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Wild Basin Creative Research Center



Wild Basin Wilderness Preserve 2022 Annual Report

(October 1, 2021 – September 30, 2022)

Submitted by

Wild Basin Creative Research Center and St. Edward's University

to

Travis County Commissioners Court
and Transportation and Natural Resources

Table of Contents

Overview of Preserve Mission, Management, and Operations	1
Wild Basin Vision	2
Trail Maintenance, Restoration, and Construction	2
Boundary Management.....	3
Vegetation Management	5
Wildlife Management.....	7
Water Quality	8
Outreach, Education, and Volunteer Coordination	8
<i>Table 1. Average water quality parameters for Wild Basin across two weeks of sampling.</i>	<i>11</i>
<i>Fig 1. Sampling locations for BIOL 1108 classes in spring 2022.</i>	<i>12</i>
<i>Table 2. Number of specimens obtained from three samples at Bee Creek sites.</i>	<i>13</i>
<i>Table 3. Undergraduate and graduate classes taught at Wild Basin FY22</i>	<i>16</i>
Scientific Research	17
<i>Fig 2. Summer soundscape at Wild Basin Wilderness Preserve.</i>	<i>18</i>
<i>Fig 3. Note composition of golden-cheeked warbler B song.</i>	<i>20</i>
<i>Fig 4. Pathway of current DTS cable at the Wild Basin Creative Research Center.</i>	<i>21</i>
<i>Table 4. Captures Per Unit Effort/Species/Site in 2021 and 2022</i>	<i>23</i>
<i>Fig 5. Comparisons of average abundance of Lepomis cyanellus at creeks around Austin.</i>	<i>26</i>
<i>Fig 6. Wildlife counts per camera per day relative to human counts per camera per day.</i>	<i>30</i>
Facilities and Signs.....	31
Security, Access, and Safety	32
Appendices	33
<i>Appendix A: Map of Wild Basin Wilderness Preserve Trail System</i>	<i>34</i>
<i>Appendix B: Aerial Map of Wild Basin and Residential Neighbors.....</i>	<i>35</i>
<i>Appendix C: Wild Basin Boundary Map</i>	<i>36</i>
<i>Appendix D: Non-Native Invasive Species Removal at Wild Basin.....</i>	<i>37</i>
<i>Appendix E: Golden-cheeked Warbler Surveys at Wild Basin/Vireo Preserve</i>	<i>38</i>
<i>Appendix F. 2022 Wild Basin Quarterly eBird Survey Report.....</i>	<i>41</i>

Overview of Preserve Mission, Management, and Operations

Wild Basin Wilderness Preserve is jointly owned and managed by St. Edward's University and Travis County (Appendix A). Wild Basin's mission is to protect and maintain its urban wilderness, and to promote the importance of environmental education, research, conservation and preservation.

Situated at the edge of the Texas Hill Country and surrounded by commercial and residential growth in west Austin (Appendix B), Wild Basin is a unique conservation property for Travis County and the larger Balcones Canyonlands Preserve (BCP) system. As an urban and publicly accessible preserve, Wild Basin provides authentic environmental education and recreation experiences for the community. The preserve's location near a major urban area also brings challenges in the form of invasive species, water pollution, noise pollution, and litter. Wild Basin strives to incorporate these challenges into learning opportunities about our urban environments for students and the public.

Since its merger with St. Edward's University in 2009, Wild Basin remains an important resource to the local community and continues to build on its rich history of promoting conservation, research, and environmental awareness. Wild Basin aspires to become a model for urban preserves, a hub for stewardship, creative research, and environmental education, and a gateway to the BCP.

In addition to helping implement preserve management, St. Edward's University operates the Wild Basin Creative Research Center based at the preserve, which houses a Visitor Gallery with environmental exhibits, staff offices, an Artist in Residence space, a classroom, a computer lab, and meeting spaces. The Research Center is a key resource for educating university level as well as K-12 students and provides a platform for public outreach and engagement.

Wild Basin's education, art, research, and preserve management programs are designed to promote conservation and environmental awareness, while encouraging and demonstrating land stewardship practices. During the reporting period Wild Basin coordinated student internships and research activities, hosted undergraduate and graduate classes, maintained public trails, managed invasive species, performed restoration work, monitored and reported on water quality, hosted public and inter-agency meetings, workshops, and trainings, and hosted an Artist in Residence Program.

Wild Basin Vision

The vision of Wild Basin is to inspire conservation by connecting communities to a dynamic urban preserve. Together with our partners, we focus on the following goals for Wild Basin:

- Managing and restoring a mosaic of habitats native to Wild Basin, including oak-juniper woodlands, riparian corridors, semi-open grasslands and cedar breaks;
- Protecting native biodiversity;
- Protecting habitat for the federally endangered Golden-cheeked warbler;
- Protecting habitats to support threatened and rare plant and animal species;
- Controlling non-native and invasive species;
- Protecting soil profiles and unique geologic features;
- Monitoring water quality relative to watershed inputs, runoff, and erosion;
- Protecting prehistoric and historic cultural sites;
- Managing a trail system that presents the regional flora and fauna, while minimizing impacts to the preserve's biotic community and inherent beauty; and
- Providing stewardship opportunities, research opportunities, and educational resources for students and the community.

Trail Maintenance, Restoration, and Construction

Wild Basin has 2.5 miles of trails that are monitored, maintained, and improved by preserve staff throughout the year with assistance from trained stewardship volunteers and interns.

Trail Maintenance and Monitoring Activities:

- Staff, volunteers, and interns conducted weekly patrols of the trail system to monitor trail conditions and identify potential hazards that need attention. Patrols are documented in the land management quarterly reports submitted to Travis County.
- Weekly staff-led stewardship workdays with 1-6 trained volunteers took place on Thursday mornings to address safety hazards, erosion issues, brush trimming along the trails, tread repair, removal of non-native invasive plant species (NNIP) and minor construction projects. Work days were subject to cancellation due to weather, preserve closures, or other operational considerations.

- Throughout the trail system, erosion control structures (like drains, berms and water bars) were cleaned out as needed and made ready for the next rains. Material was returned to the trails where appropriate.
- Arroyo Vista Trail continues to hold, even after some heavy rains at various times during the year. Several low berms were reworked on this trail to enhance the capacity to shed water off trail.
- Wild Basin visitation numbers are logged by two trail counters on Arroyo Vista Trail, one near each trailhead, as well as by manual counts from Wild Basin Security staff. The total estimated hiker count for this fiscal year was 15,492.

Trail Restoration and Construction Activities:

- Social trails off Arroyo Vista, Triknee, and the Overlook continue to self-restore due to reduced access/hours with the weekend and holiday reservation system and efforts of staff and volunteers. Thanks to reduced visitation, those that are hiking the trails experience less congestion on the trails and are therefore less likely to feel the need to step off-trail in order to enjoy nature without a crowd. Wild Basin staff and trail patrol volunteers continued to monitor the social trail recovery and disappearance, and reinforced existing barriers/signs to discourage off-trail activity. A concerted effort was made to continue to harden trail edges to help restore some of the historic “trail creep” caused by visitors stepping off trail.
- Restoration with locally native plants continued for the sensory garden along the south side of the Creative Research Center.
- The ELOO outdoor restroom construction project was completed this year. There was a soft opening in April with an official ribbon cutting ceremony in October.

Boundary Management

Every year, Wild Basin staff monitor the preserve’s entire perimeter at least twice. The majority of the perimeter was patrolled twice this year, with more frequent visits to certain sections of concern. Due to staff transitions during this year, Section C was only surveyed in its entirety once. See Appendix C for a map of the boundary noting sections referenced below.

Boundary Management Activities:

- Section A (northern boundary shared with City of Austin’s Vireo Preserve) was found to be secure in each of the quarterly surveys conducted on this section.
- Section B (southeastern boundary including back gate, in-holding, and several neighboring properties):

- After the previous year's work to control erosion issues, sediment deposits from neighboring construction projects were not a problem this year.
- Treatment of non-native invasive plant (NNIP) species continues to be a priority along this section. Previous treatments have made a huge impact on NNIP populations. Staff and volunteers are making progress in clearing them out.
- Native woody plant species are growing-in thick along this section of boundary, crowding the fence line. Clearing this out for easier monitoring and repairs will be a task for the following year.
- Staff continue to monitor for signs of change or impact from new home construction along this section of boundary.
- Section C (eastern portion of south-central boundary):
 - Some native woody plant species are crowding sections of the fence line.
 - Staff continue to monitor for signs of change or impact from new home construction along this section of boundary.
- Section D (western half of the southern boundary):
 - Neighbor impacts continue to be an issue along this section of boundary. Mainly discarding yard waste over the fence and a concentrated water runoff event that was reported in the quarterly report. This was strongly suspected to be from the neighbor's pool that was allowed to drain onto Wild Basin.
 - Staff monitor for signs of change or impact along sections with new home development.
 - At the southwestern portion of this boundary section, there's a large pocket of invasive non-natives, mainly Ligustrum and Nandina.
 - The Red oak die-off continues to be a concern along this section of boundary. After several site visits with Travis County, Texas A&M Forest Service and St. Edward's University staff, compounding abiotic factors are the leading theory for the cause of the oak die-off. The extreme heat and drought conditions from this summer were another added stress to this section of boundary.

- Section E (along Loop 360):
 - Staff and volunteers picked up trash in the eastern right-of-way of Loop 360 on multiple occasions to prevent it from traveling into the Preserve and Bee Creek. The gabion structures installed along 360 will need to be serviced in the coming year to clear sediment and woody plants getting established.
 - Non-native invasive plant species continue to be an issue along this boundary, notably at the Bee Creek culvert. A patch of Japanese honey-suckle was also found and treated during the summer.
- Wild Basin Preserve has intermittent fencing or no fencing (Section E) along the boundary which leaves the Preserve vulnerable to trespass. In addition, there are some stretches of fence that are deteriorating and could use brush management, especially in Sections B and C.
- Trees damaged by Winter Storm Uri struggled more with the extreme heat and drought of this summer. A few of them have come down near or on the boundary fence. Delayed impacts from the storm will continue to be an issue for the next few years. Work to clear the trees as they come down will continue.

Vegetation Management

Vegetation Management Activities:

- Vegetation Mapping. Wild Basin staff, volunteers, and researchers use the citizen science platform iNaturalist to map the distribution of plants within the Preserve. The smartphone app allows users to document locations, photos, and relevant notes about plant occurrences onsite. Currently, we have two projects established in iNaturalist: one project for the public to report their observations along the trails (Wild Basin Biodiversity Project), and a second project for staff, researchers, and trained volunteers to report observations of rare plants and invasive species in off-trail locations (WBCRCMappingProject). In the case of rare or endangered species, all coordinates are obscured from the public so as to not encourage iNaturalist users to venture off trail. The Wild Basin Biodiversity Project currently has 1291 Research Grade observations of 435 unique species (5 new species, three new plant species) made by 70 observers. Significantly 393 different iNaturalist members have contributed identifications to these observations.
- Rare Plant Species. All rare plant locations are documented in the iNaturalist WBCRCMappingProject or, if done through Coordinates, are obscured from the public when sightings are off-trail. A report from volunteer Master Naturalists monitoring rare plant species in Wild Basin can be found in the scientific research

section (Project 12) of this report. The following rare plant species are on our monitoring list:

Primary Species of Interest

- naked broom-rape (*Orobanche uniflora*)
- shooting-star (*Primula meadia*)
- Texas madrone (*Arbutus xalapensis*)

Secondary Species of Interest

- canyon mock-orange (*Philadelphus ernestii*)

Tertiary Species of Interest

- glass mountain coral-root (*Hexalectris nitida*)
- crested coral-root (*Hexalectris spicata*)
- Heller's marbleseed (*Onosmodium helleri*)
- Buckley tridens (*Tridens buckleyanus*)
- Louisiana broom-rape (*Aphyllon ludovicianum*, *Orobanche ludoviciana*)
- ladies' tresses (*Spiranthes magnicamporum*)
- sticky liatris (*Liatris glandulosa*)
- Virginia snakeroot (*Endodeca serpentaria*)

- Invasive Species Management.

- Preserve and Travis County TNR staff, student interns, volunteers, and American YouthWorks (AYW, contracted by Travis County) continued to map, monitor for and remove invasive non-native species, such as Japanese honeysuckle (*Lonicera japonica*), Japanese privet (*Ligustrum japonicum*), Chinese privet (*Ligustrum sinense*), nandina (*Nandina domestica*), Johnson grass (*Sorghum halapense*) and giant cane (*Arundo donax*), among others.
- Invasive species control measures at Wild Basin involve manual removal of plants by hand pulling or use of a weed wrench. In addition, in collaboration with Travis County TNR staff, we use either a "cut and paint" method or "girdle and treat" method with Garlon 3A herbicide. These treatments are used on plants too large to be removed manually. Chemical treatments are performed under supervision of Julie Murray, Travis County BCP Natural Resource Specialist, a licensed applicator through the Texas Department of Agriculture.
- Invasive species are primarily mapped and monitored using the GIS "Collector" app in cooperation with Travis County TNR.

- During this fiscal year, Wild Basin staff, interns and volunteers, and Travis County staff and contracted crew (AYW) removed 3,966 stems of invasive plants (see Appendix D).
- Due to staff transition this year, NNIP work was limited compared to previous years.
- Fuel reduction. Beginning in 2017, Travis County TNR coordinated with the City of Westlake Hills to cut fuel breaks along the southern border of Wild Basin in areas adjacent to residential areas. In FYs 17 and 18, a total of 2.2 acres were treated. No treatments have been needed in these areas since the work was completed. Staff continue to monitor the status of the shaded fuel breaks and plan to do a maintenance treatment in the coming fiscal year. Firewise guidelines of clearing debris and trimming back branches and woody brush continue to be followed in the area immediately surrounding the visitor center.

Wildlife Management

- Golden-cheeked Warbler. A total of 44 surveys were conducted at Wild Basin and the adjacent Vireo Preserve between 9 March and 21 June by Darrell Hutchinson, Lisa O'Donnell, Jim O'Donnell, and volunteer River Ahlquist for a total of 148 survey hours. Between the two preserves, five separate males were detected during the breeding season. Four males paired and two of the nesting pairs reproduced successfully. Compared to recent years, plot density was lower and down substantially from 2021 when nine males established territories. Four out of five males were color-banded. One male was a banded return from 2021. One was banded in 2022 as after second-year (ASY) bird. Two were banded in 2022 as second-year (SY) birds. Banding was accomplished by John Chenoweth. For a full report see Appendix E.
- Feral Hogs (*Sus scrofa*). No strong evidence of hog activity was noted this year on Wild Basin. Light rooting has been observed around the preserve, but is more likely the work of armadillo, skunk or porcupine. These animals are known to be on Wild Basin and routinely found on the game cameras, where feral hogs are not.
- Wildlife Activity. Wild Basin continued to monitor the Preserve boundaries using motion-triggered cameras along the boundary and trails. Additionally, we continue to monitor human hiker activity alongside wildlife activity using images from the trail cameras. Cameras are regularly maintained and data are collected and analyzed (ongoing) by Wild Basin staff, interns, research students, and volunteers. A report of the findings is included in the scientific research section of this report.

Water Quality

- Monthly water quality monitoring of Bee Creek at the waterfall continued for this fiscal year. Wild Basin staff (with some assistance from student interns) used the LCRA's Colorado River Watch Network (CRWN) test kits and monitoring protocols to measure various parameters including: pH, nitrates, turbidity, dissolved oxygen, specific conductance, *E. coli* bacteria counts, and field observations. Water quality testing data from the Wild Basin site can be found on the CRWN website at <https://crwn.lcra.org/events.aspx?qrySite=72>.
- Wild Basin staff continue to monitor Bee Creek and North Hollow for impacts from neighbors and upstream development. Historic concerns have been around foreign sediment and algae blooms fed from runoff. This year has been an improvement from previous years thanks to holding neighbors accountable for impacts to the watershed. Construction continues at the Addie Development upstream from North Hollow. Most of the major earth work has been completed at this point. The main point of concern with that development now is ensuring that onsite water treatment does not pollute North Hollow. There are plans to enact expanded water quality monitoring activities for both Bee Creek and North Hollow in the coming year.

Outreach, Education, and Volunteer Coordination

Wild Basin actively provides environmental educational opportunities and volunteer stewardship opportunities for the community. A total of 1092 education, stewardship and volunteer hours were logged at Wild Basin on a number of outreach-related activities, including trail maintenance and stewardship (described above), environmental and education. The events and programs held at Wild Basin from October 1, 2021 to September 30, 2022 are summarized below.

Educational Permits

Five permits for educational activities were issued during the reporting period. The description and progress of each project is provided below.

(1) Ackermann, C and Willette, J. Star Walks at Wild Basin

Project Description This event involves an introduction to the night sky through a hike and a guided exploration of the constellations. Permittee and/or subpermittees will lead up to 10 attendees on a 2-hour hike staying on public trails. Permittee is responsible for assuring all participants leave Wild Basin and gate is locked after the hike.

Progress In 2022, REI guides hosted 29 Star Walks for the public, leading 225 visitors on nighttime hikes at Wild Basin. The hikes are held throughout the year. Star Walks begin 30 minutes before sunset and last for two hours. REI guides and visitors hike along Triknee Trail, Possum Trail, and Creek Trail. REI provides visitors with interpretive content of Wild Basin and Central Texas throughout the Star Walk, including while star viewing once the skies are sufficiently dark.

(2) O'Keefe, K. Environmental Conservation and Climate Change Lab

Project Description The proposed project is to continue an ongoing laboratory course for the Environmental Biology and Climate Change program at Saint Edward's University. This course (BIOL 2423) utilizes a Course-based Undergraduate Research Experience (CURE) format, in which students conduct an original research project together as a class. The overall research objectives of this project are to: (1) Determine differences in vegetation structure and composition between urban and natural habitats and (2) Link vegetation differences with anthropogenic drivers (e.g., changes in microclimate, habitat fragmentation, disturbance, etc.). Students will collect vegetation and environmental data together as a class at two field sites: (1) Blunn Creek (a more disturbed "urban" site) and (2) Wild Basin (a less disturbed, more "natural" habitat). The data collected using this larger framework will then be used by small student groups to investigate individual research questions that more specifically address Obj. #2.

Progress Students developed independent projects within the larger framework of comparing vegetation at Wild Basin with Blunn Creek. Specifically, they were interested in comparing soil characteristics (soil pH, compaction, and composition) across the two sites. We conducted field work over two days at Wild Basin, collecting vegetation and soil data at two different locations. Students collected tree species composition, ground cover, canopy cover, tree basal area, and soil characteristics.

They are currently processing soil samples and are beginning to analyze their vegetation data. Preliminary analyses indicate that tree species diversity is higher at Blunn Creek compared to Wild Basin, although we think this may be due to an increased number of invasive species at Blunn Creek.

(3) Quinn, B. Phenology and Vegetative Composition Studies for BIOL and Ecology Lab Courses.

Project Description Permittee and up to 16 students enrolled in St. Edwards University Biology and Ecology courses may go off trail at Wild Basin on four occasions to collect phenology and vegetation composition information. This information may include photo-documentation and the collection of soil samples and leaves. Leaf collection will be limited and must not kill the plant. Permittee will coordinate with Wild Basin staff to assure that golden-cheeked warbler territories are avoided.

Progress On February 9, the permittee and 14 Ecology Lab students were at Wild Basin for two hours. The students assembled in seven groups and estimated vegetative cover of herbaceous and woody species at varying aspects at the Preserve. The permittee monitored the activity of all seven groups. The results were inconclusive, largely due to inexperience in sampling techniques by the students. On March 29, the permittee and 16 students in Freshman Biology Lab assessed the water quality and riparian community in the lower end of Bee Creek. The students broke up into four groups and each group had two representatives in the creek measuring flow rate and sampling for macroinvertebrates using kick nets. The other member of the group made visual assessments of the riparian community at the same time. Their results were reported to the course coordinator for all eight sections of the Freshman Biology Lab course.

(4) DeWhatley, D. Course-based undergraduate research experience with an introductory biology course (BIOL 1107) at St. Edward's University

Project Description As part of the process of learning about scientific research, students will collect water samples from Bee Creek in Wild Basin and then conduct analyses in the St. Edward's labs to evaluate water quality parameters (nitrates and chlorophyll a). Water samples will be collected from three locations in Wild Basin where Bee Creek intersects a trail (2 locations on Creek Trail and one location on

Yaupon trail). At most, 72 students will collect 500 mL samples over a two-week span (10/24-11/3/22).

Progress Between October 24, 2022, and November 3, 2022, approximately 72 students from six sections of the BIOL 1107 lab at St. Edward's University visited Wild Basin to collect water samples from Bee Creek. Each student visited one of three sites: 1) "Upstream" – upstream of the waterfall, at the crossing on the Yaupon Trail that is nearest to the Creek Trail, 2) "Midstream" - at the crossing on the Creek Trail that is about halfway between the Woodland Trail and the east entrance to the Yaupon Trail, 3) "Downstream" - at the crossing nearest to the eastern intersection of the Creek Trail and the Yaupon Trail. The water samples were taken to the lab at St. Edward's University and tested for nitrates in the first week of collection and chlorophyll a in the second week (Table 1). Nitrates were tested using the Hach cadmium reduction method 8039. Chlorophyll a was extracted from filtered phytoplankton using 90% acetone, then concentrations were assessed using spectrophotometry.

Table 1. Average water quality parameters for Wild Basin across two weeks of sampling.

*Standard deviation values are shown in parentheses following each average value. N represents the number of individual water samples that were tested.

Parameter	Upstream	Midstream	Downstream
Nitrate (NO ₃ ⁻ in mg/L)	0.335 (0.410), N=5	0.108 (0.148); N=5	0.922 (0.810); N=5
Chlorophyll a (mg/L)	0.00092 (0.00089); N=4	0.00138 (0.00033); N=3	0.00179 (0.00203); N=4

(5) Green, M., DeWhatley, M., Quinn, B., and Edwards, C. BIOL 1108 - Gen Bio Lab II

Project Description Permittee will take up to 48 students enrolled in BIOL 1108 at St. Edward's University on field trips to Wild Basin Preserve to instruct them on the use of the scientific method by having students conduct water quality projects. Students, in 4-person teams, will collect data on physical and chemical stream characteristics, as well as one biological indicator, at two locations where Bee Creek intersects Wild Basin trails. Students will measure water temperature, pH, stream velocity, and estimate riparian vegetation, canopy cover, and phytoplankton abundance. For macroinvertebrates, students will select a location in a stream riffle and set up a one-ft wide D-net. One student will stand in the stream holding the net while the other will disturb rocks in a one-sq. foot area front of the net for one minute.

Macroinvertebrates will be collected, identified to order at the site, and then released back into the stream. Any macroinvertebrate unable to be identified to order will be preserved in ethanol and brought back to the lab for identification.

Progress Students collected three samples at each of two sites in Wild Basin Preserve - Bee Creek Downstream and Bee Creek Upstream (Figure 1). One way that the City of Austin determines the water quality of local streams is to calculate the number of individuals belonging to the environmentally sensitive orders Ephemeroptera, Plecoptera, and Trichoptera, and dividing those by the total number of individuals collected. This data point is known as the percent EPT, and the higher the value, the better the water quality. At the Bee Creek Downstream site, the percent EPT was 71%, which indicates good water quality (Table 2). At the Bee Creek Upstream site, the percent EPT was 82%, which indicates good water quality (Table 2). Eleven other stream sites were sampled in the Austin area, and together they had an average percent EPT of 52%, indicating that the water quality in Bee Creek is above average for the Austin area. These data may be compared to future spring 1108 class data to monitor water quality changes in Wild Basin over time.



Fig 1. Sampling locations for BIOL 1108 classes in spring 2022.

Table 2. Number of specimens obtained from three samples at Bee Creek sites. Macroinvertebrates were grouped by order, with the exception of bivalvia, gastropoda, and turbellaria, which are classes

Macroinvertebrate Group	Bee Creek Downstream	Bee Creek Upstream
Hirudinida (leech)	0	0
Lumbriculida (aquatic earthworms)	0	0
Coleoptera (beetles)	1	0
Diptera (flies)	3	3
Ephemeroptera (mayflies)	48	36
Hemiptera (true bugs)	0	0
Megaloptera (dobsonflies and hellgrammites)	2	0
Odonata (dragonflies and damselflies)	13	5
Plecoptera (stoneflies)	7	0
Trichoptera (caddisflies)	3	2
Amphipoda (scud)	0	0
Decapoda (crayfish)	0	0
Bivalvia (mussels and clams)	0	0
Gastropoda (snails)	1	0
Turbellaria (flatworms)	0	3
Other	3	3
TOTAL	81	79

Environmental Education and Interpretive Programs

- School Programs – Since the start of the pandemic shutdown the first on-site guided environmental education hike occurred on September 30th, 2022. There were 24 students and adults in attendance for that event. Three volunteers donated nine hours of their time to support this offering. Guided program group size is restricted to a maximum of approximately 40 students per day to control impact on the preserve and ensure volunteer guides have a manageable group size. Wild Basin also began in September of 2022 creating two online curriculum guides with the focus of “Environmental Justice: Now or Never”. The two new curriculum guides provide broad, foundational science-based background information about environmental education concepts tied to natural science themes and concepts for 3rd-8th grades. The guides also offer inquiry-based questions and general activity suggestions have been developed to serve teachers as resources for stand-alone lessons or for pre- or post-visit field trip classroom activities.

- Public Programs – REI offered public programs (see permit report above). The Artist in Residence program offered one youth/adult workshop, as well as a final reception (see below).
- Artist in Residence – in 2022, Wild Basin welcomed Juliette Whitsett as the spring Artist in Residence. Her project “Encounters with Biodiversity” showcases the color palettes of Texas 73 state-listed endangered species and features 18 original designs from her Biodiversity of Texas Series. Wild Basin welcomed Ania Safko as the fall Artist in residence. Her project involved researching the impact of droughts and floods on the landscape of Central Texas and produced sculptural pieces to help visitors connect with the deep history of Wild Basin Wilderness Preserve. The project included ceramic and wooden sculpture and an audio recording of her writings.
- Educator Training - Educator Training - In September 2022 Wild Basin hosted a refresher training for 11 returning trail guides and three new trail guides. This two-day (12 hour) event was led by certified interpretive guide trainer Clark Hancock.

Environmental Education Resources for the Public

- Interpretive Visitor Gallery. During most years, visiting groups and the general public have access to the Wild Basin Visitor Center on Monday-Friday, 9am-4pm year-round, except major holidays. Due to continuing Covid-19 pandemic protocols, Wild Basin kept the Visitor Center closed to the public until March 2022. Visitors can explore the educational exhibits, including projector microscopes to view natural science specimens, interactive bird calls and binoculars, as well as look up trail sightings using iNaturalist data on two touch screen monitors. Exhibits also include information on the Balcones Canyonlands Preserve and the protection of endangered species, and interpretive slideshow of wildlife photos from a trail camera research project.
- Public Visitation. This year we continued to monitor two trail counters at the trailheads to estimate the number of visitors using the wild basin trail system. We assume that each individual is counted twice (arriving and leaving) , so we total both counters together and divide by two for monthly visitation estimates. We also utilized head counts provided by our Wild Basin Security Guard. Data from the trail counters indicate that approximately 15,492 visitors hiked at Wild Basin during 2021-2022 FY. Visitation rates were lowest in August 2022 (454 visitors) and greatest in March (2,135 visitors).
 - The FareHarbor reservation system was operational during FY22 (weekends & federal holidays); The system caps daily visitation at 63 cars (3 hiking

sessions w/21 parking spaces each - until 5:30pm). After 5:30pm, reservations are not required.

Community Science

- eBird quarterly walks - Wild Basin volunteers coordinated quarterly bird surveys to participate in the community science program. eBird is a global citizen science program established and run by the Cornell Lab of Ornithology and National Audubon Society. Three sections of Wild Basin's trail systems are included in separate survey locations (Loop 360 Segment, Bee Creek Segment, and North Hollow Segment), and all birds seen or heard during the quarterly walks were recorded in the eBird database. 70 bird species and 346 birds were observed/heard during FY22. For a full report see Appendix F.
- iNaturalist - Students, volunteer natural resource stewards, and the public are encouraged to participate in the Wild Basin Biodiversity Project and community science project on the iNaturalist platform.

(<https://www.inaturalist.org/projects/wild-basin-biodiversity-project>).

This project allows users to submit observations of flora and fauna, supported by photos and sound recordings, using either their mobile device or desktop computer. The community of members on iNaturalist then helps to determine or confirm the identity of the animal or plant and it becomes a valuable data point for our natural resource management efforts as well as broader scientific research. iNaturalist allows users to view observations uploaded by other visitors to the preserve. A total of 1330 observations documenting 443 species have been reported by students, volunteers and visitors in the Wild Basin Biodiversity Project on iNaturalist. The Open Space report, which includes all observations from Wild Basin, has 3469 observations of 663 species.

Volunteer Stewardship

Volunteer Stewardship Workdays provide opportunities for the public to volunteer and assist with land management activities, as well as learn about the BCP and conservation practices and issues. Altogether, stewardship volunteers contributed 567 hours, including dedicated weekday and weekend individual volunteers, and group stewardship events.

- Thursday Workdays – Five to six regular volunteers showed up nearly every Thursday the Preserve was open to help with trail construction/maintenance, signs, trash/recycle receptacle installations, small repair projects, trail inspections, creek sediment monitoring, litter pickup along Loop 360, etc.

- St. Michael's School Stewardship Day - January 6, 2022, 12 students and one teacher volunteered for trail patrol under direction of Interim Preserve Manager.
- Saturday Workdays – These have been on hold due to staff transition and onboarding. They will start back up again in early 2023.

Public events, meetings, workshops, and conferences

*If not reported above under educational permits

- Dr. Darren Proppe, Wild Basin Research Director, gave a guided hike to the Environmental Journalism class from St. Edward's University on February 4, 2022. Participants included the faculty instructor (Yowell) and ~15 students.
- Dr. Darren Proppe provided guest lectures on Wild Basin for three courses
 - Animal Behavior (Goldey) – October 30, 2021 and April 28, 2022
 - Environmental Science (Beck) – February 28, 2022
 - non-majors Animal Behavior (Heiden) - March 31, 2022
- Dr. Kim O'Keefe conducted a 2-hour lab at Wild Basin on October 20, 2021. Students surveyed vegetation as part of her Environmental Conservation and Climate Change course.
- Student researchers presented their work on Wild Basin-related research projects at the SOURCE symposium at St. Edward's University on April 1, 2022:
 - Sanfeliz, I., Ditto, S., Proppe, D.S., and O'Keefe, K. Developing a novel sensor network for environmental monitoring at St. Edward's University and Wild Basin Wilderness Preserve
- Courses – See Table three for a list of undergraduate and graduate courses that incorporated Wild Basin into their curricula in Fall 2022 and Spring 2022.
- Dr. Barbara Dugelby gave ten guided hikes to SEU groups, neighbors, and supporters of the Wild Basin Creative Research Center.

Table 3. Undergraduate and graduate classes taught at Wild Basin FY22

Course #	Title	# Students	Semester
JOUR 3303	Environmental Journalism	15	Spring 2022
SP 4142.01	Ecology Lab	16	Spring 2022
BIOL 1107	Biology Lab	72	Fall 2022
BIOL 1108	Biology Lab	48	Spring 2022
	TOTAL	151 students	4 classes

St. Edward's University Events

- Wild Basin staff participated in Earth Day in April 2022 at SEU with a table to share information about Wild Basin's efforts in sustainability and conservation.
- Staff Retreats and Meetings – Regular staff meetings and two staff and one volunteer trail guide training sessions were held during the FY 2022. The Creative Research Center was used for meetings and/or retreats by three SEU departments and the President's Cabinet.
- A botanical artist group met at Wild Basin in June 2022.
- Meetings of businesses and government entities - Wild Basin did not host any of these meetings in FY2022.
- St. Edward's University events – Wild Basin staff participated in the SEU fall 2022 homecoming and involvement fairs.
- Recreational Equipment Incorporated (REI) conducted 29 Star Walks with 228 participants in 2022.
- Wild Basin Internship Program – Wild Basin provided internships for 21 undergraduates and two high school students in Land Management, Biological Research, Invasive Species, Environmental Education, Media Arts, and Outreach/Public Relations. Projects included water quality testing, invasive species removal, trail maintenance, sediment monitoring, monitoring animal behavior with camera systems, acoustic monitoring, butterfly garden maintenance, tabling events, trail patrol, photography, videography and curriculum development.

Publications

- *Proppe, D.S., ed. Songbird Behavior and Conservation in the Anthropocene. Taylor & Francis Group, 2021.*
- *Buschele, M. Austin research points to why birds seemed louder at the start of the pandemic. KUT-NPR. March 20, 2022.*

Scientific Research

During the 2021-22 reporting period, 13 permitted research projects were carried out at the Wild Basin Wilderness Preserve. Project participants included three Wild Basin CRC staff, four faculty from St. Edwards University, three faculty from outside of St. Edwards University, 11 undergraduate students from St. Edward's University, two graduate students, and 12 community partners/volunteers. Excluding Wild Basin CRC

staff and contractors, over 3,500 hours were expended on research at Wild Basin during the reporting period.

(1) Quinn, B., Proppe, D., and Deppe, H. Quantifying the daily, seasonal, and COVID-19 shut-down variation in the soundscapes of the Wild Basin Wilderness Preserve

Project Description Acoustic recordings will be made using passive acoustic recorders and hand-held acoustic recorders. Passive recorders will be moved weekly and each of 20-30 locations will be visited bi-weekly through the duration of the project. Hand-held recording will occur at 69 locations in each of two years from mid-May to mid-July. Visitation will generally be conducted by two individuals but may be up to five individuals.

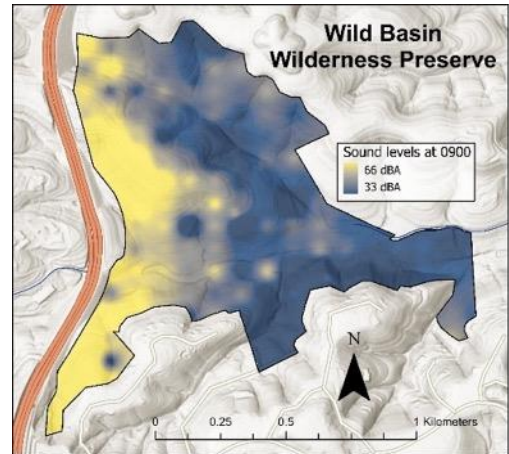


Fig 2. Summer soundscape at Wild Basin Wilderness Preserve.

*Louder regions (yellow) are due to a highway on the western park border and insect activity along riparian areas.

Progress Acoustic data from 15 permanent and 134 short-term (24 hours) recording sites was compiled to produce soundscape maps in ArcGIS (Figure 2). These maps demonstrate the spatial distribution of sound across the preserve and a series of maps compares sound distribution over time (i.e., by year and by time of day). Data from the 134 short term stations was collected over the summer months, and future work will compliment this dataset by resampling the short-term sites during the winter months.

(2) Concilio, A., Troiani, D., Pacheco, I., Kudrick, J., and Luhrs, M. Edge effects on invasive plants in the Balcones Canyonlands Preserve

Project Description The objective of this study is to determine the impact of edge effects on the spread of invasive woody species from the horticultural industry into the BCP preserves. We aim to sample at least three or four different preserves. At each preserve, we will collect data along a minimum of 10 transects (placed 1 woodland habitat at least 100 m apart from one another); half of which are adjacent to housing developments and half which are not. We will measure plant species composition along 50-m transects from the preserve boundary to the interior.

Progress Students collected data on this project with help from research advisor Amy Concilio in Fall 2020 (Natalie Cuellar) at Wild Basin Wilderness Preserve and Fall 2021 at Emma Long and Wild Basin (Dom Troiani, Isabel Pacheco, Julia Kudrick, Maxwell Luhrs). In 2020, Natalie surveyed eight sites at Wild Basin – four that were adjacent to suburban neighborhoods and four adjacent to the Vireo Preserve. She found that invasive plants from the horticultural industry such as privet and nandina, were more abundant on transects adjacent to suburban neighborhoods than in the interior of the preserve (adjacent to the Vireo Preserve). In 2021, students surveyed three transects in Wild Basin along the roadside, and four transects at Emma Long – two bordering suburban developments and two bordering the river. I will continue to recruit students to work on this project next fall, ideally sampling one or two more preserves within the BCP so that we can make some generalizations about the effects of suburbanization on the spread of invasive species.

(3) Proppe, D., Warren, C., Marin, D., Yost, A., and O'Donnell, L. Assessing changes in golden-cheeked warbler songs over time

Project Description The objective of this project is to collect high-quality recordings of golden-cheeked warbler B songs at multiple BCP tracts in order to compare current song structure to those recorded on the BCP in 2008. Permittee and/or subpermittees will visit each site two to ten times with the objective of obtaining B song recordings from two to six individuals per site.

Progress B songs from over 30 individuals were recorded in 2021-22 and compared to a similar number of individuals from 2008-10. Our results indicate that trill notes have become more common while buzz and tonal notes are less common (Figure 3). A couple of small notes, termed up-swoop and down-swoop, also changed in usage between the two time periods. This analysis is being finalized and the results are being prepared for potential publication.

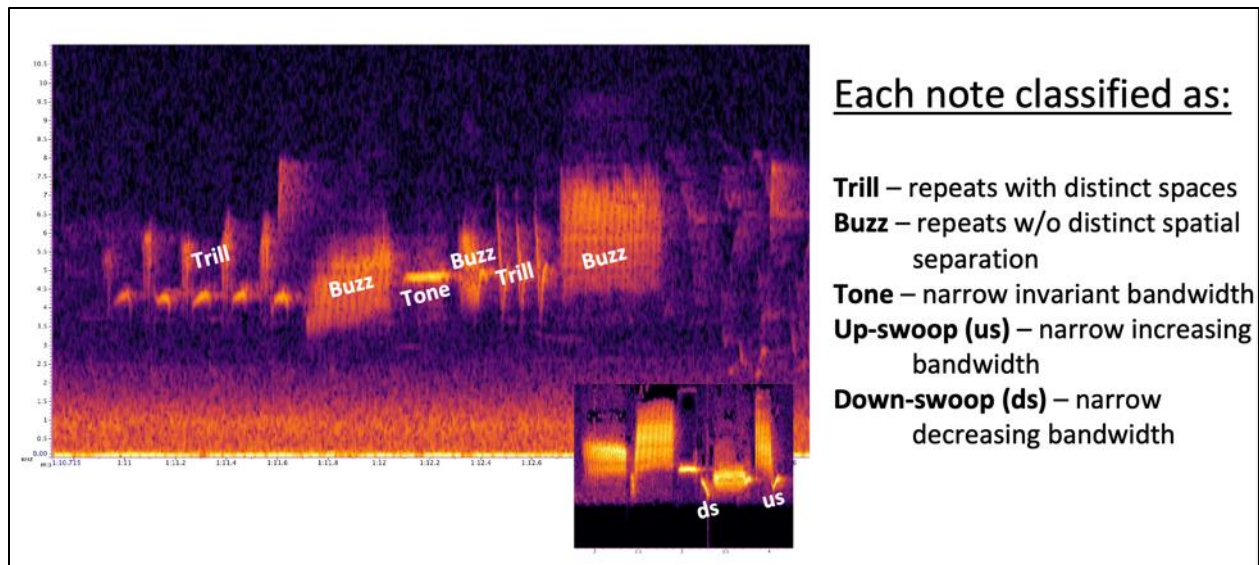


Fig 3. Note composition of golden-cheeked warbler B song.

*Arrows indicate the direction of change between past (2008-10) and current (2021-22) B songs. Significant changes were detected for all note types.

(4) Proppe, D., Tanner, E., Tanner, A., Fuhlendorf, S. Fine-scale thermal assessment of juniper and oak dominated habitats on the Edward's Plateau

Project Description Permittee and assistants will investigate thermal variation in ground and canopy environments at Wild Basin Preserve using Digital Thermal Sensing (DTS) technology. A 650-m DTS cable will be placed on the ground and then looped back along the same route at approximately 3-m height in the tree canopy. The power source will be an outlet at the Creative Research Center. The cable will cross underneath the Arroyo Vista trail under a bridge and/or by digging a tunnel and then covering it. The cable will be checked at least twice weekly and repaired as necessary.

Progress On September 10, 2021, the DTS cable was placed on the ground, and began recording data. The first route option was decided on with some minor changes (Figure 4). The route now extends farther into the preserve (358.5M) and no longer loops back on itself. By extending the route we now include more open and closed-canopy vegetation types, expanding our sample size and including more variation in topography, which plays a large role in determining the thermal landscape. The DTS recorded data every half meter, every minute until December 30, 2021, at which point the cable broke. It was repaired, with a cable loss of 1.5 meters on June 21, 2022, and has been recording data since and will be for the foreseeable future. In addition, a drone flight took place in October 2021, which collected thermal and multispectral imagery for this 12-acre field site.

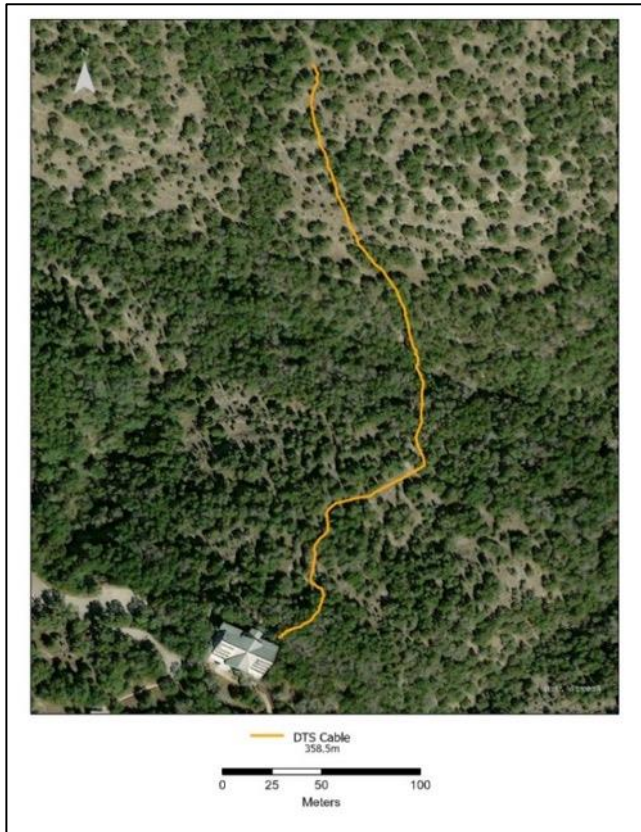


Fig 4. Pathway of current DTS cable at the Wild Basin Creative Research Center.

(5) Proppe, D., Tanner, E., Tanner, A., Fuhlendorf, S., Beck, L. The effect of temperature and vegetation on sound transmission

Project Description The objective of this project is to quantify the effects of temperature and vegetation on sound transmission, taking advantage of high-precision data being provided by the fiber optic DTS system currently installed at Wild Basin. Results can be used to modify the effects of a changing climate on sound propagation in natural systems. Two to four research assistants will playback sounds from a handheld blue-tooth speaker (JBL Wind) placed at 2m from the ground. Sounds will be recorded at 6-20 distances via Songmeter Mini ARUs (Wildlife Acoustics) also placed at 2m above ground. Recorders will be placed at transition points between open and closed canopies. Playback sounds will include tones (2, 5, 8 kHz), broadband noise (white, pink, Brownian), and animal vocalizations (leopard frog, cicada, golden-cheeked warbler). Warbler songs will be played back during periods when this species is not on site. All playback sounds will be broadcast at 80 dB SPLA

(measured at 1m from the source). Trials will be conducted on at least 10 days between February and August 2022 to capture a range in temperatures. Each sound stimulus will be 5s in duration followed by 10s of silence. The playback track will be repeated until three repetitions of each sound have been recorded that are free from bird song or other highly influential noises. Humidity will also be collected via an iButton at each recorder.

Progress In September 2021 the DTS cable was placed and began recording data at Wild Basin Preserve. A MS student was hired in June 2022, to begin work on this project. They are expected to submit a thesis proposal by April 2023 and begin field work that summer.

(6) Steffenson, M., Wostl, E., Proppe, D., Dean, E., Poulsen, M., and Abney, J. The impact of temperature on the distribution of ectotherms at the Wild Basin Wilderness Preserve

Project Description The goals of this project are to map temperature across time and space at the Wild Basin Wilderness Preserve to correlate with samples of arthropod and herpetofauna diversity. We will then use this information to model shifts in future distributions of ectotherms based on the influence of anthropogenic activity and climate change.

Progress Malaise and pitfall traps were set up to continuously collect arthropods, amphibians, and reptiles at six representative habitat types found at Wild Basin. In addition, iButton data loggers were placed in both the sun and shade at each site to collect data regarding temperature and humidity variation that may affect the distribution of the ectotherms being sampled.

Arthropod samples were collected from August 2021 to June 2022. Samples are still being processed and identified to the Family level (it is expected to take approximately two years), but a subset of the data is completely identified, and the data is currently being compiled for analysis and inclusion into a talk at the annual meeting of the national Society for Integrative and Comparative Biology being held in January 2023. This data will be presented for a second time at the regional meeting of the South-Central Division of the National Biological Honor Society in April 2023. Data analysis will include Family richness, as well as measures of diversity and evenness (Simpson's and Shannon-Weiner indices). We are additionally working on calculating

changes in relative abundance for the ten most abundant arthropod families found among our samples to better map what Family level changes account for the largest shifts in diversity and evenness indices.

Between 09 May 2022 and 23 June 2022, we conducted herpetological surveys at Wild Basin Nature Preserve using six pit-fall arrays. Each Array consisted of four five-gallon pitfall separated by 25' of metal flashing or silt fencing arranged in either a linear or "Y" configuration. On each side of each fence there was a funnel trap (six funnel traps/array). Traps were run for 45 consecutive days and total sampling effort was 1028.28 pitfall sampling days and 1242.22 funnel trap sampling days. A sampling day is equal to one trap open for 24h. Effort reflects trap closures due to trap malfunction, water accumulation, invasion by fire ants, and excessive temperatures. In total, we captured 95 specimens representing 10 species of reptile and amphibian in pitfall traps and three specimens representing three species in funnel traps. Table four provides data on capture rates at all sites. Between two and seven species were detected at each site. Simpsons Diversity Index ranged from 0.5-1.0.

Table 4. Captures Per Unit Effort/Species/Site in 2021 and 2022

Species	WB04		WB05		WB07		WB08		WB10		WB14	
	'21	'22	'21	'22	'21	'22	'21	'22	'21	'22	'21	'22
<i>A. gularis</i>	-	0.006	-	0	0	0.018	0	0.011	-	0	0	0.024
<i>E. marnocki</i>	-	0	-	0.006	0	0	0	0	-	0.006	0	0.006
<i>G. infernalis</i>	-	0	-	0	0	0	0	0.023	-	0	0	0
<i>I. nebulifer</i>	-	0	-	0	0	0	0.174	0.057	-	0.034	0.115	0.145
<i>L. berlandeiri</i>	-	0	-	0	0	0	0	0	-	0	0	0
<i>N. erythrogaster</i>	-	0	-	0	0	0	0	0	-	0	0.016	0
<i>P. obsoletus</i>	-	0	-	0	0	0	0	0.006	-	0	0	0
<i>R. dulcis</i>	-	0.006	-	0	0	0	0	0	-	0	0	0
<i>S. lineata</i>	-	0	-	0	0	0	0	0	-	0	0	0
<i>S. olivaceus</i>	-	0	-	0.012	0	0.018	0	0.017	-	0.011	0	0
<i>S. lateralis</i>	-	0	-	0.036	0	0	0	0.023	-	0.034	0.066	0.036
<i>S. dekayi texanum</i>	-	0	-	0	0	0	0.035	0	-	0	0	0
<i>T. gracilis</i>	-	0.006	-	0.006	0	0	0	0	-	0.006	0	0
<i>T. proximus</i>	-	0	-	0	0	0	0	0.006	-	0	0	0
Total	-	0.017	-	0.059	0	0.036	0.209	0.142	-	0.092	0.197	0.211

(7) Wostl, E. Assessment of Amphibian and Reptile Communities of Wild Basin Wilderness Preserve

Project Description In 2022 we continued monitoring the herpetological communities at Wild Basin Nature Preserve. The objectives of the work are:

1. Establish presence/absence and relative abundance data on the reptiles and amphibians at Wild Basin
2. Use these data and continue to collect data of this nature to assess population trends of amphibians and reptiles at Wild Basin
3. Use these data to model the fine scale distribution of each species at Wild Basin and estimate how it will change in the face of climate change. This aspect of the work overlaps with an i4 grant from St. Edwards University titled “the impact of temperature on the distribution of ectotherms at the Wild Basin Wilderness Preserve” that ended in August 2022.

To meet these ends there were multiple survey efforts roughly divided into pit-fall surveys, diurnal surveys, and nocturnal surveys. Across all efforts and methods, we made 184 observations of 19 species of amphibian and reptile.

Progress

Pit Fall Arrays

Pitfall survey results are described in previous project (The impact of temperature on the distribution of ectotherms at the Wild Basin Wilderness Preserve).

Diurnal Surveys

Diurnal surveys took one of two forms: Looking for and recording amphibians and reptiles as we hiked between pit-fall survey sites and a few dedicated surveys in the spring to locate several species that are best found by searching under cover objects (rocks). This method is most productive when soil moisture is high and the draught conditions this spring probably had an impact on the detection rate. In all cases rocks and cover objects were carefully replaced back in their original position.

Nocturnal Surveys

An early season nocturnal survey was conducted on 06 March 2022 in an attempt to locate *Pseudacris streckeri*. Additional nocturnal surveys were conducted on 18 May 2022, 26 May 2022, 02 June 2022 and 17 June 2022. These surveys were conducted

along Bee Creek and the trails to and from. Nocturnal surveys often reveal different species and are a useful survey tool. Additionally, these surveys are being used to monitor the population of water snakes (*Nerodia erythrogaster*) inhabiting Bee Creek. The surveys were not as extensive as hoped for due to scheduling conflicts that developed in June. Only juveniles were encountered this year, all individuals were measured, weighed, and pit-tagged if needed. The location of each was recorded. One individual was a recapture from 2021. This individual, a juvenile male, had grown 20 mm (342 mm SVL to 362 mm SVL) and gained 7.5g (24.5 g to 32 g) Between 19 August 2021 and 19 May 2022. Additionally, three adult snapping turtles were encountered and PIT tagged in 2022.

Additional Notable Herpetological Observations

Researchers working on a bird-banding project showed me photos of an eastern box turtle they had encountered on 06 May 2022 and took me to the spot where it was observed. There are few recent records from the area and the individual in the photographs appears old.

(8) Wostl, E., Gutierrez-Cano, A., Stone, S. Fish Communities of Wild Basin Nature Preserve and Creeks of the Austin Area Hill Country

Project Description Permittee and assistants will assess species composition and relative abundance of fish communities in Bee Creek. They will establish transects of up to 25m long such that each habitat type (riffles, pools, runs, glides) is sampled at least twice. Each transect will be marked with flagging at the downstream and upstream end. At three points of each transect they will measure the width of the creek, depth of the creek at mid-current, depth of the creek 0.25 m from each bank, record the substrate, mid-current flow rate, turbidity, temperature, and canopy cover. To assess if the transects are representative of the creek, they will visit 20 randomly selected sites along the creek and measure the same parameters

Progress All of the fish captured from the Wild Basin Wilderness Preserve were identified as *Lepomis cyanellus*, so the data suggests the sampled section of Bee Creek has an Alpha diversity value of 1. The relative abundance of *L. cyanellus* at Blunn creek and Bull creek were 8.74% and 7.95%, respectively (Figure 5). A section of Barton Creek was also sampled, but zero *Lepomis cyanellus* were captured. The section of Bee Creek sampled at the Wild Basin Wilderness Preserve had the lowest population diversity compared to the other three watershed creeks that were sampled

around Austin. The Wild Basin Wilderness Preserve had the lowest population diversity compared to the other watersheds sampled in Austin, Texas, with 100% of the fish captured in this area identified as *Lepomis cyanellus*, also known as the Green Sunfish. In the future, further data analysis will be done to estimate the population size of each species collected in each creek sampled in the Austin area. This will create a clearer picture of the variation in population size and diversity of fish communities across different creeks in Austin.

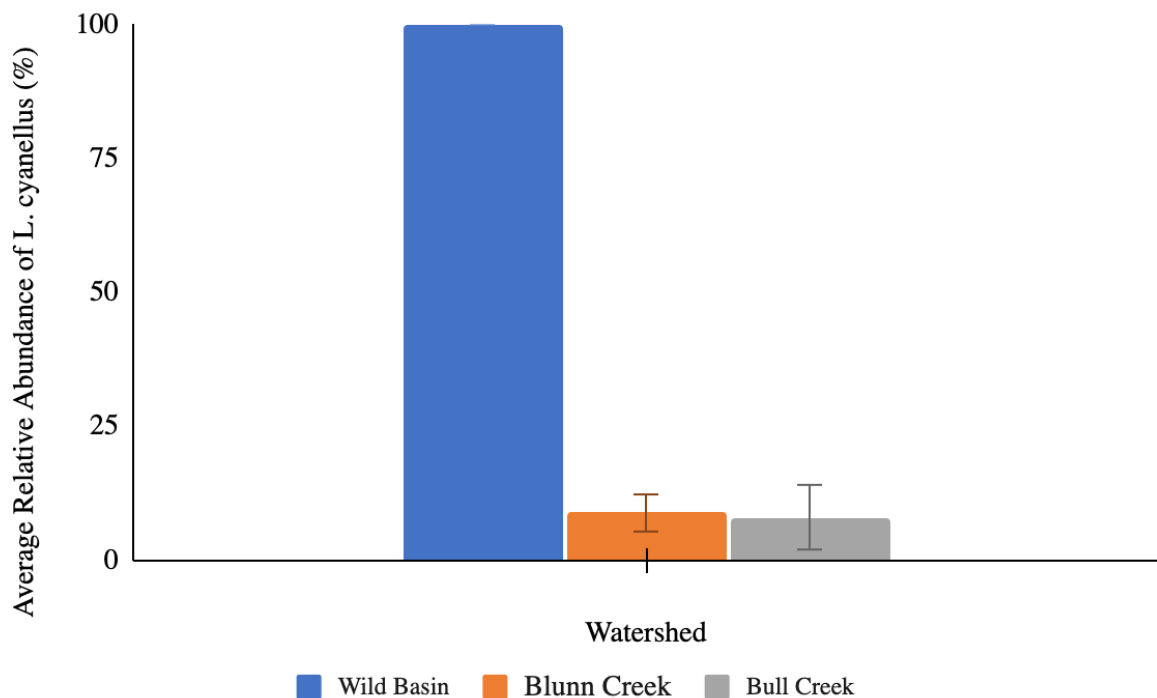


Fig 5. Comparisons of average abundance of *Lepomis cyanellus* at creeks around Austin.

*The error bars in the figure represent the standard deviation of the average abundance of *Lepomis cyanellus* captured at each watershed.

(9) Todzia, C. Checklist of Vascular Plants of Wild Basin Preserve, Travis County
Project Description Permittee will update the checklist of the flora which was compiled 24 years ago, vouchering uncommon species, putting information in database format which will be Web accessible.

Progress No additional surveys were completed during the permitting period. Project is considered complete at this time.

(10) Barr, J., Fabre, C, Powers, M., Sertich, G., Cohen, D., and Guerra, P. Rare Plant Monitoring

Project Description Permittee and assistants will conduct monthly monitoring to document the occurrence, location, conditions, and threats to the Plant Species of Special Interest listed in the attached proposal. Permittee and assistants may travel off trail and will not collect specimens.

Progress COVID restrictions have eased and we were able to make several successful field trips to look at our rare plants and assess their condition. Feb 2021 Winter storm Uri's exceptionally prolonged cold appears to have had minimal long-term impact. According to the Texas State Climatologist, John Nielson-Gammon central Texas has been in a drought since September 2021 which combined with an extended period of triple digit temperatures all summer to create difficult conditions. These are the worst conditions since 2011, but not as bad as that record-breaking year. Dry conditions are predicted to persist through the winter. A mycorrhizal fungi research project used the data from this study to select locations for field samples of roots below ash juniper and red or live oak occurring in close proximity to Belatia and Magnicamporium orchids. Another drought year resulted in generally poor conditions for all the plants at Wild Basin. We made four focused outings:

March 9 & 18 led by Mike with Gary, Darla, and Patty to resurvey Texas Madrone. Mike is a previous land Manager at Wild Basin and we took advantage of his extensive knowledge of the madrones to resurvey know individual trees, find new recruits, assess the current condition, and to make recommendations.

April 8 led by John with Mike, Patty, and Darla accompanied by two other permit holders: Carol Todazda and Terri Seigenthaler to look at the Shooting stars and search for the One Flower Broom-rape (Carol and Terri were the individuals who found a single plant several years ago near the 'lost location' from decades ago).

September 21 led by John accompanied by Gary. While collecting samples for the mycorrhizal fungi study, several quick side visits were made to the shooting stars, and to re-locate the "queen" madrone, an older madrone with apparent burn scars.

Arbutus xalapensis (Texas Madrone) two outings led by a very experienced previous land manager found only 11 of the 26 previously reported trees. They also found two new saplings about 2-4 years old. The conditions around the madrones continues to change with trees and shrubs growing larger. These conditions make relocating the old madrones increasing difficult. Since we do not have tags on any of the trees, relying exclusively on GPS points makes finding and identifying the individual trees difficult. Because of the conditions and the lack of tags, we cannot say for sure if our population is declining, but the significant drop in observed individuals makes it likely we are slowly losing our Texas Madrones.

Primula meadia these plants continue to persist. This year was not productive, and no bloom spikes were observed.

The value of this ongoing project was demonstrated when researchers on a separate mycorrhizal fungi study reached out for help locating junipers and oaks near our orchids. Our orchid data set was the largest and most extensive on all the BCP properties. We contributed 14 data points, the next best county and COA property contributed 3.

Additional information: The iNaturalist Wild Basin Biodiversity Project currently has been stagnate in the past year with only 1283 Research Grade observations of 441 unique species made by 71 observers. Significantly 441 different iNaturalist members have contributed identifications to these observations.

(11) Morley, M. Understanding Native Texas Orchid Pollinators

Project Description Permittee and sub-permit will deploy minimally invasive motion capture cameras in select locations at the BCP to observe pollination and visitation events for native Texas orchids. The cameras will be mounted on a tripod 20-35 cm from orchids. They will also collect leaf tissue from 10% of orchid individuals in each stand. Cameras will be active from October-November and April-July.

Progress After a brief period of pilot data collection, the project did not progress at this site.

(12) Dugelby, B. and White, A. Documenting spatial and temporal patterns in wildlife distribution across Wild Basin

Project Description This research continued in FY22 and has two components: (a) Documenting wildlife distribution and movement patterns along and through Wild Basin boundaries and (b) Study of the impact of human foot traffic on native mammal use of trails in an urban preserve.

(a) Documenting wildlife distribution and movement patterns along and through Wild Basin boundaries

This study, initiated in 2017, employs 15 motion-triggered wildlife cameras to document wildlife species and their activity patterns across the Wild Basin landscape. Cameras have been installed at a distance of at least 250m from each other or along Wild Basin Preserve boundaries.

Progress Data from perimeter cameras is being collected and processed (photos reviewed for wildlife activity) for a final time. No formal analysis has been conducted on the data collected over the past year and cost of camera upkeep has become a constraint. Disassembly of the perimeter camera grid has begun.

(b) Study of the impact of human foot traffic on native mammal use of trails in an urban preserve.

This study, initiated in 2019, examines the effect of human activity on wildlife use of preserve trails using 13 motion-triggered wildlife cameras. We aim to evaluate the impact of human relative activity (HRA) on wildlife relative activity (WRA) at different locations along the trail network at Wild Basin.

Progress Data from cameras continues to be collected and processed bimonthly. Analysis is currently prioritizing a 6-month period prior to the COVID-19 closure of the preserve and a 6-month closure period when trail activity was limited to the few staff working during the closure period. For these two 6-month periods, collection and processing of images has been completed and the dataset has been prepared for analysis. Preliminary analysis using a subset of data has shown a significant difference in WRA and HRA between the two periods (Figure 6), as well as a temporal shift in WRA. Analysis of the full dataset is being conducted to increase the robustness of the analysis. Statistical analysis is being conducted in collaboration with advanced

statistics students at Calvin University. Writing of the manuscript has begun with hopes of submission for publication early next year.

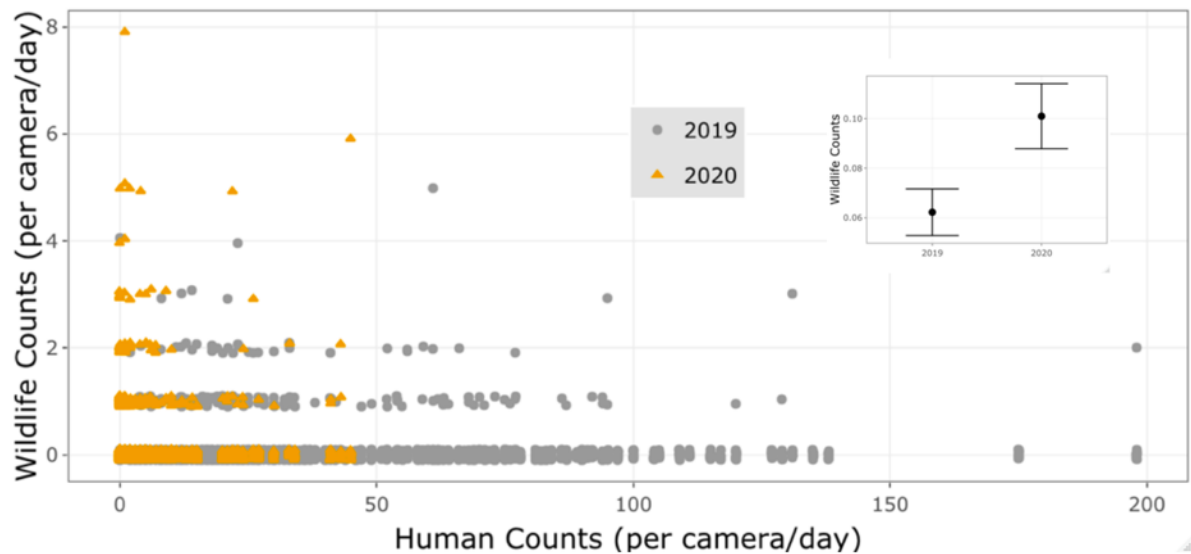


Fig 6. Wildlife counts per camera per day relative to human counts per camera per day.

*Colors depict pre-COVID (gray) and COVID closure period (yellow). Inst in top right represents mean daily wildlife counts during the two time periods.

(13) Ditto, S. Environmental Monitoring Using LoRaWAN Wireless Network and Sensors – Pilot Project

Project Description Permittee will set up, deploy, and maintain wireless data networks and sensors at Wild Basin Preserve using long-range wide-area network (LoRaWAN) technology. Up to four wireless gateways may be stationed at Wild Basin, pending site location and design approval by Travis County and St. Edwards University. The network and sensors will collect environmental monitoring data, which the permittee will manage, store, and display in a password protected dashboard. The dashboard can be accessed for research and education purposes by Travis County, St. Edward's University, and other entities as mutually agreed upon by the Permittee, Travis County, and St. Edward's University. This is a pilot project with the possibility of becoming a long-term project.

Progress Wireless infrastructure was placed at the Wild Basin Creative Research Center and three pilot sensors were placed within the habitat in the spring of 2022. Early data was promising although challenges with hardware and transmission remained.

Facilities and Signs

Facilities

- The building's security is monitored by ADT.
- Composting toilets are located in the Visitor Center and are maintained regularly by adding water and wood shavings, and turning weekly.
- Two Eloo evaporative toilets were installed in the lower parking lot. Staff maintains them regularly by raking and removing dried material. Liquid levels are monitored on a weekly basis to ensure units are functioning properly.
- The gate system with its remote-capable feature worked well the majority of the year. There were a couple of instances of storm related malfunctions during this year. Repairs were done by a gate maintenance vendor.
- An upgraded surveillance camera system was installed around the Creative Research Building. This allowed previously deployed cameras to be shifted to other areas of the preserve, mainly the parking lot areas.

Signs and Maps

- We provide digital maps on our website for visitors to access on their smartphones, including a Google Earth file for the trail system and a PDF copy of the trail map. We also have other information on the website including interpretive information and resources for specific age groups. A weather-resistant map of the trail system is mounted at each trailhead.
- Numerous informational, parking, and rules signs are around the parking lot and trailheads to welcome, direct and inform Preserve visitors.
- "No Decorations Please" signs were temporarily tied to trees along Loop 360 during the Christmas season.
- Eight new interpretive signs began to be installed along the Arroyo Vista Trail loop. These were funded through a grant. Illustrations and layout of the signs were conducted by the Wild Basin Artist in Residence. The full installation should be completed by the end of January 2023.
- "No Trespassing" signs have been posted along much of the Preserve's eastern, southern and western boundaries. The northern boundary is shared with the City of Austin's Vireo Preserve and does not need these signs.

Security, Access, and Safety

Emergency Preparedness

Wild Basin staff continued to improve the Wild Basin Wilderness Preserve (Wild Basin) Emergency Response Plan (ERP) developed with St. Edward's University Campus Safety personnel. This plan describes how staff, student interns, and volunteers respond to emergencies, addresses various types of hazards and establishes policies, responsibilities and operations designed to effectively and efficiently address an incident. Wild Basin personnel developed this ERP in collaboration with the Director of Campus Resilience and is a dynamic document. This plan outlines the roles and responsibilities of identified parties and as well as the training and exercises that will be conducted on a regular basis. All staff and volunteers who work at Wild Basin have access to a copy of the ERP. It is located in the "Wild Basin Share" directory of the SEU online file hosting service "Box", filed under "**Safety Resources and Emergency Response Plan.**" Additionally, a hard copy of this ERP is stored in a labeled binder located under the hutch on the front desk of the Wild Basin Creative Research Center.

Security

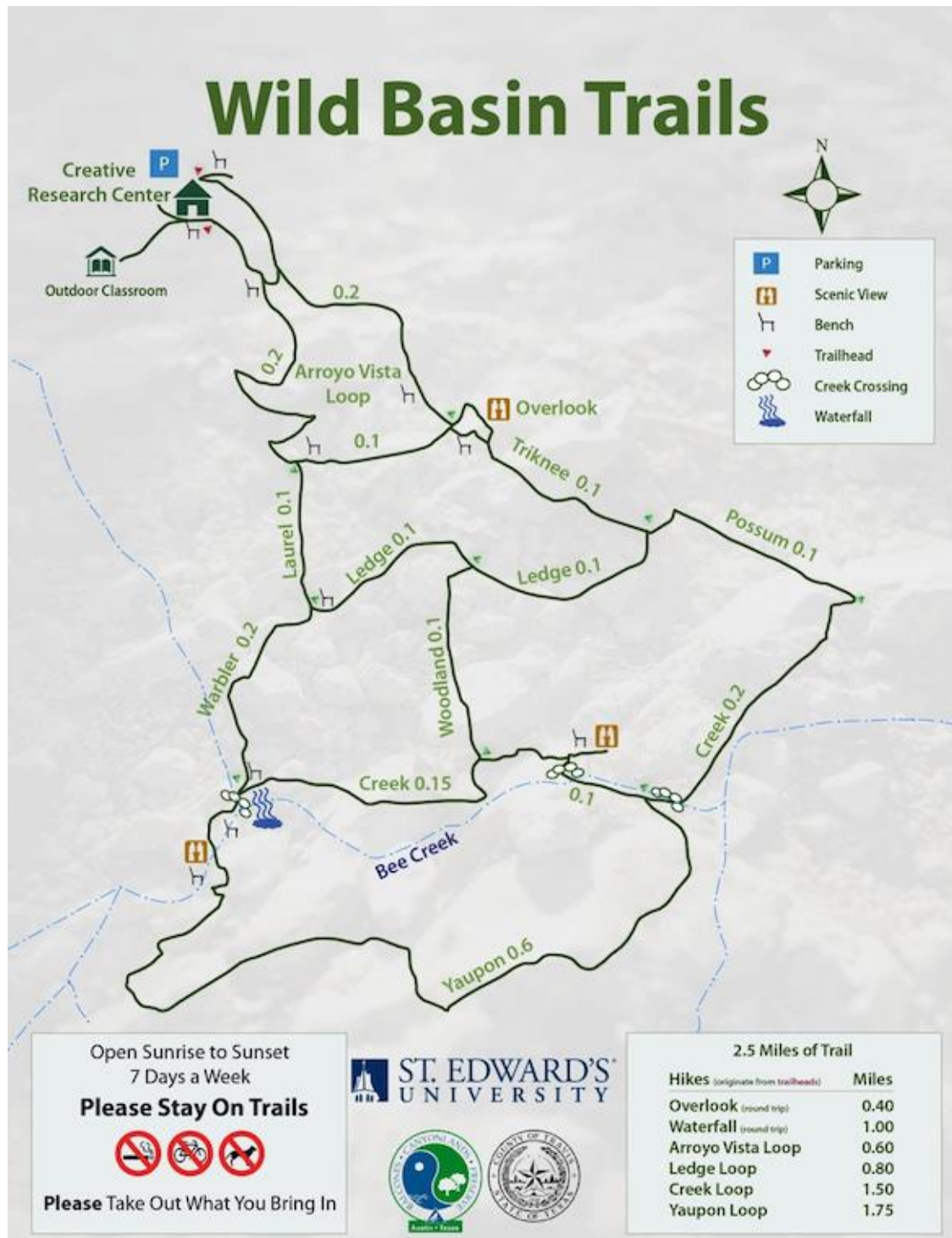
- Wild Basin has a security officer on site five days a week. This officer is provided by Travis County in response to security and integrity issues such as vandalism, car break-ins, and visitors bringing dogs into the Preserve.
- The security officer works with a gate attendant on weekends and holidays. Having the reservation system and the additional gate attendant have been extremely helpful when they are on duty, but Wild Basin continues to face many of the same issues when the officer and attendants are off duty during the evenings. Surveillance cameras and incidental observations show dogs on trails when staff or security are offsite or off work.
- There is an automatic gate at the Preserve entrance timed to open at first light and close at sunset. The gate is equipped with a sensor that will open the gate arms when people leave the Preserve after hours.

Fire Safety and Preparedness

- Firetron, in coordination with St. Edward's University, completed their annual inspection of the Creative Research Center. We continue to collaborate on resolving issues and keep the Creative Research Center up to code.
- Wild Basin trimmed brush back from building as per firewise recommendations. Wild Basin continued to work to implement Westlake Fire Department fire management recommendations.

Appendices

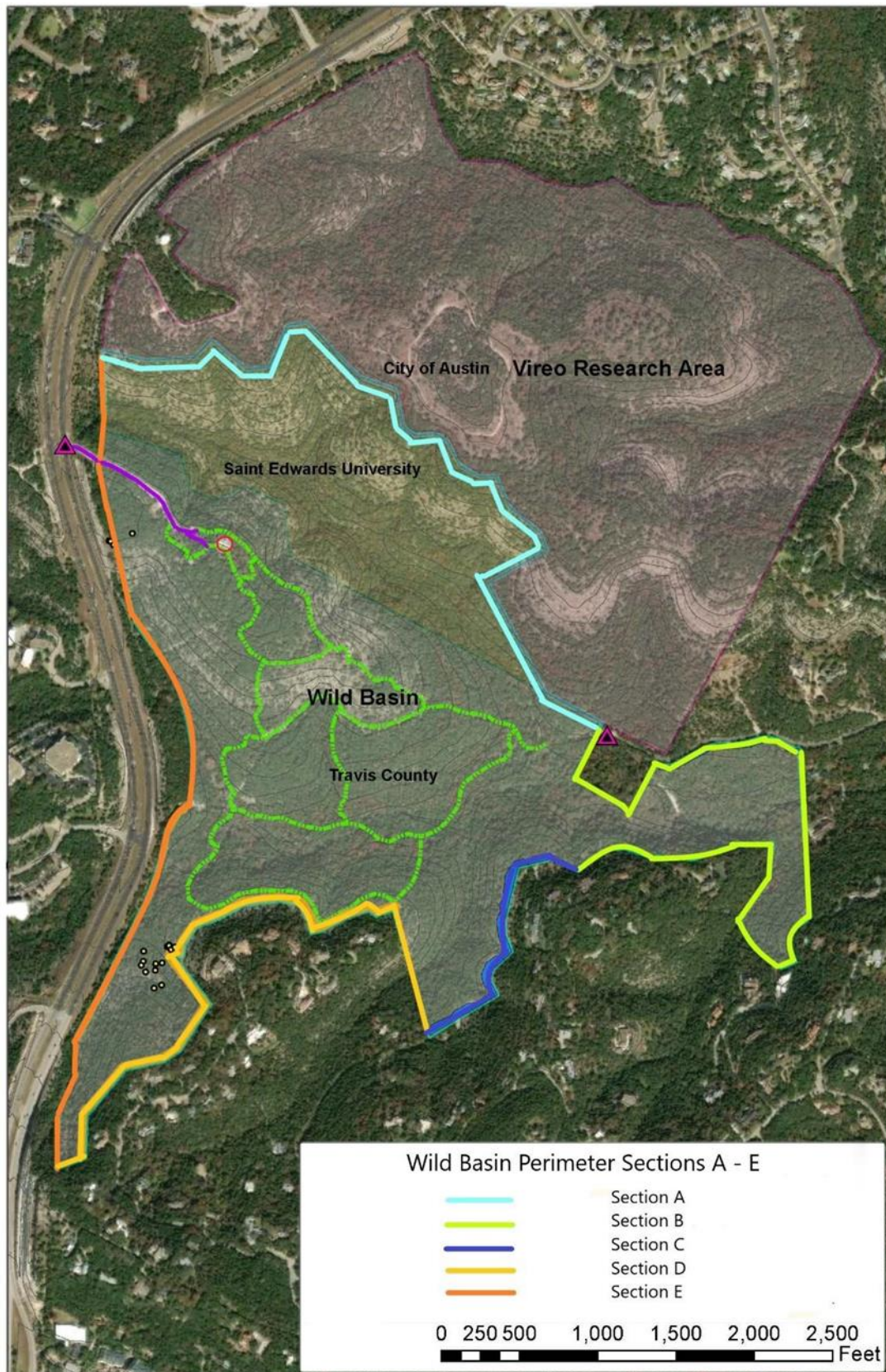
Appendix A: Map of Wild Basin Wilderness Preserve Trail System



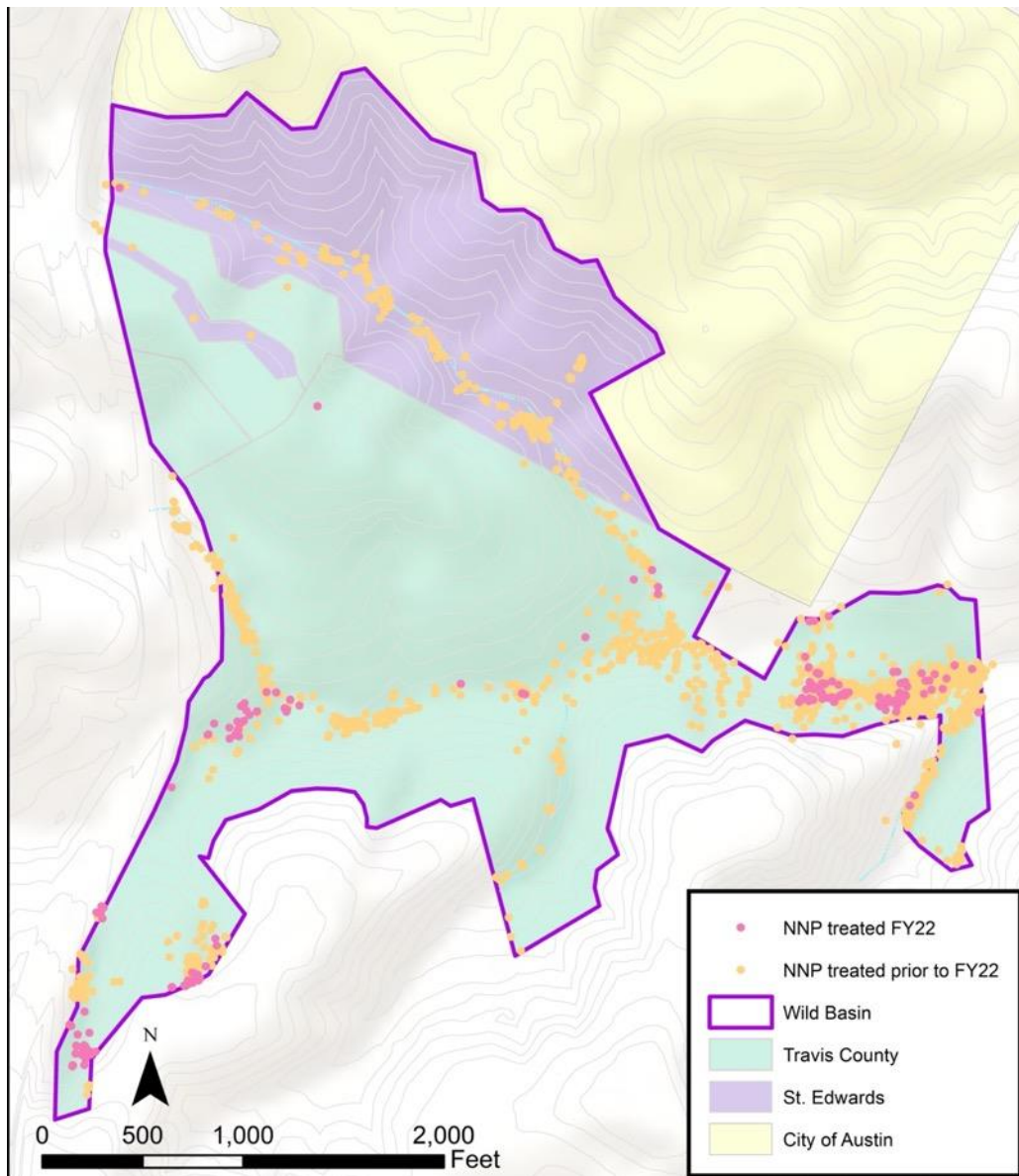
Appendix B: Aerial Map of Wild Basin and Residential Neighbors



Appendix C: Wild Basin Boundary Map



Appendix D: Non-Native Invasive Species Removal at Wild Basin



Appendix E: Golden-cheeked Warbler Surveys at Wild Basin/Vireo Preserve

Darrell Hutchinson, City of Austin Field Biologist

A total of 44 surveys were conducted at Wild Basin and the adjacent Vireo Preserve between 9 March and 21 June by Darrell Hutchinson, Lisa O'Donnell, Jim O'Donnell, and volunteer River Ahlquist for a total of 148 survey hours.

Between the two preserves, five separate males were detected during the breeding season. Four males paired and two of the nesting pairs reproduced successfully. Compared to recent years, plot density was lower and down substantially from 2021 when nine males established territories.

Four out of five males were color-banded. One male was a banded return from 2021. One was banded in 2022 as after second-year (ASY) bird. Two were banded in 2022 as second-year (SY) birds. Banding was accomplished by John Chenoweth.

YE/SI:MV/PI was banded SY at Vireo Preserve on 7 April 2021. He returned in 2022 and defended the same large territory. The male's territory extended from the Wild Basin Creative Research Center across North Hollow to the second knoll at Vireo Preserve and measured over 80 ac. and nearly 35 ha. On 18 April, the male and female were observed together by the second knoll at Vireo Preserve. On 18 May, the female was observed with nesting material next to the Wild Basin Creative Research Center. We assume the pair made, at least, two nesting attempts – one on Vireo Preserve and one on Wild Basin. No nests were found but both failed as the adults were never observed with fledglings.

OR/BK:WH/SI was banded ASY at Wild Basin on 29 April. He paired and their nest was found during building stage just north of upper Woodland Trail on 14 April. The nest was inactive and presumed predated on 9 May. The female was never resighted and the male was last observed on 30 May.

DB/PI:DG/SI was banded SY at Wild Basin on 25 April. He occupied a territory in the lower North Hollow. He was never observed with a female and was last detected on 9 May.

WH/SI:RD/YE was banded SY at Vireo Preserve on 27 April and also defended a very large territory. The male's territory extended from the top of the main ridge north to the Vireo Preserve boundary and measured 115 ac. and over 45 ha. He paired and their

nest produced a minimum of three fledglings on approximately 10 June. The late fledging date suggests that the pair's previous nesting attempt(s) failed. No nests were found.

UBVP1 successfully paired and fledged one nest at Vireo Preserve. The nest was not found but the nest produced a minimum of three fledglings on approximately 5 May. We observed no evidence of double brooding. For the last three years, an unbanded pair has occupied a territory by the water tower and bred successfully.

For the first year in decades, a pair of Black-capped Vireos occupied a territory at Vireo Preserve. The male was observed multiple times between 17 May and 28 July. The female was seen between 7-10 July. A probable inactive nest was found, but the pair failed to breed successfully.

2022 was an unusual year. The majority of GCWA adults returned from the wintering grounds a week or more later than average, and Central Texas experienced a severe drought through late spring and summer. Across the Balcones Canyonlands Preserve, GCWA fared poorly. The overall return rate of color-banded males was 30% (range 30% - 56% between 2011 – 2021). Overall breeding success observed for all monitored territories was 51% (range 51% - 75% between 2011 -2014, 2017 -2022). Both values are the lowest recorded since City of Austin/Travis County began its GCWA demographic study in 2011.

Surveys were funded by City of Austin Wildlands Conservation Division and conducted according to City of Austin's Balcones Canyonlands Preserve GCWA demographic study protocols.

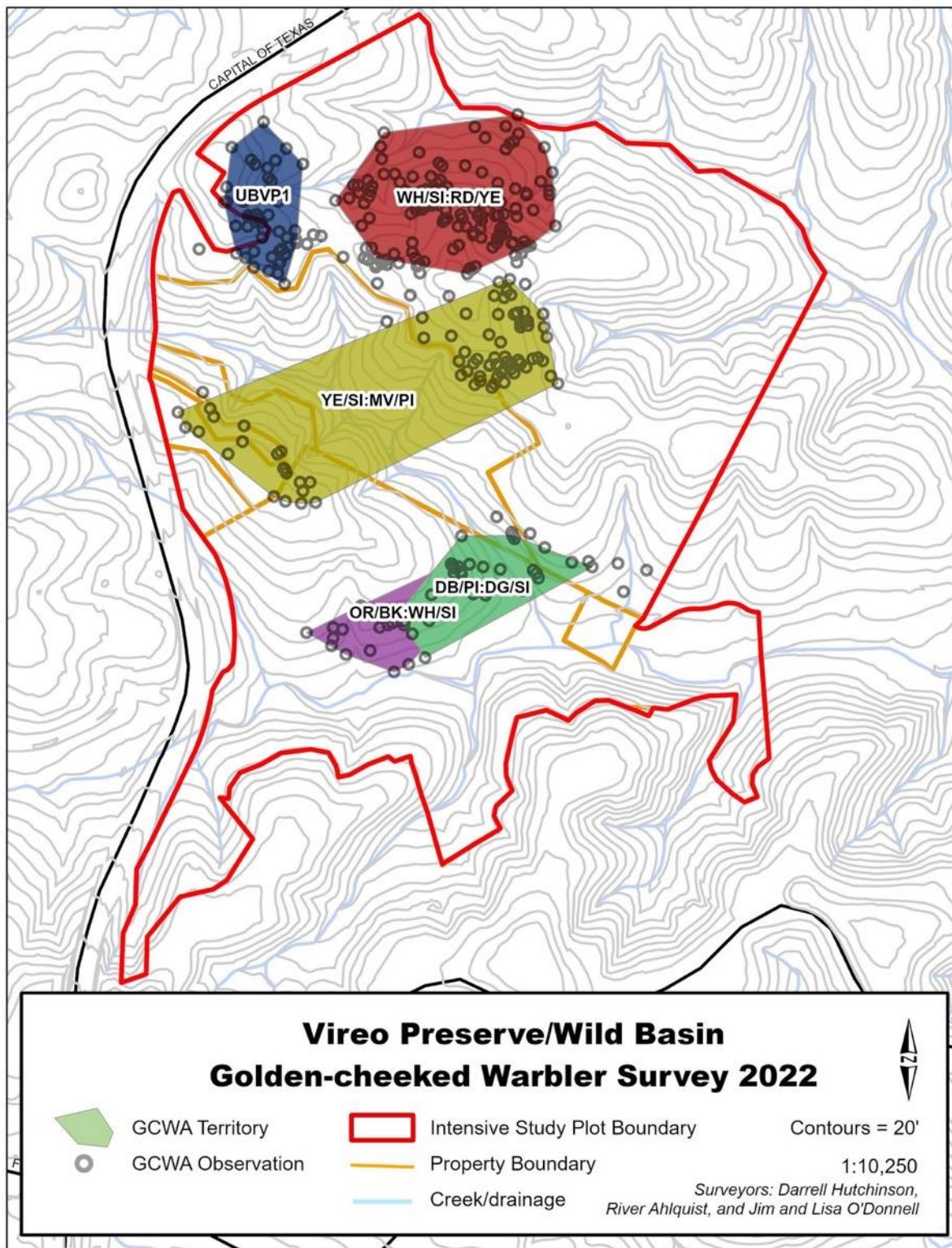


Figure E1. 2022 Golden-cheeked Warbler territories

Appendix F. 2022 Wild Basin Quarterly eBird Survey Report

Four quarterly eBird surveys were conducted at Wild Basin Preserve by Terri Siegenthaler and other volunteers as noted below, following protocol Allan Seils had developed and used for a number of years. Weeks for the surveys were selected in advance of known forecasts, and the actual dates within those weeks were chosen based on forecasts for low precipitation and wind. Due to heavy woodland vegetation in many parts of Wild Basin Preserve, many of the bird observations are by ear.

Each of the four survey dates was logged in eBird as three segments described below. Additional notes about each of the three segments on each of the four survey dates are available on individual eBird checklists (submitted with this report), including: weather conditions; start and end times; and participating volunteers.

- North Hollow Segment: The North Hollow Segment is approximately 0.4 mile in length beginning at east end of Creek Trail and proceeding up Possum and Triknee Trails and the northern portion of Arroyo Vista Trail to conclude at the Creative Research Center.
- Bee Creek Segment: The Bee Creek Segment is approximately 0.45 mile in length beginning at the Bee creek Waterfall and proceeding east along the creek. Segment concludes at the beginning of Possum Trail.
- Loop 360 Segment: The 360 Trail Segment is approximately 0.5 mile in length from the Creative Research Center, down western portion of Arroyo Vista Loop and Laurel and Warbler Trails, and concluding at Bee Creek Waterfall.

Table F1. Summary of Bird Observations by Survey Date

Observations	3/31/22	7/21/22	10/19/22	12/14/22
# birds	84	104	56	102
# species	25	16	16	13

Table F2. 2022 Wild Basin Quarterly eBird Surveys: Bird observations by date and segment

Common Name	3/31/22				7/21/22				10/19/22				12/14/22			
	NH	BC	360	Totals	NH	BC	360	Totals	NH	BC	360	Totals	NH	BC	360	Totals
white-winged dove			3	3												
mourning dove						1		1								
black-chinned hummingbird	2		1	3	2			2								
great blue heron			1	1												
turkey vulture											1	1				
Cooper's hawk									1			1				
eastern screech-owl										1		1				
red-bellied woodpecker		1		1												
ladder-backed woodpecker						2		2						1		1
downy woodpecker					1			1								
northern flicker										1	1	2				
white-eyed vireo	1	1		2	2	2		4								
blue-headed vireo	1			1										1		1
blue jay							1	1	1			1				
Woodhouse's scrub-jay		1		1												
American crow														1		1
common raven	1			1												
purple martin							40	40								
Carolina chickadee			2	2		6	2	8	3		4	7		2		2
tufted/black-crested titmouse	1	4	2	7		1	1	2			5	5	2	6	1	9
house wren									1	1		2				
Carolina wren		2	1	3		6	2	8	2	2	2	6		3	2	5
Bewick's wren		1		1						1		1				

blue-gray gnatcatcher	2	2	1	5	2		5	7								
ruby-crowned kinglet	5	4		9					2	2	2	6	1	5		6
golden-crowned kinglet		2		2										3	2	5
hermit thrush		2		2					2	1		3		4	2	6
American robin													42	7	4	53
gray catbird			1	1												
house finch					1			1								
Common Name	3/31/22				7/21/22				10/19/22				12/14/22			
	NH	BC	360	Totals	NH	BC	360	Totals	NH	BC	360	Totals	NH	BC	360	Totals
lesser goldfinch			1	1	2	2	2	6								
spotted towhee														1		1
rufous-crowned sparrow					2		1	3	2			2				
Lincoln's sparrow		1		1												
white-throated sparrow		3		3												
sparrow sp.									2			2				
black-and-white warbler	2	1		3												
orange-crowned warbler	1			1												
Nashville warbler										1	1	2				
yellow-rumped warbler	3	2	2	7										1		1
golden-cheeked warbler	1	2	1	4												
summer tanager						1										
northern cardinal	7	9	3	19	3	9	5	17	5	6	3	14	1	8	2	11
painted bunting					1			1								
Total # birds per date				84				104				56				102
Total # species per date				25				16				16				13