawkWatch International
Clem Shute	Santa Cruz Valley Citizen's Council

With Planning, Design, and Facilitation services provided by:

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Introduction

Tubac, Arizona is considered one of the state's premier destinations, known for its significant cultural history and local art. With beautiful views and connections to the Tumacácori Mountains, Santa Rita Mountains, and the Santa Cruz River corridor, local residents want this small town known for one more thing - nature.

The Tubac Nature Preserve is a 160+ acre parcel of land bordering the Santa Cruz River and made up of a lowland riparian forest, semi-desert grassland and wetland. As of June 2023, the property is under private ownership; however, the land is anticipated to be donated to the Tubac Nature Center for use as a nature preserve. The Santa Cruz River and Juan Bautista de Anza National Historic Trail (the Anza Trail) run north-south through the property. At this time, a portion of the land is used to pasture cattle, but other portions of the site have designated trails that have long ago been created for the public to use freely.

The main body of this report focuses on the planning process and preliminary conclusions for an approximately 36-acre area (Phase 1) in the northwestern portion of the larger site. Phase 1 is highlighted in blue in Figure 1. The remaining 124 acres are mainly comprised of riparian forest, which is discussed in detail in the Tubac Nature Preserve Restoration Management Framework (attached at the end of this report).

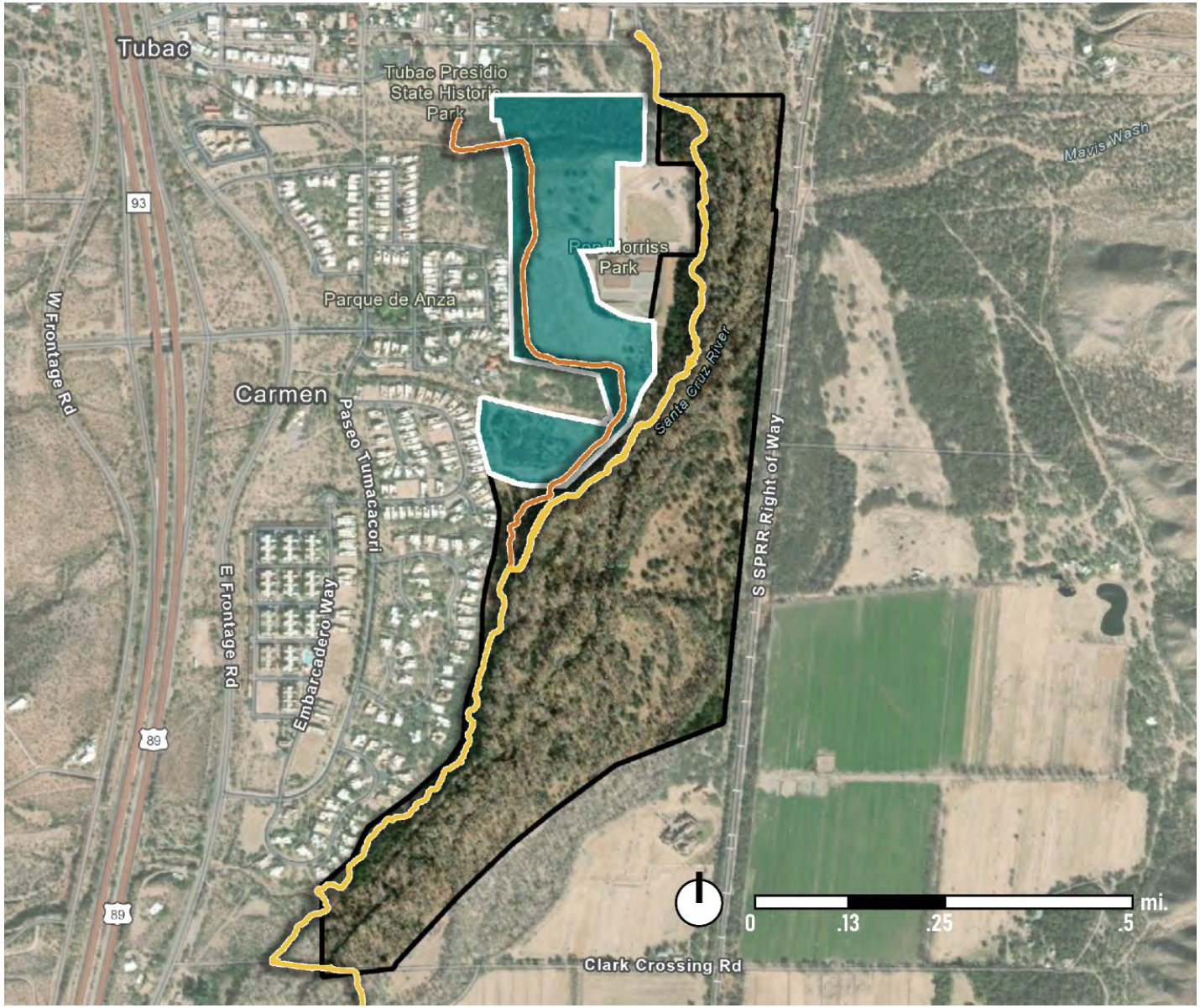

Figure 1 - Site Plan and Phase 1 Area with Anza Trail (yellow) and spur trail (orange) highlighted.

Background

In April 2020 Jim Karp, President of the Tubac Nature Center, sent an email to Gary Brasher, the managing partner of Baca Float Land Development, asking him to consider donating the land around the borrow pit wetland to the Tubac Nature Center (TNC). Though the wetland had once been a vibrant area full of birds and other wildlife, it had become overgrown, dominated by invasive species of plants, and a poor remnant of its former self. The email led to several meetings and further discussion. In January 2022, Brasher indicated that his company owned 167 acres of land including the wetland. He said that only 7 acres in the southwest corner of the parcel had significant value to the business. Karp suggested that the remaining 160 acres be donated to the TNC to create a nature preserve to benefit the greater Tubac community. Brasher took to the idea immediately, indicating that it had always been the intent of Baca Float Land Development to protect the land in some fashion.

Though much of it is in a deteriorated natural condition, the 160-acre parcel contains a rich diversity of natural habitat. In addition to the wetland, the land includes a perennial section of the Santa Cruz River, a cottonwood/willow gallery forest on each side of the river, remnant sections of mesquite bosque, and some open fields. Though the need for habitat restoration in each of the various habitats is clear, the opportunity for a robust nature preserve is equally obvious.

TNC was fortunate to be selected to receive the services of Laura Bolyard of the National Park Service – Rivers, Trails, and Conservation Assistance Program (NPS-RTCA) to guide the process to develop a concept plan for the proposed nature preserve. Representatives from a group of 10 relevant organizations were assembled to form a committee to carry out the design of the concept plan for the preserve. The group began meeting in September 2022. When the basic plan was completed by the committee, it was presented for review by the public at a meeting of the Santa Cruz Valley Citizens Council on February 13, 2023. Though the plan received broad support, it also received some criticism from members of the nearby neighborhood. On March 30, 2023, a community workshop was organized by Bolyard to address the issues raised at the Citizens Council meeting. The workshop proved to be a big success. Forty-five members of the community assembled, discussed the issues, and the end result was that most of the issues were resolved to the satisfaction of the attendees. Since the workshop, a small group, including Brasher, Karp, and representatives of the neighborhood, have been meeting to hammer out the final details leading to the conveyance of the 160-acre parcel to TNC for development of the Tubac Nature Preserve.

Vision Statement

The Tubac Nature Preserve will be a restored, healthy ecosystem and community treasure, offering stimulating activities and a peaceful environment. This destination will connect art, history, and nature through education and recreation.

Mission Statement

Create and sustain a treasured Nature Preserve with restored ecosystems and public access for the education, inspiration and enjoyment of those who visit.

Goals

Goal 1: Restore the ecosystem.

Goal 2: Create a multi-purpose nature preserve that offers educational experiences for everyone.

Goal 3: Improve access to and within the site to allow for ease of access, safety, inspiration, and enjoyment by all.

Goal 4: Make the preserve a financially sound project.

Goal 5: Have effective involvement and collaboration with all stakeholders.

1.0 Site and Context

1.1 Site Description

The Phase 1 site, located in the northwest portion of the full property, has not been surveyed, but has been observed physically and through maps:

- Located approximately at 31°36'33.56"N and 111°2'37.99"W,
- Approximately 14 acres of open meadow which includes invasive species,
- Approximately 7 acres at the south associated around a borrow pit wetland that resulted from the development of the nearby neighborhoods,
- Existing trails throughout the site with vegetated edges/buffers from adjacent properties and transitioning to the Santa Cruz River.

1.2 Site Context

The 36-acre Phase 1 area is centrally located in Tubac, Arizona with important connections to adjacent properties:

- Primary access through Ron Morriss County Park from Calle Iglesia,
- Service access at Avenida Urrutia through the site to the water treatment facility to the east,
- Trail access from Tubac Presidio State Historic Park toward the northwest that connects through the site to the Santa Cruz River and the Anza Trail to the east of the site,
- Borders the neighborhoods of Cielito Lindo and Trailshead to the west,
- Narrows around the historic Valle Verde Ranch property to the southwest to include the borrow pit wetland,
- Less than 1-mile from the I-19 Frontage Road.

For purposes of this report, "borrow pit", "borrow pit wetland" and, when referring to the specific place, "wetland" all refer to the same area in Phase 1.

1.3 Precedent and Background Research

1.3.1 Public Space

- Public space is an area that is open and accessible to the public at large, including people of all genders, races, ethnicities, ages, and socio-economic levels (UNESCO, 2023).
- Public spaces can bring multiple benefits. Not only can they bring people together and foster social relationships, but they also contribute towards a stronger economy and a sustainable society.
- To create inclusive public spaces for all, there must be a shift in the balance of private versus publicly owned places to establish an effective design framework.

1.3.2 Accessibility and Mobility (See Appendix I for more)

Four key characteristics for planning public spaces for older adults (Sarkissian & Stenberg 2013):

- Potential decrease in physical mobility, changes in muscular efficiency and co-ordination,
- Possible sensory and perceptual changes,
- Potential loss in comprehension and orientation, including: memory loss, forgetfulness, disorientation, and incoherence; and
- Possible reduction in social contacts, caused by retirement, loss of health, death of intimate friends, etc.

Commonly desired interventions in public open spaces include:

- Shaded seating areas, accessible washrooms and pathways, and exercise equipment (Goodchild 2021),
- Better accessibility for all, public events, level pedestrian crossings, sidewalks in good condition, and more benches and game tables (Foyatier 2021),
- Non-slip walking surfaces, adequate stairway railings when needed, entry ramps for wheelchairs and walkers, and safe pedestrian crossings for navigating traffic (Stevenson 2016).

1.4 Selected Case Studies (See Appendix II for more)

Riverwalk Sensory Trail, Schuylerville, NY along the Hudson River
Designer(s): CLA Site Landscape Architecture, National Park Service Office of Accessibility
Project Completion: July 2013
Key words: sensory trail, accessibility

Project Summary:

- Designed to improve the recreational experiences of the community at large, with special attention to making the trail accessible for individuals who are mobility or visually impaired.
- This 1,540-foot-long trail is one of the longest sensory trails and one of the only few handicap-accessible trails in the United States.
- The community advocated for the creation of a trail along the Hudson River that connected to the existing Hudson Crossing Park and could be used as both an educational and recreational resource (Figure 2).
- Amenities along the trail include: Tour-Mate Eco-Box audio interpretive units that allows users to hear short stories relevant to the surrounding areas; Overlook decks that provide moments of pause along the river trail (Figure 3); Wide and smooth trails that provide ample space for wheelchair accessibility along the entirety of the trail (Figure 4).

Design Implications:

This project is a result of the work that community advocates did to make this community resource a reality. The most notable result of this project is that it gives people with visual and mobility impairments the ability to have experiences that otherwise they might not have. For example, along the trail, there are outlook decks that are meant to mimic spaces that might be inaccessible to people in wheelchairs, such as treehouses. By mimicking the environment of a treehouse on the ground level, it removes a physical barrier that is exclusionary to those who cannot climb a tree or ladder. Additionally, the audio descriptive boxes allow people with visual impairments the ability to immerse themselves in the landscape more deeply and independently, without having to rely on others to describe their surroundings to them. These factors could be easily overlooked by able-bodied people who take their physical abilities for granted. By including communities with disabilities in the design process, the trail is now a sanctuary that can be experienced and enjoyed by people of all abilities.

Figure 2 - Riverwalk Sensory Trail: Educational Resource.

Figure 3 - Riverwalk Sensory Trail: Overlook Deck.

Figure 4 - Riverwalk Sensory Trail: Wide, smooth trails.

Watertown Riverfront Park and Braille Trail, Watertown, MA
Designer(s): Sasaki, Perkins School for the Blind
Project Completion: 2016
Key words: sensory trail, accessibility, braille trail, low-visibility users

Project Summary:

- Park and ¼ mile trail along the Charles River in Watertown, MA,
- Community resource makes recreation accessible to all members of the Watertown community (Figure 5), with a special focus being placed on making the spaces accessible for people with visual impairments,
- The project is composed of a sensory garden (Figure 6), including tactile sculptural elements and braille signage (Figure 7), as well as a connecting braille trail that uses guidewires and tactile elements to signal nearby amenities to park users,
- The project was designed in conjunction with input from the nearby Perkins School for the Blind.

Design Implications:

This project allows for independence for the site's users through the integration of accessible wayfinding features along the length of the trail. The guidewires allow users with low vision a secure feature to hold on to as they travel along the trail, and the tactile beads that signal nearby amenities allow them to find what they need without having to rely on others. Additionally, the tactile sculptures and signage in the park allow them experiences such as feeling what an object might look like and reading the same educational information as others. By integrating these features into the park, users can enjoy these experiences without assistance.

Figure 5 - Riverfront Park and Braille Trail: Accessible community resource.

Figure 6 - Riverfront Park and Braille Trail: Sensory garden with interactive features.

Figure 7 - Riverfront Park and Braille Trail: tactile sculptural elements and braille signage.

Additional case studies and project lists are provided at the end of Appendix VIII. These examples are mostly focused on the restoration and management aspects. More case studies are included in Appendix II, although these were less influential in this project after being reviewed by the committee.

2.0 Inventory and Analysis

2.1 Regional and Local Context

Tubac is a small arts and retirement community with a rich history located in Santa Cruz County, Arizona. It is located along the I-19 and Santa Cruz River corridors approximately 50 miles south of Tucson and 25 miles north of the U.S./Mexico border (Figure 8). The entry signage to the village states “Where art and history meet” but recently community discussion has centered around also emphasizing natural amenities and associated activities, such as birding and hiking.

There are several community landmarks within a mile of the site (Figure 9):

- Tubac Community Center,
- Ron Morriss County Park,
- Wingfield Bridge aka the Tubac Bridge,
- Tubac Golf Resort & Spa,
- Tubac Presidio State Historic Park,
- Tubac Center of the Arts.

Additionally, the I-19 freeway is in close proximity to the site, making it easily accessible to visitors coming from communities such as Tucson, Rio Rico, Nogales and beyond, as well as sites of interest such as Tumacácori National Historical Park.

Tubac's elevation is 3,250 feet above sea level. The Santa Cruz River serves as an important migratory path for birds and supports important habitats (Figure 10). Tubac is an unincorporated community in Santa Cruz County with zip code 85646. Demographics listed as:

- Population: 1,223 (more from November to April)
- Median Home Value: $341,200
- Median Household Income: $68,835
- Median Age: 64.8
- Race: 83.2% White Non-Hispanic
  (See DATA USA, n.d.)

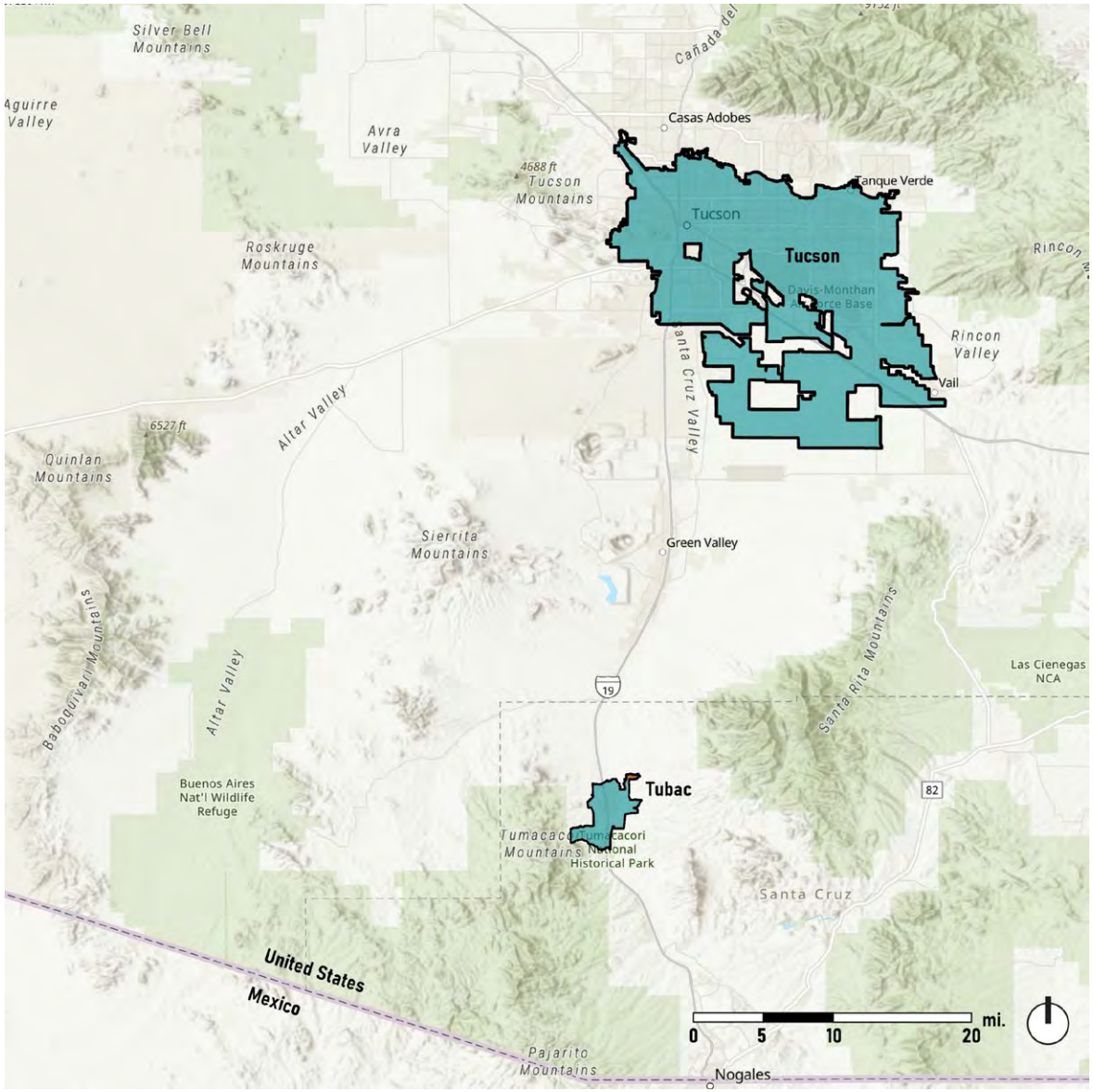

Figure 8 - Tubac, Arizona in relation to Tucson and the United States/Mexico Border.

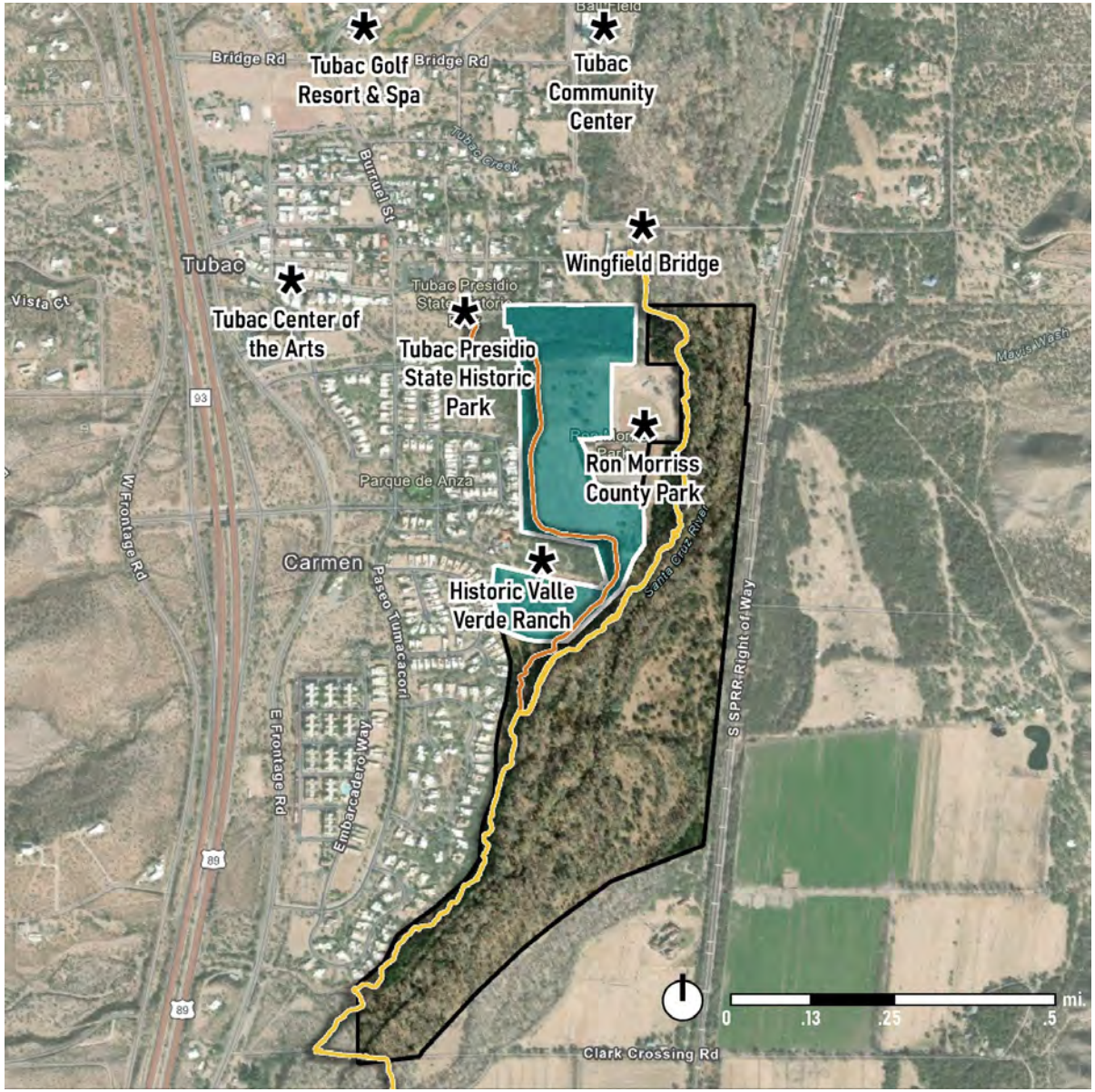

Figure 9 - Community landmarks near the Phase 1 site.

Figure 10 - Beautiful views of the mountains and bosques surround the site.

2.2 Site Inventory and Analysis (Figure 11)

2.2.1 Access to Phase site

- Principal public vehicular access is from the north along Calle Iglesias through Ron Morriss County Park at the east side of the Phase 1 site.
    - Arrival through the park creates an opportunity for shared arrival amenities such as parking and restrooms,
    - This access is a direct access and short distance from the current location of the Tubac Nature Center.
- A second private vehicular access point is from the west along Avenida Urrutia.
    - This is a private maintenance access point for the water treatment facility and should not be access for general use.
    - Parking near this access should be discouraged, being within the Cielito Lindo neighborhood.
- Existing pedestrian access points serve the site well (Figure 12).
    - Access from the county park should be enhanced as a welcoming point for primary public entry.
    - Access from the Anza Trail and the Tubac Presidio State Historic Park may be enhanced with wayfinding to encourage access to the site.
    - Access from the neighborhoods should be designed to discourage non-residents.

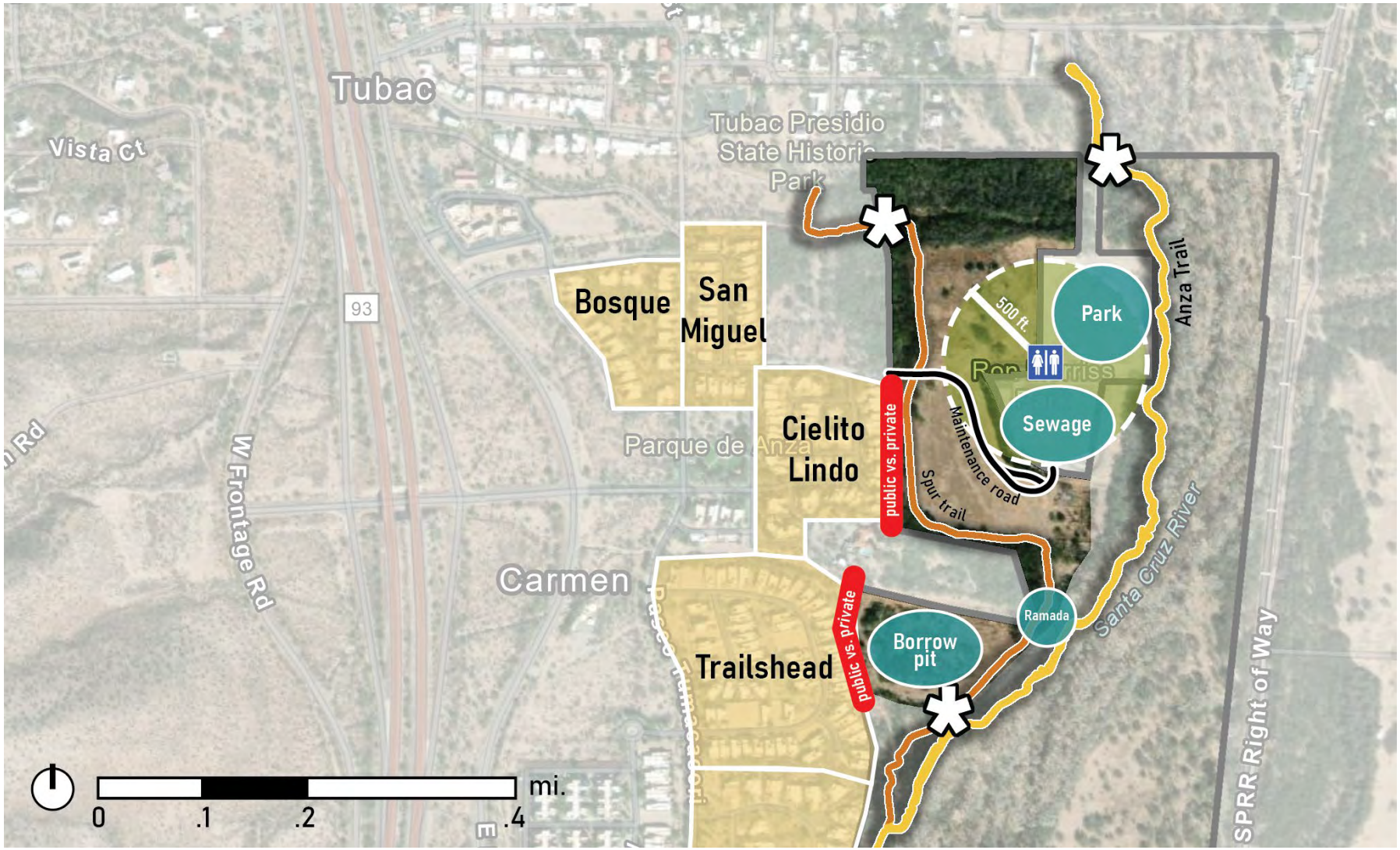

Figure 11 - Inventory and analysis diagram for the Phase 1 site.

Figure 12 - Existing trails along the edges of the site set the stage for new future circulation throughout the preserve.

2.2.2 Neighbors

- Neighborhoods including the Bosque, San Miguel, Cielito Lindo, and Trailshead have close proximity to the site and access for residents should be maintained.
- Cielito Lindo and Trailshead have shared boundaries between the site and the backyards of several residents.
    - Existing vegetation should be maintained and this visual buffer should be enhanced.
    - Any new amenities that attract visitors to the site should not be considered in these areas.
    - Existing trails in these areas may be maintained.
    - Protecting the privacy of neighbors is a high priority.
- Trail access to the Tubac Presidio State Historic Park should be maintained.
- Trail access will be maintained around Historic Valle Verde Ranch with no new public connections.
- Access path and service road to the water treatment facility will be maintained primarily for maintenance access. Clarifications of property boundaries and access easement may be necessary.

2.2.3 Amenities

- Ron Morriss County Park brings shared resources (Figure 13).
    - Visitors to either the park or the preserve can easily access adjacent resources including ramadas, picnic benches, restroom, ball field and a dog park.
    - The main entrance proximity to the park restroom negates the need for additional restrooms for Phase 1.
- An existing ramada east of the Valle Verde Ranch near the spur trail connection to the Anza Trail should be maintained.
- The borrow pit wetland is a valuable birding area, but lacks amenities that may facilitate the activity and engagement at this portion of the site.

Figure 13 - Existing activities in the adjacent Ron Morriss County Park and the Anza Trail can encourage use of the preserve once established. Source: Tubac Nature Center.

2.2.4 Biological

There are three key biological communities on site—the lowland riparian forest or cottonwood-willow gallery forest, semi-desert grassland and the borrow pit wetland, which has potential as a wetland resource. Each ecosystem is in need of rejuvenation, restoration and/or reconstruction. They have very different challenges and likely, very different approaches to becoming healthy components within the nature preserve. During the initial phases of restoration, focus will be applied to the grassland and wetland components, moving to increased attention to rejuvenating the riparian forest based on the results of various studies. Please refer to the Tubac Nature Preserve Restoration Management Framework for a more exhaustive analysis, set of goals, restoration processes, and potential funding sources for each of these biological communities on site.

- **Native Grasses and Wildflowers:** This biological community is primarily found west of Ron Morriss County Park, extending past the Baca Float wastewater treatment plant, around the east side of the Valle Verde Ranch, and almost encircling the borrow pit wetland.
    - The areas currently in grass represent seed distributed during earthwork activities undertaken to develop the Barrio properties. Over time these areas have morphed into a combination of grasses and weeds, native and non-native (Figure 14).

- The composition of grasses is an unknown but lacks diversity and exhibits a paucity of wildflowers. Pigweed seems to make up a large percentage of many of the grassy areas.
- Water is not available in or near most of the areas currently in a grassy state.
- Having desirable native species of grasses and wildflowers will be pleasing to local residents and visitors. The area will provide food for winter birds if maintained (cut down) at the appropriate seasons. It will draw butterfly enthusiasts if blooming native host plants are featured in the summer.
- Healthy, native, drought tolerant grasses and wildflowers cost less to maintain.

Figure 14 - Invasive grasses cover the site and are extremely overgrown.

- **<u>Borrow Pit Wetland:</u>** The borrow pit holds some water, has some marsh-like vegetation, and is overgrown with various species of trees and shrubs, including some invasive plants. A maintenance easement serves as a trail around the pit. (See Appendix III).
    - The hydrology investigation completed several years ago for Valle Verde Ranch provides a basis for understanding how much potential and effort will be needed (See Appendix IV).
    - The neighbors to the west are screened by berms and some mesquites (Figure 15). There is valid concern that their views may be affected by increased activity. Consider planting native fruit-bearing shrubs that will grow 15'+ high as winter food and offer screening for neighbors to the west.
    - The condition of the wetland is primarily a function of monsoonal moisture, winter rains and runoff. No maintenance is done to the vegetation. The cottonwoods indicate some moisture is available but portions of the eastern end show that there is very little moisture much of the year and surface water recedes to the west (Figure 16).
    - Recent bird sightings indicate that marsh birds have not returned subsequent to the drought years of 2019 and 2020. American Coot, Marsh Wren and Sora were not recorded in late 2022.
    - May be regraded for better function for off-site storm water management before entering the Santa Cruz River as a higher functioning wetland.

Figure 15 - Site is directly adjacent to multiple neighborhoods, bringing up privacy concerns from homeowners along site edge.

Figure 16 - Borrow pit needs to be regraded to function properly as a wetland, as well as improve safety for users walking in the area.

- **<u>Lowland Riparian Forest:</u>** The Santa Cruz River runs through the center of the Nature Preserve. Although the river is perennial, it has a history of low flows in late spring/early summer seasons during severe droughts. Sometimes flooding comes within adjacent lowlands with the monsoons of July/August and at times September. Main water sources come from upstream the Nogales International Wastewater Treatment Plant in Rio Rico and the Sonoita Creek. This river is considered a critical habitat at both the state and federal level for a number of declining aquatic, terrestrial, and avian species.
    - The forest needs a better mix of age classes, offering senescent, mature and young trees with a regular cycle of emergent seedlings. The most common species of trees in the riparian corridor are Fremont cottonwood and possibly Goodding's willow. Most trees are mature with very little regeneration occurring. There is only one age class of cottonwood present. Significant die-off is occurring from the extended drought cycle of most of the Southwest.
    - A lush understory of native shrubs, grasses and forbs is needed as a vegetative border to the river to act as overland sediment filters. The preserve area has had cattle grazing for many years. Nearly all visible green vegetation has been removed during the drought years, clearing the forest floor and exacerbating the erosion potential.

- The amount of woody biomass on the forest floor is heavily affected by monsoonal storms and flooding. The loss of old cottonwoods in recent years has increased woody biomass.
- Trash debris piles accumulate in the river and in adjacent floodplain during monsoons. Abundant plastic bottles, tires, household trash and assorted waste are left behind each year by flood flows, requiring major cleanup days.

3.0 Public Process

3.1 Working Group

3.1.1 Working Group makeup

As a collaborative partner, NPS-RTCA assists projects to achieve successful outcomes by engaging communities in visioning, planning and implementation of each project. NPS-RTCA encourages strong community partnerships and facilitates meaningful community engagement to increase likelihood that conservation and outdoor recreation projects last into perpetuity. RTCA partnered with the University of Arizona, through a Cooperative Ecosystems Studies Unit (CESU) program, bringing on two Graduate Research Assistants (GRAs) and a professor from the School of Landscape Architecture and Planning. The NPS-CESU team made up the Design Team. The Tubac Nature Preserve Partners Committee was formed and made up of representatives from many area organizations to assist in the design process for the nature preserve. The committee was led by the Tubac Nature Center board members and the RTCA project facilitator.

3.1.2 Visioning

After a site visit to observe key locations on the land, RTCA facilitated a visioning workshop in which the partners committee developed the mission and vision statement for the preserve. Project goals and objectives for the preserve were developed to assist in determining the short-term goals versus the long-term goals for the site. Figures 17-18 show part of the process of the visioning meeting held on October 7, 2022.

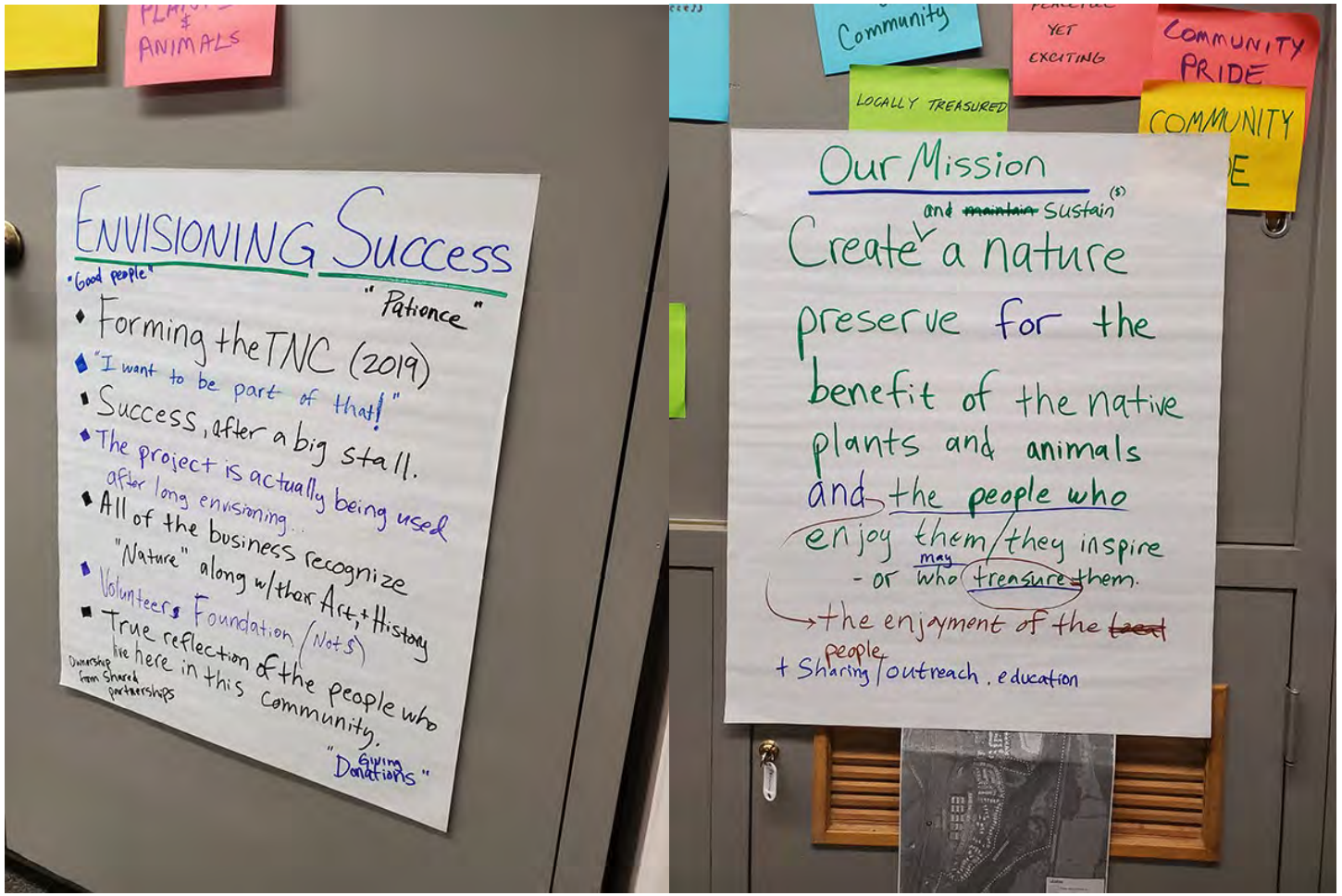

Figure 17 - Early iteration of the Vision and Mission of the Tubac Nature Preserve.

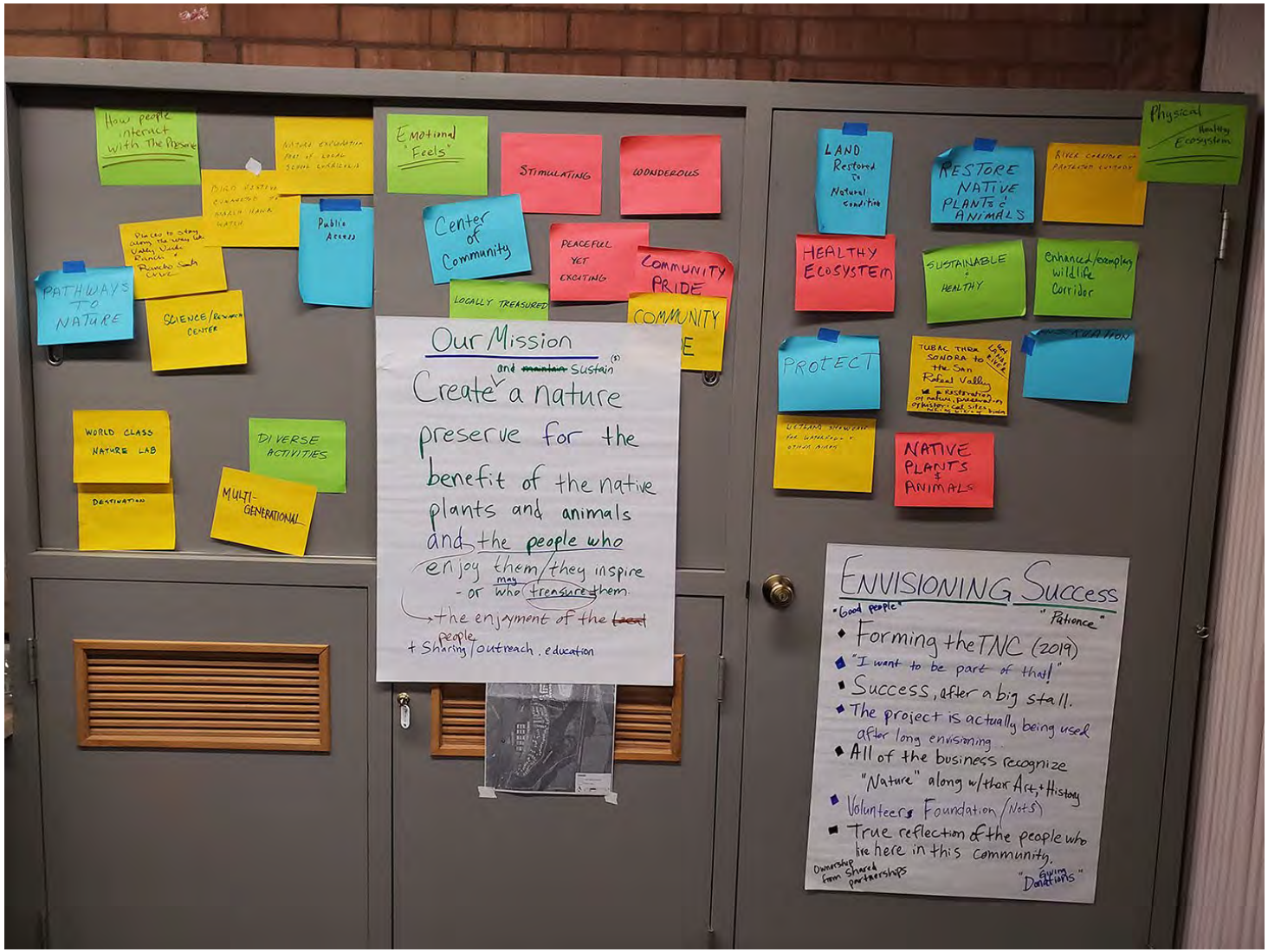

Figure 18 - Summary of results at the visioning meeting. Post-its represent ideas and descriptions of the preserve.

3.1.3 Advisory

Following the establishment of the vision, design sessions were held with the partners committee to map existing conditions. Members assisted the design team in identifying notable points of interest and site features that local residents and other stakeholders could easily recognize on a map to orient themselves. Following the site assessment, a rough concept map was created to identify locations for groups to gather on the site, and where design, restoration, and enhancements should be focused.

3.2 Community Engagement

One of the five major goals of the Partners Committee is to have effective involvement and collaboration with all stakeholders. Throughout the process, Tubac Nature Center sent newsletter updates to keep stakeholders informed of key process steps. The NPS-RTCA facilitator used the IAP2 Spectrum of Public Participation (Figure 19) to help guide the process.

An online public survey was used to inform, consult and connect with as many people as possible; a hands-on workshop allowed the direct involvement of those interested to participate; and the committee collaborated with neighbors whenever possible to work towards identifying issues and finding solutions that all parties could live with.

During future phases, the Tubac Nature Center board will continue to work closely with stakeholders, as design solutions are developed, before making major decisions adjacent to residential neighborhoods.

IAP2 Spectrum of Public Participation

IAP2's Spectrum of Public Participation was designed to assist with the selection of the level of participation that defines the public's role in any public participation process. The Spectrum is used internationally, and it is found in public participation plans around the world.

INCREASING IMPACT ON THE DECISION

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

Figure 19 - Spectrum of Public Participation (Source IAP2 International Federation 2018).

3.2.2 Survey

A 10-minute online survey was conducted from January 16, 2023 to February 23, 2023 in order to gather community feedback on ways the site in its current condition is used by community members and to guide initial conceptual design work based on the desires and needs communicated by respondents. The survey was developed and distributed online via email and newsletters from the Tubac Nature Center and members of the Tubac Nature Preserve Partners Committee to various networks and received 189 responses.

Survey data, summarized in Figure 20 (See Appendix V for full results) was utilized to:

- Guide decisions on the design.
- Gauge community interest levels for participation in the processes (refer back to Figure 19).
- Gather contact information for updates and invitations to a later workshop.

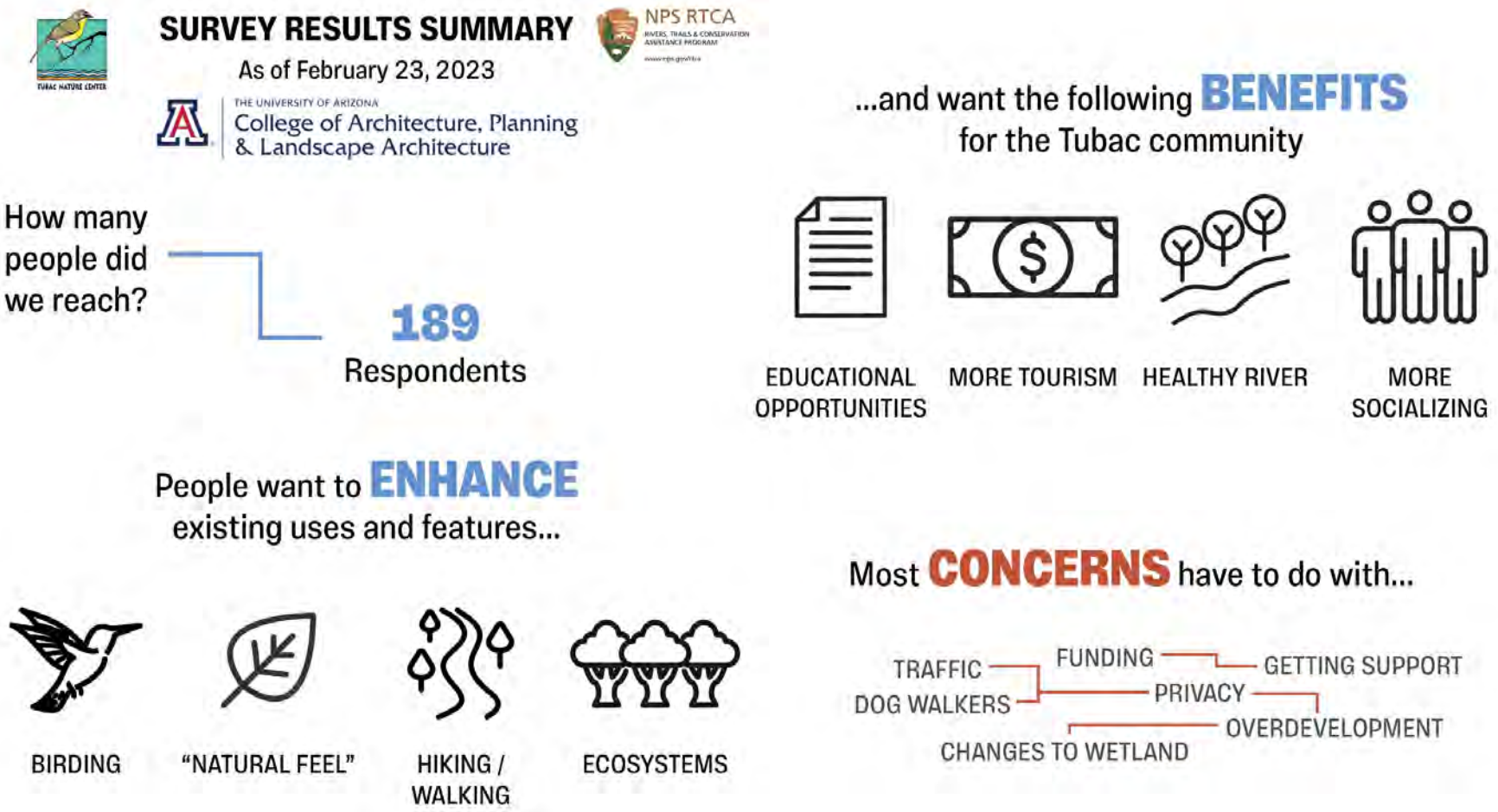

Figure 20 - Survey Results Summary prepared for Tubac Nature Center newsletter.

3.3.1 Meeting at Santa Cruz Valley Citizen's Council – February 13, 2023

The Tubac Nature Center had a brief presentation during the Santa Cruz Valley Citizen's Council Meeting on February 13, 2023 (See Appendix VI for presentation slides).

- Community members, whether they had completed the survey or not, had an opportunity to express concerns and ask questions regarding aspects of the project.
- The feedback echoed some of the survey findings, and also brought to light additional concerns from adjacent neighborhoods (Figures 21 and 22 show some of the most relevant questions that emerged after this presentation).

CITIZEN'S COUNCIL PRESENTATION FEEDBACK

February 13, 2023

Question: Has Santa Cruz County been a part of the conversation around this project?

Answer: We will coordinate with the county as we approach a plan that's more prepared for execution. We will ask for help with the needed equipment to remove salt cedar when time comes to work on the borrow pit area.

Question: What will you do about privacy concerns from people with adjacent property?

Answer: We plan to meet with concerned communities to discuss possible design solutions to keep their backyards safe and private. Increased control over this land, plants for screening, and stronger police presence as offered by the county's sheriff, are options. Moreover, any structures will be concentrated around the park.

TUBAC NATURE CENTER

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College of Architecture, Planning & Landscape Architecture

Figure 21 - Questions and Answers from the Santa Cruz Valley Citizen's Council Presentation.

CITIZEN'S COUNCIL PRESENTATION FEEDBACK February 13, 2023

Question: Will your plans for the borrow pit area create any hazards for us?

Answer: Any work in the borrow pit is intended to increase its capacity and potential as a managed wetland. The removal of invasive species such as salt cedar will actually make the wetland area safer, as those plants are a fire risk.

Question: What about increased traffic? Will our neighborhoods become visitor parking lots?

Answer: There will be parking near the preserve's entrance. Signage is to be installed to penalize violations and discourage visitors from parking in residential areas.

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Figure 22 - Questions and Answers from the Santa Cruz Valley Citizen's Council Presentation.

3.3.2 Community Planning Workshop – March 30, 2023

The community design workshop was held on March 30, 2023. At this workshop, participants were divided into six groups that included representatives from each neighborhood. Each group was presented with a draft site plan and various materials (colored dots associated with amenities, tree cutouts, scales, etc.) and asked to work together as a team to develop a concept map. Once all six groups completed their concept maps, participants were encouraged to explore other teams' maps and record what they liked, what they felt was missing, and what similarities they observed to their group's concept. Finally, all participants contributed to an open discussion about their concerns regarding site design.

- The design exercise and open discussion allowed the community to more clearly express concerns, discuss them together, and come to a resolution and vision that all participants could support, particularly regarding expectations regarding the necessary buffering between the preserve and the adjacent neighborhoods.
- The notes and maps from each team were synthesized to inform a revised concept from the design team.

See figures 23-30 from the workshop activities. These show some of the talking points that were then discussed together as well as the groups that attended the workshop.

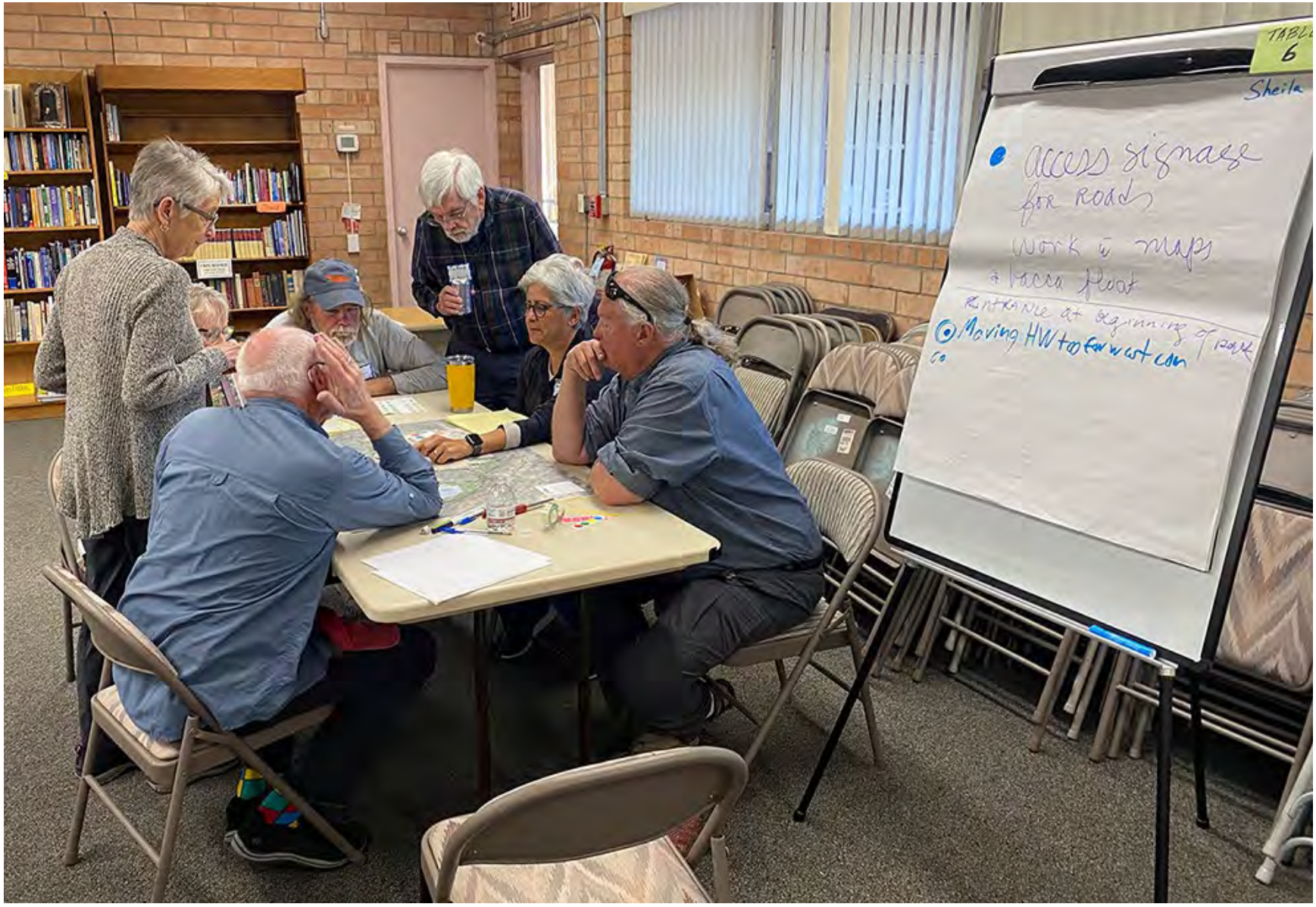

Figure 23 - One of the groups working together during the community planning workshop.

Figure 24 - One of the groups working together during the community planning workshop.

Figure 25 - One of the groups working together during the community planning workshop.

Figure 26 - One of the groups working together during the community planning workshop.

Figure 27 - One of the groups working together during the community planning workshop.

Figure 28 - One of the groups working together during the community planning workshop.

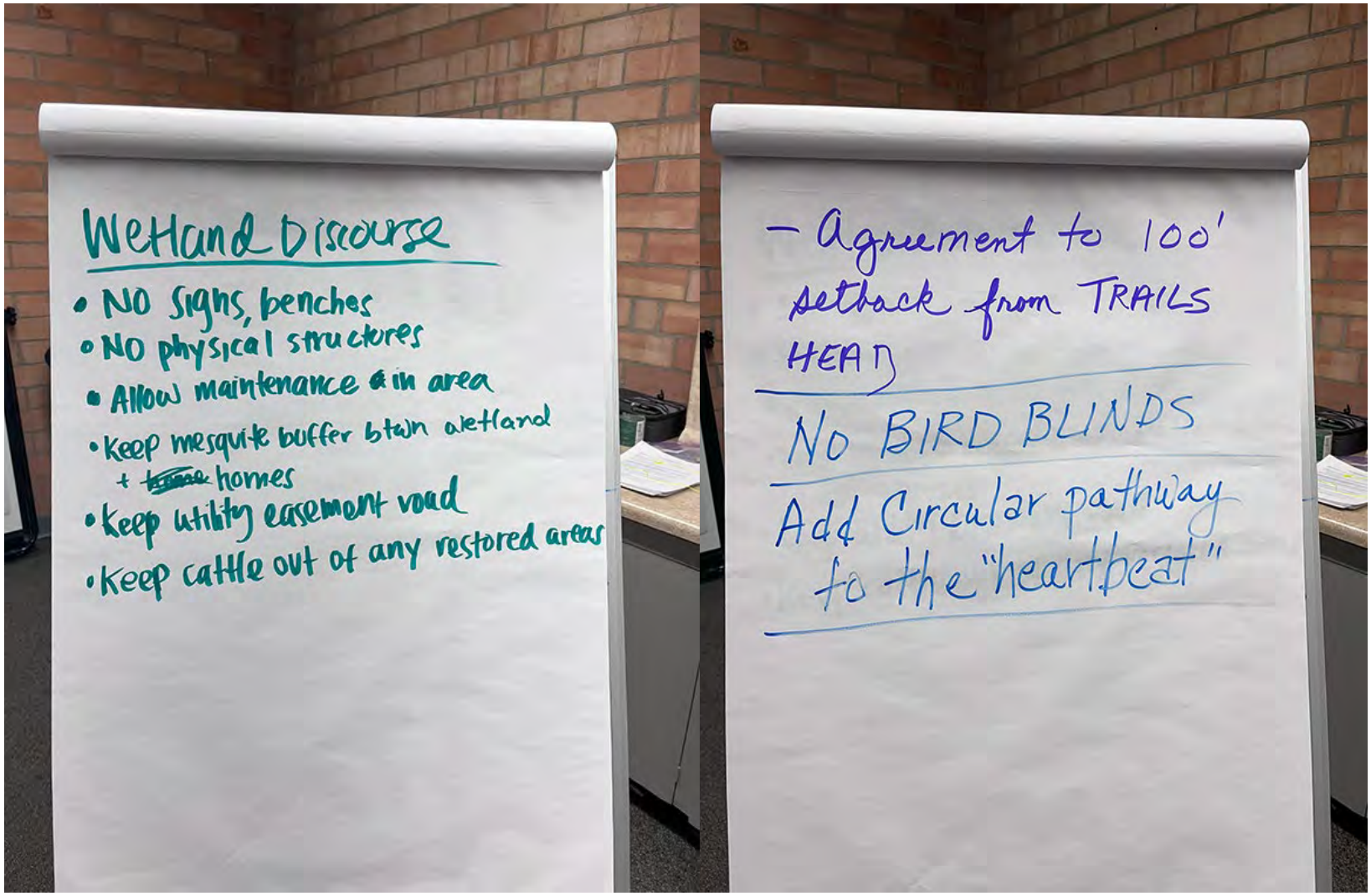

Figure 29 - Boards used in the meeting with points of discussion that were then discussed as a group with all attendees.

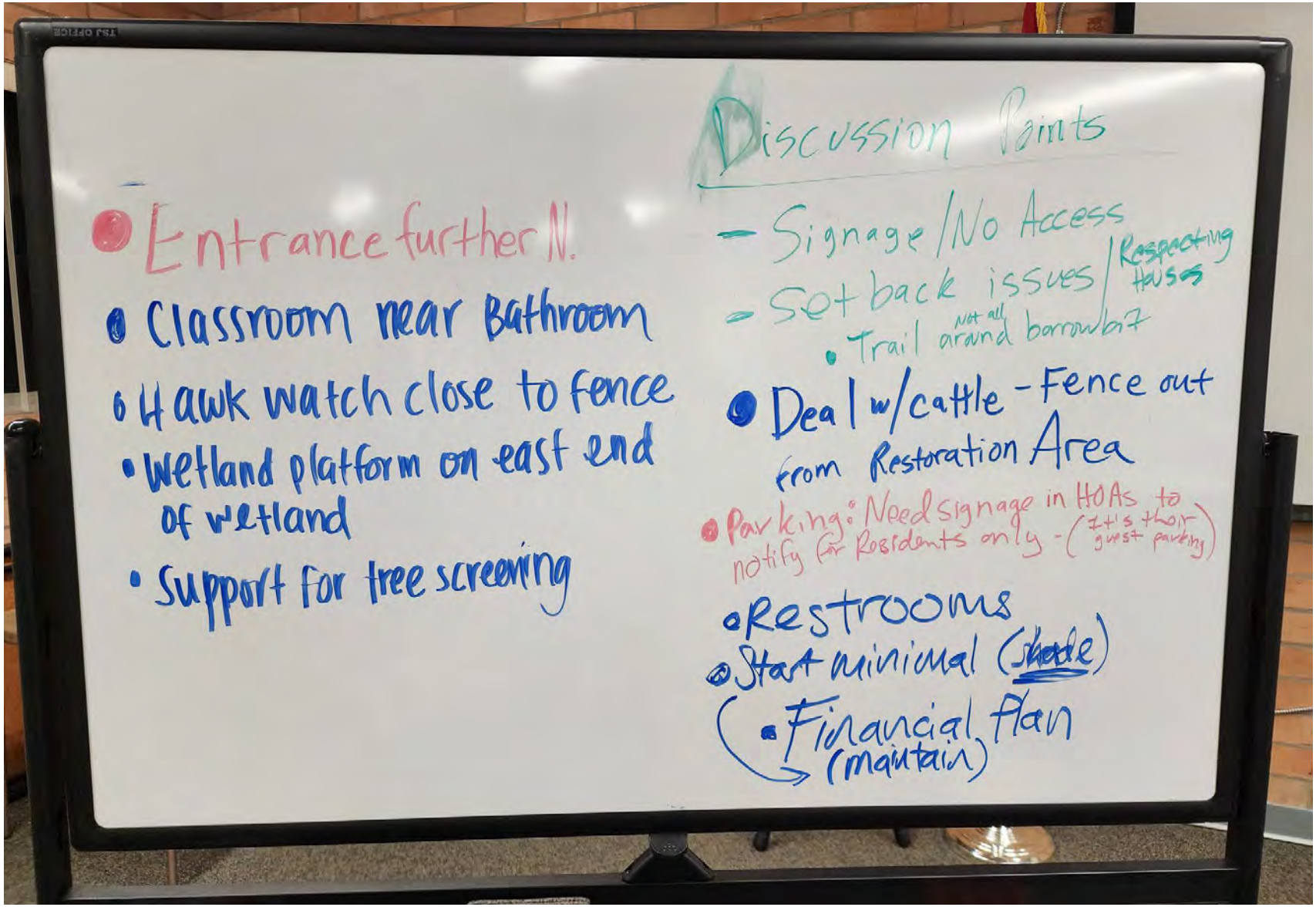

Figure 30 - Board compiling discussion points and concerns discussed with workshop attendees.

3.4 Revisions

The conceptual master plan went through several revisions and represents broad ideas emerging from the community engagement process to inform later technical drawings. The plan most recently was adjusted to reflect the input received from attendees of the community planning workshop held on March 30, 2023. Key adjustments include:

- The new preserve entrance from Ron Morriss County Park was shifted further north to be closer to the proposed parking area for more direct access (Figure 31).
- An informational kiosk is proposed to be placed close to the preserve entrance for wayfinding, and to inform visitors of upcoming events and other relevant information pertaining to the preserve (Figure 31).
- The Hawk Watch platform was not included at this time, as the placement and design needed to be discussed further with the Hawk Watch professionals. However, a proposed overhead shade structure is included near the preserve entrance to provide shade during Hawk Watch activities (Figure 31).
- The remains of the acequia are emphasized on the map to ensure this historic element is remembered. This creates opportunities for interpretation and education (Figure 31).
- The wetland platform was moved to the southeast corner of the constructed wetland to better address privacy concerns of neighbors in the adjacent neighborhood and to provide better viewing and photography opportunities for

birders and platform users. Final location should be determined by wetland experts as part of the wetland design plans (Figure 32).

- Benches around the wetland were removed from the plan to encourage visitors to remain closer to the platform area and the existing trails (Figure 32).
- Pollinator-attracting plants are suggested at different locations throughout the site, rather than having a centralized butterfly/pollinator garden (Figure 31 and 32).

3.5 Agreements with the community

Over the stages of community engagement of this project, neighbors have communicated many concerns to the TNP partners committee. As described earlier, feedback from the survey informed communications with the public and initial design plans. Later on, feedback from the community planning workshop and later feedback and collaboration between the community and the committee informed the work in this report to propose design solutions that best address concerns from the Tubac community. Below are the agreements reached with the community through the community engagement and collaboration activities:

- Retain all existing trails, including the utility easement road that serves as a trail around the constructed wetland.
- Keep a 100’ setback from the back of patio walls in Cielito Lindo and Trailshead. Vegetation to be cared for, but no structures to be built there.

- Keep benches and viewing platform away from the west side of the preserve, and always respect views, directing visitors' attention toward the preserve and away from homes.
- Keep cattle out of any restored areas.
- Keep structures close to the preserve's entrance.
- Prioritize habitat work in the borrow pit area during initial stages of the project. Offer the wetland restoration specialists' plans to the stakeholders for review and comment.

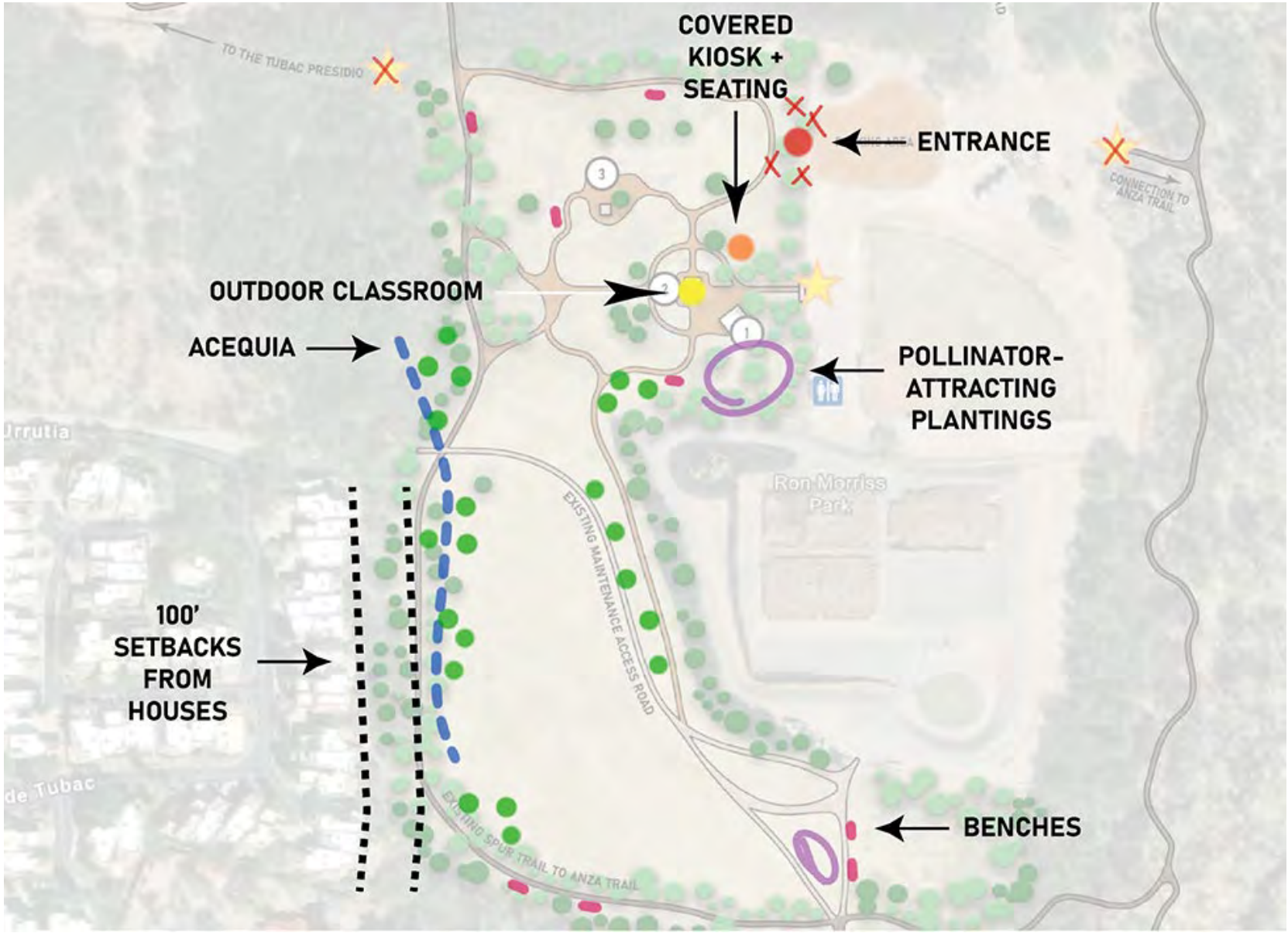

Figure 31 - Compilation of Community Feedback - North end.

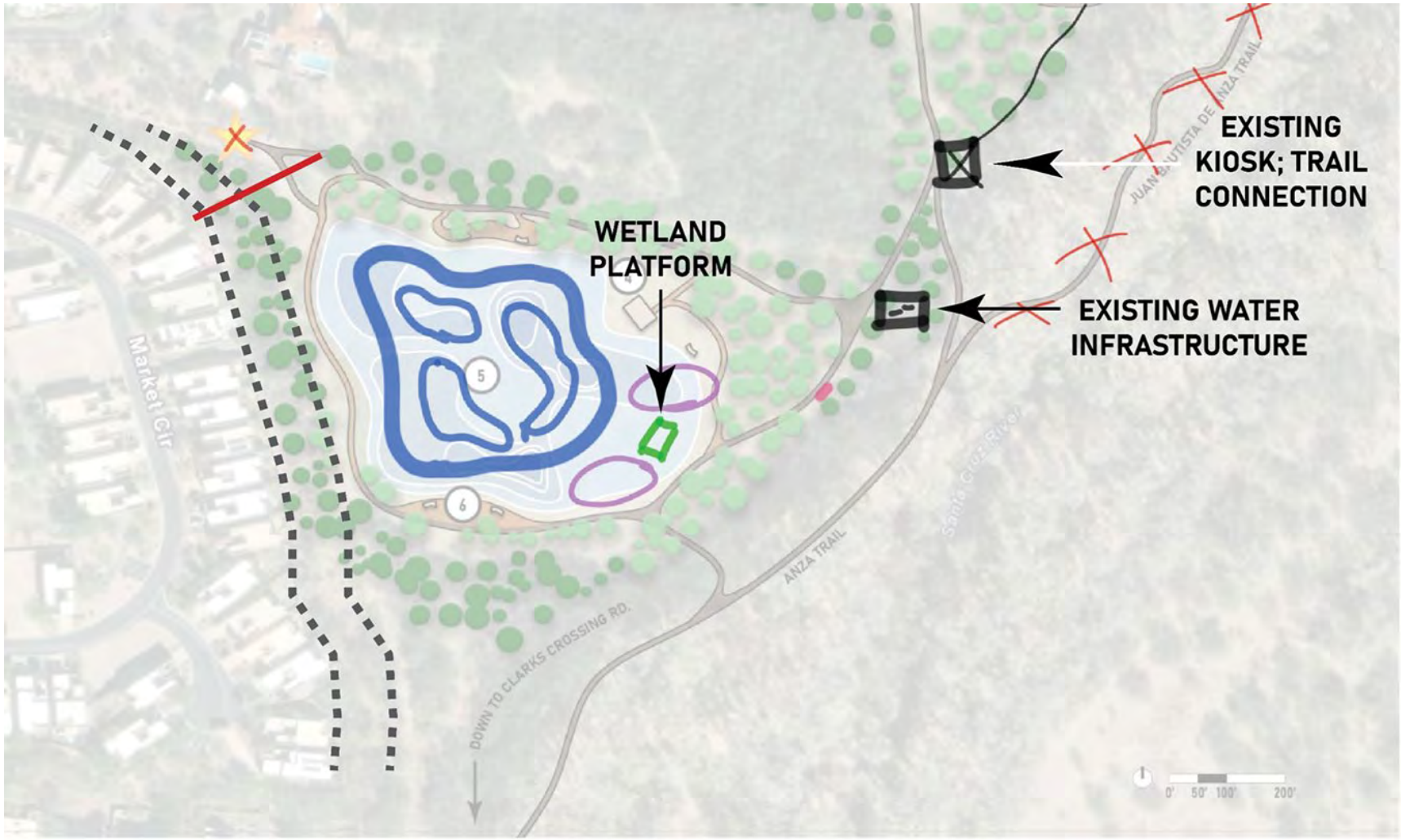

Figure 32 - Compilation of Community Feedback - South end.

4.0 Conceptual Design Solution

4.1 Proposed conceptual master plan

The proposed conceptual master plan for the Phase 1 site (Figure 33) strives to:

- Provide a clear and welcoming entry from the Ron Morriss County Park, and effective wayfinding along the trails throughout (Figure 34),
- Facilitate room for expansion/overflow from the park for Hawk Watch (Figure 34),
- Provide an outdoor classroom for educational and recreational activities within the preserve (Figure 34),
- Facilitate birding opportunities in a constructed wetland area at the borrow pit (Figure 35),
- Maintain privacy for neighboring residential properties (Figures 34 and 35),
- Minimize impact with strategically selected materials to not take away from the site's natural beauty and feel,
- Leave most of the land area untouched, aside from recommended plant remediation to remove invasive plant material and to establish a diverse palette of native plants and pollinators (Figures 34 and 35),
- Maintain and enhance existing trails for accessibility with a strategic addition of a few new paths and trails (Figures 34 and 35),
- Provide more seating and shade for comfort and safety (Figures 34 and 35).

- To protect the privacy of neighbors, benches will not be added on the west side of the property and those that are placed within sight of the houses will face the opposite direction.

Figure 33 - Master Plan (See appendix VII for a full quality copy).

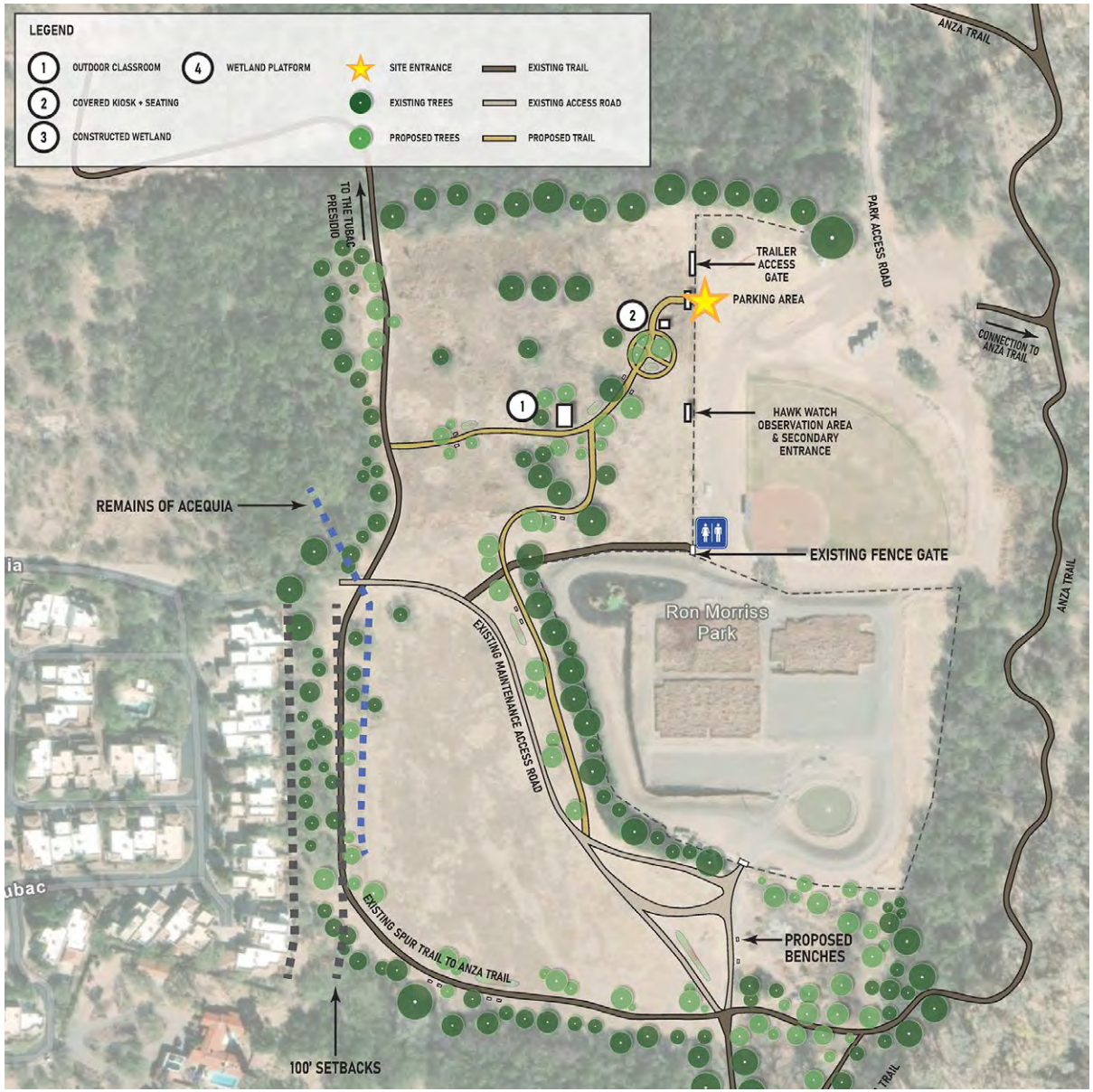

Figure 34 - Master Plan - North end enlargement.

Figure 35 - Master Plan - South end enlargement.

4.2 Public Space

The conceptual master plan is intended to create a framework to ensure the nature preserve as a public space with attention to *accessibility, specificity, authenticity, adaptability*, and *functionality*.

4.2.1 Accessibility

- Orientation and wayfinding are achieved through strategic cues comprehensively across the site that help visitors understand where they are, where they came from and where they are going. Orientation and wayfinding strategies include:
    - Clear public entrance/gateway from Ron Morriss County Park (See Figure 36),
    - A variety of options for access and circulation with clear hierarchy
    - Clearly defined trails with appropriate signage for direction options at nodes,
    - Viewpoints and sightlines to localized landmarks (i.e., shade structure),
    - Distinct areas within the site (open grass/wildflower area, wetland, adjacent lowland riparian forest),
    - Trails map at entry kiosk.

- Universal access is important for enhancing mobility for a wide audience of visitors.
  - When possible, path materials, dimensions, amenities and other features should be designed and maintained following the United States Access Board guidelines on Outdoor Developed Areas. As recommended, “Designers, owners, and operators are encouraged, but are not required, to exceed the minimum requirements where possible to provide increased accessibility and opportunities for people with disabilities to enjoy trails and other outdoor developed areas.”
  - Use smooth trails meeting or exceeding minimum widths (Figure 37 and 38) and slopes on existing and proposed trails throughout the site (Figure 38).
  - Use and maintain level transitions and crossings between surface types and trail intersections (Figure 39), particularly at intersections with the wastewater treatment facility access road.
  - The proposed trails are generally level, but where grade change merits, particularly at the constructed wetland, use ramps (Figure 40) and not steps. Minimum standards should be exceeded here to accommodate bi-directional access.
  - Provide accessible space for access to amenities such as tables (Figure 41), benches (Figure 42), and on viewing platform (Figure 43).

Figure 36 - Nature Preserve entrance from Ron Morriss County Park.

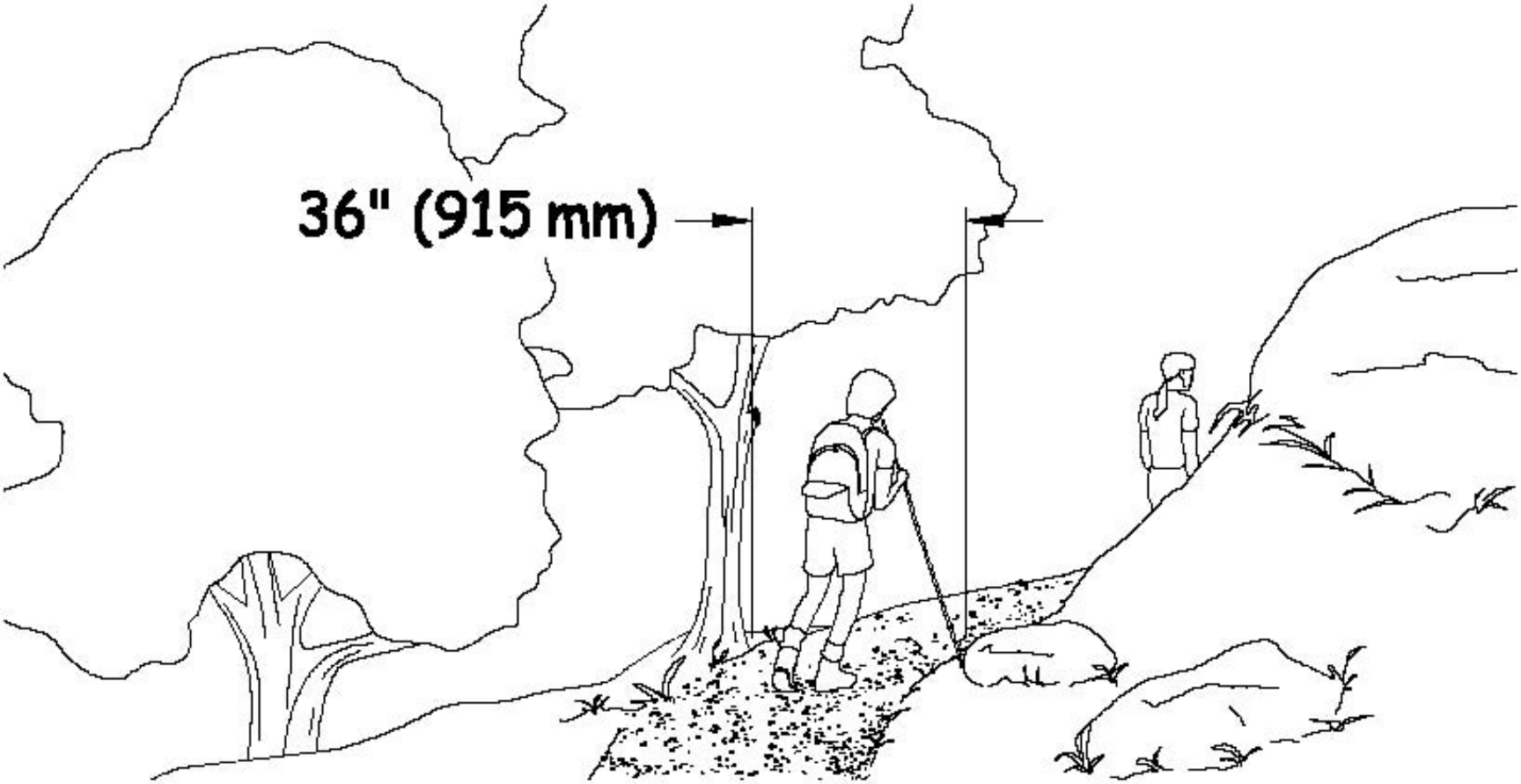

Figure 37 - Sample guideline showing minimum trail width. Source: USAB.

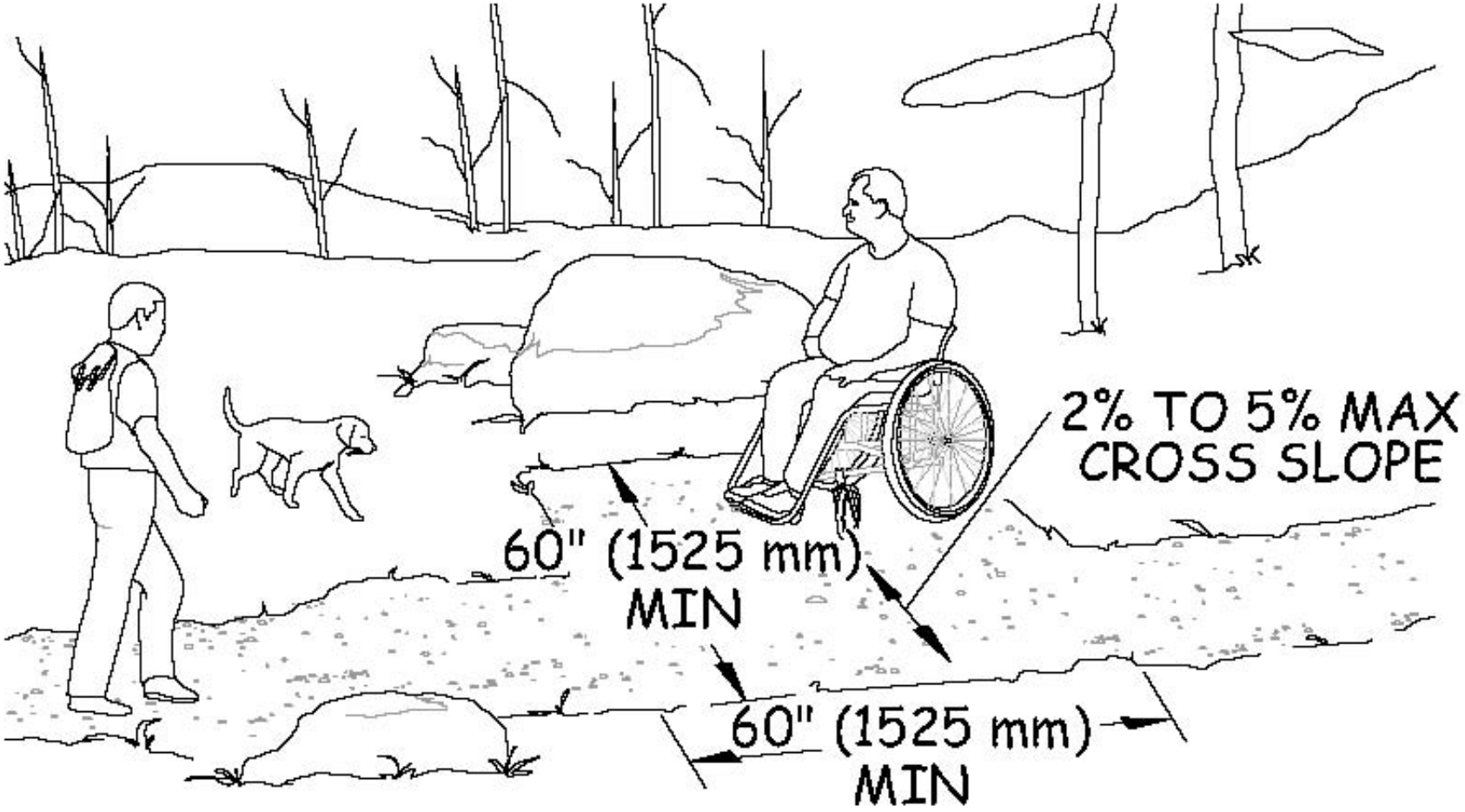

Figure 38 - Sample guideline showing minimum trail dimensions for passing and maximum surface cross slopes. Source: USAB.

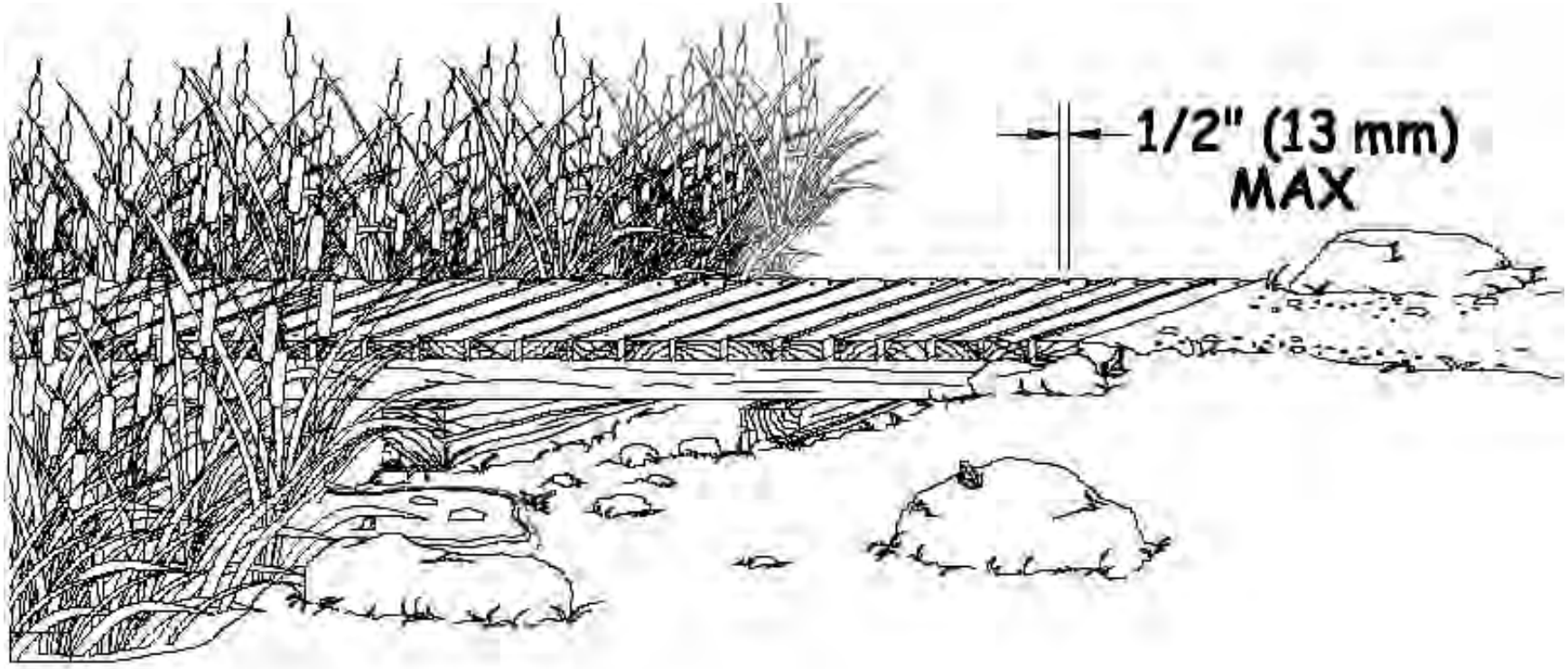

Figure 39 - Sample guidelines showing smooth transitions and surface considerations for accessibility. Source: USAB.

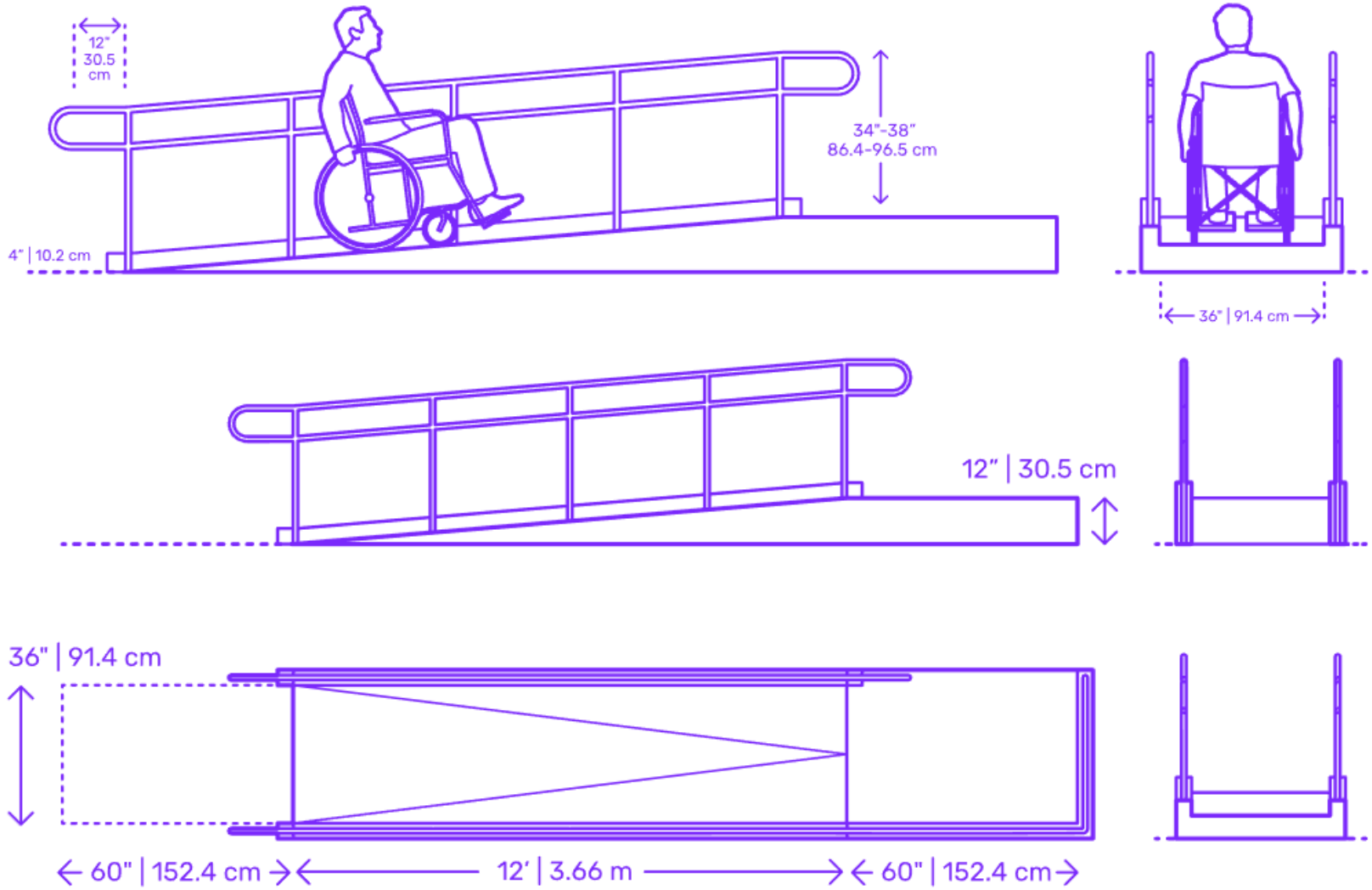

Figure 40 - Sample guidelines for minimum ramp dimensions. Source: Dimensions.com.

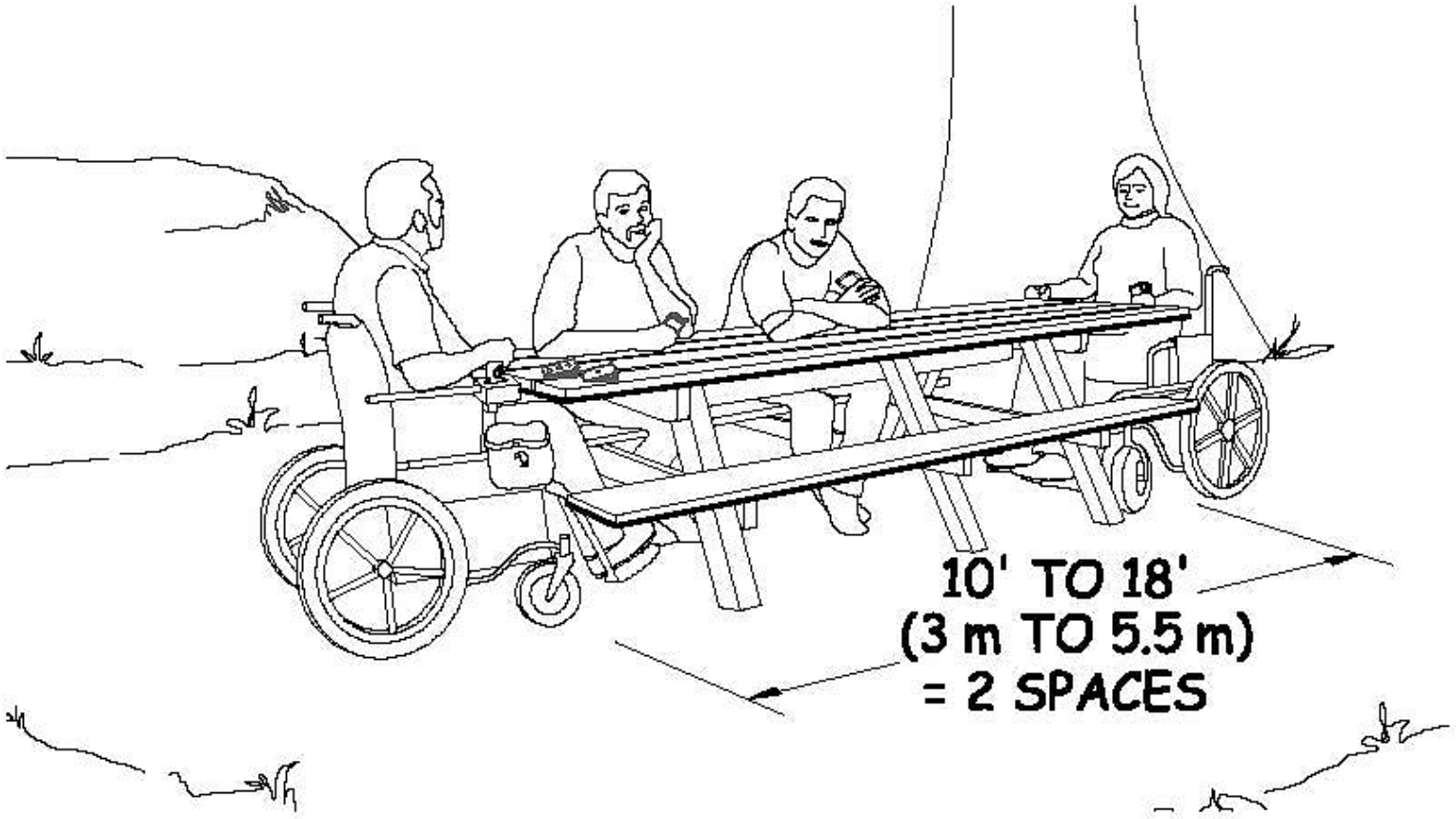

Figure 41 - Sample guideline showing enhanced access to picnic tables. Source: USAB.

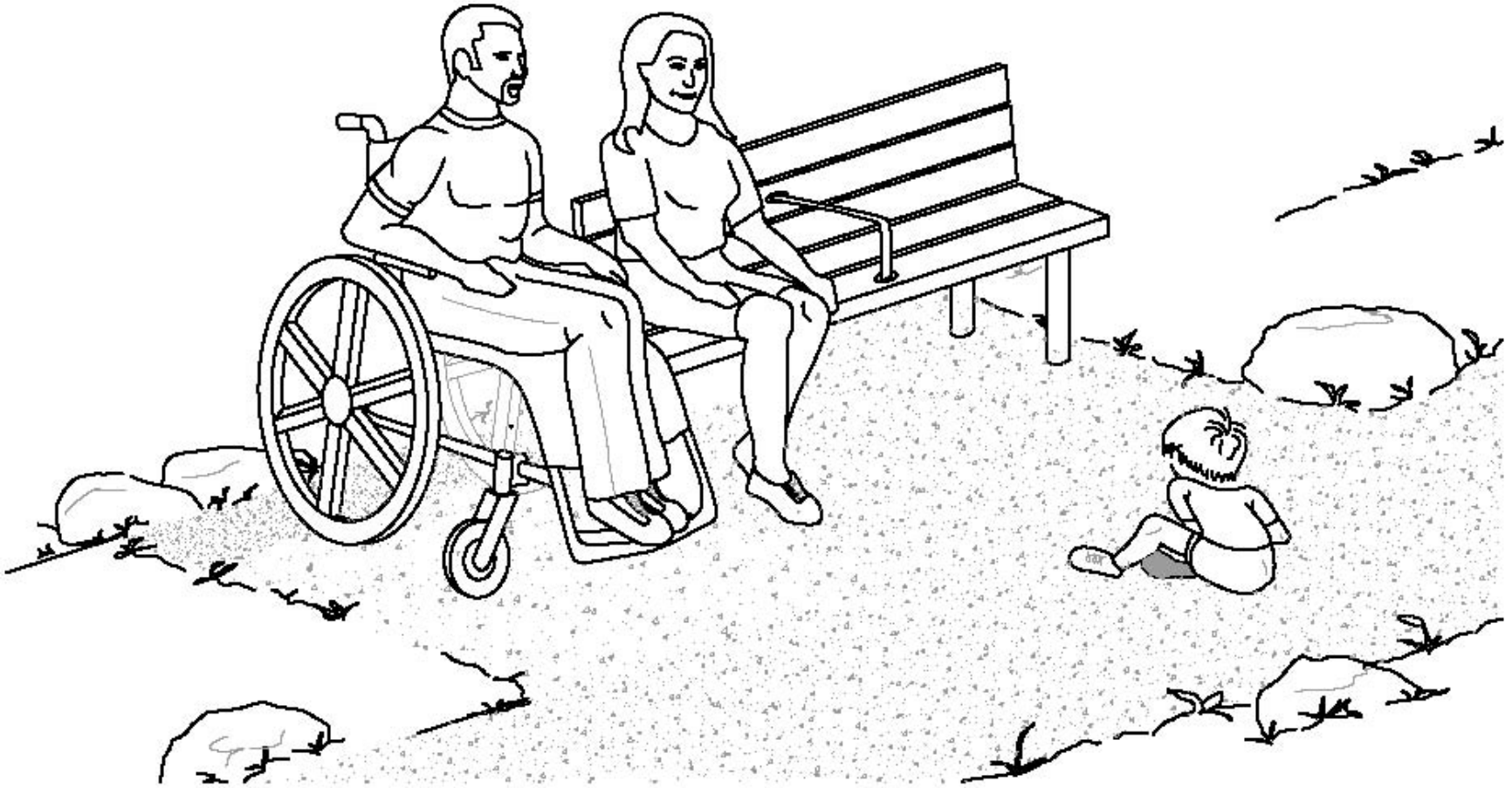

Figure 42 - Sample guideline showing enhanced space accessibility for benches. Source: USAB.

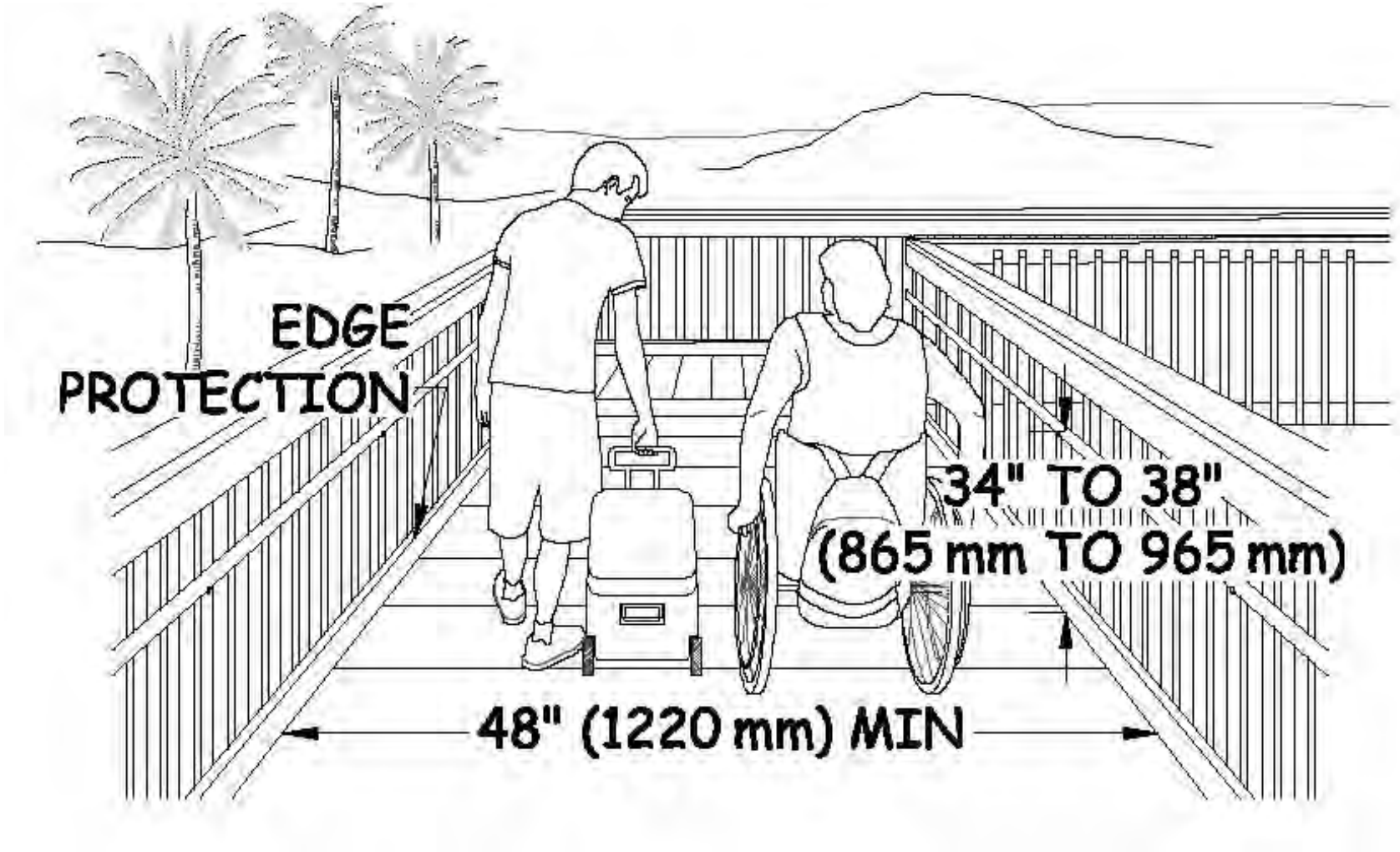

Figure 43 - Sample guideline for minimum platform width and edge characteristics. Source: USAB.

4.2.2 Specificity and Authenticity

The public process revealed a desire to keep the project with a local place-based feel of nature endemic to the Santa Cruz River corridor that speaks to all the senses.

- Construction materials used should be natural and artistic with a priority on local sourcing, especially for artistic craft.
- Any labels or signage should be prioritized for tactile features, artistic appearance, and congruency with sturdy natural materials (wood, stone, steel).
- Plant materials should be native with a variety of textures, colors, interest through the seasons, fragrances, etc.
- Trails and features are to be minimal and strategic in connecting visitors with the natural landscape. For example, the wetland platform should be sufficiently sized for universal accessibility and protrude strategically into the wetland to immerse the visitor into the restored habitat (Figure 44).

Figure 44 - Platform within the constructed wetland with vegetation restoration and strategic placement to avoid visual conflict with neighboring community.

4.2.3 Adaptability and Functionality

- Shade from trees and seating should be located strategically throughout the site and along the trail network.
- Entry kiosk and classroom should be sized for a variety of group uses and roofed for shade and rain protection to facilitate year-round function (Figures 45 and 46).
- Spaces should be designed to accommodate a variety of social opportunities for enhancing current uses and accommodating future uses, from the intimate (morning walk) to the public (Hawk Watch event).

Figure 45 - Shaded entry kiosk.

Figure 46 - Shaded outdoor classroom.

Section 5.0 Next Steps

5.1 Conclusion

This report provides a clear review of the 7-month process to research, consult with stakeholders, and prepare conceptual design recommendations and restoration framework of the Phase 1 area of the Tubac Nature Preserve for the first 5 years. This time frame allows the Tubac Nature Center, the community, and partners to act upon the high priority recommendations that will address immediate ecological restoration needs and accessibility to the public.

Though our expectation is to achieve much more, we (the Tubac Nature Center) are committing ourselves to the following timetable as a minimum:

By the end of year 1 after the conveyance,

- We will complete a professionally designed entrance feature from Ron Morriss County Park into the Preserve.
- We will complete the trail from the entrance to the Anza Trail south of the sewage treatment plant.

By the end of year 2 after the conveyance,

- We will have a professionally prepared wetland restoration plan for the borrow pit wetland in hand and be ready to implement the plan.

By the end of year 3 after the conveyance,

- We will have a river/forest restoration plan prepared by a professional organization completed.

By the end of year 4 after the conveyance,

- We will have a professionally done restoration plan for the open grasses/wildflower area aimed at improving the area for pollinator species.

The eight appendices provide guidance and best practices that will assist in the future design processes to develop more detailed aspects of the preserve and its amenities including accessible trails, artistic signage, entrance, kiosk, ramada, and other seating and viewing areas.

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Disability In Santa Cruz County

The American Communities Survey (ACS) collects data on the number of people living with disabilities across the United States. Using the ACS 2015-2019 data, a collection of maps were gathered to show the amount of people with any type of disability that reside in Santa Cruz County. Generally, the higher the age, the higher the number of people living with disabilities.

The map is broken down by census tract.

Males in Santa Cruz County with at least one disability by Census Tract

Ages 5-17

Ages 18-34

Ages 35-64

Ages 65-74

Ages 75+

Legend

0

1-50

51-100

101-150

151-200

200+

Disability In Santa Cruz County

The American Communities Survey (ACS) collects data on the number of people living with disabilities across the United States. Using the ACS 2015-2019 data, a collection of maps were gathered to show the amount of people with any type of disability that reside in Santa Cruz County. Generally, the higher the age, the higher the number of people living with disabilities.

The map is broken down by census tract.

15%

of men in Santa Cruz County identify as disabled

12%

of women in Santa Cruz County identify as disabled

13%

of total people in Santa Cruz County identify as disabled

Females in Santa Cruz County with at least one disability by Census Tract

Ages 0-5

Ages 5-17

Ages 18-34

Ages 35-64

Ages 65-74

Ages 75+

Legend

0 | 1-50 | 51-100 | 101-150 | 151-200 | 200+

Tubac Nature Preserve

Precedent Reviews

Prepared by Oscar Rodriguez Ponce & Patricia Vasquez Cabrera

Table of Contents

Wetland Precedents

- Lagunas de Anza
- Yuma East Wetlands
- South Los Angeles Wetland Park
- Sweetwater Wetlands

Lagunas de Anza
Nogales, AZ

This wetland restoration project is an educational resource for the Nogales and Rio Rico communities.

Pros:

- Educational historic and environmental signage in English and Spanish
- Community gardens and birding stations
- Community art display
- Outdoor classrooms
- Picnic area

Lagunas de Anza
Nogales, AZ

Cons:

- Lack of accessibility on lower portion; users must take steps down to the wetlands
- Presence of invasive plants like *Arundo donax* around the wetlands
- Trails in the wetland area are narrow; few spots to sit along the trails
- Erosion makes some trails hard to traverse

Yuma East Wetlands

Yuma, AZ

Infested with invasive species, crime, and pollution before restoration, this site is now cherished as a natural wonder of Southern AZ.

Pros:

- Community involvement from the outset; landowners, indigenous peoples, and many more had a voice in the project
- Colorado River banks were stabilized with native vegetation instead of concrete
- Trails connect all the pieces of the project to the surrounding urban areas and downtown
- Allows for heavy seasonal use. Yuma Bird Festival takes place in the wetlands for one week every year

South Los Angeles Wetland Park

Los Angeles, CA

This project transforms a brownfield into a community park that captures and treats urban stormwater runoff through a wetland. Park amenities include:

- 4.5 acres of constructed wetlands and 4.5 acres of upland habitat
- A series of trails, boardwalks, and observation decks
- Picnic areas
- Educational signage that teaches park visitors about the planting zones and water management
- A natural rock-garden seating area

South Los Angeles Wetland Park

Los Angeles, CA

Pros:

- Addresses social equity by creating a neighborhood-rejuvenating amenity in a historically underserved community
- The addition of trees and other vegetation sequesters an estimated 1.82 tons of atmospheric carbon annually
- Construction of the wetlands helps filter stormwater runoff and leads to cleaner water being reintroduced into the ecosystem

Cons:

- Lacks educational signage in Spanish, which limits understanding for a majority of the local population
- The addition of trees is focused in the wetland area and not enough in the usable areas such as trails
- Does not account for unexpected climate conditions, leading to incorrect water calculations and as a result, the wetlands are drying out and additional water from external sources is needed to support the wetlands

Sweetwater Wetlands
Tucson, AZ

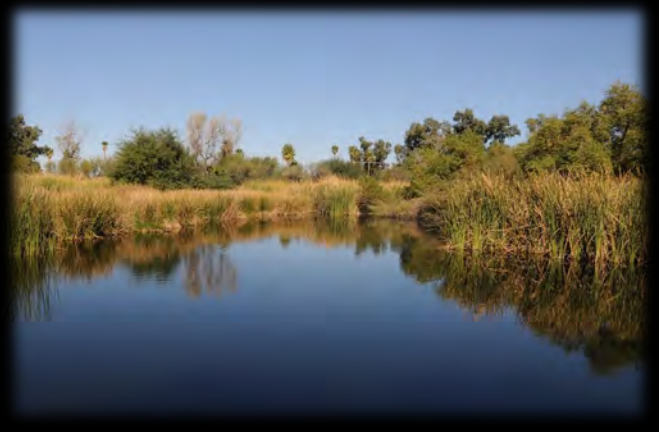
These constructed wetlands are part of Tucson's reclaimed water network. They provide another layer of treatment and serve as a habitat and educational resource.

Pros:

- Regular maintenance reduces mosquito breeding and fire risk
- Exposes visitors to deep, shallow, and open water habitats
- Accessible pathways
- Infrastructure as public space/amenity
- Guided and self-guided tours and activities
- Shaded seating areas

Cons:

- Users cannot interact with the water for safety reasons and pets are not allowed
- Soil becomes slippery after rain due to its high clay content, limiting use



Summary of Wetland Projects

Key lessons from wetland projects include:

- Take opportunities for education on historic and environmental topics relating to the site
- Provide opportunities for users to engage with nature – examples include birding stations, signage, and outdoor classrooms
- Maintenance is key to keep spaces safe and accessible
- Connectivity to the surroundings improves access and encourages use of the site
- Community involvement is crucial to ensuring the project serves community needs and will be taken care of

Community Precedents

- George “Doc” Cavalliere Park
- WMG Living Lab and Learning Center

George "Doc" Cavalliere Park

Scottsdale, AZ

This public park works as a massive stormwater management installation and recreation center. Features include:

- Green Infrastructure
- Shaded seating and recreation areas
- Native vegetation from different Arizona biotic communities
- Reuse of on-site materials, such as gabions and decomposed granite, to build amenities

WMG Living Lab and Learning Center

Tucson, AZ

The Watershed Management Group HQ is a publicly accessible demonstration site for sustainability in the desert. Features include:

- Passive and active rainwater harvesting
- Affordable amenities like solar ovens and "tippy-taps" for handwashing
- Educational signage in English and Spanish, plus digital self-guided tours in both languages
- Outdoor event/teaching areas
- Composting toilets

Summary of Community Projects

Main lessons from community projects include:

- Involve the community in the design process and beyond. Provide opportunities for volunteering, learning, and social engagement
- Provide spaces for all age groups and users

  For example, spaces for children with playgrounds or exploratory play; quieter seating areas
- Give users options on how to learn and use the site – guided and self-guided activities could be provided

Accessibility Precedents

- Accessible Anza Trail Cultural History Park
- Riverwalk Sensory Trail

Accessible Anza Trail Cultural History Park

Tucson, AZ

This park provides engaging learning opportunities using inclusive Universal Design Principles and is located adjacent to the AZ State Schools for Deaf and Blind.

Features include:

- Sensory garden beds
- Outdoor classroom
- Shaded seating
- Lighting
- Tactile interpretive public art
- Audio messages and QR code-linked videos w/ American Sign Language

Pros:

- Community engagement process included students and staff from the Schools for the Deaf and Blind, resulting in a learning oriented park that everyone can enjoy
- The bike path was rerouted around the park to keep fast traffic away from park visitors
- Turn-off indicators added to paths for cane users
- Low maintenance sturdy infrastructure (concrete and steel) and plant materials
- Public art designed with the community increases neighborhood pride and is less likely to be vandalized

Accessible Anza Trail Cultural History Park
Tucson, AZ

Cons:

- Graffiti is highly prevalent in the surrounding areas, making the site susceptible to vandalism
- Guide cables that run along the edges of the pathway have been stolen

Riverwalk Sensory Trail

Schuylerville, NY

This sensory trail project is designed to provide a riverside experience for individuals who are mobility or visually impaired. It is one of only a few handicap-accessible trails dedicated to visually impaired people in the United States.

Features include:

- Audio description stations along the trail
- Overlook decks that provide moments of pause along the river trail
- Wide and smooth trails that provide ample space for wheelchair accessibility

Pros:

- Audio descriptions allow the visually-impaired to gain a clearer sense of the surrounding environment and allows them to immerse themselves in the space
- Some overlook decks were designed to mimic spaces that are inaccessible to people with mobility impairments (ex. treehouses), expanding their range of possible experiences

Summary of Accessibility Projects

Main lessons from accessibility projects include:

- Apply Principles of Universal Design – Design environments to be usable by all people to the greatest extent possible
- Exceed ADA minimum thresholds to make movement through the site more comfortable for all users
- Artistic works help users better engage with the educational aspects of a project
- QR codes allow for a cost effective mode to provide users with audio/visual interpretive engagement.

  For instance, animal sounds, plant information, site history, and more, can be provided to supplement the experience
- Provide spaces for users to stop and rest along the trail

Overall summary of lessons

- Convey information to users in multiple ways. Audio, video, and multilingual options
- Apply Principles of Universal Design to make spaces usable by all people, without the need for specialized design
- When possible, reuse on-site materials for sustainability and economic reasons
- Connect the site to the surroundings for better accessibility and visibility
- Involve the community beyond the design process. Allow them to keep adding to the site after the project's "completion"
- Provide spaces for all age groups and users, and design for both small and large activities
- Design for maintenance tasks to be as seamless as possible to keep the site safe, accessible, and inviting for all users

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- Riverwalk Sensory Trail — Hudson Crossing Park

The importance of context in **understanding place:** Tubac Nature Center Wetland

Jonathan Horst
Director of Conservation + Research
aka “Nature Farmer”

TUCSON AUDUBON SOCIETY
conservation education recreation

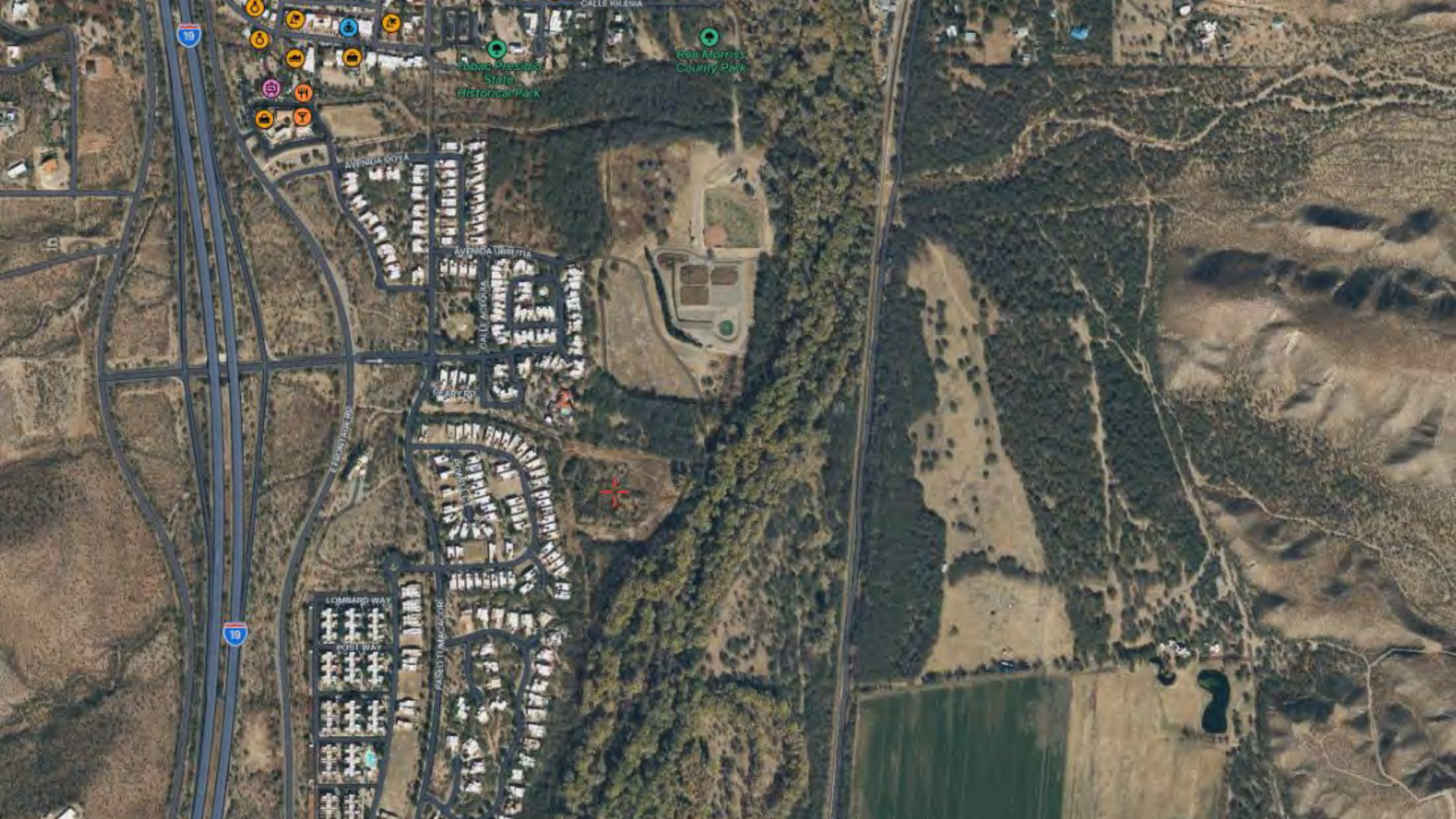
Tucson Audubon

inspires people to enjoy and protect birds through recreation, education, conservation, and restoration of the environment upon which we all depend.

Ecological restoration is the process of assisting the recovery of the primary *functions* of an ecosystem that has been degraded, damaged, or destroyed.

Habitat restoration seeks to repair degraded areas for the specific benefit of a particular species or suite of species.


GEARY LN
CALLE ARCEGUIA
CALLE ESPADA
NANCY LN
DE ANZA
MARKET CIR
POWELL CT
MARKET CIR
SUTTER CT
PASEO TOMACOD
DE ANZA
Santa Cruz River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Tubac Presidio State Historical Park
Ron Morris County Park
AVENIDA GOYA
LOMBARD WAY
POST WAY
19

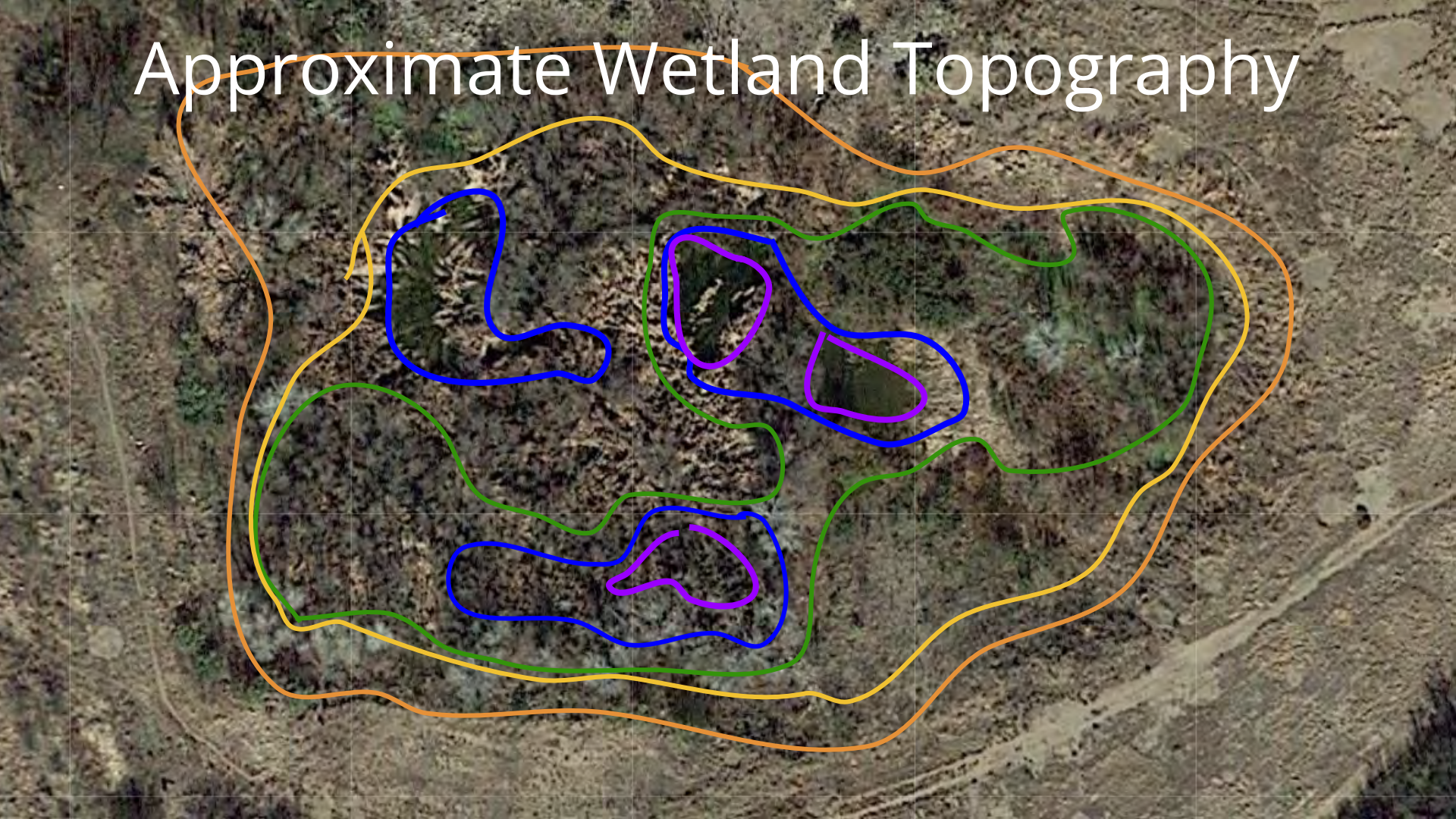
Ecological restoration is the process of assisting the recovery of the primary *functions* of an ecosystem that has been degraded, damaged, or destroyed.

Habitat restoration seeks to repair degraded areas for the specific benefit of a particular species or suite of species.

Potential Importance to Birds:

A unique habitat patch within a larger gallery riparian corridor and mesquite bosque (and cattail forest)

Approximate Wetland Topography



Phase 1: Treat invasives

Phase 1: Treat invasives

Salt cedar (cut stump treatment)
Johnsongrass (all of the above)
Russian thistle / Tumbleweed
and...?

Phase 2: Choose desired targets | Habitat Type(s) or Bird/Species

Cienega
Ephemeral wetland
Cattail Forest
Gallery-subgallery forest

Phase 2: Choose desired targets | Habitat Type(s) or Bird/Species

Cienega

Ephemeral wetland

Cattail Forest

Gallery-subgallery forest

Waders

Wren/Sparrow/Warbler

DeAnza Suite

Phase 2: Choose desired targets | Habitat Type(s) or Bird/Species

Cienega
Ephemeral wetland

Waders

Cattail Forest

Wren/Sparrow/Warbler

Gallery-subgallery forest

DeAnza Suite

Phase 3: Plant Appropriate Natives

Sacaton historically dominated semi-arid grasslands of the southwest

Important floodplain grass
Long (30') fibrous roots - excellent soil stabilization

Regionally, these grasslands occupy less than 5% of original distribution

Floodplain grasses are easy

Arizona black walnut (*Juglans major*)

Fruit-bearing trees: eg.
Elderberry / Chokecherry / Hackberry

Alan Schmierer

Overstory trees: eg. Cottonwood / Ash / Willow?

Maintain those that are in good spots

Use those that will drown with elevation modifications as sources for new plants in appropriate locations

Remove individuals that will be hazard to health and human safety

Ephemeral wetland + Cienega: eg. Arizona Eryngo / H. Water-umbel? High-value pollinator plants

USFWS permission for some of these - attainable

Require conditions that minimize competition from cattails / bullrush

Sedges / nutsedges / oxalis / milkweeds / asters + umbels ... wide range of pollinator plants

Wetland: eg.
Spike rush / sedges
High-value pollinator plants

Jim Morefield

Require some ongoing maintenance to minimize competition from cattails / bullrush

Sedges /spike rush / monkeyflowers / catchfly ... wide range of pollinator plants

Threats and Opportunities

Threats

- Dropping water table decreases capacity for keeping zones wetted
  - Drought / Continued downcutting of Santa Cruz River
- Larger storms → too much water in the wetland drowning vegetation
- Sedimentation from adjacent wash

Opportunities

- Additional stormwater harvest from adjacent wash
- Raising water table through restoration for SCR channel itself
- Raising water table through wash and wash-plain restoration of adjacent bosque

Funding Opportunities

Probable Fits

Partners for Fish and Wildlife - $25,000 per property - Species Habitat

wYBCU / monarch / pollinators / maybe a couple T&E plants

North American Wetlands Conservation Act (Small) - $100,000 cap

5-Star + Urban Waters Restoration - $40,000 cap

Arizona Water Protection Fund - $400,000? cap

Bit of a Stretch

North American Wetlands Conservation Act (Standard) - $$Big$$

Use as a mitigation site


Questions?

Valle Verde Ranch

Reconniassance Level – Preliminary Drainage Analysis

By Ben Lomeli, Hydrologist CFM

9/4/1992: Note “Natural” NE flow direction of wash as shown by vegetated drainage towards old racetrack. (Valle Verde Ranch property shown within green polygon).

6/18/1996: Borrow Pit area appears scarified, probably in preparation for excavation.

8/26/2006: Borrow Pit ponding water.

6/7/2007: Borrow Pit dry in Summer.

3/16/2010: Only a small pond in Borrow Pit in early Spring.

6/4/2010: Borrow Pit dry again in Summer.

9/26/18: More trees and less ponding evident in Borrow Pit in Fall images since the Spring of 2010.

Box culvert under I-19 much larger than the 3 CMPs at Anza Trail (*outlet to river*).
(Photo by Rich Kiker)

Box culvert at East Frontage Road also much larger than the 3 CMPs at Anza Trail (*outlet to river*).
(Photo by Rich Kiker)

Arch culverts under Paseo de Tumacacori. Possible sediment build-up likely reducing hydraulic capacity.

The wash receives additional lateral inflows from both banks from adjacent residential subdivision streets, roofs, sidewalks, and other impervious surfaces.
(Photo by Rich Kiker)

Looking downstream towards river at beginning of sediment high spot.

3 CMPs at Anza Trail appear to be undersized.

(Much less conveyance capacity than all upstream box and arch culverts).

Preliminary Hydrologic Perspectives:

Based on observations during initial site visit and discussions of September 30th, 2020, and on subsequent Google Earth Pro imagery review, the preliminary salient points described below are not conclusions, but are shared now simply as starting points for further discussion; and/or as a possible basis for further observation, survey, investigation, etc.

Further discussion may reveal other pertinent pieces of information, alternative perspectives, and a need for some revisions or more detailed analysis.

Preliminary Hydrologic Findings:

The 3 CMPs at Anza Trail appear to be undersized and causing "backwatering" at the lower end of the subject wash. This outlet structure is considerably smaller with considerably less hydraulic conveyance capacity than the upstream box culverts under I-19 and East Frontage Road and the arch culverts under Paseo de Tumacacori.

The wash also receives additional lateral inflows from both banks from adjacent residential subdivision streets, roofs, sidewalks, and other impervious surfaces.

The wash is contained in the straight and well-defined grass-banked trapezoidal channel through the residential subdivision, but the channel is undefined downstream. The unconfined wash "opens-up" and spreads out from there, where its gradient and velocity decrease, (*it flattens out and slows down*).

The wash naturally flattens out as it reaches the river's floodplain alluvium. Excess sediment deposits fan out from there in a "delta-like" pattern.

Sediment deposits are currently semi-stabilized with dense tall grass (*Johnson grass?*). Excess sediment deposits have accumulated to create a "high-spot" that effectively forms a low crossflow berm that partially obstructs downstream low flows. The obstructive crossflow sediment berm causes upstream backwater ponding and consequent overflow flooding and sedimentation, primarily NE towards Valle Verde Ranch. Water and sediment flows both follow the laws of physics and seek the "Natural" NE flow direction.

The borrow pit immediately south of the wash is a desirable site for a bird-watching wetland but has been "filling-in" with sediment deposits.

Possible "*Win-Win*" Solution:

1. Reestablish (*clear with sufficient conveyance*) channel at lower end of wash to **return flows** towards Santa Cruz River and direct overflows towards borrow pit (*desired wetland*), instead of towards Valle Verde Ranch.
2. Create earthen berm and/or bank with protective native vegetation (*at a minimum*) to keep flows heading down towards river instead of entering Valle Verde Ranch.
3. Provide adequate wash conveyance and outlet capacity to Santa Cruz River by replacing/upgrading the 3 CMPs at Anza Trail with either an open-span foot bridge, a properly sized box culvert, con-arch culvert(s), additional CMP barrels, or any other hydraulically equivalent structure.
4. Provide erosion protection for the potable water supply well at Anza Trail (*outlet to river*) with appropriately designed toe-down scour cut-off wall and riprap-lined "*banks/side-slopes*".

I am always happy to discuss these preliminary findings, and/or any other reasonable perspectives with anyone.

I am also always willing to listen to any concerns, constructive criticism, or other suggestions; and I always welcome any questions.

TUBAC NATURE PRESERVE

SURVEY RESULTS REPORT
February 23, 2023

Prepared by Oscar Rodriguez Ponce
2nd-year Master's of Landscape Architecture

THE UNIVERSITY OF ARIZONA
College of Architecture, Planning & Landscape Architecture

NPS RTCA
RIVERS, TRAILS & CONSERVATION ASSISTANCE PROGRAM
www.nps.gov/rtca

TUBAC NATURE CENTER

SURVEY RESULTS SUMMARY

How many people did we reach?

189
Respondents

...and want the following **BENEFITS** for the Tubac community

EDUCATIONAL OPPORTUNITIES

MORE TOURISM

HEALTHY RIVER

MORE SOCIALIZING

People want to **ENHANCE** existing uses and features...

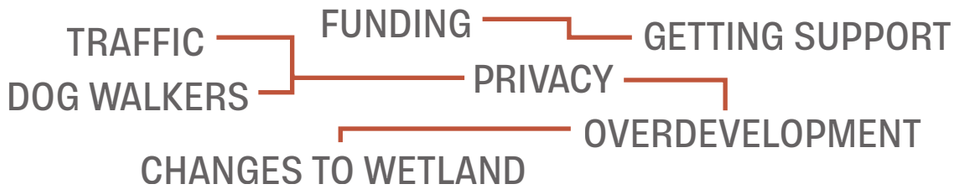
BIRDING

“NATURAL FEEL”

HIKING / WALKING

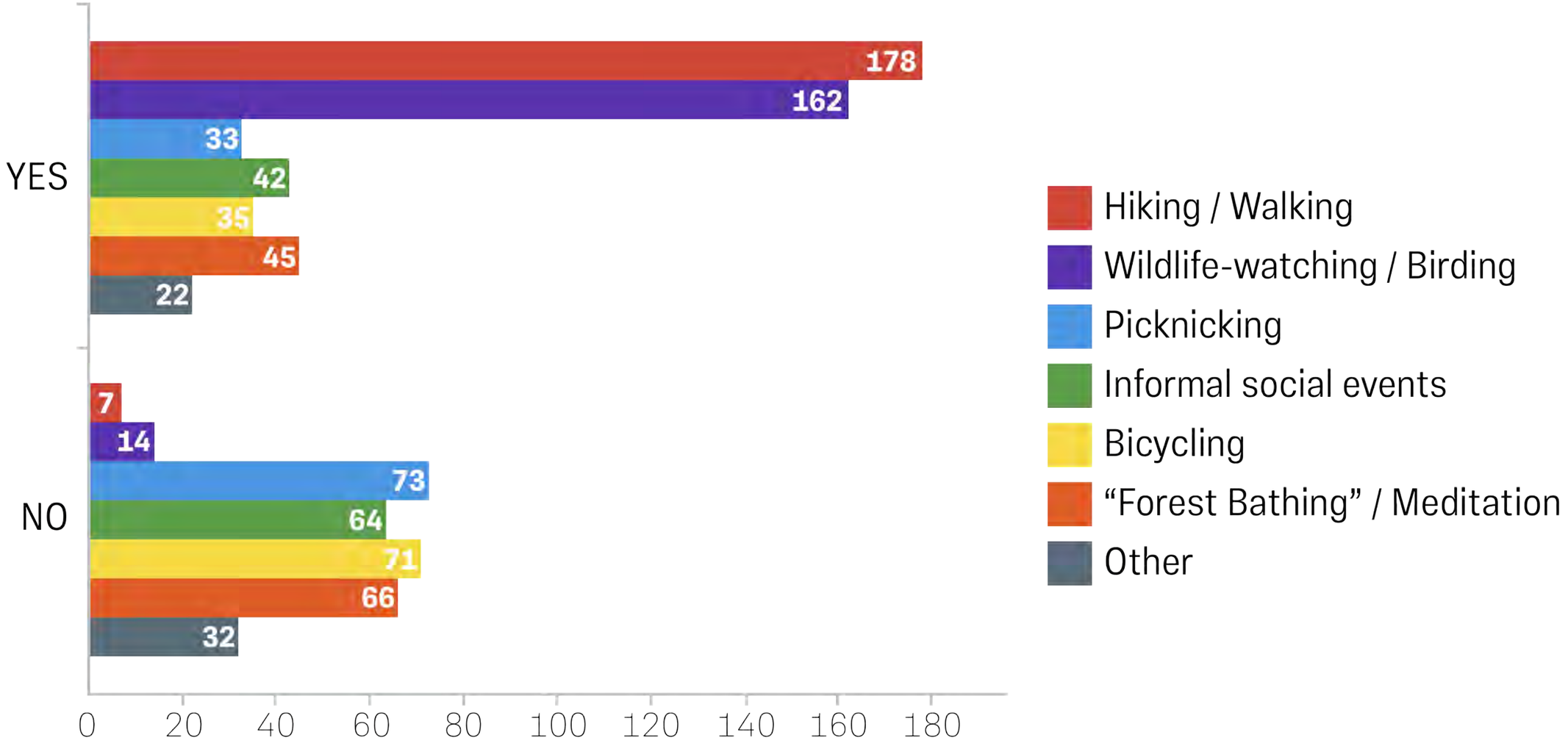
ECOSYSTEMS

Most **CONCERNS** have to do with...



1) Have you participated in any of the following activities in the area within the black boundary line?

Most people use the area for *recreational uses*.
Despite the low numbers on picknicking, there is a *strong demand for picnic tables and areas*.



1) Other - Fill in the blank

Amongst respondents that chose “YES” and filled in the blank, the following activities were the most popular.

1. Dog Walking - 11 mentions
2. River/trash cleanup - 5 mentions
3. Hawk Watch - 3 mentions
4. Photography - 2 mentions
5. Stargazing - 2 mentions

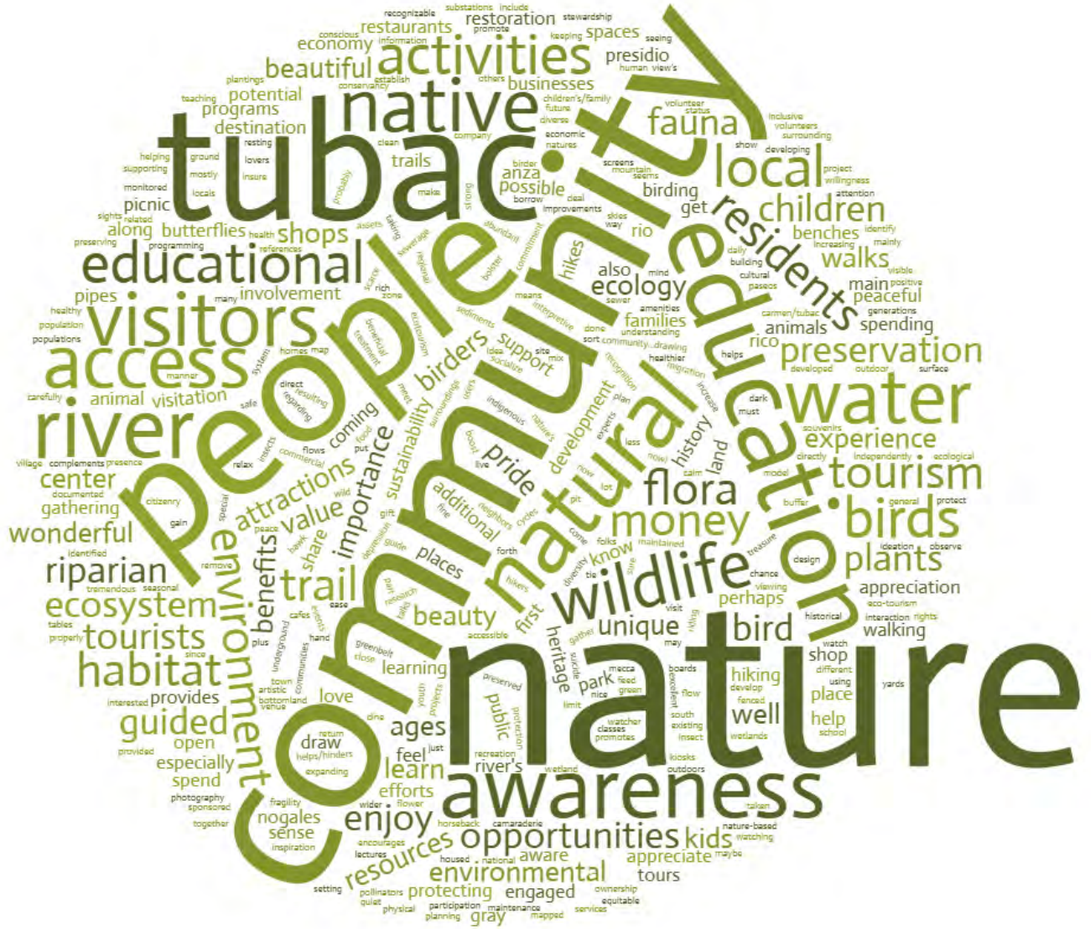
2) What amenities and features would you like to see in these areas? (text entry)

Most people agree that *seating, signage, and restored ecosystems are necessary in the area while minimizing intervention*.

1. Trails - 52 mentions
2. Benches - 46 mentions
3. Signage - 26 mentions
4. Wetland - 17 mentions
5. Restrooms - 16 mentions
6. Picnic - 14 mentions
7. Tables - 11 mentions
8. Parking - 10 mentions
9. Seating - 8 mentions
10. Platform - 7 mentions

3) What community benefits would you like to see from this project? (text entry)

Preserving nature, new amenites and spaces, social and educational benefits, and economic benefits are listed.



1. Nature/natural - 35 mentions
2. Educational/education - 28 mentions
3. Community - 21 mentions
4. Tubac - 17 mentions
5. Tourism/visitors - 17 mentions
6. River - 9 mentions
7. Awareness - 9 mentions
8. Water - 8 mentions
9. Wildlife - 7 mentions
10. Money - 5 mentions

4) What concerns or comments do you have for this initial concept plan? (text entry)

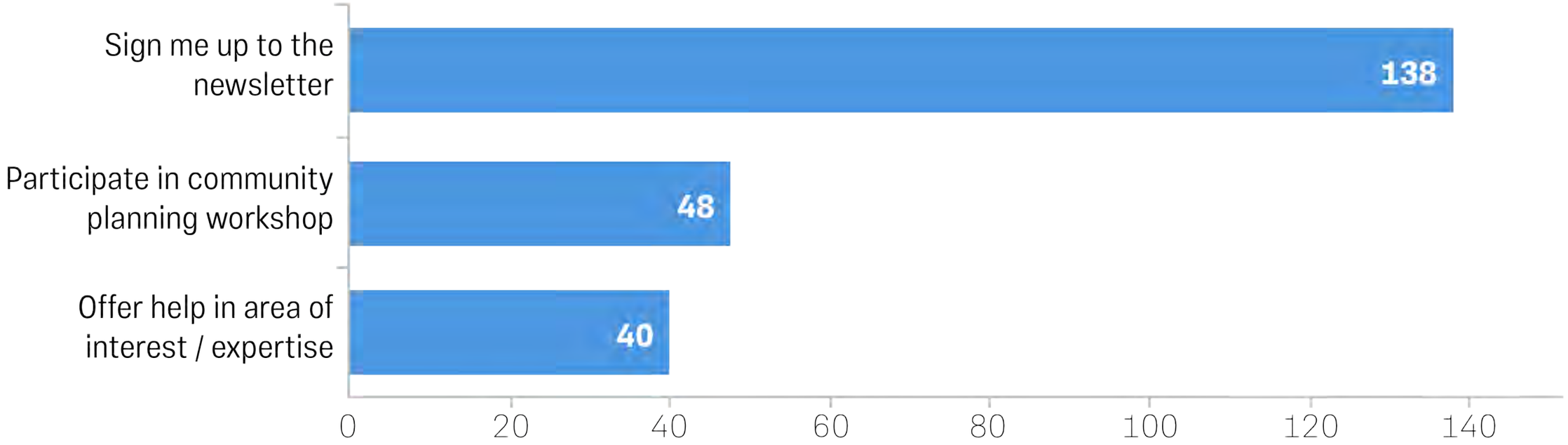
Most concerns relate to *access & parking, the wetland, funding and maintenance, and misuse of the preserve*.

1. Trails - 20 mentions
2. Parking/traffic - 15 mentions
3. Wetland(s) - 13 mentions
4. Access - 11 mentions
5. Natural - 11 mentions
6. Dog(s) - 10 mentions
7. People - 8 mentions
8. Volunteers/support - 8 mentions
9. Cielito Lindo - 6 mentions
10. Funding/money - 6 mentions

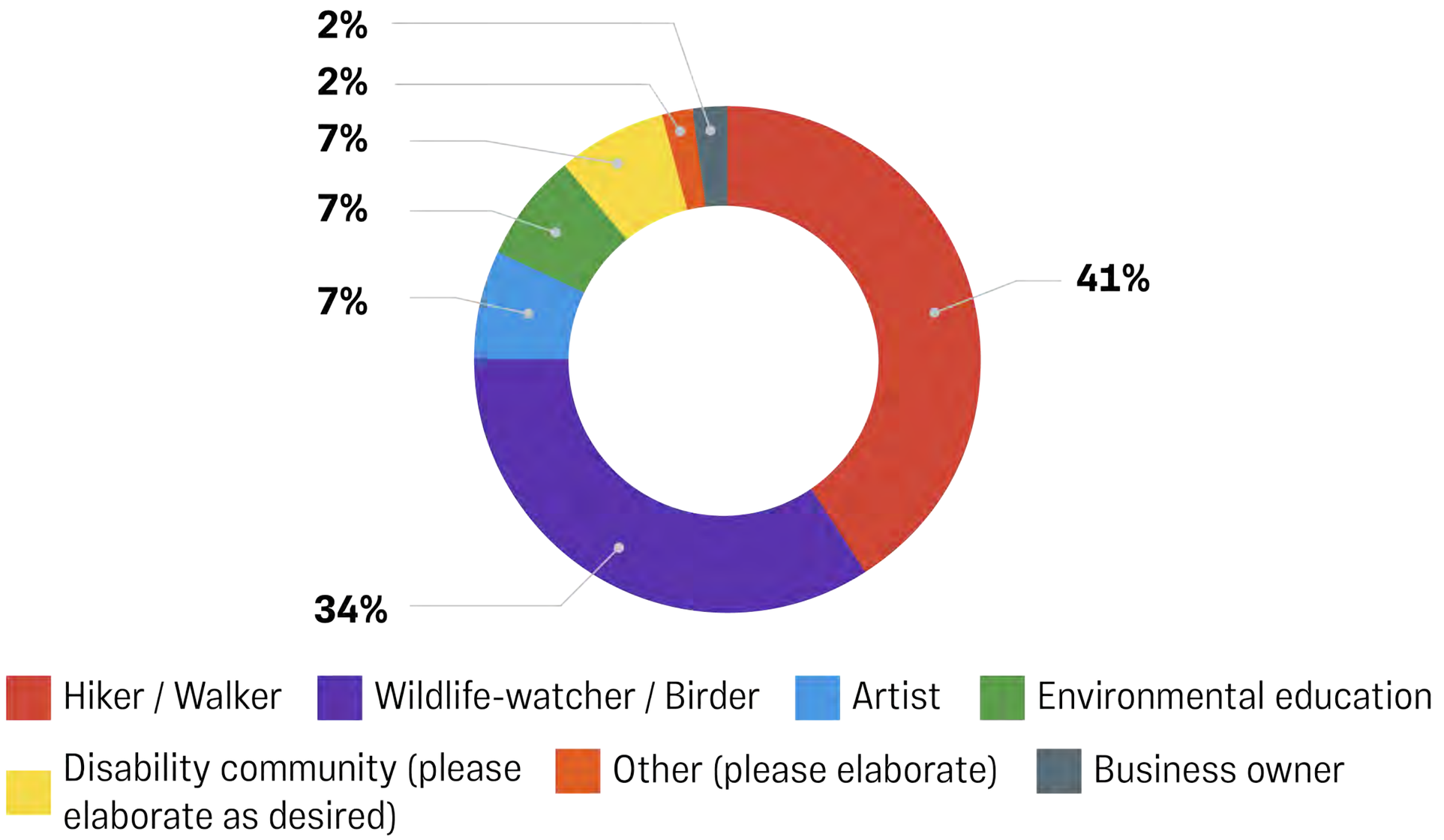
5) Let us know how you would like to be involved, and what skills or expertise you would like to offer.

Most respondents showed interest in the project in one way or another. Multiple people are willing to help with *educational programs, site construction, publicity, and much more*.

This information is conveyed in great detail on the Excel table associated with this presentation, along with the results of Q6) Contact information and proximity to project, in order to facilitate communication with people willing to engage more closely with the Nature Preserve.



7) Do you identify yourself or anyone in your household as any of the following?



7) Disability community

Only six respondents specified a disability. These are all the responses for this question.

“Family members with dementia and extreme medical issues”

“Mobility constraints”

“Walk with a cane”

“Use walker and scooter”

“I have three girlfriends in wheelchairs that I hope will be able to finally access this area”

“Mobility challenges”

7) Other - Fill in the blank

1. **Nature lover / Outdoor enthusiast - 4 mentions**
2. **Photographer - 4 mentions**
3. **Volunteer - 2 mentions**

Dark sky advocate

Publisher

Pima County master naturalist

Butterfly enthusiast

Gadfly

Anza Trail maintenance

Board member - Community Garden of Tubac

President, Friends of Sonoita Creek

Dog walker

Horseback rider

Biker

Botanist, mycologist

Daughter and grandsons of Tubac resident

Visitor

Heritage advocate

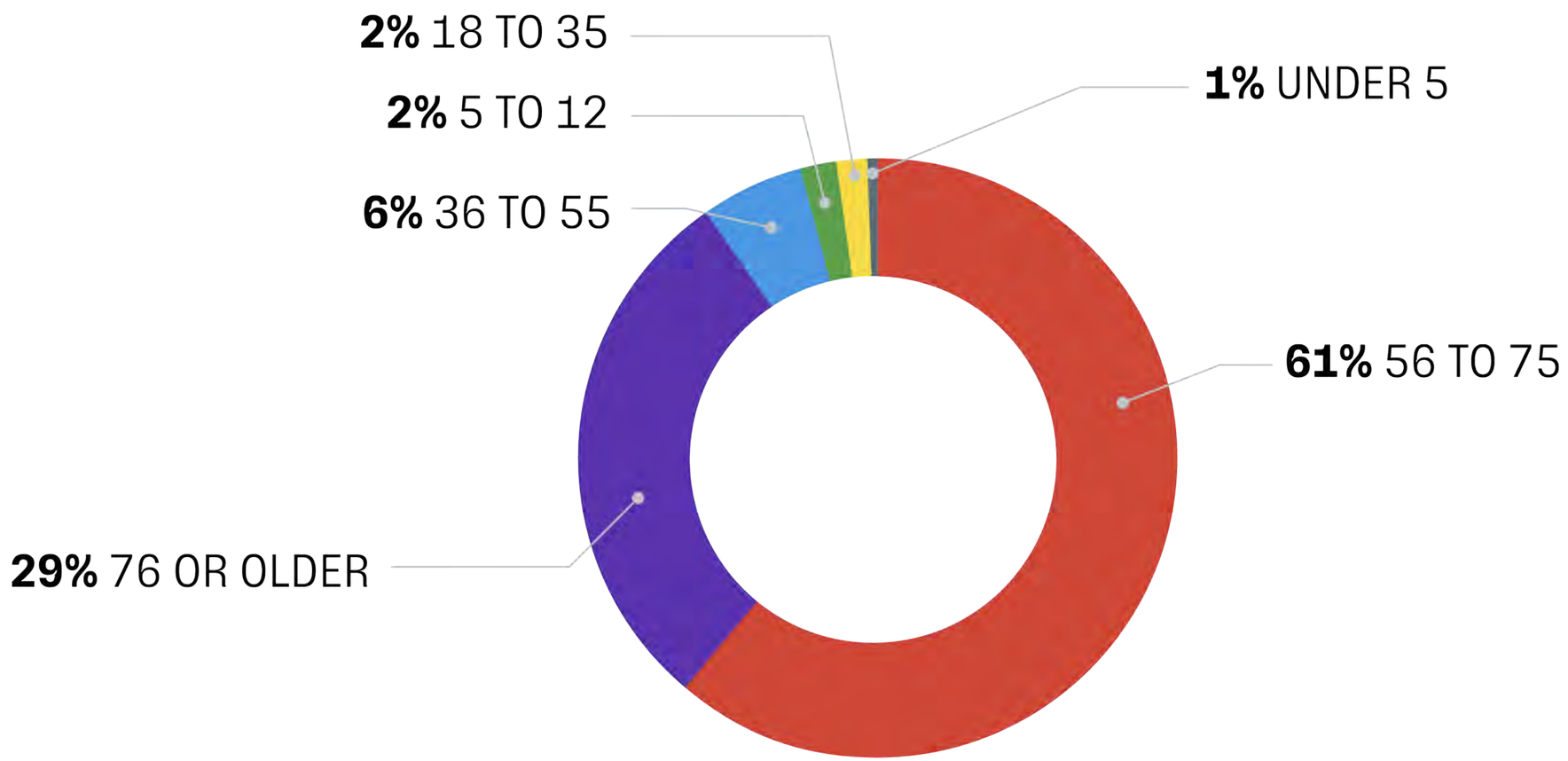
Gardener

Master naturalist in Michigan

Docents at AZ-Sonora Desert Museum

8) What age groups are present in your household? (check all that apply)

Only 11% of respondents have members in their household younger than 55 years of age. However, many respondents still called for greater attention to kids and educational programs.



Tubac Nature Center

Location: Room B2

Hours:

Wednesday 10:00 - 12:00

Saturday 10:00 - 2:00

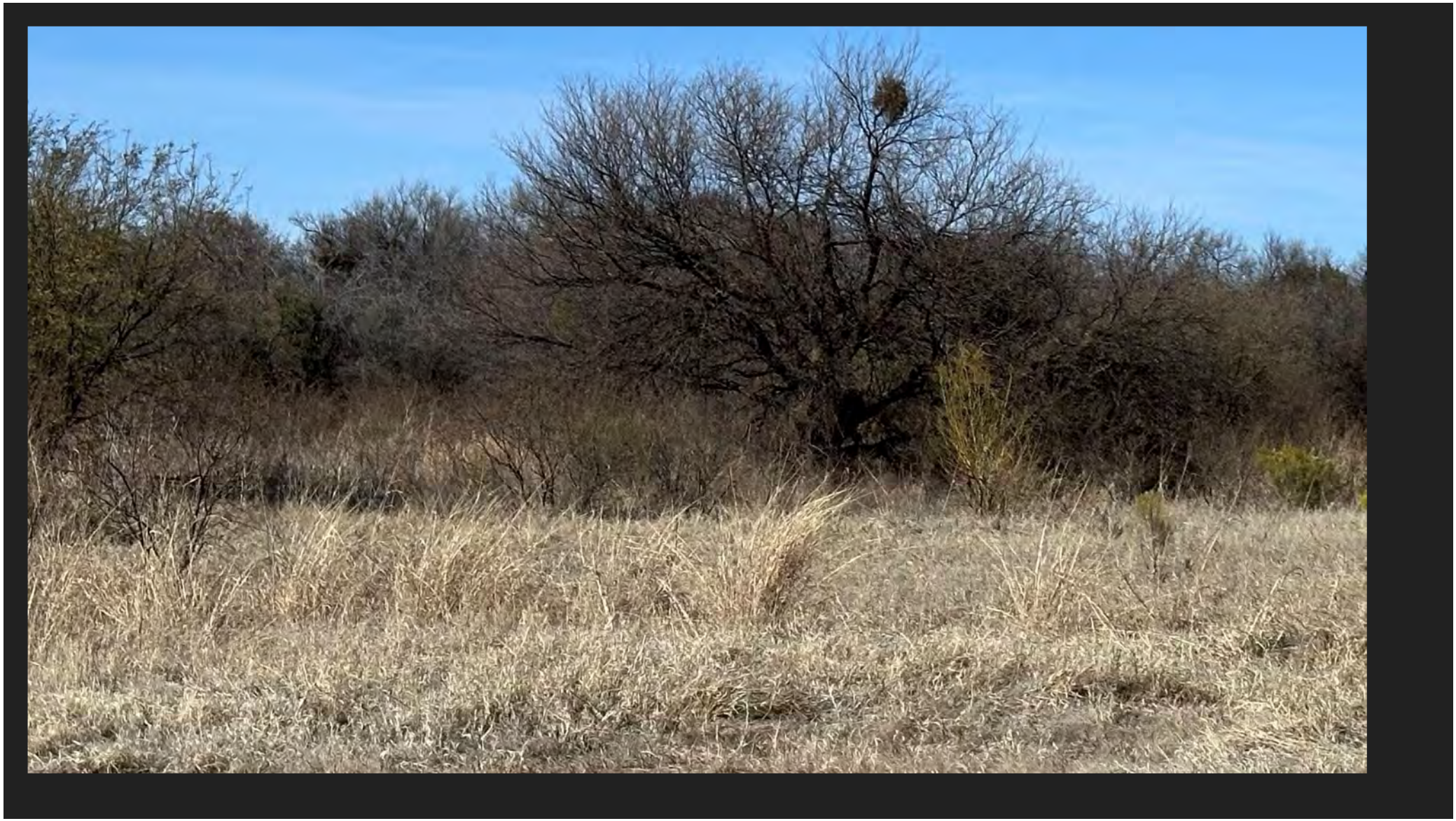

WELCOME
TO THE
TUBAC NATURE CENTER
A Work In Progress!
HAWK WATCH
SKY HIGH PARADE
Parades are fun!
NEXT
TO
NATURE
ALONG THE
SANTA CRUZ
RIVER
THE
SANTA CRUZ RIVER VALLEY
AND, THERE IS A FIESTA!
A VALLEY RICH WITH LIFE!

Tubac Nature Preserve

Proposed 160 acres

Santa Cruz River

Cottonwoods



TUBAC NATURE PRESERVE PARTNERS COMMITTEE

Santa Cruz Valley Heritage Alliance	- Mary Dahl
Barrio de Tubac Neighborhood	- Bill Lisowsky
Tubac Nature Center	- Jim Karp and Michael Dunn/Carolyn Fowler
Presidio	- Mary Dahl
FOSCR	- Sheila Slaughter
Anza Trail Coalition	- Rich Kiker
Tubac Community Garden	- Rich Kiker
Tucson Audubon	- Jonathan Horst and Kari Hackney
Hawk Watch International	- Mike Shaw
Tubac Citizen's Council	- Clem Shute

ASSISTED BY

National Park Service RTCA, Community Project Facilitator - Laura Bolyard

Dept. Landscape Architecture & Planning, The University of Arizona:

- Patricia Vasquez Cabrera (GRA)
- Oscar Rodriguez Ponce (GRA)
- Professor Kirk Dimond

Vision Statement

The Tubac Nature Preserve will be a restored, healthy ecosystem and community treasure, offering stimulating activities and a peaceful environment. This destination will connect art, history, and nature through education and recreation.

Opportunity

Tubac Nature Preserve

Habitat Restoration & Design

Presentation - February 13, 2023


St. Ann's Church
Tubac Bridge
Tubac
Tubac Center for the Arts
Tubac Presidio State Historic Park
Future Entrance
Tubac Market
Hawk Watch
Ron Morriss County Park
93
Bosque
San Miguel
Cielito Lindo
Native Plant Trail
W Frontage Rd
Historic Valle Verde Ranch
Carmen
Future Wetland
Trails Head
Santa Cruz River
RR Right of Way

The Importance of Context in Understanding Place:

Tubac Nature Preserve Wetland

Jonathan Horst
Director of Conservation + Research
aka “Nature Farmer”

TUCSON AUDUBON SOCIETY
conservation education recreation

GEARY RD
CALLE ACEQUIA
CALLE CORRAL
NANCY LN
DE ANZA
MARKET CIR
POWELL CT
MARKET CIR
PASEO TOMACO DR
SUTTER PL
DE ANZA
Santa Cruz River

Ecological restoration is the process of assisting the recovery of the primary *functions* of an ecosystem that has been degraded, damaged, or destroyed.

Habitat restoration seeks to repair degraded areas for the specific benefit of a particular species or suite of species.

Potential Importance to Birds:

A unique habitat patch within a larger gallery riparian corridor and mesquite bosque (and cattail forest)


Phase 1: Treat invasives

Phase 2:
Choose desired targets
Habitat Type(s) or
Bird/Species

Cienega
Ephemeral wetland

Phase 3:
Plant Appropriate Natives

Sacaton historically dominated semi-arid grasslands of the southwest

Important floodplain grass
Long (30') fibrous roots - excellent soil stabilization

Regionally, these grasslands occupy less than 5% of original distribution

Floodplain grasses are easy

Overstory trees:

Fremont Cottonwood
Velvet Ash
Gooding's Willow

Maintain those that are in good spots

Use those that will drown with elevation modifications as sources for new plants in appropriate locations

Remove individuals that will be hazard to health and human safety

Wetland Plants

Example Images

Inspiration towards future amenities

Entrance Ideas


Welcome to Tualatin Hills Nature Park
Programs & Activities
Volunteers & Stewardship
Rules
Why No Dogs?
Tualatin Hills Nature Park
Community Connections

Classroom idea #1


Classroom
idea #2

Hawk Watch

Tubac Hawk Watch

Tubac Hawk Watch

Hawk Watch


CAPE HENLOPEN
HAWK WATCH
RAPTOR MIGRATION
RAPTOR MIGRATION
HAWK WATCH

Wetland
Viewing Platform

Trails/ Paths

Trails/ Paths

(Stalok binder added to natural soil, then compacted w/roller. Precedent: Saguaro NP)

Bench /
Artistic
Signage /
Sculpture

Bench/ Artistic Signage/ Sculpture opportunities

Sturdy Universally-designed w/back and arm rests for stabilizing user when standing. Can add tiles or natural impressions to concrete benches.

Artistic Signage / Mini Sculpture Opportunities

Braille / Tactile

Ideas for Tactile Mini Sculptures / Links to Educational material on website

Butterfly Garden


MONARCH WAYSTATION


Questions?

Tubac Nature Preserve Restoration Management Framework

There are three very different ecological systems on the property: riparian forest, grasses and a small gravel pit that has potential as a constructed wetland. Each is the result of human disturbance. The desired future condition for each will require rejuvenation, restoration and/or reconstruction. They have very different challenges and while they each have some aspects in common, they will likely require very different approaches to becoming healthy components within the new Tubac Nature Preserve. They all will require significant funding over varying periods of time. Thankfully, there are a number of granting entities that will favor restoration projects like this, particularly since we have a number of partners that are in support of our objectives.

Developing a long-term restoration strategy is a primary goal of the Tubac Nature Center. Here is an outline of the proposed objectives of this strategy:

- Provide a comprehensive overview of current and desired conditions in the Tubac Nature Preserve.
- Provide a concise reference and a unified source of guidance to agencies and organizations working within and outside the TNP, with a focus on shared goals.
- Promote solutions to complex problems and effective, sustainable management practices in the Preserve.
- Offer a "toolbox" of information and resources on stewardship practices, monitoring, funding opportunities and other topics.
- Identify, prioritize, and design general concepts for restoration projects important to accomplish over the next 25 years.
- Outline a framework for continued monitoring and adaptive management with the Preserve along with collaboration with adjacent lands along the Santa Cruz River.
- Develop a variety of funding avenues to accomplish priority projects.

The framework describes strategies, projects, best management practices, and available resources for accomplishing the general objectives outlined above. It is meant to be a dynamic, interactive, living compilation of resources that is consistently updated by diverse stakeholders in the watershed and adapted as progress is made and new challenges arise. It includes an approach to tracking progress on collaborative projects as well as environmental and social conditions throughout the watershed. Hopefully, these strategies will also have some applicability to other areas outside the Tubac Nature Preserve (TNP) that are similar but not under the purview of this committee.

Part I: Native Grasses and Wildflowers Restoration/Creation

The primary location for this component is west of Ron Morriss Park, extending past the Baca Float water treatment plant, around the east side of the Valle Verde Ranch and almost encircling the former gravel pit affectionately called "The Pit."

1. Analysis of the Existing Condition
    a. The areas currently in grass represent seeds disturbed and/or distributed after earthwork moving in the creation of the Barrio properties. Over time they have morphed into a combination of grasses and weeds, native and non-native.
    b. A portion of the area now in grass will be utilized for trails, butterfly plantings, an outdoor classroom, shade structures and an area for hawk-watchers to gather.
    c. The access road to the Treatment Plant cuts through the grassy portion just south of the park and will remain for use by Baca Float.
    d. The composition of grasses is unknown. Obvious, if only by visual inspection, is the lack of diversity and paucity of wildflowers. Pigweed seems to be a large percentage of many of the grassy areas.
    e. The property does not have a designated water source in or near most of the areas currently in a grassy state, although there may be potential to work with Baca Float to utilize an old irrigation pipe on the west side of the treatment plant. Use of the old well located on the parcel south of Valle Verde and north of the pit could also be explored.

2. Available Data and Additional Needs
    a. The work being done by Buenos Aires NWR and the Altar Valley Conservation Group has some comparability. Contact with them offers great potential to learn what they have done and how they did it. Adapting their restoration prescription to grassy areas in the Preserve could be a good place to begin to show the positive efforts of the Tubac Nature Center acquisition. A number of regional parks have created butterfly gardens, which offers some insight into potential ways that TNC might go.
    b. Knowing what grasses and weeds are present is an early step towards identifying the key actions needed.
    c. Is the tank just outside the SE corner of the parcel south of the Valle Verde property an alternative? Is it still a water source and if so, how much water is available and at what cost? It is fenced but appears out of operation.
    d. There will be a need for watering during the first year(s) of planting.
    e. Identify nearby sources of the desired vegetation. Whenever possible, use local seeds and native plants that have been grown in southeastern Arizona.
    f. Areas that need to be fenced (and then maintained) need to be identified.
    g. Consult with botanists, butterfly host plant experts, irrigation specialists, nurseries, state and local agencies to identify the mixes of grasses and specific plants to be planted. Appleton-Whitehall in conjunction put out a publication in 2015 called “Bloom Time Chart” with native plants for hummingbird gardens.
    h. Identify areas that may require tilling or ground preparation and appropriate methods to accomplish this task.
    i. There are a number of great reference materials available related to grasses in Arizona. The following list was copied from a reference list included in the “Grasses of Las Cienegas National Conservation Area” publication:

i. A Catalogue of the Flora of Arizona by J. Harry Lehr, 1978, published by The Desert Botanical Garden.
ii. Arizona Range Grasses: Their Description, Forage Value and Management by Robert R. Humphrey. Revised 1970. University of Arizona Press, Tucson AZ. *Line drawings, descriptions, and grazing information focusing on grass.*
iii. Field Guide to the Plants of Arizona by Anne Orth Epple. 1995. Lew Ann Publishing Company, Mesa, AZ. *Color plates and text descriptions and habitats of many plants found in Arizona, arranged by life form, flower color, and family.*
iv. Grasses of Southeastern Arizona *is one of several plant volumes in a series produced by the Coronado RC & D Area, Inc., and Conservation Districts of Southeastern Arizona. These are pocket-sized, and include descriptions and general information on each topic group.*
v. Grasses of the Southwestern United States by Frank. W. Gould. 1993 (6th printing). University of Arizona Press, Tucson. *Line drawings, keys, and descriptions to aid in identifying native and introduced grasses.*
vi. Manual of the Grasses of the United States (2 volumes) by A.S. Hitchcock. 1950. Revised by Agnes Chase. Dover Publications, Inc., New York. *The standard for grass identification.*
vii. North American Range Plants by Stubbendieck, Hatch and Butterfield. 1997. University of Nebraska Press. *Line drawings of a lot of our plants.*
viii. Weeds of the West by Tom D. Whitson, Editor and Author, and others. Revised 1992. Published by the Western Society of Weed Science in cooperation with the Western United States Land Grant Universities Cooperative Extension Services. *Photographs and species descriptions of plants that often cause problems for land managers.*
ix. An Illustrated Guide to Arizona Weeds by Kittie F. Parker. 1972.University of Arizona Press, Tucson AZ. *Line drawings, descriptions, and control mechanisms for some plant species that are growing where they aren't wanted.*

3. Desired Future Condition
    a. TNC wishes to reduce the invasive species and some of the existing native grasses with more desirable native species of grasses and wildflowers that will be pleasing to local residents and visitors. The area will provide food for winter birds if maintained (cut down) at the appropriate seasons. It will draw butterfly enthusiasts through blooming native host plants that are featured in the summer.
    b. Plant a mix of flowers and grasses that flower at different times. Host plants for threatened species are prioritized.

c. The focus on native grasses and butterfly plantings is well timed. The decline in pollinators is a nationwide problem that could be helped by the careful selection of host plants. This could also be a tactical advantage in finding funding and pollinator-friendly vegetation certainly could draw more visitors. The business community would welcome the eco-tourism aspects of native wildflowers drawing butterflies and moths leading to increased visitation.
d. Healthy, native, drought tolerant grasses and wildflowers cost less to maintain and use very little additional water post-establishment.
e. The areas close to Cielito Lindo will remain mostly in grasses in support of the neighbors' requests.
f. The restored areas will have to be protected from stray cattle through maintained fencing at boundaries to grazing operations.
g. As much of the facilities and trail shall be universally acceptable as possible.
h. Some of the signage, particularly key interpretive panels, should be bilingual.
i. Interpretation of the area and selected flora and fauna will help visitors learn about the area and increase their knowledge of the environment.

4. Restoration Tactics and Sequence
    a. Volunteers can help remove some of the undesired invasives and participate in planting and maintaining new vegetation. Contracts will likely be needed as well.
    b. Development of water sources for plantings that need water to become established is a high priority. It will also dictate some of the trail locations and the first spots to add native plantings. Once begun, the plants need to be given supplemental water to establishment, and the water source/system will have to be monitored and maintained. Many grass species can have their initial watering reduced once they reach 2 inches in height.
    c. Seed and plant sources for desired species must be identified. A mix of seeds is recommended.
    d. Fences needed for protection must be installed prior to any planting and continually inspected and maintained.

5. Potential Funding Sources
    a. Look for "pollinator focused" funding. The US Fish and Wildlife Service and Arizona Game and Fish Departments are very supportive of efforts to increase pollinator viability.
    b. Arizona State Parks and Trails have several applicable categories of grants related to trails, recreation, accessibility and "parks". Grants can be applied for at any time. If you apply after June, the funding will be available until July of the following year at the earliest. The Recreational Trails Program is federal funding coming from FHWA. RTP grants do cover paved paths, however, with the current $150,000 grant request limit. https://azstateparks.com/grants.
    c. Native grasses are desirable and grants exist to restore them, usually with a matching percentage.

d. Perhaps partnering with Baca Float could be a way to reduce watering costs if a suitable supply and existing line is nearby.
e. A number of conservation organizations are looking for places to enhance native grasses and may be willing to partner with TNC, perhaps by helping provide source materials.
f. Volunteers are not a free lunch but may be a partial solution in removing invasive species as well as planting and maintaining some of the desired vegetation.

Part II: Wetlands Restoration/Creation

The location for this element is the old borrow pit that does hold some water, has some marsh-like vegetation and is overgrown with various species of trees and shrubs. There is a primitive road that serves now as a trail around the Pit. This road will not be modified and will serve as the western boundary for any planned work.

1. Analysis of the Existing Condition
    a. The ephemeral nature of the wetlands begs the question of how low does it go during drought years, and why?
    b. The hydrology investigation done several years ago provides a basis for understanding how much potential and effort will be needed, but more specific detail is needed.
    c. The neighbors to the west are screened by berms and some mesquites. There is valid concern that their views and privacy may be affected by increased activity and changes in vegetation.
    d. The condition of the wetlands is simply a function of monsoonal moisture and runoff. No maintenance is done to the vegetation. The cottonwoods indicate some moisture is available but portions of the eastern end show that there is very little moisture much of the year and surface water recedes to the west.
    e. Recent bird sightings indicate that marsh birds have not returned subsequent to the drought years of 2019 and 2020. Yellow-headed Blackbirds, American Coot, Marsh Wren and Sora are rarely seen or heard anymore.

2. Available Data and Additional Needs
    a. Study the water table and expected annual water inflow. Do monitoring wells indicate any particular change in water levels over time? Is there enough water to maintain water levels? Can nearby storm water runoff be utilized?
    b. Will this site hold water or is there a need to “seal” the bottom?
    c. The preliminary concept plan shows development clustered on the east end of the future wetlands and a perimeter trail that ties into the existing road on the west side. No new trail construction is anticipated on the west side, and the neighbors to the west (Trailshead) have been promised that no benches, trails, roads, or other constructed features will be done within 100 feet of their property.

d. Jonathan Horst from Tucson Audubon completed a preliminary assessment that outlined the following:
    i. This site has potential to become a unique habitat patch within a larger gallery riparian corridor and mesquite bosque, which makes it important to birds.
    ii. Phase 1 should be to treat invasives such as Salt cedar, Johnson grass, Russian thistle and tumbleweed, among others.
    iii. Phase 2 will be to choose desired target habitat types based on bird species. (Cienega/Ephemeral wetland/Cattail Forest/Galley-subGallery Forest.)
    iv. Phase 3 will be to plant appropriate natives, like Sacaton and other floodplain grasses, fruit bearing trees like Elderberry/Chokecherry/Hackberry, wetland pollinator plants, beneficial trees like Arizona Black Walnut, etc.
e. Tucson Audubon has given TNC a quote of $10,000 for development of a detailed restoration plan. If accepted, they will provide a plan that includes a phased list of restoration activities, invasive treatment methods, recommend any recontouring of the wetland, stormwater harvesting opportunities, plant lists for various zones, plant installation recommendations (soil/site prep, planting densities, etc.), target species, applicable grants, recommended trail layout and design.
f. The preliminary plan and expected reconstruction approach will be reviewed and discussed with the Trailshead neighbors <u>before</u> beginning any implementation.

3. Desired Future Condition
    a. TNC desires that a vibrant, healthy wetland is created and maintained, offering a variety of vegetation and diversity of wildlife. Lowering maintenance costs are kept in mind and factored into all construction decisions.
    b. Keep water levels relatively constant, or at least change water levels slowly. Occasional managed burns could be a useful tool if skilled professionals are found and they take the proper precautions. This can help control cattails and improve wetland habitat for key species. It is important to leave some vegetation so species that depend on the area have habitat.
    c. The activities in the vicinity of the wetlands are focused more on the eastern end of the project and no new impacts will occur closer than 100 feet from our neighbors in the Trailshead subdivision. The existing road on the west end will be used as a trail rather than creating a new one.
    d. A viewing platform will be placed in such a way that visitors can see wildlife in the wetlands and vegetation is arranged to provide screening for both wildlife and people. Seating will be provided on the platform. Sun angle will be considered in siting it, as well as being screened from viewing the houses to the west.

e. The site will be accessible from the east by connecting it to the Anza Trail and any new pieces of trail created by TNC.
f. As much of the trail and platform should be universally accessible as possible.
g. Interpretive signing should be provided to help enhance the visitor experience and educate them about the environment. Some of the interpretive materials should be bi-lingual.

4. Restoration Tactics and Sequence
    a. *Whichever experienced contractor is hired to evaluate and propose a design for the wetlands can best help develop this section of the strategy.*
    b. A viewing platform is likely an expensive project and should be done as reconstruction of the wetlands occurs to reduce construction costs and eliminate adverse effects to the established wetlands vegetation likely by deferral.
    c. Consider planting native fruit-bearing shrubs that will grow to 15' (+/-) high as winter food and offer screening.
    d. Pollinator plantings can be done in conjunction with the trail and sitting areas, with a high priority based on drought tolerant host plants.

5. Potential Funding Sources
    a. Wetlands restoration and enhancement projects that benefit wetlands-associated migratory birds are eligible for North American Wetlands Conservation Act (NAWCA) grants via US Fish and Wildlife Service. The Small Grants Program funds on-the-ground projects less than $100,000 and provides a requirement for a 1:1 match. They are expected to be sponsored by the local JV, in our case, the Sonoran Joint Venture.
    b. Partners for Fish and Wildlife grants up to $25,00 per property for focal species habitat. (i.e., YBCuckoo, pollinators, monarchs, any T&E plants) https://www.fws.gov/program/partners-fish-and-wildlife
    c. 5-Star and Urban Waters Restoration – up to $40,000 for riparian and wetlands projects, particularly those with partners and an environmental education piece. https://www.nfwf.org/programs/five-star-and-urban-waters-restoration-grant-program
    d. Arizona Water Protection Fund – up to $400,000. See more details under Riparian Woodlands funding opportunities.

Part III: Lowland Riparian Restoration

The Santa Cruz River runs primarily through the center of the new Nature Preserve property. The river is perennial although it does have a history of very low flows in the late spring/early summer seasons during severe droughts. The monsoons of July/August and sometimes September often cause flooding within adjacent lowlands. The primary water source comes from upstream water treatment facilities and Sonoita Creek. Like all water moving through desert areas, this river is considered critical habitat at both the state and federal levels for a number of declining aquatic, terrestrial and avian species. Lowland

riparian forests are considered one of the most threatened forest ecosystems in the country by many experts.

1. Analysis of the Existing Condition
    a. One of the known issues concerning forest health is the advancing infestation of mistletoe. It seems to be moving south from the Tubac Resort property which has not done any treatment. Mistletoe doesn't tend to kill their tree hosts but it is possible and certainly they can do harm, leaving the hosts more vulnerable to other stressors.
    e. Many reaches of the river once flowed year-round. Flows began to dry out due to groundwater pumping but there is now an added influx of highly treated water from the Nogales International Wastewater Treatment Plant that has helped a bit. Many local folks will tell you that the groundwater levels have dropped in recent years. The recent edition of "A Living River" from the Sonoran Institute shows that the 2021 annual streamflow volume in Tubac reached its highest level since 2008, and likely continued into 2023 due to two consecutive excellent monsoon seasons.
    f. The meandering nature of the river actually offers greater potential for regeneration, particularly if it were to occur in spring and provided there is a shallow depth to groundwater. In the past five years, the river has mainly been confined to the ever-deepening channel, although it does overtop the banks and is often diverted into side channels during heavy monsoon rain events in late summer.
    g. Stream water quality has improved since 2009 as the treatment plant was upgraded, however, unsafe concentrations of E. coli bacteria due to excess runoff and sewage breaches have occurred periodically including several from the aging International Outfall Interceptor transporting wastewater from Ambos Nogales (both in MX and AZ) to the treatment plant. A multiyear rehabilitation project began in 2022 to address this contamination. Contaminated stormwater runoff remains an unsolved problem.
    h. Stream hydrology has changed dramatically in the past twenty years and banks have eroded severely. In just the past three years, scouring floods have resulted the downcutting of the channel by another 2-3 feet in some places, which is one of the larger concerns. This has likely caused the groundwater levels of the existing cottonwood forest to be lower, and the deeper the groundwater, the harder it is for seedlings to establish and it adds to the reduced health in mature trees when more than 5 meters below the surface. In addition, over the past decade, there have been very few spring rains along the Santa Cruz River and thus no spring flooding events. Conversely, there is anecdotal and scientific evidence that flooding events greater than a 100-year return period have led to significant tree losses in some areas.
    i. There is some evidence that a portion of the undercutting seems due to the addition of dirt and rip-rap about four years ago to provide a shallower river

crossing at Clark Crossing, however, this needs to be investigated, along with other areas where the channel has become very deep.

j. The most common species of trees in the riparian corridor are Fremont Cottonwood, sycamore, Goodding and other willow species, alder, cypress, and walnut. Several factors restrict germination of the cottonwoods and willows to spring and early summer. These include early spring dispersal, short periods (1-5 weeks) of seed viability and rapid seed germination. These adaptations help synchronize germination with periods of high spring flows. (Fenner, et.al. 1984) Moist mineral soil or alluvium is necessary for germination and establishment. Goodding's Willows tend to establish closer to the stream than Fremont's Cottonwoods. Goodding's tend to release seed about a month later, also.
k. Groundwater within 5 meters (16.4 feet) of the land surface is needed to provide water for the cottonwoods and willows along the river (fide Sonoran Institute). Between 2020 and 2021 groundwater depths dropped in some wells in Amado and Rio Rico, but then began to rise quickly starting in July 2021. The Tubac reach maintained characteristically steady levels, generally less than 3 meters. There are no monitoring wells on the property. (The cited groundwater monitoring well is not located on the new property.)
l. Most trees are mature with very little regeneration occurring. There is only one age class of cottonwood present. Significant die-off is occurring, worsened by the long-term effects from the severe drought of 2019-2020, and the extended drought cycle of most of the Southwest. Cottonwood and willow seedlings have a high rate of mortality during drought and summer and fall flood events or during periods of rapid water table decline (i.e., > 3 cm per day). Moist soil and shallow groundwater (1-3 meters below the surface) during the growing season are a necessity for both species to establish. (Stromberg, et. al 2007.)
m. There are invasive species that may be inhibiting natural regeneration as well as taking advantage of areas that have been denuded. Trees are considered invasive if they are exotic or non-indigenous species that grow aggressively and replace native vegetation in environments in which they did not evolve. Invasive plants often have no natural enemies to limit their reproduction (e.g., insects that feed on them), and thus displace native vegetation and can cause environmental damage. Tamarisk, Russian Olives, Poison Hemlock and English Rocket are just some of the invasives being seen in the area.
n. The new preserve area has had cattle grazing and deer browsing for many years. Nearly all visible green vegetation has been removed during some recent drought years, opening up the forest floor to invasives and enhancing erosion potential. There is no written contract regarding grazing within the parcel. Deer can access the property from all directions. Similar properties along the Santa Cruz that have no grazing have a much greater understory vegetative component and some, albeit minimal, forest regeneration.
o. Fencing of this property is currently maintained by the ranchers that graze cattle, and it is not only a difficult job, it is a critical one. Monsoon flows, debris

buildups, other ranchers, illegal immigrants, overeager hikers and falling trees have all resulted in fences being destroyed and breachable.

p. The amount of woody biomass on the forest floor is heavily affected by monsoonal storms and flooding. The loss of old cottonwoods in recent years has increased woody biomass.
q. Debris piles accumulate in the river and in the adjacent floodplain during monsoons. These "Bottle dams" often result in the river jumping the banks, creating new channels and spreading into adjacent low spots. Tons of plastic bottles, tires, household trash and assorted junk are left behind each year, requiring major cleanup days.
r. The rarity of this ecosystem makes the potential for partnership with regional conservation groups very high. There is strong support for restoration and positive energy to create partnerships.

2. Available Data and Additional Needs
    a. Consultation with regional conservation groups and specialists must be undertaken to determine specific data needs.
    b. There is a high priority need to understand groundwater levels on the property, and in particular, in areas that are likely to be pilot areas for regeneration or plantings. Monitoring wells can be expensive to install but volunteers like FOSCR may be able to help record monthly data. "A Living River" December edition has some long-term groundwater data through 2021. There are added data online at the Sonoran Institute website to support and enhance the report.
    c. Is there any seed source in the understory? A comprehensive vegetation survey should be conducted to assess current overall health and composition. Coordinates should be taken for any cottonwood seedlings so that they can be protected.
    d. Is there an increased presence of metals in the soil? Are there sufficient nutrients? Flooding events can both add and deplete nutrients. Some studies are needed to understand the suitability of the soil and the potential for seed germination and natural regeneration and conversely, what is lacking. There may be soil data available for Tumacacori NHP that can be interpolated in addition to site specific testing that is needed.
    e. Tumacacori NHP has two existing monitoring wells with long term data. This park is part of the Sonoran Desert Network, an environmental arm of the National Park Service that monitors water, soil, wildlife and ecological conditions for 11 National Park units in the Sonoran Desert region.
    f. Tumacacori NHP had 15 acres of assorted debris from the 2022 monsoon flows. With the help of the Sonoran Institute, they are submitting grant proposals to identify sources and potential options which can lend itself to solutions/reductions for TNP as well.
    g. There needs to be an inventory for invasive species, looking particularly for those species that tend to outcompete the cottonwoods and willows.

h. A number of approaches to both natural and human-aided regeneration have been tried and there are lessons to be learned from each. Actual site conditions will dictate early efforts. In some cases, fenced plantings should be initiated. Some may need water until established. In others, the elimination of grazing alone may be the most appropriate way to let nature begin to regenerate.
i. The hydrologic function of the river through the property has greatly evolved in the past decade. An assessment of current conditions and opportunities to improve the streambanks and stream profile must be undertaken. Small earthen dams may be an option. Professional guidance on how to actually make recommended improvements is needed. At some point, permits may be required if significant channel work is envisioned. This question should be explored during the planning phase.

3. Desired Future Condition
    a. TNC desires the river to have clean water surrounded by a healthy forest with a good mix of species and age classes, offering senescent, mature and young trees with a regular cycle of emergent seedlings. The understory should be comprised of lush native shrubs, wet meadow grasses and forbs. Streambanks should be stable with little erosion even at peak flows.
    b. Vegetative borders to streams should act as overland sediment filters.
    c. An appropriate amount of water will be available to vegetation year-round, but in particular during spring periods when regeneration is favored.
    d. Let understory, ground-level, and vegetation grow freely. As soon as possible, fence cows out of the densest part of a gallery riparian area and away from the stream channel to protect young trees and fragile banks. If grazing must happen, keep it minimal and isolated, and only during non-growing seasons. Make every effort to keep livestock out of the stream channel itself and away from the banks. Ultimately, no grazing will be permitted in the Preserve.
    e. Invasive species are much reduced and strategies in place to monitor the area and limit future invasions.
    f. Utilize regional expertise and skills to evaluate, plan, implement and monitor the riparian forests on the property. Encourage and support similar efforts on nearby properties that need riparian restoration.

4. Restoration Tactics and Sequence
    a. Bring together interested parties to form a partnership group that will guide and support restoration efforts. Applying the data from site specific studies will lead to targeting the underlying mechanisms of plant establishment. It seems obvious, of course, but the best chances for early success will come if initial restoration activities are guided by the conclusions derived from studies undertaken to understand why this forest is now declining and how best to regenerate it.
    b. Restoration actions can then be linked to strategies that have the greatest chances for success.

c. It seems likely that small portions of the property may be identified as test sites, with initial plantings fenced off for protection during their early years. Ensuring that these plantings have sufficient water will be critical. Seedlings may need extra protection from browsing deer, perhaps by using plastic tubing. There are a number of debris diverters that can help keep seedlings from being knocked down during flooding events. There seems to be merit in using a "pilot test" concept. Start with a small block and monitor. A test project like this may be of interest to local schools or perhaps even some college students during research on riparian restoration.
d. Arizona Field Ornithologists (AZFO) have offered to conduct a "Bio-Blitz Weekend" as soon as 2024 to gather data about many of the taxa that exist on the property. Experts will guide volunteers to identify and record existing species.
e. Monitoring wells should be placed in high priority restoration sites as soon as possible. These areas must be in areas that are or can be fenced off to protect seedlings. After those sites are being monitored, additional parts of the property should be checked or additional wells added.
f. Waterjet stingers and hammer drills have been used in places to plant deep cuttings, but the base ends must be in or within 6 inches of the free water of the water table throughout the growing season, so that roots can develop in the capillary fringe until well-established. The depth of 5 meters, or less, is considered optimum.
g. In some cases, particularly where groundwater is very deep and unlikely to be reached by a new planting, cutting a healthy cottonwood just above ground level will encourage suckers to sprout which may lead to a replacement over time.
h. The lateral roots on existing mature cottonwood often reach 1-3 times the height of the tree away from the tree. New plantings must try to avoid being within the range of these roots. Open areas with relatively recent sediment deposits would be favored. Case studies have pointed out that new trees have been out-competed for moisture at critical times of the year by the mature cottonwoods.
i. Riparian lowland forests have historically required a major spring runoff event to stimulate widespread regeneration. These events are rare. Despite the complexity and expense of actually effecting a "designed" flooding event, this option should at least be given some consideration. It would likely require the cooperation and expertise of multiple state and federal agencies, not to mention the support of the local area. There have been some major river systems in the west that have created special "environmental flows" and these may offer some guidance to that discussion.
j. Forest restoration efforts take 10-50 years to show significant results, and the public should be reminded that it is a slow process. This system is also highly vulnerable to local and regional climate changes. Pole planting and whip cuttings can "jump start" the process in areas with higher groundwater levels. Willows appear to establish more quickly than cottonwoods. The Friends of Sonoita

Creek have tried some cottonwood restoration along Sonoita Creek with about a 12% survival rate, so there will be some spots that just don't pan out and need one or more replantings or even abandoned in favor of other more promising sites.

k. Subsequent efforts will be guided by initial results, new science and strategies will be adapted accordingly. Successes will be built upon and less successful efforts modified based on analysis of results. Funding often follows when success can be proven.
l. Water levels in the river are a major concern and many groups are involved in ensuring flow levels are maintained. TNC will remain a partner in those efforts, in addition to consulting with those partners in looking for ways to return stream channels to a more healthy and functional condition.
m. Tumacacori has a grant proposal out related to "bottle dams" that could be tailored to apply to lands within the Preserve.
n. There are no nearby precedent examples for forest restoration along the Santa Cruz but there are stretches of the river in a similar, albeit declining, condition. Any projects undertaken within the TNP would have widespread application within other lowland riparian areas including the adjacent conservation easement north of the bridge on Bridge Road and any other properties that have a forest health emphasis.
o. For treatment of mistletoe on existing trees, it is important to remove it before it produces seed and spreads to other limbs or trees. Mechanical control through pruning tree branches is the most effective method for mistletoe removal.
p. Existing cattle grazing will be phased out through discussions with existing ranchers. A three-year window is envisioned with available areas reduced over time.
q. Fencing will be difficult but critical to any lowland riparian restoration efforts. The fencing must be inspected often and maintained. Perhaps a variety of fence types should be considered based on site specific conditions. For example, chain link fencing, while expensive to install, and not appropriate in areas of high flow, may well be a good alternative on higher elevation sites due to service life, strength and reduced maintenance costs.
r. Use volunteers and contractors to reduce threatening invasives. When considering any treatment for invasive tree or shrub species, including Russian-olive and tamarisk, choose an option that best meets individual management objectives. Options may include tree removal, use of chemical treatments and replanting native species. Chemical treatments such as herbicides can be effective if product directions are carefully followed, but they can be time-consuming and costly, may not be practical or effective for all situations, and may be of concern if used near bodies of water. It is essential to research the best possible treatments for a specific area before taking action, and assess the site's potential for native re-vegetation. If adequate stands of native vegetation already exist on a site, it may not be necessary to actively re-vegetate.

5. Potential Funding Sources
    a. The Santa Cruz River is a primary focal area for the Sonoran Joint Venture and there are numerous species of concern within this zone. Emphasis on improving habitats to support these species is highly supported, funding-wise. Examples include:
        i. Urban and Community Forestry grants via the US Forest Service. Minimum grants of $100,000 with 1:1 match for projects that provide equitable access to trees and green spaces and the benefits they provide. Improving Forest resilience to climate change, pests and storm events favored.
        ii. Arizona Water Protection Fund has grants for enhancing and restoring riparian habitat. The grants are 100% reimbursements for approved projects once the applicant has spent the money. Grants submitted in July and August and extend for up to 5 years (azwpf.gov).
        iii. The Sonoran Joint Venture (SJV) Awards Program provides funds through a competitive program to support the conservation of birds and their habitats within the SJV geography. Individual SJV Awards Program grants range from $5,000 to $15,000.
        iv. The State of Arizona Department of Forestry and Fire Management offer community assistance for governments and non-profits that plan to undertake forest restoration activities. Their science and Community Forestry specialists' advice would be assets in an recovery efforts. There are some grants available, but more likely tied to Urban Forestry but consultation with our local office may shed more light on this. The "local office" is in Tucson. ((520) 628-5480)

    b. Developing a "matching fund" will aid greatly in finding grants. Many of them have requirements to prove they are available before they are even considered.
    c. Perhaps a cooperative agreement could be reached with adjacent landowners and nearby ranchers to help monitor and maintain the integrity of fencing.
    d. A number of maintenance activities lend themselves to being done by volunteers, perhaps as community work days (some which already occur) including river clean-up days, and maintenance of fencing, planting and irrigation systems.

Other Key Reference Information

1. Key Contacts
    a. Adam Hunnuksela – Sonoran Joint Venture (adam_hunnuksela@fws.gov)
    b. Luke Cole – Sonoran Institute (lcole@sonoraninstitute.org; 520-290-0828 Ext2; www.sonoraninstitute.org)
    c. Sarah King – Altar Valley Conservation Alliance (sarah@altarvalleyconservation.org)
    d. Tumacacori National Historic Park (Part of the Sonoran Desert Network) TBD
    e. Borderlands Restoration Network and Nursery TBD
    f. Arizona State Parks & Trails - Mickey Rogers, Chief of Grants and Trails (602) 542-6942 w (480) 708-9709 c mrogers@azstateparks.gov
    g. Friends of Sonoita Creek – TBD
    h. Tucson Audubon Society – Jonathan Horst

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    b. Altar Valley Osa Wetlands Project https://www.dropbox.com/s/2ubtheb4dijx031/Altar%20Valley%20Watershed%20Plan.docx?dl=0
    c. Borderlands Restoration Network Projects – Various grasses and forest projects https://www.borderlandsrestoration.org/watershed-and-habitat-restoration.html
    d. Borderland Wildlife Preserve – Borderlands Restoration Network https://www.borderlandswildlifepreserve.org
    e. Santa Fe Ranch (Tony Sedgewick) http://www.santaferanchfoundation.org
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l. Las Lagunas de Anza Wetlands - http://www.laslagunas.org
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