WILD BASIN
WILDERNESS PRESERVE

ST. EDWARD'S UNIVERSITY

Wild Basin Creative Research Center



Wild Basin Wilderness Preserve
2023 Annual Report

(October 1, 2022 – September 30, 2023)

Submitted by

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

to

Travis County Commissioners Court
and Transportation and Natural Resources

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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 ("the 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 Center is a key resource for educating university level as well as K-12 students and provides a platform for public outreach and engagement.

The Center's education, art, research, and preserve management programs are designed to promote conservation and environmental awareness, while encouraging and demonstrating sustainable land stewardship practices. During the reporting period the Center 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 Center staff throughout the year with assistance from trained stewardship volunteers and interns.

Trail Maintenance and Monitoring Activities:

- Staff, volunteers, and interns monitor the trails during weekly patrols to assess conditions and address potential hazards. Patrols are documented in the land management quarterly reports submitted to Travis County TNR.
- Staff lead weekly stewardship workdays for a crew of up to six trained volunteers on Thursday mornings. Depending on their schedules, land management interns work as a part of the Thursday stewardship crew. During these workdays, the crew address safety hazards, trail erosion issues, clear vegetation growing into hiking trail corridors, repair trail tread, remove trash from trails and along the Loop 360 boundary, remove non-native invasive plant species (NNIP) and assist with minor construction projects. Stewardship

workdays are subject to cancellation due to weather, preserve closures, or other operational considerations.

- In FY23, hiking tread was restored using decomposed granite (DG) along 150' of the upper "easy stroll" section of the Arroyo Vista trail.
- Wild Basin visitation numbers are logged by two trail counters on Arroyo Vista Trail, one near each trail head, as well as by manual counts from Center security staff. The estimated hiker count for this fiscal year was 12,788.

Trail Restoration and Construction Activities:

- Phase II of the North Hollow sediment retention pond restoration project was completed in March. During this phase, a contractor was hired to excavate the sediment that had filled the pond's basin since its initial construction in the late 1970's. The contractor reshaped and stabilized the banks of the pond with an erosion mat and subsequently spread an approved native seed mixture along the banks. Sediment was also removed from the Inflow and outflow sections of the pond. Excavated material from the pond was taken offsite to use in a restoration project on another BCP property by Travis County TNR. It is recommended that the pond is assessed every five years moving forward.
- Construction of a new ADA parking space next to the Evaporative Toilet structure in the parking lot was completed in February. To meet the ADA code requirements, two regular parking spots were combined, excavated, and leveled to create the handicapped parking space. Four new speed bumps were also installed along the entry driveway for added safety.
- Social trails and trail edge restoration continued to show progress this year due to multiple reasons. Controlled access through the weekend and holiday reservation system helped keep congestion on the trails low. New and reinforced vegetative barriers along trail edges helped discourage hiker off-trail activity. Maintaining efficient drainage along the trails reduces flooded or muddy sections from developing that hikers try to avoid by walking along the edge, creating "trail creep".

Boundary Management

Center staff monitor the preserve's entire perimeter at least twice annually. Some sections are monitored more frequently as needed due to problems or other conditions.

Boundary Management Activities:

- Section A (northern boundary shared with City of Austin's Vireo Preserve) Nothing of significance to report from monitoring this section of the boundary. Because this is a shared boundary with another BCP property, there is little concern along this section.
- Section B (southeastern boundary including back gate, in-holding, and several neighboring properties)
    - The shaded fuel break along Wild Basin Ledge in this section of boundary was damaged by February's Winter Storm Mara. Major branches that were impacting the fence were addressed. Future retreatment might be advised.
    - Staff did not observe any issues with erosion control or sediment deposits from previously concerning neighbor properties.
    - Native woody plant species continue to grow-in and crowd the fence line along the southeastern corner.
    - Introduction of non-native plant species from neighbor properties is an issue along this section of boundary.
- Section C (eastern portion of south-central boundary)
    - The shaded fuel break along this section of boundary had some damage from Winter Storm Mara. Any branches or uprooted trees impacting the fence line were removed. Future retreatment might be advised.
- Section D (western half of the southern boundary)
    - The struggling red oaks that were being monitored on a north-facing hillside along this section of boundary were majorly impacted by Winter Storm Mara. Many of them were either severely damaged or entirely uprooted by ice during the weather event. Other mature trees, like Ashe juniper, were fully uprooted as well. This damage was in a shaded fuel break and will need treatment in the future.
    - Staff continue to monitor for potential signs of trespassing or neighbor impact from this section.
    - Introduction of non-native plant species from neighboring properties is an issue along this section of boundary.
- Section E (along Loop 360)
    - Loop 360 continues to be the biggest source of litter and trash entering the preserve. Staff and volunteers did several dedicated trash pick workdays along the 360 right-of-way.

    - TxDOT's gabion structures along the Loop 360 banks continue to help prevent erosion damage. Future maintenance is recommended to maintain effectiveness and longevity.
    - Staff continue to monitor and treat non-native invasive plant species mainly introduced through culverts along this section.

Additional notes about boundary conditions:

- There is no fencing along Section E of Wild Basin's boundary, which leaves the preserve vulnerable to trespass from the highway. Fencing along Sections B, C, and D are shared with private residential properties, which also pose an increased risk of trespassing or impacts to the preserve.
- Woody plant species encroachment and steep terrain along areas of Sections B, C, and D are making boundary monitoring difficult. Selective brush thinning along the fence line will make monitoring more efficient in future years.
- Tree damage extreme weather is most noticeable along boundary edges.

Vegetation Management

Vegetation Management Activities:

- Winter Storm Mara: Clean up and recovery from Winter Storm Mara was a major focus of land management activities during FY23. The storm impacted the Austin area from January 31st to February 2nd. The weight of accumulated ice during the storm caused significant damage to trees in Wild Basin in the form of broken branches and even total uprooting of some trees. When staff were able to return to the preserve on February 2nd, it was estimated that there were close to 200 obstacles to be cleared from the main entrance driveway, parking lot, and trails. Chainsaw work was initially prioritized during clean up because of the anticipated arrival of the golden-cheeked warblers in early March. Hazards and obstructions were cut, and the vegetative debris was staged along the edge of the parking lot and trails to be hauled away later. Thanks to the help from dedicated volunteers, staff were able to fully open Wild Basin's trails on March 10th. In the following months, staged debris was moved to either trail restoration projects or staging spots to be chipped.
- Vegetation Mapping: Center staff, volunteers and researchers use the citizen science platform iNaturalist to map the distribution of plants within the Preserve. See "Community Science" below for report on FY23 iNaturalist observations.
- Rare Plant Species: All rare plant locations are documented in the iNaturalist WBCRCMapping Project. If off-trail observations are recorded using geographic

coordinates, exact location is obscured so that the public cannot see the exact location. The scientific research section below includes a report from specialized volunteers monitoring rare plant species in Wild Basin can be found in the scientific research sections (Barr et al.) of this report. The following rare plant species are on our monitoring list:

Primary Species of Interest

- Naked broomrape (*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 coralroot (*Hexalectris nitida*)
- Crested coralroot (*Hexalectris spicata*)
- Heller's marbleseed (*Onosmodium helleri*)
- Buckley tridens (*Tridens buckleyanus*)
- Louisiana broomrape (*Aphyllon ludovicianum, Orobanche ludoviciana*)
- Ladies' tresses (*Spiranthes magnicamporum*)
- Sticky liatris (*Liatris glandulosa*)
- Virginia snakeroot (*Endodeca serpentaria*)

- Invasive Species Management:
  - Center staff and Travis County TNR personnel worked with student interns, volunteers, and crews from American YouthWorks (AYW) to continue the mapping, monitoring, and removal of non-native invasive plant species from the preserve. The main plant species included in this work are Japanese honeysuckle (Lonicera japonica), Japanese privet (Ligustrum japonicum), Chinese privet (Ligustrum sinense), nandina (Nandina domestica), Johnson grass (Sorghum halapense) and Chinese photinia (Photinia serratifolia).
  - Non-native invasive plant species at Wild Basin are managed by either manual removal or selective use of herbicide. Manual removal is done by hand pulling plants, removing as much of the roots system as possible, and leaving them exposed to UV radiation from the sun to ensure they are dead. The herbicide work is done in collaboration with Travis County TNR staff. Wild Basin staff 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, 5,919 stems of non-native invasive plants were removed by staff, interns, volunteers and AYW crews (see Appendix D).
    - Focus on NNIP management this year was limited due to prioritizing winter storm recovery and trail restoration projects.
- Fuel Reduction: Beginning in 2017, Travis County TNR coordinated with the City of Westlake Hills to cut shaded fuel breaks along the southern border of Wild Basin in areas adjacent to residential properties. In fiscal years of 2017 and 2018, a total of 2.2 acres of shaded fuel brakes were established. No additional brakes have been established since the initial treatments were completed. Winter Storm Mara had major impacts in some of the shaded fuel breaks at Wild Basin. Though some initial clean up and recovery work was done this year, there is still a need for additional retreatment in some areas.

Wildlife Management

- Golden-cheeked Warbler A total of 47 surveys were conducted at Wild Basin and the adjacent Vireo Preserve between March 8th and June 6th by Darrell Hutchinson, Lisa O'Donnell, Jim O'Donnell, and River Ahlquist for a total of 176 survey hours. Between the two preserves, 13 individual males were detected during the breeding season. Twelve males established territories. Eight (possibly 9) males paired and six of the nesting pairs reproduced successfully. This is the highest plot density and nesting success records since intensive surveys of this marked population began in 2011. Full report in Appendix E.
- Feral Hogs (*Sus scrofa*) No evidence of hog activity in Wild Basin was observed this year.
- River Otters In the course of using motion-triggered game cameras to monitor wildlife use of trails and portions of Bee Creek, river otters (*Lutra canadensis*) were observed at Wild Basin on multiple occasions. In the photos, at least two adult and two juvenile individuals were captured on camera.
- Wildlife Activity Motion-triggered cameras are used to monitor activity along Wild Basin's trails, driveway, and parking lot. Cameras are regularly maintained,

and data is collected. The previous focused study of wildlife activity at Wild Basin through trail cameras was completed in the previous fiscal year.

Water Quality

- Center staff continued to conduct monthly water quality monitoring of Bee Creek above the waterfall at the preserve. LCRA's Colorado River Watch Network (CRWN) test kit and monitoring protocols were used to measure multiple parameters including pH, nitrates, water transparency, dissolved oxygen, specific conductance, E. coli bacteria counts and field observation of the testing site. Water quality testing data from Wild Basin can be found on the CRWN website at https://crwn.lcra.org/events.aspx?qrySite=72
- In collaboration with Travis County, LCRA, Wild Basin Creative Research Center and community stakeholders, permanent water monitoring equipment stations were installed near the Bee Creek and North Hollow culverts. An online dashboard provides staff with real time information about water level and turbidity at the culvers. The Bee Creek station can also pull special water samples from the culvert pool if certain protocol conditions are met. These water samples are taken to the LCRA Environmental Lab for deeper analysis than the CRWN monthly monitoring provides. These stations better allow Wild Basin staff ability to monitor Bee Creek in real time and be better informed to respond to concerns more promptly.
- Center staff continue to monitor Bee Creek and North Hollow for impacts from upstream activity, like sediment pollution or algae blooms fed from commercial and residential runoff into the watershed. No significant incidence was observed this year.

Outreach, Education, and Volunteer Coordination

The Center actively provides environmental educational opportunities and volunteer stewardship opportunities for the community. A total of 970 volunteer hours were logged at Wild Basin on various outreach-related activities, including trail maintenance and stewardship (described above), environmental education, public engagement, and nature art. The events and programs held at Wild Basin between October 1, 2022 and September 30, 2023 are summarized below.

Educational Permits

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

(1) DeWhatley 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 3 locations in Wild Basin where Bee Creek intersects a trail (2 locations on Creek Trail and 1 location on Yaupon trail). At most, 144 students will collect 500 mL samples (one sample per four students) over a two-week span (10/30-11/9/23).

Summary of Results: Between October 30, 2023, and November 9, 2023, approximately 144 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)	0.631 (0.800), N=6	0.647 (0.602); N=5	0.749 (0.881); N=6
Chlorophyll *a* (mg/L)	0.00362 (0.00346); N=4	0.00143 (0.00140); N=6	0.00240 (0.00233); N=6

(2) Vickery, P. Wild Basin Wilderness Preserve: Education program videos

Project Description: Permittee and sub-permittees (Hubbard, P. and Ward, R.) will create and produce a variety of free, on demand environmental educational videos covering topics from Life Science, Earth Science, and Environmental Science. Videos will be correlated to the Texas Essential Knowledge and Skills (TEKS) and highlight key science topics such as watersheds, scientific investigations, wildlife, native plants, geology, and field science. Most of the videos will be filmed on-trail but occasional off-trail filming of unique features, permitted research, and preserve management activities may occur. Efforts will be made to obscure the locations of off-trail sites. In a few instances, plant leaves may be collected but native plants will not be permanently harmed. Each video will educate about outdoor ethics on the preserve and emphasize the Leave No Trace seven principles along with the primary theme.

Summary of Results: Two environmental justice videos were produced. Environmental Justice: Making a Difference in Austin has interviews with several individuals in the Austin area that work on environmental justice issues. Environmental Justice at Wild Basin: Now or Never is focused on the history, operations, and commitment of the Center to promoting environmental justice. Two off trail interviews with the preserve manager occurred and short clips can be seen in the videos. Two environmental justice curriculum guides were developed along with the videos. The videos and curriculum guides are available on the Wild Basin Creative Research Center Website for all to download and use free of cost.

(3) Vickery Video Flyover for Environmental Justice Video

Project Description: Permittee and drone operator (Proppe) will conduct up to three 10-minute flight sessions over Wild Basin Wilderness Preserve for the purpose of collecting video footage for use in an Environmental Justice video. The drone will fly near the Wild Basin boundaries but will not go over neighboring properties. Permittee will coordinate with City of Austin golden cheeked warbler surveyors to avoid flying over warbler territories. Darren Proppe will be the sole operator of the drone.

Summary of Results: On April 10th, 2023, the Center's drone was flown in three different locations and about 30 minutes of video footage was collected. A few short video clips were used in the development of an environmental justice video focused

on Wild Basin. Another video clip was used as the introduction to our monthly Speaker and Social Series videos. The drone footage may also be used in future video projects.

(4) O'Keefe, K. Environmental Conservation and Climate Change Lab – Fall 2023

Project Description: This project is a continuation of an ongoing laboratory course for the Environmental Biology and Climate Change program at St. 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 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 are then used by small student groups to investigate individual research questions that more specifically address Obj. #2.

Summary of Results: 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), air temperature, and relative humidity 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 also collected temperature and humidity data using iButtons. The students are currently analyzing their data and assembling their final reports. 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.

(5) Willette, Justin. Recreational Equipment (REI) Inc. Star Walks and Night Sky Hiking Tours at Wild Basin Wilderness Preserve

Summary of Results: In 2023, REI guides hosted 10 hiking tours open to the public, leading 90 visitors on nighttime hikes at Wild Basin Wilderness Preserve. These two-

hour hikes are held throughout the year. Each hike includes educational information on hiking etiquette, leave no trace principles, and the role of Wild Basin Wilderness Preserve. REI's Star Walks include education information on stars, the moon, and constellations when sky conditions permit. REI's Night Sky Hiking Tours focuses on nighttime flora and fauna while hiking on the trails after dark. REI guides and visitors hike along Triknee Trail, Possum Trail, and Creek Trail.

(6) Hermanowski, W. & M. Leach Dark Sky and Electric Composition at Wild Basin Wilderness Preserve

Project Description: Dark Sky preservation is essential to the protection of wildlife native to Central Texas. This project will culminate in an electric music composition based on source materials collected during a citizen science educational outreach activity in which participants will help document the late-night activities of Texas wildlife in audio recordings. The permittee and sub-permittees will use a combination of Marantz with Sennheiser mic recording systems, a small collection of passive acoustic recorders, and Logic Pro, to complete the composition. The final product will culminate in a musical composition that can be showcased as a sound installation at the Creative Research Center at Wild Basin Preserve. This permit allows access to Wild Basin Preserve both during day and at night for up to 10 people per visit to collect the sound recordings. The permittee will provide a list of participants to Wild Basin Creative Research Center staff more than 24 hours before access is to occur. Most recordings will occur between June 13-17. All participants will stay on the trails when collecting sound recordings.

Summary of Results: During the week of June 13th through the 17th, Molly Leach and Will Hermanowski explored the Wild Basin Wilderness Preserve at night and during the day. During this exploration, Leach and Hermanowski captured audio examples of various wildlife and general ambiance of flowing water and the wind. Those sounds have been collected, exported, and organized for future processing. The sounds are being processed through Digital Audio Workshops (DAWs) such as Apple Logic Pro X and Reaper. The results of these processed sounds will result in an electronic musical composition, the duration of which will be between 8 and 12 minutes.

Environmental Education and Interpretive Programs

- School Programs – School field trips occurred in both the fall of 2022 and spring of 2023. A total of 18 school field trips occurred and 467 students participated. 15 volunteers donated 130 hours of their time to support these offerings. 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 completed in the summer of 2023 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. Two environmental justice videos were also completed in the Summer of 2023 to support general knowledge and understanding of environmental justice in the Austin area and at Wild Basin Wilderness Preserve.
- Public Programs – REI offered public programs (see permit report above). The Artist in Residence program offered two youth and two adult workshops, as well as two final public art receptions (see below).
- Artist in Residence – in 2023, Wild Basin welcomed Leila Ali as the spring Artist in Residence. Ali is a botanical artist, and her project "Plant Blindness" showcases how plants are often overlooked and neglected. The concept of plant blindness sums up the inability of humans to see, notice or pay attention to plants on a day-to-day basis. The term implies that we have become desensitized to the aesthetic qualities and structures of plants. Wild Basin welcomed Thomas Cook as the fall 2023 Artist in Residence. Cook is a landscape painter and his project started as a personal understanding and focus to highlight the importance of nature in his own life but became a broader realization of the importance of nature in society, and the importance of accessibility to outdoor spaces. Many people may have a difficult time escaping to nature.
- Trail Guide Training - In October and November of 2022 Wild Basin provided two guided hike experiences for volunteer trail guides. Fifteen volunteers participated in the two trainings.
- Second Saturday Guided Hikes – In January 2023 a trail guide volunteer offered to provide a monthly guided hike to the public. In FY 2023 a total of eight hikes occurred and another one was canceled due to weather. A total of 72 adults and 3 children participated in these hikes.

- Speaker and Social Series - A monthly, in person, speaker and social series was launched in February 2023. A total of eight public events have occurred inside the Center. In FY23, 158 adults and 8 children attended this series.
- Walk and Talk with Wild Basin's Executive Director – this public offering started as a monthly weekday experience in early 2023 and then transitioned into a quarterly offering. In FY23, five hikes were provided and 30 adults participated.
- Wild by Wild Basin – During spring break 2023, the Center offered two public guided hikes in which 13 adults and 11 children participated. Travis Audubon provided a guided bird walk for 10 adults and 3 children. GCWA were observed on the hike. Space was also provided at the parking lot trailhead for the Austin Paleo Society to have a popup tent for guests to touch and learn about fossils.
- Walk to the Waterfall Wednesdays – During the months of June and July a public guided hike was provided every Wednesday morning. Eight hikes were provided, and 31 adults and 3 children participated.

Environmental Education Resources for the Public

- Interpretive Visitor Gallery. During most years, visiting groups and the public have access to the Wild Basin Visitor Gallery on Monday-Friday, 8am-3pm year-round, except major holidays. 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. In the Spring of 2023, a touch table was created to provide visitors with a tangible experience with provided items including bones, fossils, wasp nests, and other items from nature.
- Public Visitation. Wild Basin visitation numbers are logged by two trail counters on Arroyo Vista Trail, one near each trail head, as well as by manual counts from Center security staff. The estimated hiker count for this fiscal year was 12,788.
    - The FareHarbor reservation system was operational during FY22 (weekends & federal holidays); The system caps daily visitation at 78 cars (3 hiking sessions w/26 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. Forty-two bird species and 265 birds were observed/heard during FY23. 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 1405 observations documenting 456 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 4001 observations of 737 species.

Volunteer Stewardship

Volunteers Stewardship Workdays provide opportunities for the community to engage with the land management activities, as well as learn about the BCP and conservation practices and issues unique to the Texas Hill Country. Altogether, stewardship volunteers contributed 566 hours, including dedicated weekday and weekend volunteers, and group stewardship events.

- Thursday Workdays are regularly facilitated by staff for a group of up to six long-term volunteers and student interns. The group assisted with a variety of land management projects over the course of the year and are an indispensable resource to maintaining Wild Basin.
- Monthly weekend workdays were hosted on the third Saturday of each month. These events were open to the public, with a focus on engagement of neighbors and the SEU campus community. Most of the work done was focused on management of vegetative debris from Winter Storm Mara.
- Volunteers also help with the weekly monitoring of hiking trail conditions through the Trail Patrol Program.

- Westlake High School Senior Service Day: A group of 13 students and 2 school staff worked with Center staff to remove trash along the Loop 360 preserve boundary.

Public events, meetings, workshops, and conferences

*If not reported above under educational permits

- Paul Vickery provided a guest lecture on Wild Basin to an SEU marketing research class in fall 2023.
- Dr. Kim O'Keefe conducted two, 2-hour labs at Wild Basin in Fall 2022. Students surveyed vegetation as part of her Environmental Conservation and Climate Change course.
- Students presented their work on Wild Basin-related research projects at:
    - SOURCE symposium at St. Edward's University on Mar 31, 2023
    - Texas Society for Ecological Restoration Meetings in El Paso, TX Spring 2023
- Courses – See Table 2 for a list of higher education courses that incorporated Wild Basin into their curricula in FY23.
- John Barr provided 8 Second Saturday Public Guided Hikes in which 72 adults and three youth participated.
- Dr. Barbara Dugelby gave twelve guided hikes to SEU groups, neighbors, the public, and supporters of the Wild Basin Creative Research Center.

Table 2. Undergraduate and graduate classes taught at Wild Basin FY23

Course #	**Title**	**# Students**	**Semester**
FSEM1403-02	Freshman Seminar	7	Fall 2022
SP 4142.01	Ecology Lab	16	Spring 2023
ENSP 3326	Nat. Res. Cons. & Mgt	22	Spring 2023
FSEM 1409-01	Freshman Seminar	22	Fall 2022
BIOL 1108	Biology Lab	15	Spring 2023
	TOTAL	**82 students**	**5 classes**

St. Edward's University Events

- Wild Basin staff participated in Earth Day in April 2023 at SEU with a table to share information about Wild Basin, the Center's programs and the Center's efforts in sustainability and conservation.
- St. Edward's University events – Center staff participated in the SEU fall 2023 homecoming events, the spring and fall SEU student involvement fairs, spring and fall career fairs, and one live well involvement fair. These events highlight internship and volunteer opportunities for students and event opportunities for faculty and staff. A Wild Basin Creative Research Center research symposium was held on campus in April. Students presented results of research projects conducted at the preserve.
- Staff Retreats and Meetings – Center staff met at least twice each month during FY23. The Center was also used for meetings and/or retreats by several SEU departments, including SEU Marketing Department, an SEU Network for Vocation in Undergraduate Education (NetVUE) retreat, SEU Social Work faculty meeting, NSF S-STEM undergraduate scholar workshop, SEU Administrative Directors retreat, School of Natural Science staff retreat, SEU Big Event (student/staff volunteer event), SEU Ecological Society student hike, and Dean of Student Planning team retreat. In addition, several SEU courses utilized the preserve for classes, training, or lab work (see Table 2).
- Appreciation Events – The Center hosted spring intern and summer volunteer appreciation events.
- Meetings of businesses and government entities – During FY23, the Center hosted meetings for the following entities: a monthly book club, Bee Creek Conservancy, quarterly meetings between Travis County TNR and Center staff, and a quarterly meeting of the BCP Education and Outreach Partners that include personnel from the City of Austin, Travis County, Travis Audubon, Wild Basin Creative Research Center, and Westcave Outdoor Discovery Center.
- Recreational Equipment Incorporated (REI) conducted 20 Star Walks with 183 participants in FY23.
- Wild Basin Internship Program – The Center provided internships for 14 undergraduate and 2 high school students. The focus of these internship included: land management, research, invasive species monitoring and control, 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, public outreach via social media, and curriculum development.

Publications

- Haight, J. D.; S. J. Hall; M. Fidino; S. A. Adalsteinsson; A. A. Ahlers; J. Angstmann; W. J. B. Anthonysamy; E. Biro; B. Dugleby; T. Gallo; A. M. Green; L. Hartley; M. J. Jordan; C. A. M. Kay; E. W. Lehrer; R. A. Long; B. MacDougall; S. B. Magle; D. E. Minier; C. Mowry; M. Murray; K. Nininger; M. E. Pendergast; K. R. Remine; T. Ryan; C. Salsbury; C. J. Schell; C. Sekercioglu; C. J. Shier; K. C. Simon; C. C. St. Clair; T. Stankowich; C. J. Stevenson; D. Will; J. Williamson; L. Wilson; A. J. Zellmer; J. S. Lewis. Urbanization, climate and species traits shape mammal communities from local to continental scales. *Nat Ecol Evol* **7**, 1654–1666 (2023). https://doi.org/10.1038/s41559-023-02166-x

Scientific Research

During the 2022-23 reporting period, seven 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, 12 undergraduate students from St. Edward's University, two graduate students, and 12 community partners/volunteers. Excluding Wild Basin CRC staff and contractors, over 3,000 hours were expended on research at Wild Basin during the reporting period.

(1) Proppe, D., Conner, W., Calleros, S., Loza, N., Taylor, L., Enriquez, A. The impact of anthropogenic noise on songbirds: Masking or Fear?

Project Description: The goal of this research was to determine whether the aversion to anthropogenic noise that has been documented in many songbird species is due to fear of noise or masking of sounds. To test this hypothesis, we played back mobbing calls of black-crested titmice (*Baeolophus atricristatus*) and Carolina chickadees (*Poecile carolinensis*) at the Wild Basin Wilderness Preserve, Blunn Creek, and Nootsie properties. Mobbing calls serve as a strong attractant that typically leads to vocalization and approach from nearby songbirds in order to dissuade predatory behavior from an identified threat. Our playback sessions consisted of either, 1) a control that contained only three mobbing calls (quiet), 2) three mobbing calls entirely masked with anthropogenic noise (overlapped), or 3) three mobbing calls with anthropogenic noise played between calls (offset). Behavioral response in wild birds was evaluated acoustically and visually. Acoustic parameters were latency to calling and number of calls. Visual parameters were latency to first visual approach within 10 meters of the speaker and number of approaches. If masking is the primary driver of noise aversion, we predicted that behavioral responses to offset playback and the control situation would be similar while overlapped calls would garner reduced response. Alternatively, if fear also served as the driver for aversion, we expected reduced response to both non-control playback conditions.

Summary of Results: Twenty playback experiments of each type (N=60) were completed in fall of 2022. Additional playbacks were conducted in the spring of 2023, but these data have not been analyzed. Results presented here are based solely on data from 2022. We did not control for species responding to playback, but black-crested titmice and Carolina chickadees were the primarily species to respond. Patterns were observed in acoustic and visual patterns of behavior. Birds took significantly longer to approach within 10 meters of the playback speaker for both overlapped and offset call with noise than in the control condition (χ^2 = 24,476, df = 2, $p < 0.001$; Fig. 1). Although not significant, a similar pattern of equal and reduced response in both noise playback conditions was observed for a number of acoustic vocalizations (F = 1.75, df = 2, 45, p = 0.185; Fig. 2). In both cases, behavioral responses from our study indicate that fear is equally responsible to masking in driving the observed patterns of aversion to anthropogenic noise seen in songbirds.

(2) Tanner, E., Tanner, A., Beck, L., Fuhlendorf, S., O'Donnell, L., Hauwert, N., Proppe, D. 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.

Summary of Results: 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. 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.

Technological malfunctions with the DTS and temperature calibration have led to data from June 22, 2022-September 23, 2023, to be unusable. The issues have since been resolved and the DTS is now recording. The cable most recently collected data during the solar eclipse on October 14, 2023. Vegetation metrics will be collected along the cable to determine impacts of vegetation cover and structure on thermal buffering dynamics during the eclipse. Data are also currently being analyzed to assess how thermal microclimates influence arthropod communities as part of an arthropod study completed in 2021.



Figure 1: Pathway of current DTS cable at Wild Basin.

(3) Tanner, E., Tanner, A., Fuhlendorf, S., Beck, L., Proppe, D. 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 play back 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.

Summary of Results: In September 2021, the DTS cable was placed and began recording data at Wild Basin Wilderness Preserve. A MS student was hired in June 2022, to begin work on this project. They submitted their thesis proposal in summer 2023. A transect was set up at Wild Basin in September 2023, along which sounds would be propagated and recorded.

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

Project Description: Permittee will conduct a long-term monitoring project of amphibian and reptile communities at Wild Basin Wilderness Preserve. Permittee will set up a drift fence array at a subset of up to 8 of the 15 established monitoring sites on Wild Basin. Each drift fence array will consist of 3 “arms” of aluminum fencing (approximately 24 inches high), 4 pit-fall traps, and 3 funnel traps. The drift fence survey will be coupled with standardized visual encounter surveys and cover boards. The drift fence array will be in operation at least 4 days each month and will be monitored twice daily when open. Each captured animal will be removed from the trap, identified to species, marked, weighed, and released near the point of capture. Lizards will be marked using either a permanent marker or a “bee-tag” (used for marking queen bees in apiculture; skinks only). Snakes will be marked by clipping ventral scales in a manner that allows for unique identification. Permittee may implant pit tags into snakes, lizards, frogs, and toads that are large enough to safely handle the pit tags. Two specimens of each species will be euthanized, preserved as a voucher specimen, and deposited at the University of Texas Biodiversity Center Herpetology collection.

Summary of Results: Between 08 May 2023 and 05 June 2023, we conducted herpetological surveys at Wild Basin Wilderness Preserve (WB) and Barton Creek Habitat Preserve (Hereafter BCHP or simply “Barton Creek”), Travis County; Texas. Surveys consisted of pitfall arrays, each consisting of four five-gallon pitfalls separated by 25’ of metal flashing or silt fencing arranged in either a linear or “Y” configuration. There were three active arrays at Barton Creek and six at Wild Basin. Within this time

frame, traps were closed on 12 May 2023 and opened on 15 May 2023 (expecting heavy rains). Traps were also closed on 19 May 2023 (after check) and reopened on 21 May 2023. Additionally, individual pit falls within an array were closed periodically due to the presence of standing water or fire ants (*Solenopsis invicta).* In total there were 23 days of sampling, resulting in 537.6 “pitfall days” at Wild Basin and 266.4 pitfall days at BCHP where one pitfall day is equal to 1 pitfall trap active for 24 hours. Surveys utilizing the same arrays were also conducted during the same time of year in 2022 at Wild Basin Nature Preserve. This season, we did not utilize funnel traps in association with the pitfall arrays due to their low efficacy last year and potential overheating of captured animals.

Overall, we detected 25 individuals of seven species of amphibian and reptile at Barton Creek and 72 individuals of 8 species at Barton Creek. Total catch per unit effort (CPUE) for Wild Basin was 0.134 captures per pitfall day. For Barton Creek the CPUE was 0.094. These numbers obscure the fact that sampling at Wild Basin coincided with the dispersal of metamorphic amphibians during which large numbers of metamorphic *Lithobates berlandeiri* and *Incilius nebulifer* were captured. Excluding metamorphic amphibians, there were 38 captures at Wild Basin and a CPUE of 0.071. Table 3 provides a list of sites, their coordinates, configuration, sampling effort at each, and capture per unit effort.

Table 3. Drift fence arrays, effort, and CPUE at Wild Basin and Barton Creek Habitat Preserve - May 8th through June 5th, 2023.

Site	ID	Latitude	Longitude	Fence Configuration	Pitfall Days	CPUE
Wild Basin	WB04	30.30979	-97.82168	Linear	89.97	0.044459
Wild Basin	WB05	30.30995	-97.81917	Linear	92.1	0.09772
Wild Basin	WB07	30.30759	-97.82055	Linear	92.29	0.075848
Wild Basin	WB08	30.30742	-97.81763	"Y"	79.02	0.063275
Wild Basin	WB10	30.30511	-97.82072	Linear	92.05	0.076046
Wild Basin	WB14	30.30553	-97.81363	"Y"	92.14	0.065118
Barton Creek	BCHP01	30.28939	-97.90978	Linear	90.59	0.099349
Barton Creek	BCHP02	30.28874	-97.90992	Linear	91.75	0.054496
Barton Creek	BCHP03	30.28817	-97.9091	Linear	84.07	0.130843

(5) Barr, J., C. Fabre, M. Powers, G. Sertich, P. Guerra. Rare Plant Monitoring

Project Description: Several rare and unusual plant species have been noted at Wild Basin.

In the past, the presence of these species has been documented in Wild Basin newsletters, periodic surveys, and personal communication. Bill Carr's 1996 Annotated Checklist of the Vascular Plants of Wild Basin compiled all of the previous documentation into one resource.

Project researchers continue to use iNaturalist as our favored method of documenting and tracking rare and unusual plant species. The exact location is included in iNaturalist, available to Wild Basin staff and approved volunteers, but obscured to the public. This step inhibits poaching while promoting scientific sharing. We have also created a Google Calendar of bloom periods to assist with focusing our efforts.

Wild Basin's unique geographical location: Wild Basin is the extreme range limit of two plant species: 1) the southern-most individuals of the eastern shooting star (*Primula meadia*); and 2) the eastern-most individuals of Texas Madrone (*Arbustus xalapensis*). As the global and local climate changes, our plants could be harbingers of the future. Continued monitoring is very important.

Summary of Results:

2023: Significant events: Weather events continue to have significant impacts on the natural environment of Wild Basin. Winter storm Mara in late January and early February brought 0.71 inches of accumulated freezing rain and ice resulting in downed limbs across Austin, including Wild Basin. Staff and volunteers spent the next weeks opening trails: cutting downed branches, limbs, and trees and moving debris. Ashe juniper and live oak, because of their evergreen foliage, sustained the most damage. While access to the rare plant populations was impaired with downed limbs across trails and paths, there did not appear to be any direct damage to these plants.

Despite 5.75 inches of rain in August of 2022, the multi-year drought, which began in September 2021, has persisted, and 2023 is on track to be even drier than 2022. Below average rain and record-breaking hot temperatures in July, August, and September resulted in 'Extraordinary Drought" conditions persisting across a wide swath of central Texas, including Wild Basin.

(Texas State Climatologist report September 2023) The abnormally dry soils appear to have stressed and possibly killed many plants of different species across Wild Basin.

2022-2023 Survey Outings: We made two focused outings, and several additional scouting outings. 2/21/23: About three weeks after the ice storm, John Barr, Master Naturalist Volunteer, made a solo trip to assess the impact of the ice and downed limbs on the shooting star and madrone populations. No direct impact was observed, and both populations of both species appeared healthy. 9/26/23: John Barr again visited the shooting star and madrone populations to assess the impact of the summer heat and drought. Significant impacts on both populations appear likely. Additional outings by John Barr and one or more study collaborators occurred on 12/6/22, 5/5, 5/18, 6/10, 7/17, and 8/21/23.

Target rare and unusual plant species:

Primary Species of Interest

One-flowered Cancer-Root aka Naked Broomrape (*Aphyllon uniflorum,* formerly *Orobanche uniflorum*):

4/8/23: One outing during bloom period failed to find any plants.

Shooting-star (*Primula meadia*, formerly *Dodecatheon meadia*):

2/21/23: No apparent impact from the ice storm. Plants were green and there were no downed trees impacting the plants. These were not checked during the peak bloom period. 9/26/23: All plants in both populations apparently dormant and no sign of any earlier bloom spikes.

Texas Madrone (*Arbutus xalapensis*):

2/21/23: No apparent loss or damage due to ice storm Mara.

9/26/23: The madrone trees appear to have been significantly negatively affected by the drought. Most established trees lost 1/3- 2/3 of their canopies. The smaller of the two eastern-most madrones appears to be dead. Two small madrone saplings near the old Madrone trail appeared to be dead. The large burn-scared madrone nearest loop 360 (affectionately known as the Queen) appeared to be in good shape. Photos of the impacted canopies are included in the iNaturalist observations.

Secondary Species of Interest

Canyon mock-orange (*Philadelphus ernestii*):

5/8/23: The single plant that was given to Wild Basin and planted over 10 years ago on the hill south of the Center was observed to be in good health.

Tertiary Species of Interest

Bletia species (Possibly *B. arizonica*):

6/29/23: Wild Basin preserve manager, Trevor Rice, alerted us to the appearance of a new population of *Bletia* near the NE corner of the Center. Two clusters of plants (eleven stems in one cluster and two in a second cluster) were just breaking ground. Over the course of the next two months, the stems grew, and flower buds began forming, then they stopped growing, desiccated, and died back to the ground without any buds or flowers fully forming (only a trace of rain fell while they were growing). This was the first time for any *Bletia* in this exact location. The general area to the north and east of the WB building is a hot spot for *Bletia* at Wild Basin. Based upon the timing and the diminutive size of the flower stalks, I doubt that these were *Bletia spicata,* which tend to bloom around April with thick, tall bloom stalks. They also seemed early for *Bletia nitidia* which usually appear in August and September. Based upon the size and timing, it is possible that these were *B. arizonica*. We've never positively identified any *B. arizonica* at Wild Basin, but we have had two likely candidates in years past: one single stemmed plant was broken before blooming, and one plant with two stems formed seeds pods without opening any flowers. Trevor placed a wire cage around the groups of plants to protect them from browsing and accidental damage by any foot traffic, and the cages were removed when the stalks were obviously dead.

Glass Mountain coralroot (*Beletia (for. Hexalectris) nitida*):

Incidental monitoring of known trailside locations: None observed. No observations posted to iNaturalist by anyone else. This species is sensitive to drought conditions and only blooms in wet years.

Crested coralroot (*Belata (for. Hexalectris) spicata*):

Incidental monitoring of known trailside locations: None observed. No observations posted to iNaturalist by anyone else. Other populations in Austin were observed in bloom this year.

Heller's marble seed (*Lithospermum helleri,* formerly *Onosmodium helleri*):
9/26/23: Attempted to locate the plants in North Hollow and upstream of the upper Bee creek crossing, but no sign of either population was found. The ice storm made accessing these locations extremely difficult. No observations posted to iNaturalist.

Buckley tridens (*Tridens buckleyanus*):
No Monitoring. No observations posted to iNaturalist.

Louisiana broomrape (*Aphyllon ludovicianum* formerly *Orobanche ludoviciana*)
Because we do not have an exact location of previous plants, we monitor while surveying for other plants. None seen. No observations posted to iNaturalist.

Candidate Species:
Ladies Tresses orchids (*Spiranthes Magnicamporum*):
12/6/22: Three bloom spikes posted to iNaturalist. Multiple rosettes found and observations posted to iNaturalist when searching for shooting stars and other plants.

Sticky Liatris (*Liatris Glandulosa*): No monitoring of the late summer blooming species.

Virginia Snakeroot (*Endodeca serpentaria*): No monitoring. No other observations were posted to iNaturalist.

Conclusions: Another drought year resulted in generally poor conditions for all the plants at Wild Basin.

***Arbutus xalapensis* (Texas Madrone):** The exceptional drought conditions are severely impacting the health of the madrones at Wild Basin. Most of our madrones likely predate and therefore survived the drought of 2011, the 1961 fire, then likely the multi-year drought of the 1950's, but the extreme temperatures and exceptional drought since 2021 have killed several and caused the loss of much the crown of the others. We might be witnessing the geographic range shift expected due to climate change.

Primula meadia: These plants continue to persist. This year was not productive, and no bloom spikes were observed. It seems likely that the ongoing drought will cause some loss of these diminutive plants.

(6) Steffenson, M. J. Capistran, S. Conner, E. Dean, R. Martinez, S. Mathieu, C. Rowland, and S. Stone. Insect Collections for Entomology (BIOL 2420) at St. Edward's University

Project Description: Students enrolled in Entomology (BIOL 2420) at St. Edward's University during the Fall 2022 semester were required to create an insect collection as part of their grade. The insect collection serves to help students learn how to preserve insects according to museum standards, as well as how to correctly use a specialist-level taxonomic key.

Summary of Results: Sampling was conducted for approximately three hours on Monday, September 12th and Monday, September 19th, 2022. Students sampled by rock flipping, sweep netting, and aerial netting. The following taxonomic groups were present in the specimens collected:

- Subphylum Chelicerata
    - Class Arachnida
        - Order Araneae
            - Suborder Araneomorphae
            - Suborder Mygalomorphae
        - Order Opiliones
        - Order Scorpiones
- Subphylum Hexapoda
    - Class Insecta
        - Order Coleoptera
        - Order Diptera
        - Order Hemiptera
        - Order Hymenoptera
        - Order Lepidoptera
        - Order Odonata
            - Suborder Anisoptera
            - Suborder Zygoptera
        - Order Orthoptera

        - Order Zygentoma
- Subphylum Myriapoda
    - Class Chilopoda
    - Class Diplopoda

(7) Conner, W., D. Proppe, E. Wostl. Monitoring use of restored areas by avian and insect pollinator communities in the Balcones Canyonlands Preserve.

Project Description: The Balcones Canyonlands Preserve (BCP) system was formed in 1996 to protect important habitat for endangered avian species which rely on mixed juniper-oak woodlands. However, the preserve consists of several tracts of land which vary in habitat quality, with some sites undergoing active restoration. These sites lack critical information on how they are being used by local avian and insect pollinator communities, which could be used to inform future best practices for land management. This project aims to address this gap in knowledge by running surveys of avian abundance and diversity, as well as surveys of insect pollinators at several sites across the BCP. Eleven restored and eleven unrestored plots were set up, each 25x10 meters, and categorized by whether active restoration had been ongoing at the site. Each plot also contains three smaller 3x3 meter plots for the purpose of insect pollinator surveys. Surveys consist of one 10-minute audiovisual bird survey observing whether a bird came within the plot, and three 5-minute insect pollinator surveys, one for each subplot. Preliminary data indicates significant differences in avian diversity, individual counts, and uses between restored and unrestored sites. As data collection continues, the information collected by this project will provide land managers with new information about how avian and insect pollinator communities are using the land they manage.

Summary of Results: *Introduction.* The Balcones Canyonland Preserve (BCP) is a preserve system that conserves habitat for wildlife in Central Texas. It was established in 1996 in response to dramatic habitat loss as the Austin area urbanized; between the years of 1985 and 2016, the Austin metropolitan area lost over 24% of its forest cover (Dreiss et al. 2022). The BCP consists of several tracts of land with varying levels of habitat quality, as many were degraded by use before becoming part of the preserve (Balcones Canyonlands Preserve 2007). Many of these tracts are actively being restored, which led to our questions: How does restoration affect how much the land is used by avian and insect communities, and how does it change the composition of

those communities? We predicted that restored areas would have higher avian species richness, and more use overall by both avian and insect pollinator communities.

Methods: This study is being conducted on four BCP properties owned by the City of Austin and Travis County: JJT, Medway Ranch, Vireo Preserve, and Wild Basin Wilderness Preserve. Six plots were located at Medway, 10 were located at JJT, and three plots were located at each Vireo Preserve and Wild Basin Preserve. Each site consists of one 25x10m plot (with three 3x3 plots within for pollinator surveys), which we marked on our maps. There are 22 in total, with 11 in restored areas and 11 in unrestored areas. We conducted 10-minute audiovisual surveys of avian use as well as species diversity, and surveyed pollinator use via three 5-minute pollinator use surveys. At least three replicate surveys will be conducted at each site. We did not collect anything in the field beyond observational data.

Results: We have not collected all necessary data, but we performed some preliminary analyses with the data we have collected to date. We have not collected pollinator data yet, so our preliminary data focuses on the avian data we have collected. We found restored sites had an average species richness of 3.600 species, while unrestored sites had an average of only 0.714, due to some surveys not recording any birds at all. We found similar numbers in our individual and use counts, with an average of 8.2 uses for restored sites, and 1.0 for unrestored sites.

To test for significance, we performed two-tailed T-tests for our three variables (species richness, individual counts, and use counts), and found a significant difference between restored and unrestored plots for all three (P-values <0.000).

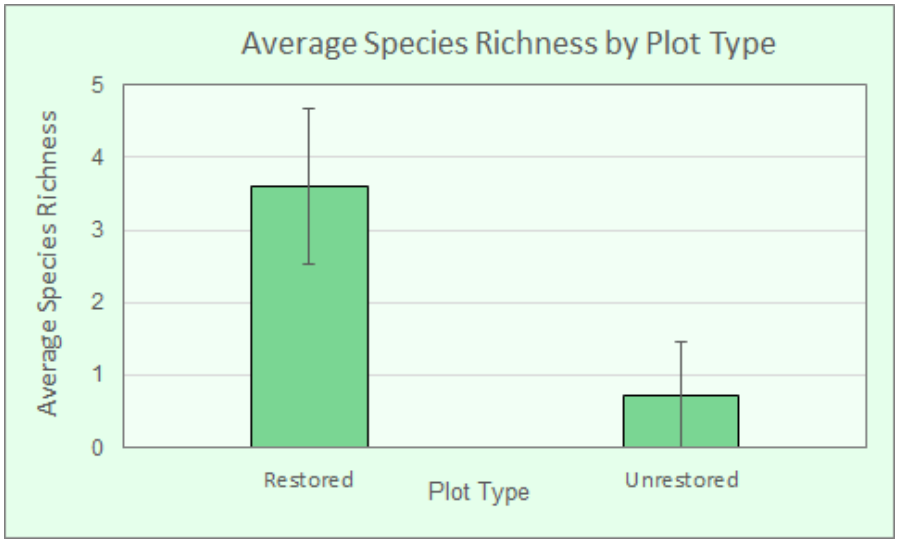


Figure 2. Average number of birds found in restored and unrestored plots.
Error bars = standard deviation. T-tests revealed a significant difference with a P-value of 0.000003.

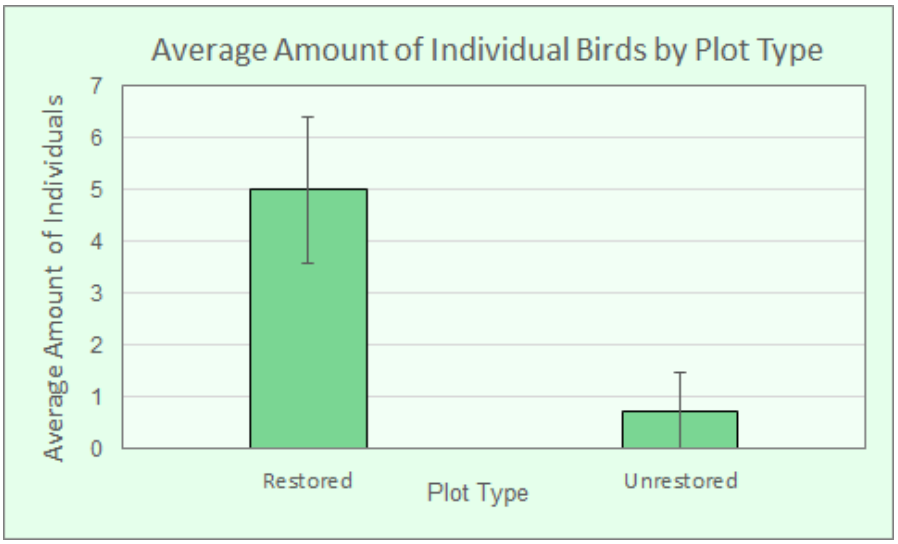


Figure 3. Average species richness found in in restored and unrestored plots.
Error bars = standard deviation. T-tests revealed a significant difference with a P-value of 0.00002.

Conclusions: We predicted that restored areas would have higher avian species richness and use by avian communities, and our preliminary results and analysis support this prediction. T-tests showed significant differences between both the average species richness ($p < 0.000$) and the average number of individual birds ($p < 0.000$) per plot based on whether the plot had been restored.

These results are also supported by previous research by Hanle et al. (2020), which found regenerating vegetation (such as increased ground cover and shrub cover) is correlated with increasing bird diversity. One possible contributing factor to the lower individual numbers in the unrestored plots is that habitat quality is diminished due to fewer sources of food, so those plots can only support smaller quantities of birds.

Though these analyses are preliminary, the data we have so far strongly supports our hypothesis and suggests that the restoration efforts in the BCP have a strong positive impact on bird diversity. For this reason, restoration efforts for protected BCP land should continue, as the investment to restore these lands seems well worth the effort.

Facilities and Signs

Facilities

- The Wild Basin Creative Research Center building is monitored by ADT.
- Composting toilets located in the Center are maintained regularly by adding water and wood shavings as needed. The tanks below the building are turned monthly.
- There are two evaporative toilets located in the parking lot. Staff maintain them weekly by raking contents and disposing of dried according to guidelines. Liquid levels are monitored and recorded to ensure units are functioning properly. Stronger fans were installed this year to help with evaporation during inclement weather conditions.
- Working with a new vendor, a new gate control system was installed this year. The new system allows better control of scheduling, monitoring, and remote access control through an online dashboard and a mobile app. An electrician was also contracted to resolve chronic issues with power serving the gate.

Signs and Maps

- Center staff, interns, and volunteers completed the installation of eight new interpretive signs along the Arroyo Vista Trail loop and at the Sensory Garden behind the Center. These signs were funded through a grant from the Environmental Fund of Texas with illustrations and content created in collaboration with a former Wild Basin Artist in Residence.
- A digital map is available for hikers on the Wild Basin website or through a QR code posted on the weather-resistant map of the trail system at the main trailhead. The website also provides interpretive information and resources for specific age groups.
- Numerous informational, parking, and rules signs are mounted through the parking lot and trailheads to welcome, direct, and inform Wild Basin visitors.
- “No Trespassing” signs are posted along the preserve’s boundary fence line abutting residential properties.
- “No Decorating Please” signs were temporarily tied to trees along the Loop 360 preserve boundary during the Christmas season.

Security, Access, and Safety

Emergency Preparedness

Center staff continue to review and update the Wild Basin Emergency Response Plan (ERP) developed with St. Edward's University Campus Safety personnel. This plan describes how staff, student interns, and volunteers should respond to emergencies, address various types of hazards, and established policies, responsibilities, and operations, with the goal of addressing incidents effectively and efficiently. Center staff developed the ERP in collaboration with the Director of Campus Resilience, and it is considered a dynamic document. All staff and volunteers have access to a copy of the ERP. A hard copy is stored in a labeled binder located in the central office of the staff area of the Center. A digital copy is stored in the "Wild Basin Share" directory of the SEU online file hosting service, Box, filed under "Safety Resources and Emergency Response Plan."

Security

- Wild Basin is staffed with a security officer on site five days a week. The officer is an SEU employee, whose position is supported through the partnership with Travis County, to provide site security from issues such as vandalism, car break-ins, visitors bringing dogs into the preserve, or generally not following posted user guidelines.
- A hiking reservation system was implemented in 2021 to limit visitation on weekends and federal holidays, when visitation is very high. Having dedicated security staff and the reservation system has been helpful, however, Wild Basin continues to face many of the issues mentioned above no staff are present after hours. Surveillance cameras show dogs on trails, damage to preserve infrastructure, off-trail activity, and occasional vandalism.
- A gate at the Wild Basin entrance is scheduled to open at sunrise and close at sunset. The gate is equipped with a sensor that will open the gate arms when a vehicle is leaving the preserve after hours.

Fire Safety and Preparedness

- Firetron, in coordination with SEU, completed their annual inspection of the Center building, entry driveway, and parking lot. The Center and other facilities remain up to code.
- Center staff and volunteers trimmed vegetation back from buildings as per firewise recommendations.

- Future treatments of established shaded fuel-breaks along the preserve's boundary will be needed due to significant tree and limb damage caused by Winter Storm Mara.

Appendices

Appendix A: Map of Wild Basin Wilderness Preserve Trail System



Figure A1. Wild Basin Wilderness Preserve Trail System

Appendix B: Aerial Map of Wild Basin and Residential Neighbors



Figure B1. Map of Wild Basin and Residential Neighbors

Appendix C: Wild Basin Boundary Map

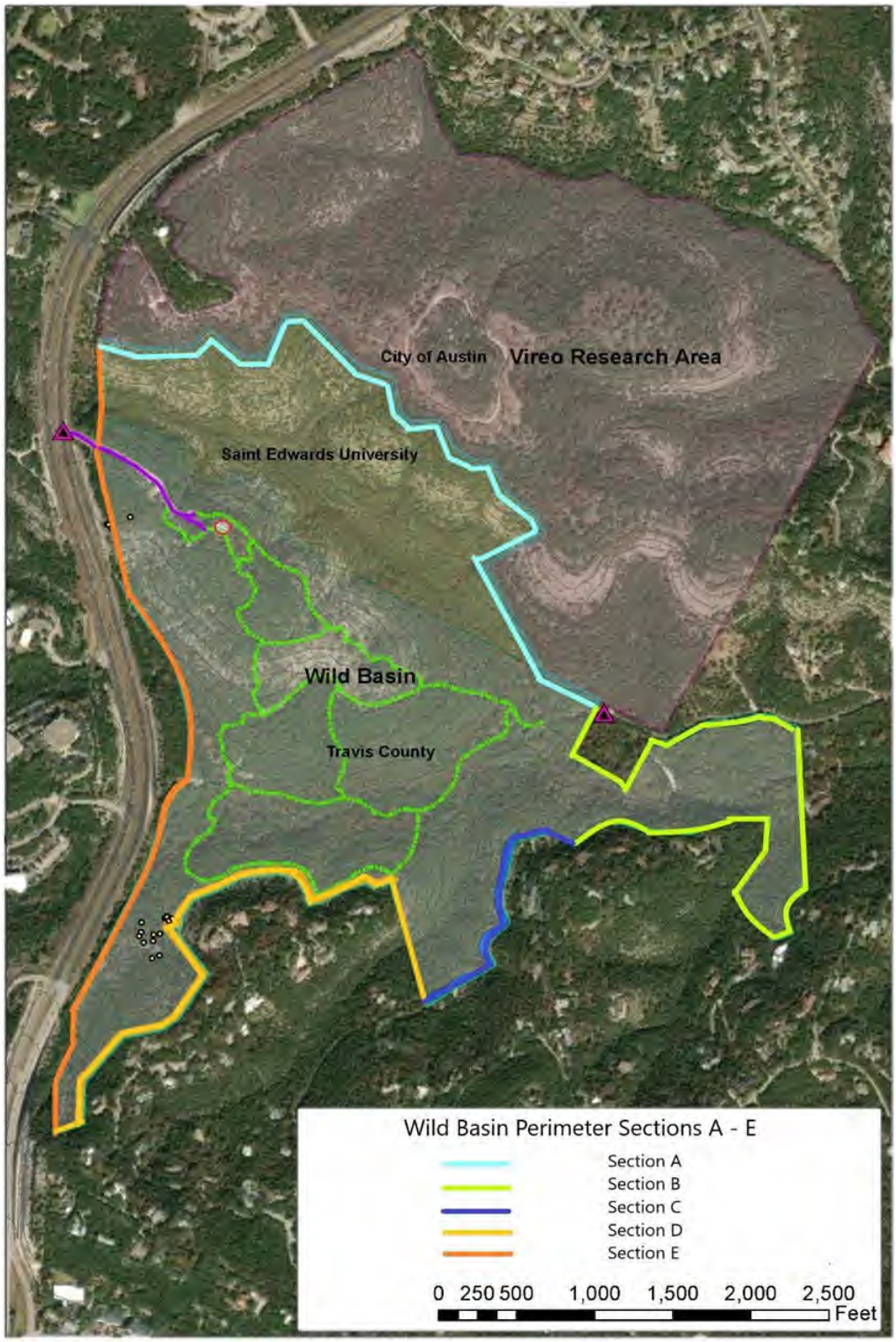


Figure C1. Wild Basin Wilderness Preserve Boundary Sections

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

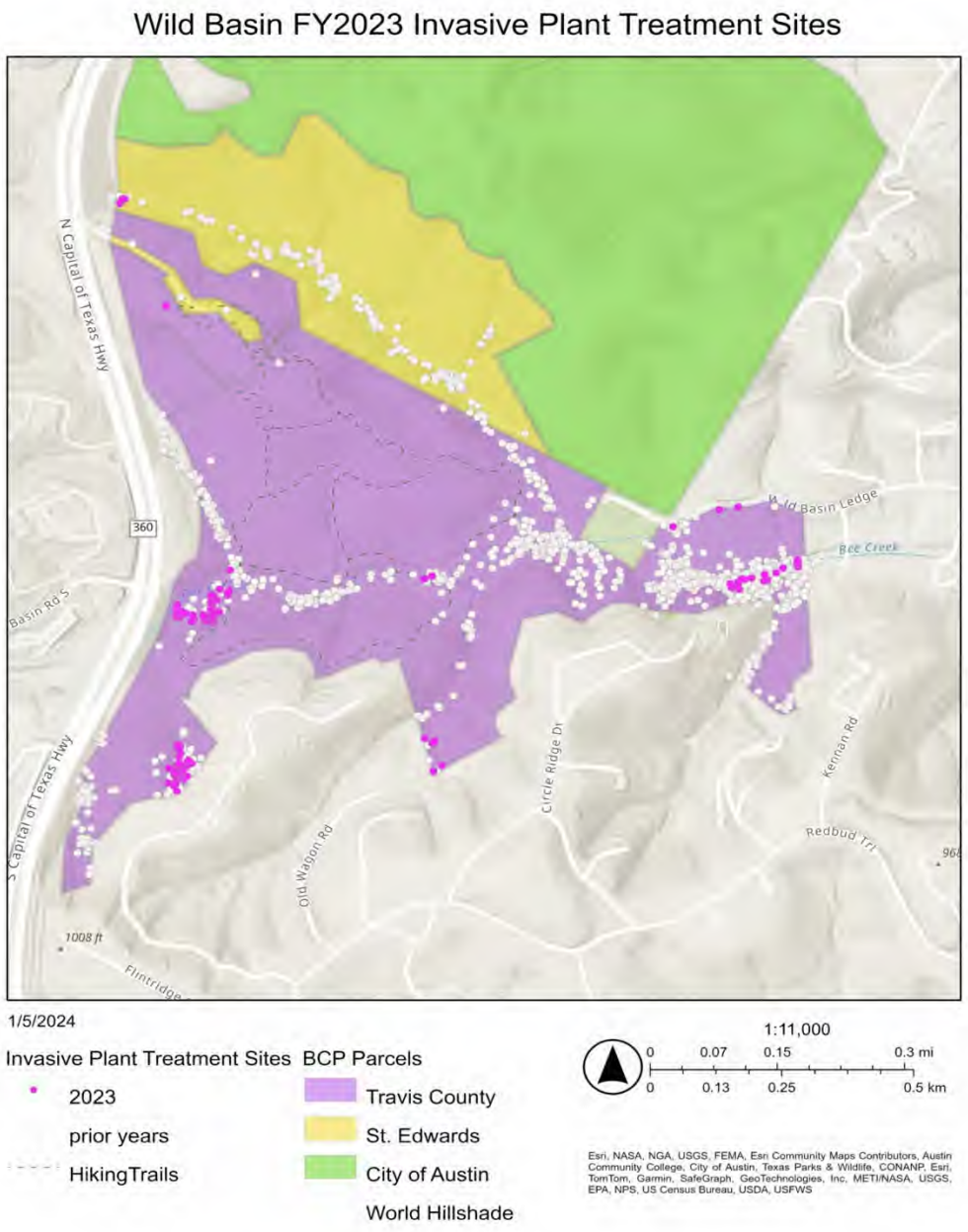


Figure D1. Wild Basin FY23 Invasive Plant Treatment Sites

Appendix E: Golden-cheeked Warbler Surveys at WB/VP

Darrell Hutchinson, City of Austin Field Biologist

A total of 47 surveys were conducted at Wild Basin and the adjacent Vireo Preserve between 8 March and 6 June by Darrell Hutchinson, Lisa O'Donnell, Jim O'Donnell, and River Ahlquist for a total of 176 survey hours.

Between the two preserves, thirteen separate males were detected during the breeding season. Twelve males established territories. Eight (possibly nine) males paired, and six of the nesting pairs reproduced successfully. This is the highest plot density and nesting success recorded since intensive surveys of this marked population began in 2011 (see Table 4).

Table E1. Golden-cheeked Warbler plot density, pairing success, and nesting success at Wild Basin/Vireo Preserve between 2011 and 2023.

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
No. of Territories	11	6	8	10	8	8	4	4	5	6	9	5	12
No. of Territories w/females	8	5	6	5	6	6	2	3	4	6	7	4	8
No. of Territories Producing ≥ 1 Young	5	3	3	1	1	1	0	3	1	4	3	2	6

Eleven out of thirteen males and one female were color-banded for a total of twelve banded warblers on plot. Two males were banded returns, one each banded in 2021 and 2022. During 2023, one male and the female were banded as after second-year (ASY) birds, and the remaining eight males were banded as second-year (SY) birds. Banding was accomplished by John Chenoweth, Jim O'Donnell, and Darren Proppe.

YE/SI:MV/PI was banded SY at Vireo Preserve on 7 April 2021. He returned in 2022 and 2023, and defended the same large territory that extends from the Wild Basin Creative Research Center across north hollow to the second knoll at Vireo Preserve and measures approximately 75 ac. or 30 ha. The male was never detected with a female or fledglings, nor observed provisioning. However, he was detected regularly

between 12 March – 6 June, which suggests he did pair and their nesting attempt(s) failed.

WH/SI:BL/YE was banded SY at Wild Basin on 12 April. He paired and they occupied a territory around the Wild Basin Creative Research Center. An active nest was located on 18 April but found depredated on 6 May. The female likely swapped mates for her second nest attempt, as male WH/SI:BL/YE was detected on Vireo Preserve on 24 May and male BK/DB:BK/SI was observed attending her next to the Wild Basin parking lot on 26 May. A second nest was found post-fate just north of the “Honey Bucket” and was also predated.

BL/DG:DG/SI was banded SY at Wild Basin on 7 April, and occupied a territory in the lower north hollow. He paired and their nest produced a minimum of two fledglings around 27 April. The male was observed late in the season acting “nesty”, so it’s possible this pair attempted to double brood but failed in their second attempt.

BK/DB:BK/SI was banded SY at Wild Basin on 7 April, and first occupied a territory on Woodland Trail. He paired and their nest produced a minimum of two fledglings around 27 April. They seemingly disappeared until the male was resighted next to the Wild Basin parking lot on 21 May, feeding older fledglings. It’s suspected that this male paired with WH/SI:BL/YE’s female on her second nest attempt, as he was observed attending her on 26 May.

DG/OR:MV/SI was banded SY at Wild Basin on 28 April. He paired and they occupied a territory along Warbler Trail north of the waterfall. The male later extended his territory eastward after BK/DB:BK/SI vacated the territory on Woodland Trail. DG/OR:MV/SI was first detected on 9 April, after the pair arrived and the female had probably already built her nest. No evidence of fledglings nor provisioning were observed, so it’s assumed the pair’s nesting attempt(s) failed.

OR/SI:YE/RD was banded SY at Wild Basin on 7 April. He paired and they occupied a territory in the south hollow, which is an area that has not been occupied in recent years. Their nest was located and produced a minimum of two fledglings around 8 May.

OR/OR:PI/SI was banded SY at Wild Basin on 13 April. He paired and they occupied the territory north of the back gate on Vireo Preserve. Their nest produced a minimum of one fledgling around 14 May.

UBVPWB1 occupied a territory that spanned the mid north hollow. His response to playback was weak, so he was never banded. Plumage characteristics indicated he was likely SY. He failed to pair and was last detected on 16 May.

DB/DB:WH/SI was banded ASY at Vireo Preserve on 14 March. His mate RD/SI:BK/RD was banded ASY nearby on 8 April. It's suspected that this male, and possibly the same female, have returned to occupy the same territory near the water tower since 2020. The male had avoided being captured and banded until this year, when he was lured into a mist net days after arriving on plot and shortly before the female arrived. The pair double brooded successfully producing four fledglings around 1 May and a minimum of one fledgling around 31 May. The "water tower" pair have successfully bred every year since 2020 and occupy, by far, the most productive warbler territory at Wild Basin and Vireo Preserve in recent years.

WH/SI:RD/YE was banded SY at Vireo Preserve on 27 April 2022. He also defended a large territory and was observed on Vireo Preserve and Wild Basin. He paired and their nest produced four fledglings.

BL/RD:WH/SI was banded SY at Vireo Preserve on 8 April. He failed to pair and was last detected on 10 May.

UBVPWB2 occupied a territory adjacent to DB/DB:WH/SI by the water tower at Vireo Preserve. He was likely SY and failed to pair, although he was detected on plot throughout the season from 26 March – 30 May.

DG/SI:YE/WH was banded SY at Vireo Preserve on 3 April. He was detected on plot for less than three weeks and failed to establish a territory.

For the second year in a row, an unbanded pair of Black-capped Vireos occupied a territory at Vireo Preserve around the second knoll. The male was first detected on 13 April. An active nest was found on 10 May and the pair successfully produced four fledglings on 4 June. This is the first time Black-capped Vireos have bred successfully at Vireo Preserve since 1997.

Compared to recent years, Golden-cheeked Warbler breeding success and plot density was higher. Breeding success is often correlated to food resources. This season, with mild temperatures and steady rainfall, insects were abundant and nest predators had plenty to eat. Higher numbers of breeding pairs may be a positive sign of local population increase or the result of displacement as land use conversion increases and warblers are forced into the last remaining patches of habitat.

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. 2023 Golden-cheeked Warbler territories

Appendix F. FY23 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 three survey dates was logged in eBird as three segments described below. Data for the July 2023 surveys were lost in a house fire. 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	**10/19/22**	**12/14/22**	**3/14/23**	**5/24/23**
# birds	56	102	54	53
# species	16	13	17	20

Table F2. FY23 WB Quarterly eBird Surveys: Bird observations by date and segment

Common Name	10/19/22				12/14/22				3/14/23				5/24/23			
	NH	BC	360	Total	NH	BC	360	Total	NH	BC	360	Total	NH	BC	360	Total
American crow				0		1		1				0		1		1
American robin				0	42	7	4	53				0				0
ash-throated flycatcher				0				0				0	1			1
Bewick's wren		1		1				0				0				0
black vulture				0				0			2	2				0
black-and-white warbler				0				0	1			1				0
black-chinned hummingbird				0				0		1		1	1			1
black-crested titmouse				0				0		2		2	1			1
blue jay	1			1				0	2			2		3		3
blue-gray gnatcatcher				0				0				0	3	1	1	5
blue-headed vireo				0		1		1				0				0
Carolina chickadee	3		4	7		2		2				0		1		1
Carolina wren	2	2	2	6		3	2	5	2			2	1	3	2	6
cedar waxwing				0				0		7		7				0
chimney swift				0				0				0	4			4
common raven				0				0	4			4				0
Cooper's hawk	1			1				0				0				0
eastern screech-owl		1		1				0				0				0
golden-cheeked warbler				0				0	1	2	1	4	1	1		2
golden-crowned kinglet				0		3	2	5		1		1				0
great blue heron				0				0				0	2			2
hermit thrush	2	1		3		4	2	6		2	2	4				0
house wren	1	1		2				0				0				0

Common Name	10/19/22				12/14/22				3/14/23				5/24/23			
	NH	BC	360	Total	NH	BC	360	Total	NH	BC	360	Total	NH	BC	360	Total
ladder-backed woodpecker				0		1		1				0				0
lesser goldfinch				0				0				0	1		2	3
mourning dove				0				0				0		1		1
Nashville warbler		1	1	2				0				0				0
new world sparrow sp.	2			2				0				0				0
northern cardinal	5	6	3	14	1	8	2	11	3	12	4	19	3	4	1	8
northern flicker		1	1	2				0				0				0
painted bunting				0				0				0	1	2		3
ruby-crowned kinglet	2	2	2	6	1	5		6	2	2	1	5				0
rufous-crowned sparrow	2			2				0				0			2	2
spotted towhee				0		1		1		1		1				0
Swainson's warbler				0				0				0		1		1
tufted x black-crested titmouse (hyb)			5	5	2	6	1	9				0				0
turkey vulture			1	1				0	2		1	3				0
white-eyed vireo				0				0	3	1		4	2	4		6
white-winged dove				0				0				0		1		1
Woodhouse's scrub-jay				0				0		1		1				0
yellow-billed cuckoo				0				0				0	1			1
yellow-rumped warbler				0		1		1				0				0