ST. EDWARD'S UNIVERSITY

Wild Basin Creative Research Center

Wild Basin Wilderness Preserve

2015 Annual Report

(October 1, 2014 – September 30, 2015)

Submitted by

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

to

Travis County Commissioners Court
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OVERVIEW OF PRESERVE MANAGEMENT AND OPERATIONS

Wild Basin Wilderness Preserve is jointly owned and managed by St. Edward's University and Travis County. Wild Basin's mission is to promote the importance of environmental education, research, conservation, and preservation.

Wild Basin's education and preserve management programs are designed to promote conservation and environmental awareness, while encouraging and demonstrating land stewardship practices. Throughout 2014 and 2015, Wild Basin hosted stewardship days for students and the public; coordinated and trained trail guides for school group tours; organized educational and interpretive events; coordinated internships and research activities; hosted classes; maintained public trails; managed invasive species; monitored and reported on water quality; hosted meetings, workshops, and trainings; and designed and installed new environmental education exhibits in the Wild Basin visitors center. Situated at the edge of the Texas Hill Country and surrounded by commercial and residential growth in west Austin, 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, it provides authentic environmental education experiences for the community. Its urban proximity 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 and environmental education, and a gateway to the BCP.

WILD BASIN VISION

Our vision is to preserve endangered species habitat and to educate students and the general public about the role Wild Basin and the BCP have in maintaining habitat integrity and ecosystem services. Together with our partners, we focus on the following goals for Wild Basin:

- Managing and restoring a mosaic of habitats indigenous 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 and Black-capped vireo;
- 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

Trail maintenance and monitoring

- Regular trail patrols were conducted along the trail system (Appendix A) to monitor trail conditions and identify potential hazards.
- To reduce the need for paper maps, we posted digital trail maps on the Wild Basin website's homepage (www.wildbasin.org). This allowed visitors to access maps on their smartphones in either PDF or Google Earth format.
- Two TrailMaster trail counters (one at each trailhead) were set up and checked regularly to document the total number of visitors as well as temporal patterns in activity.
- Vegetation adjacent to designated trails was pruned throughout the year to maintain a visible trail for visitors. Well-maintained trails will minimize confusion about trail edges so the public can easily and efficiently hike to scenic areas. This maintenance is completed regularly to keep up with vegetative growth.
- Throughout the year, as "social trails" (informal trails created by public or animals) were created, signs were placed to indicate that visitors should stay

on designated trails. In addition, dead and downed material was strategically placed to deter foot traffic by humans and wild animals.

- Several new trail signs indicating directions and trail names were added at confusing trail intersections, and native plant markers along the entryway to the Wild Basin visitors center were replaced and updated.
- Several log steps were repaired on Yaupon Trail to replace rotting and loose logs on the easternmost portion of the trail.
- The rock steps on Triknee Trail were repaired and updated to reduce erosion potential.
- Several major snags that were adjacent to trails and presented risks to the public were removed by Wild Basin and St. Edward's University staff.

Trail restoration

- Wild Basin continued to work with representatives from Central Texas Trail Tamers to incorporate trail maintenance techniques that minimize erosion and lead to more sustainable trails. CTTT hosted three hands-on training workshops at Wild Basin to train volunteers and lead groups in sustainable trail maintenance practices (November 2014, March 2015, and May 2015). They helped with several major projects, including repairing steps on Triknee Trail, removing berms to allow sheetflow off trail, and incorporating soil berms/swales to direct water off trails and prevent erosion.
- Throughout the year, trail crews cleaned existing drainages along the entire trail system to improve functionality and allow water to drain from trails.
- A new creek crossing in Bee Creek was installed upstream of the waterfall on Yaupon Trail. The new crossing is a large stepping stone that is stabilized with mortar and rebar to allow visitors to cross the creek without making a large leap or stepping on loose rocks in the creek. The crossing is placed in a location that reduces impacts to the exposed roots of a large sycamore tree at that location.
- The closed trail to the back gate is lightly pruned to maintain foot traffic access in case of emergency. This trail is of concern for the Westlake fire department as it may be the only way homeowners on Wild Basin Ledge Rd. can escape if a fire is moving from the east (Appendix B). This trail should remain closed to the public (except for authorized neighbors) as it is a dead-end trail off of the main trail system and is unmarked. This trail is no longer depicted on Wild Basin maps.

- Land management activities used only native juniper and native limestone when needed for trail maintenance. No old-growth junipers or other native hardwoods are cut down in the preserve for such uses. All trail maintenance and other land management activities avoid impact or disturbance to cultural and archaeological resources.

Construction

- The low railings at the Overlook were completely replaced in November 2014 by Wild Basin volunteers and St. Edward's University student volunteers. The railings are now stable and better able to deter off-trail hikers in this area.

BOUNDARY MANAGEMENT

- A new solar-powered timer system was installed in July 2015 to connect the front gate to a timed operation system for opening and closing. The timer ensures that the gate opens around sunrise and closes at sunset.
- Staff monitored the perimeter to check the integrity of fencing and boundary markers. One major spot of concern that was identified in 2014 has been reviewed with Travis County staff and a volunteer to help with repairs.
- Trash along Hwy 360 adjacent to Wild Basin was picked up by volunteer crews on multiple occasions throughout the year to prevent it from traveling onto the preserve and into Bee Creek.
- Signs discouraging holiday tree decorations were placed along Hwy 360 at the beginning of the holiday season. In addition, holiday tree decorations were removed from trees promptly to discourage further decoration. In 2015, St. Edward's University students researched and designed several "wildlife-friendly alternatives" for tree decorations, and they decorated a tree in the Wild Basin parking lot as a demonstration for the public.

VEGETATION MANAGEMENT

- Vegetation mapping – Wild Basin staff, volunteers, and researchers are currently using a citizen science platform called iNaturalist to map the distribution of plants within the preserve. iNaturalist is accessible via a smartphone app or on the web from a computer. It allows us to document locations, photos, and relevant notes about plant species on-site. 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). For the second project, all coordinates are obscured from the public so as not to encourage iNaturalist users to leave the trail. All iNaturalist observations can be exported and then uploaded to ArcGIS or Google Earth for mapping or further analysis. A total of 347 plant observations were made in the Wild Basin iNaturalist projects between October 2014-September 2015.

- Rare plant species – All rare plant locations described are documented in the iNaturalist WBCRCMappingProject (Appendix C). Coordinates are obscured from the public when sightings are off-trail.
    - Orchids in the *Hexalectris* genus were documented in multiple locations at Wild Basin in May-September 2015, including two areas adjacent to Arroyo Vista trail, one area adjacent to Creek Trail, and a patch near the northern bank of Bee Creek.
    - Orchids in the *Spiranthes* genus were documented in multiple locations at Wild Basin in October-November 2015, including along Arroyo Vista Trail, adjacent to Ledge trail, adjacent to Triknee Trail, and in the North Hollow drainage.
    - Two planted canyon mock orange individuals are located near the Wild Basin visitors center.
    - Eastern shooting-stars (*Dodecatheon meadia*) have been documented in several locations at Wild Basin, including the south-facing slope of North Hollow and the south-facing slope of Southwest Hollow, although these sites were not investigated in April-May 2015 to look for individuals during bloom time.
- Invasive species management – Invasive plant species are regularly mapped and monitored using the iNaturalist platform. Preserve staff and volunteers continued to monitor for and remove invasive, non-native species, such as Japanese honeysuckle (*Lonicera japonica*), Chinese Tallow (*Triadica sebifera*), Chinaberry (*Melia azedarach*), firethorn (*Pyracantha coccinea)*, Japanese privet (*Ligustrum japonicum)*, Chinese privet (*Ligustrum sinense*), nandina (*Nandina domestica*), King Ranch bluestem (*Bothriochloa ischaemum*), Johnson grass (*Sorghum halepense*), chaste-tree (*Vitex agnus-castus*), bastard cabbage (*Rapistrum rugosum*), and giant cane (*Arundo*

donax), among others. Most of the invasive species control measures currently used at Wild Basin involve manual removal of plants by invasive species crews (Appendix D). In addition, we have begun using the EZ-Ject lance with Imazapyr capsules to treat invasive stems that are too large to be removed manually with a Weed Wrench (i.e., greater than 2.5" diameter). Previous research shows that this method effectively treats invasive plant species while minimizing off-target impacts of herbicide, and we conducted several studies this year to investigate potential off-target effects on plants and soil health.

- Protection from browse pressure – Wild Basin staff maintained existing deer exclosures of hog wire cages around stands of native trees and shrubs to prohibit excessive browse by deer and other animals.
- Fuel reduction – Several sites adjacent to residential areas on the southern border of the preserve have been investigated for potential fuel reduction efforts, as coordinated by Travis County and City of Westlake. Firewise guidelines are followed to create defensible space near the visitors center.
- Replanting – Three escarpment cherry seedlings purchased from the Lady Bird Johnson Wildflower Center were planted near the visitors center, in an effort to replace a large escarpment cherry had to be removed in 2014 due to trail safety concerns.

WILDLIFE MANAGEMENT

- Golden-cheeked Warbler (*Setophaga chrysoparia*) – During the 2015 nesting season, approximately 51 independent surveys were conducted at Wild Basin by Darrell Hutchinson and Laurel Moulton, for a total of 255 survey hours. The surveys were executed in partnership and according to the protocols of the City of Austin's Balcones Canyonlands Preserve GCWA Demographic Project (City of Austin, Travis County, U.S. Forest Service, 2012 Annual report: Golden-cheeked Warbler (*Setophaga chrysoparia*) monitoring program, Balcones Canyonlands Preserve. Austin, Texas). There were 5 GCWA territories at Wild Basin in 2015, and 5 GCWA nests were found by biologists. One pair bred successfully, four pairs were unsuccessful, and one second-year male failed to attract a mate and departed the plot in mid-April (see Appendix E for full report).
- White-tailed deer (*Odocoileus virginianus*) – Deer surveys were conducted according to previously established protocols at Wild Basin, in which driving

surveys were conducted on three evenings in October 2014 in the residential neighborhoods immediately south of Wild Basin. Results are summarized in Appendix F.

WATER QUALITY AND QUANTITY

Water quality testing was conducted on a monthly basis by Wild Basin staff (with assistance from student interns) using the Colorado River Watch Network water quality monitoring protocols. Several different parameters were tested, including pH, turbidity, dissolved oxygen, and specific conductance (Table 1). All data from water quality testing at Wild Basin can be found online at the CRWN website (https://crwn.lcra.org/events.aspx?qrySite=72).

Concerns about unusually high turbidity levels and sedimentation in Bee Creek were reported to City of Austin environmental inspectors on multiple occasions, beginning in November 2014. Wild Basin staff, St. Edward's University students, and Travis County staff helped document conditions in Bee Creek with photographs and a written report in October 2015.

Table 1. Water quality parameters tested at Wild Basin, Oct 2014-Sept 2015

Date	Time	Air Temp (C)	Water Temp (C)	Flow	pH	Nitrates-N (mg/L)	DO Avg (mg/L)	DO % Sat	Cond (µS/cm)	Days Since Rain	Field Rain Gauge (in.)	Transparency (M)
10/24/14	10:30	22	22	3	7.5	< 1	7	79.8	940	11	0	> 1.22
11/25/14	9:20	11	11	5	7.5	< 4	8.9	81.88	970	3	1.4	0.09
1/30/15	10:06	9.5	13	5	7.5	< 4	8.1	77.76	980	7	0	0.93
2/27/15	13:00	2	9	3	7.5	< 4	9.3	81.84	970	24	0	0.4
3/27/15	10:45	16	14	5	7	< 4	7.7	75.46	950	6	0.05	> 1.2
4/24/15	13:00	26	20	3	7.5	< 2	6.33	69.63	830	0	0.43	0.2
6/4/15	11:00	26	21	5	7.5	< 2	6.1	68.32	880	6	0	1.22
7/1/15	11:35	28	22.5	3	7	< 1	5.5	63.25	820	1	0.7	> 1.22
7/30/15	10:00	30	23.5	2	7.5		6.3	73.71	860	30	0	> 1.22
8/25/15	10:35	30.5	25	2	7	< 1	6.25	75	910	4	0	
9/25/15	9:30	26	21.5	3	7	< 1	8	90.4	830	16	0	>1.22

OUTREACH, EDUCATION, AND VOLUNTEER COORDINATION

Wild Basin has been active in providing environmental educational opportunities and volunteer stewardship opportunities for the community. The major programs held at Wild Basin from October 1, 2014 to September 30, 2015 are summarized below.

Environmental education & interpretation programs

- School & Group Tours – Approximately **800 adolescents**, including students from local schools and community groups, attended education programs at Wild Basin. Group size limits are restricted and capped at a maximum of 40 students per visit. Nine volunteers donated an estimated **297 hours** to assist with these education programs.
- Family & Public Programs – Local children and families attended several public programs hosted by Wild Basin in 2015 including stargazing, kid-friendly hikes, full moon yoga, and public guided hikes. The stargazing tours were made possible through the volunteer efforts of the Austin Astronomical Society. On the second Saturday of each month, Wild Basin hosts a guided hike, and an additional guided hike on the fourth Saturday of the month is occasionally offered as well.
- BCP Hike and Lecture Series – Wild Basin hosted six events as part of the Hike & Lecture series. Events focused on kid-friendly and family activities such as flint knapping, an insect safari hike, a bat lecture, two spider lectures and hike, and a family birding hike.
- STEM Teacher Trainings – Wild Basin staff hosted a teacher development training session in Fall 2015 for 35 science and math teachers in K-12 schools. The teacher training sessions were funded by 3M and Applied Materials.
- Sierra Club Night Hikes – During several full moons this year, Wild Basin hosted free night hikes that were open to the public and organized by the Austin chapter of the Sierra Club.
- Austin Families and Nature Guided Hikes – Wild Basin hosted two guided hikes for this organized group of home-school families.

Environmental education resources for the public

- Interpretative Education Center – School groups and the general public have access to the Wild Basin visitors center on Monday-Friday, 9am-4pm. New exhibits were installed in 2015, including a 3-D contour map of Wild Basin, two microscopes with large display monitors, an insect wall, and educational panels about the Balcones Canyonlands Preserve and ecosystem services. In addition, we developed five videos with tour guides, volunteers, and students explaining key environmental topics at Wild Basin, such as golden-

cheeked warblers, the wildfire of 1961, watersheds & Bee Creek, and wildlife species at Wild Basin. These videos play daily on a large screen inside the visitors center.

- Public visitation – We placed 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 by the counters (arriving and leaving), so we add the totals from both counters together and divide by two for monthly visitation estimates. Estimates from the trail counters indicate Wild Basin receives **an average of 200-300 visitors per week,** including public, K-12 students, St. Edward's University students, researchers, and volunteers. Visitation rates are lowest in August (estimated 800-900 visitors/month) and greatest in March and April (estimated 2000 visitors/month). We conducted in-person visitor counts over two days in April 2015, with one weekday count and one weekend day count. The in-person visitor counts suggested that the trail counter units provide fairly accurate estimates of trail visitation (although trail counters likely miss some visitors, especially when in groups).

Citizen science

- eBird quarterly walks – Wild Basin staff and volunteers coordinated quarterly bird walks for the public to participate in the citizen science program, eBird, run by the Cornell Lab of Ornithology and National Audubon Society. Three sections of Wild Basin's trail systems are included as separate survey locations (360 Trail Segment, Bee Creek Segment, and North Hollow Segment), and all birds seen or heard during the quarterly walks were recorded in the eBird database. Thirty-five bird species were recorded during the 2015 eBird walks, with over 30 volunteers contributing as participants.
- iNaturalist – Students, volunteer natural resource stewards, and the public are encouraged to participate in the Wild Basin Biodiversity Project, a citizen science project on the iNaturalist platform (www.inaturalist.org). This project allows users to submit observations of flora and fauna, supported by photos or 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 also allows users to view observations uploaded by other visitors to the preserve. A total of **287 observations documenting 118 species** have

been reported by students and visitors in the Wild Basin Biodiversity Project on iNaturalist.

- National Geographic's Global Snapshot of Biodiversity – Students and visitors to Wild Basin documented over 70 plant and animal observations in iNaturalist as part of the Global Snapshot of Biodiversity coordinated by National Geographic in May 2015.
- Texas Nature Challenge – Wild Basin was a participant in the Central Texas Challenge from May-August 2015. Families could participate in an iNaturalist challenge and then document their experiences in blog or scrapbook form.

Volunteer stewardship

- Volunteer Stewardship Workdays- Wild Basin provides an opportunity for the public to volunteer and assist with land management activities, as well as learn about the BCP and conservation issues. Collectively, **land management volunteers contributed approximately 1,244 hours** from Oct 2014-Sept 2015. This includes contributions from approximately 200 volunteers participating in Saturday workdays, corporate group stewardship events, and a dedicated small group of volunteers participating in weekly workdays. Specific stewardship events include the following:
    - Wild Basin Stewardship Days – the public is invited to participate in stewardship days at Wild Basin one Saturday per month. During the period from Oct 2014-Sept 2015, volunteers on Saturday workdays collectively contributed over 400 hours of service.
    - St. Edward's University Stewardship Days – Wild Basin hosted three stewardship events specifically for St. Edward's University students (Oct 2014, Feb 2015, and Sept 2015). Over 80 students participated in volunteer stewardship activities including invasive species removal, trash pickup, and trail maintenance.
    - St. Stephen's Stewardship Day – In March 2015, a group of 15 students and teachers from St. Stephen's school volunteered in picking up trash along the preserve boundary with Hwy 360.
    - Dell volunteer group – Approximately 20 volunteers from Dell came to help at Wild Basin on two occasions (in March 2015 and September 2015), helping to prune vegetation, remove snags overhanging the trails, and restore slopes uphill of trails to prevent erosion.

Public events, meetings, workshops, and conferences

- Balcones Canyonlands Preserve (BCP) – Wild Basin hosted several of the BCP Education/Outreach meetings. We also hosted a meeting for the Strategic Research Planning subcommittee with representatives from Concordia University, Texas Parks & Wildlife, Wild Basin, University of Texas, and Texas Land Conservancy.
- REI – REI conducted outdoor workshops and trainings such as Wilderness First Aid, Wilderness Survival, and Intro to Backpacking at Wild Basin.
- Meetings of local organizations – Wild Basin hosted several group meetings for entities such as Lower Colorado River Authority, Bat Conservation International, Mosaic Jewish Outdoor Club, Earth Native, Sierra Club, Los Comadres, City of Austin Watershed Protection Department, and City of Austin Wildland Conservation Division.

St. Edward's University Events

- "Nature as Muse" photocommunications class and exhibition – Students in this course met at Wild Basin weekly for instruction and photography in the field. The course culminated in a public exhibition of student work in the visitors center and outdoor classroom in Spring 2015.
- Biology 1107 - Cells, Genetics, and Organ Systems - This introductory biology lab incorporated a course-based undergraduate research experience (CURE) that allowed students to participate in hands-on research. Approximately 200 students participated in a project to collect water samples and evaluate water quality parameters in Bee Creek.
- Student research symposiums – 36 student researchers presented their work on Wild Basin-related projects at two symposiums on the St. Edward's University campus. This included 12 graduate student presentations at the 3rd Annual Research Symposium for the Professional Science and Master's in Environmental Management and Sustainability program, and 24 students at the NSF-CASAR/TG/Keck Summer 2015 Research Symposium. Several graduate students also presented their Wild Basin research at national and international conferences, including the International Congress for Conservation Biology conference in Montpelier, France.

- Wild Basin Internship program – Wild Basin provided internships for 13 students in 2015. This includes internships in Environmental Management, Sustainability, Environmental Education, and Outreach/Social Media.
- St. Edward's University events – Wild Basin staff provided resources and community outreach at several SEU events on campus such as Earth Day, Sustainability Fair, and Student Involvement Fair
- Staff Retreats and Meetings – Various departments and school groups from SEU scheduled their planning and staff retreats at Wild Basin including School of Humanities, School of Behavioral and Social Sciences, School of Education, Campus Ministry, Office of Advising, Office of Career and Professional Development, Health and Counseling, IT, Student Life, Student Leadership, and Dean's Retreat.
- Courses – A list of undergraduate and graduate courses that incorporated Wild Basin into their curricula in Fall 2014 and Spring, Summer, and Fall 2015 is included in Table 2. Over 400 university students visited Wild Basin as part of their course work in 2014-2015.

Table 2. Undergraduate & graduate classes taught at Wild Basin in 2014-2015.

Course #	Title	# of Students	Semester
BIOL 1305	Contemporary Biology	10	F2014
MSEM 6301	Population Ecology	18	F2014
BIOL 2420	Entomology	15	F2014
CULF 3331	Contemporary World Issues	22	F2014
BIOL 2428	Vertebrate Biology	2	F2014
BIOL 1424	Native Plants (Austin Community College)	10	F2014
PHCO 3322	Nature as Muse	12	S2015
ENSP 2349	Spatial Analysis in Field Biology	13	S2015
ENSP 2302	Environmental Geology	24	S2015
BIOL 1305	The Diversity of Life, an Evolutionary Perspective	1	S2015
ENSP 2349	Environmental Leadership in Costa Rica	20	S2015
BUSI 4349	Strategic Management	2	S2015
ENSP 1304	Introduction to Sustainability	25	F2015
ENTR 3381	Entrepreneurship	8	F2015
BIOL 1107	Cells, Genetics, and Organ Systems Lab	224	F2015
SCIE 2320	Science in Perspective	13	F2015
	TOTAL	**417 students**	**16 classes**

Publications

- Wild Basin staff and interns reported on Wild Basin news, events, and volunteers in two email newsletters, as well as updates in regular blog posts and social media outlets.
- An article titled “Wild Basin preserve said to be worth millions ecology-wise” was published in the Austin American Statesman in June 2015 (http://www.statesman.com/news/news/local/wild-basin-worth-millions-in-eco-value-researchers/nmkDG/)
- St. Edward’s University student and Hook Scholar Brandy Shigemoto created a booklet for children titled *A Field Guide to the Golden-cheeked Warbler*.

SCIENTIFIC RESEARCH

Thirteen research projects received scientific research permits and completed work at Wild Basin in 2015. Three additional research projects were completed at Wild Basin but did not require permits (GIS and social survey-based research). Short summaries of all permitted projects are included below.

(1) Cybulska, L. and C. Cormier. The distribution of ticks across an urban landscape within and close to Austin, Texas.

ABSTRACT: The goal of this research study was to measure the distribution of tick populations in public parks in and around Austin, Texas, and to determine whether there is a correlation between the presence of ticks and any environmental variables that were measured. Carbon dioxide (CO_2) traps and tick drag nets were used to capture the tick samples. The variables that were measured include time, air temperature (°C), ground temperature (°C), humidity (%), underbrush level (0-4), light level (lux), wind speed (m/s) and direction, distance to water and roads, and the presence or absence of ticks in that area. Our seven study sites included the Bull Creek Greenbelt, Wild Basin Wilderness Preserve, Blunn Creek Nature Preserve, the Austin Nature & Science Center, the Barton Creek Greenbelt (Scottish Woods Trail and Zilker Park Access), Garlic Creek Park, and a wooded private property in Dripping Springs, TX. Although the overall number of ticks collected was relatively low (n = 14) largely due to cold weather during the first half of this study, there did appear to be some correlations made between some variables and the presence or absence of ticks. Distance to road (R= .667), distance to water (R = .445),

underbrush level (R = .309), and ground temperature (R = .293) had the greatest significance, respectively, when compared to tick presence/absence.

(2) Millan, P., A. Maxon, and S. Sheputa. The relationship between white-tailed deer, ground cover, and proximity to residences.

ABSTRACT: Overpopulation of white-tailed deer (*Odocoileus virginianus*) in North America has led to vast effects on vegetation growth and diversity, as well detrimental human-wildlife interactions, such as automobile accidents. The goal of our study was to determine how deer density, activity, and vegetative cover varied across an urban nature preserve in relation to roads, neighborhoods, and a field station. We used camera traps to estimate deer population density and activity across Wild Basin Wilderness Preserve in Austin, Texas. We gathered this information by calculating the angle of detection along with data on average velocity and group size in the preserve. To estimate plant species diversity we established vegetation plots around the camera traps and identified plant species and average height. We found a significant positive correlation between deer activity and vegetation height (rho = 0.84, p = 0.036) and a near significant negative correlation between deer density and residential areas (rho = -0.828, p = 0.058). These results suggest that with an increase in grass height there is more deer activity and with a decrease in proximity to residential areas there is a decrease in deer density. The findings are vital for understanding spatial variation in the movement and distribution of white-tailed deer, which can influence the plant communities through grazing effects. Our results can be used to improve management practices, particularly in urban landscapes where deer density is high. As many urban areas are currently increasing the protection of green space within the city, is critical for both the well being of ecosystems and human society to understand how the dominant large mammalian herbivore in North America can be effectively managed in these systems.

(3) Barnes, M. and A. Haynes. Effects of anthropogenic noise on soundscape and the stress hormone levels of the Gulf Coast toad (Incilius valliceps) in Central Texas.

ABSTRACT: Environmental stressors affect all organisms and those stressors play a role in driving adaptive evolution. Stress may reduce reproductive success or suppress immune system responses, thus reducing fitness (Bee & Swanson 2007; Wollermann & Wiley 2002; Parris et. al. 2009; Rollinns-Smith et. al. 2011; Gabor et. al. 2013). One such stressor includes sound (Tennessen et. al. 2014), with variation in frequency, intensity, and source influencing how stressful a specific sound is for a

particular species. All the sounds present within an environment make up a soundscape. With increasing fragmentation due to roads and highways, populations are becoming increasingly subjected to noise from traffic, particularly on the borders of the fragmented habitats. To understand the role road traffic noise plays in a soundscape, we collected 123 sound samples within a wilderness preserve bordered by a major highway (Wild Basin Wilderness Preserve). Our results indicate that distance from the highway can explain 66.1% of noise variation within the preserve. Recent studies have shown that road noise does affect anuran behavior primarily in regards to mate choice (Bee & Swanson 2007; Wollermann & Wiley 2002; Parris et. al. 2009). Road noise may also indirectly affect reproduction if it triggers chronic stress.

(4) Salas, K. and A. Pasquier. Predicting the arrival time of emerald ash borer to Texas based on estimated speed of dispersal.

ABSTRACT: First reported in North America in 2002, the emerald ash borer (EAB, *Agrilus planipennis*) has been spreading rapidly from its point of invasion in Michigan. This spread has resulted in ash tree mortality in massive amounts on the scale of millions of individual trees. EAB appears to spread at a relatively constant dispersal rate, as over the past 13 years it has moved from southeast Michigan to states that are nearby Texas, including Colorado in 2013, Arkansas in 2014, Kansas and Louisiana in 2015. In this study we examined previous models conducted to estimate EAB invasion such as those conducted at the University of Illinois Urbana. From these studies we found that EAB has a detection lag of 2- 5 years from initial infestation. Our main questions include how fast EAB is spreading, time it will take EAB to reach Travis County, and based estimated speed how long does Travis county have to make plans for this possible invasion. The main goals included producing a time series video indicating current spread and future predicted spread. Estimating current spread of EAB and predicting future spread using 2-5 years of detection lag predicted by several studies. Our study used a dataset that was provided by USDA/APHIS on the EAB county detection per year. Using this data we conducted an analysis using ArcGIS to calculate distance from initial infection to all other infected counties. Once this analysis was complete we used SPSS to project our data as a regression from which we obtained a slope and used this as our factor for speed. Our analysis indicated that EAB spreads 45 km/year and it will reach Travis County in 2039. We also estimated based on the closest county to Texas using the same regression equation, EAB would reach Travis County in 2024. By estimating arrival times and dispersal pathways, our study provides critical information that can be used to slow and/or prevent the invasion before it occurs.

(5) Gamboa, S. E. Joelson, and C. McGlew. Comparison of carbon sequestration methodologies for use by academic institutions in Texas.

ABSTRACT: As natural areas are continuously converted for anthropogenic use, it is important to quantify the loss of ecosystem services to the nearby communities. Until recently, the study of these services in urban areas has been limited. However, efforts to preserve these lands would be better supported if methodology was easily accessible to quantify the ecosystem services. Specifically, carbon sequestration is critical to climate regulation. Therefore, our objectives were: 1) to compare two sets of methodology for quantifying carbon sequestration based upon ease of use, cost, time requirement, and accuracy: data provided by remote LiDAR technology and field measurements incorporated into the i-Tree Eco software system, and 2) to provide recommendations to promote biodiversity protection on lands in close proximity to urban areas. We quantified carbon sequestration at Wild Basin Wilderness Preserve in Austin, Texas. We used five plots, varying in ecosystem structures across the preserve, and measured the number of trees per species, as well as diameter at breast height (DBH) and height for each tree. These data were then entered into i-Tree Eco for an estimate of carbon sequestration. These field-based estimates were then compared to estimates provided by remote LiDAR data. We found a strong positive correlation between average canopy height and amount of carbon being sequestered at each plot (rho = 0.90 p = 0.037). By improving access to different methodologies, more land potentially will be conserved and restored, which may increase protection of urban biodiversity and enhance the health and well-being of city residents.

(6) Jacot, J. Non-Target Tree Mortality After Exposure to Imazypr at Wild Basin.

ABSTRACT: The herbicide Imazapyr was injected into four large Japanese privet trees at Wild Basin Wilderness Preserve in 2014 using the EZ-Ject lance. While known as an effective measure for containing invasive species, imazapyr is also a persistent chemical known to have harmful effects on neighboring plants in some circumstances. In order to see if this was the case at Wild Basin, apical meristems of yaupon hollies and Lindheimer's silk tassels surrounding the injected trees were measured from February to April of 2015. The expected results included decreased meristem growth on plants downslope from or nearer to the injected specimen. It was concluded that being downslope from or nearer to the injected tree did indeed decrease the growth rate of nearby vegetation. This could be due to the effects of herbicide spread or other environmental factors. This shows that even an herbicide with comparatively few negative chemical qualities can still have detrimental effects

in a community. Vegetation close to and downslope from the injected trees are at particular risk and should be monitored when handling invasive species removal. Additional studies on this question were conducted in Summer 2015 (see below).

(7) Hauser, C. Metagenomics of Glen Rose Soil Microbial Systems and Their Roles in Carbon Cycling and Native Plant Restoration.

ABSTRACT: Central Texas has a region of uplifted limestone, the Edwards Plateau, providing an island of glen rose soils that fostered the speciation of many organisms and forms one of North America's areas of endemism. With an extreme and unpredictably variable climate, and alkaline soils, the survival of regional flora is increasing recognized to be dependent on tight relationships with soil microbial populations, none of which have been described. The soil biota project proposed will fall within the framework of the development of multiple species monitoring approaches for HCPs and we will follow standards now used in other HCPs (Barrows et al. 2005).

Over the summer of 2015 root microbiome was sampled from seven plant species: *Muhlenbergia reverchonii, Yucca rupicola, Sophora secundiflora, Juniperus ashei, Arbutus xalapensis, Nolina lindheimeri, Prosopis glandulosa* from the Wild Basin Creative Research Center. Microbial (bacterial, fungal) DNA samples derived from four samples associated with each species are currently being sequenced. In addition, a preliminary analysis of the microbial DNA sequences obtained from four species sampled Summer 2014 (*Muhlenbergia reverchonii*, *Carex planostachys*, *Schizachyrium scoparium*, *Juniperus ashei*) reveals potential recruitment of specific bacterial populations to rhizosphere and endosphere for each species.

Characterization of rhizosphere and endosphere microbial communities associated with endemic plants typical of black-capped vireo habitat will potentially inform restoration efforts regarding the requirements for these communities in efforts to restore/expand these habitats.

(8) Johnson, D., A. Hernandez, M. Sanchez, A. Brebion, V. Johnson, B. Navoichek, and S. Garcia. Determining interannual variability in vegetation structure and exploring plant leaf decomposition and fungal metabolism at Wild Basin Wilderness Preserve.

SUMMARY REPORT:

We resampled transects and plots, originally surveyed in 2013, for plant community composition in Wild Basin Preserve in the early summer 2015. These plots and transects were near photo-points located throughout the preserve. This study augments both the long-term management goals of Wild Basin within BCP (Forest for the trees 1999, BCP Land Management Plan 2005) and allowed students from

St. Edward's University first-hand experience conducting vegetation surveys. Plant community data was added to the database with the prior years, and change detection is currently in progress. Additionally, we continued to explore the relationships between ecosystem structure and function. In 2014, we documented leaf litter decomposition of three dominant tree species (*Quercus fusiformis*, *Q. texana*, and *Juniperus ashei*), and found that decomposition varies due to structural carbon differences between plant taxa. We repeated this sampling to determine if litter decomposition differed in 2014 and 2015 due to differences in precipitation.

Currently, the combined community analysis for all years is in progress. Preliminary results suggest higher gramminoid and forb cover across all communities in 2015, relative to 2014 and 2013. This may reflect greater precipitation. Both deciduous and evergreen tree/shrub cover has slightly increased across years across all communities. The leaf decomposition study suggests that decomposition was also greater in 2015 than in 2014, again perhaps reflecting differences in precipitation between the two years. A large analysis of all years of data is in preparation for publication in a peer-reviewed journal for 2016.

(9) Belaire, A., C. Dunphy, D. Hutchinson, R. Vargas, B. Davidson, A. Cuartas-Olarte, and N. Salinas. Abundance and distribution of avian nest predators and predator activity at Wild Basin.

ABSTRACT: Nest predator distribution and activity may have important implications for the Golden-cheeked Warbler. Some avian nest predators, especially corvid species, tend to be more abundant in human-altered landscapes. Generally, urbanization is accompanied by an increase in nest predators with a simultaneous decrease in predation rates, a phenomenon termed the "urban predation paradox." The goal of this project was to evaluate the abundance and distribution of several common avian nest predators within the Wild Basin landscape and examine the relationship between predator numbers and predatory activity. We established a grid of 13 points across the Wild Basin landscape. At each point, we conducted point counts to document presence and abundance of avian nest predators, and then we set up artificial nests with a motion-triggered camera to record video clips of any activity at the nest. Each artificial nest contained one quail egg and one plasticine egg, and nests were placed to mimic GCWA nesting position to the extent possible. Nests remained in place for one week. After collecting the eggs and cameras, we analyzed all video footage and characterized the level and type of predator activity at each nest.

Our results indicated that blue jays were more widespread across the preserve than were western scrub-jays; however, we found that blue jays visited nests less often than we would expect based on their distribution. Furthermore, even when blue jays visited a nest, they rarely attempted to remove an egg (50% of visits resulted in predation activity). The opposite trends were found for western scrub-jays, in that this species visited nests in the same locations where it was observed at point counts, and 100% of visits translated to predation activity. This suggests that the "urban predator paradox" may be occurring with urban adapter species, such as blue jays, but not with urban avoiders such as the western scrub-jay. Blue jays may be feeding on anthropogenic food sources in this urban landscape, leading to decreased rates of predation activity by blue jays. In total, eggs were removed from six of 12 artificial nests; the western scrub-jay was the most common predator (two eggs each from three total nests), and squirrels (two eggs from one nest) and blue jays (one egg from one nest) visited nests less frequently.

(10) Belaire, A., T. Bilinski, R. Vargas, N. Salinas, A. Cuartas-Olarte, and B. Davidson. Evaluating the potential off-target effects of imazapyr injection using the EZ-Ject lance.

ABSTRACT: In this study, we evaluated neighboring plants and soils around invasive trees that were injected with imazapyr using the EZ-Ject lance. We evaluated both short-term (Part 1) and long-term effects (Part 2). To examine short-term effects (Part 1), we evaluated changes in plant health and soil microbial activity between pre-injection and 3 weeks post-injection. Samples were collected at distances of 1m, 2m, and 3m from the injected stem, including both uphill and downhill samples. Our results for the pre- and post-injection comparisons demonstrated no statistically significant declines in the plant and soil response variables. There were declines in plant health and leaf area, but similar patterns were noted in control plants in the area for the same time interval. Furthermore, when we restricted the analysis to examine very close plants (within 1m of injected stem) and uphill vs downhill of injected, we still found no significant effects. In one case, we did find that a small Japanese privet <1m from an injected privet experienced mortality, suggesting some translocation through root grafting of same species. To examine the long-term effects (Part 2), we evaluated soil health and leaf litter near invasive trees that were injected several months prior to the study (3 months and 12 months). We found a significant difference in cellulose-degradation activity in leaf litter when we included these long-term sites in the analysis.

(11) Belaire, A., T. Bilinski, D. Johnson, A. Cuartas-Olarte, M. Rodriguez, and A. Brebion. Evaluating stream water quality in an urbanizing watershed.

ABSTRACT: The benefits that nature provides to people are called “ecosystem services,” which include goods and services like clean air, clean water, and livable climate. This study aimed to shed light on the water filtration services that natural areas like Wild Basin provide in an urbanizing watershed. Four sample points within the Bee Creek watershed were evaluated, each with distinct drainage basin characteristics and different upstream coverage of impervious surfaces, including two points on Bee Creek near the culvert under Loop 360, one point in North Hollow (an intermittent creek and tributary to Bee Creek, with a partly urbanized drainage area), and one point in an ephemeral tributary to Bee Creek (with a completely wooded drainage area). At each sample point, we investigated several indicators of water quality, including dissolved oxygen, conductivity, bacteria concentrations, and invertebrate biodiversity.

Results indicated that the Bee Creek sampling points had higher DO, conductivity, and bacterial concentrations than the points with more forested drainage areas. The ephemeral creek with a completely wooded drainage area had the best water quality based on chemical and bacterial indicators. Total biodiversity varied between the sampling points, with the North Hollow site containing the greatest number of taxa overall and 7 species classified as sensitive to water quality impairment, and, at the other end of the spectrum, the Bee Creek sites containing fewer taxa and only 1 sensitive species. These results suggest that Wild Basin provides an ecosystem service by filtering water that flows into several tributaries of Bee Creek, providing better water quality and conditions that support aquatic biodiversity.

(12) Bilinski, T., M Rodriguez, D. Rivas, E. Nguyen, D. Reveles, and J. Williamson. Linking native plant ecology to soil microbial community function.

ABSTRACT: All work planned for this permit fell under the imazapyr and water quality permits (10 and 11 above), and there are no additional results to report.

(13) Belaire, A. Documenting spatial and temporal patterns in wildlife distribution across Wild Basin.

ABSTRACT: Different wildlife species respond differently to environmental characteristics of the landscape and encroaching urbanization. The goal of this project is to begin documenting the long-term spatial and temporal patterns in wildlife distribution at Wild Basin. Thirteen motion-triggered cameras are set up on a sample grid of points spaced approximately 250m apart from each other, and SD cards from the cameras are collected every 6-8 weeks. Students help sort through

and analyze all images collected from cameras. Species such as white-tailed deer, bobcats, coyotes, and armadillos have been documented, and continued analysis by students in Spring 2016 will help shed light on patterns in wildlife distribution and activity. We expect to share images and findings from this project with visitors to Wild Basin and with the broader public via our website and social media.

FACILITIES AND SIGNS

Facilities

- New exhibits have been added in the visitors center, and several more exhibits are currently being developed. New exhibits include a 3-D contour map of Wild Basin, two microscopes with large display monitors, an insect wall, educational panels about the Balcones Canyonlands Preserve and ecosystem services, and a large TV screen to play interpretive videos featuring Wild Basin tour guides, volunteers, and students.
- The building's security system is currently monitored by ADT.
- We have been actively working on rodent control in the building.
- Compost toilets were emptied by a septic service in 2015.
- Several potholes in the driveway were filled, and additional work is expected in the coming year.

Signs and maps

- We are moving toward a paper-free system for delivering interpretive content and maps to visitors. Currently, we have two versions of digital maps available on the website homepage (www.wildbasin.org) 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 resources available on the website, including interpretive information and resources for specific age groups. Paper maps are still available inside the visitors center, and a weather-resistant map of the trail system is mounted at each trailhead.
- Several new trail signs were added at confusing trail intersections.

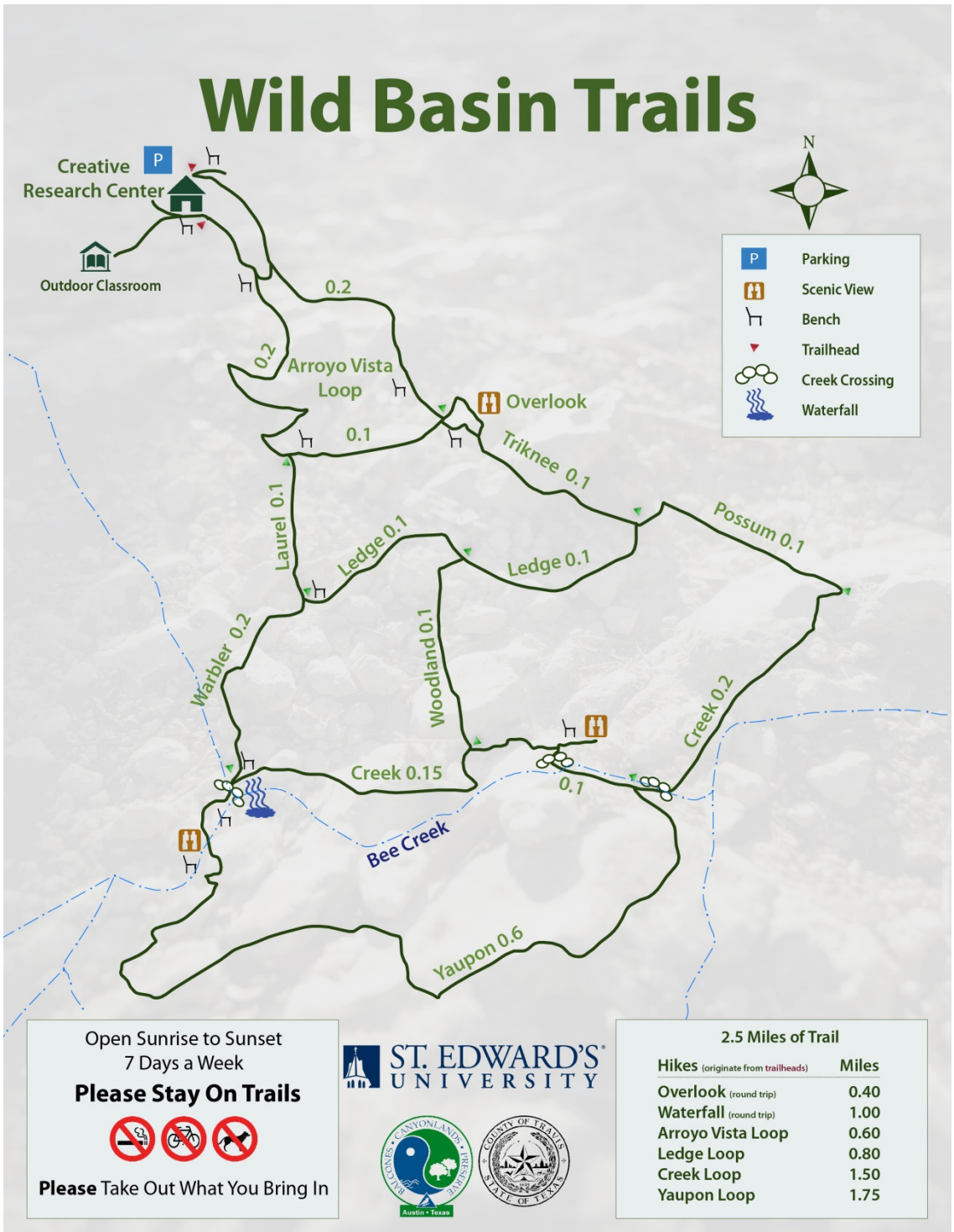
SECURITY, ACCESS AND SAFETY

Fire Safety

- Wild Basin staff communicated with Travis County personnel about fire prevention and evacuation planning. We are following the FireWise protocols of removing dead and down trees near the visitors center and adjacent to the driveway.
- Care Specialty currently monitors for fire in the building.
- Westlake Fire Department inspected the visitors center and the newly-installed solar-powered gate at the entry, and we passed inspection.

APPENDICES

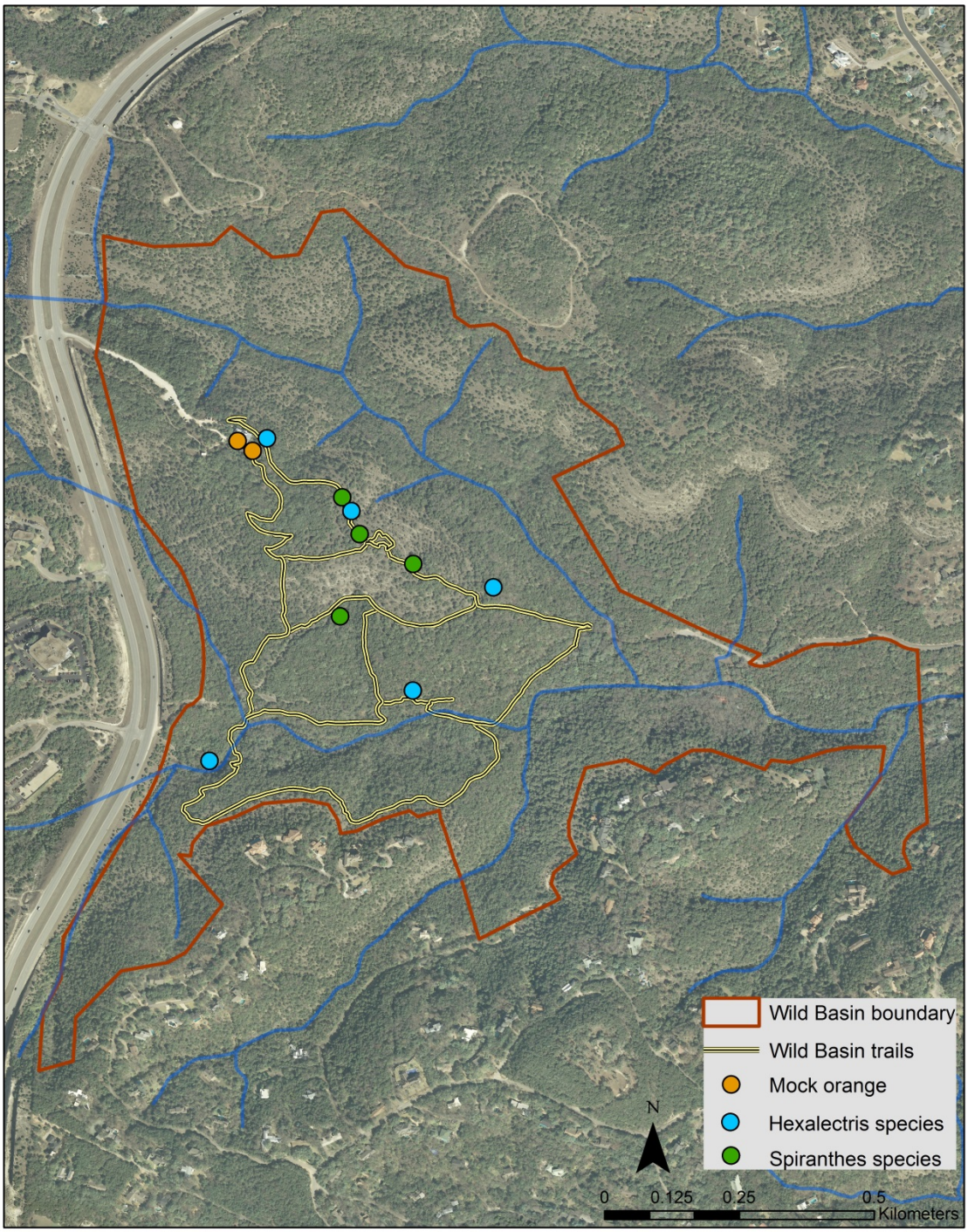
APPENDIX A: Map of Wild Basin Wilderness Preserve trail system



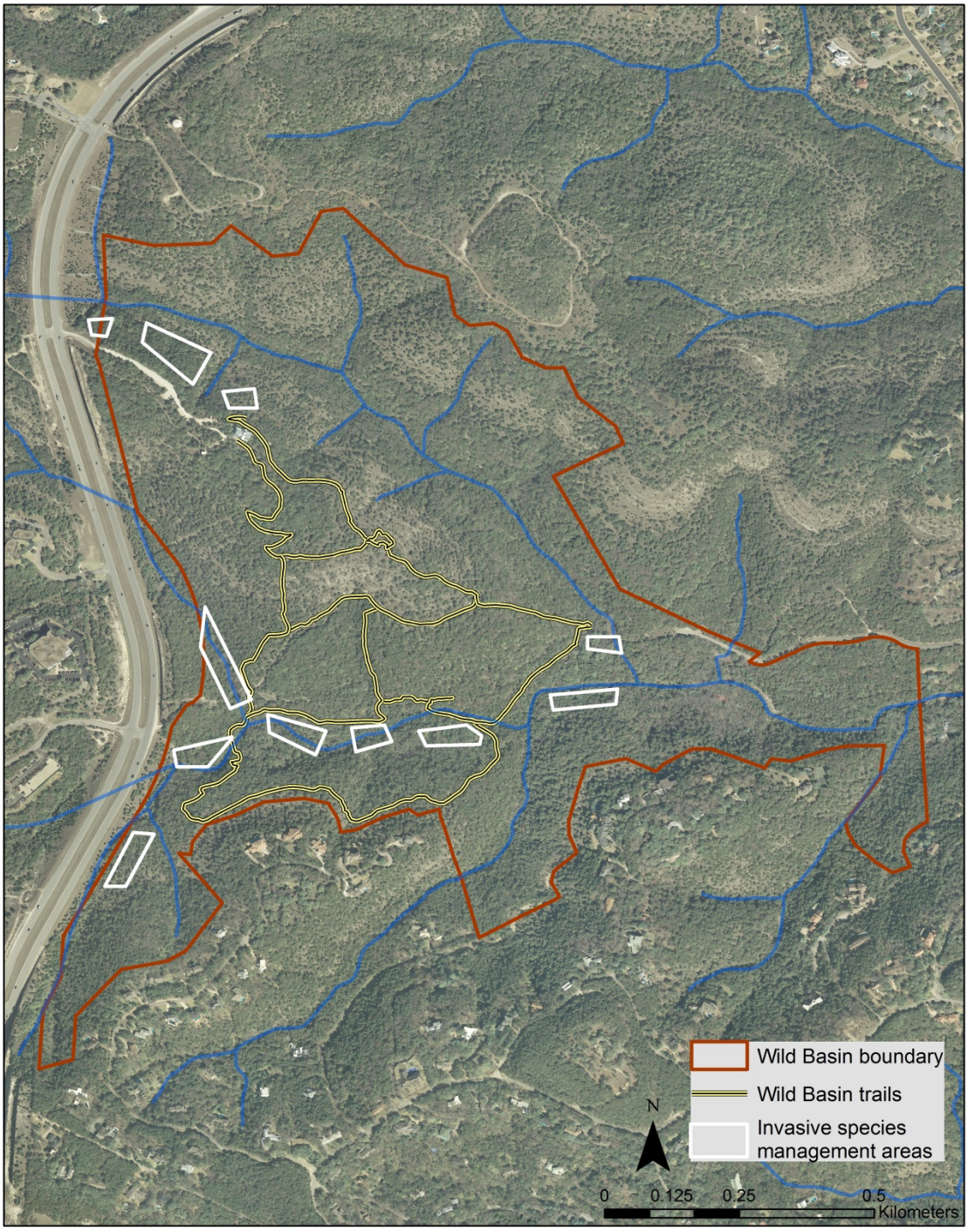
APPENDIX B: Aerial Map of Wild Basin and residential neighbors to south and east



APPENDIX C: Locations of rare plants identified at Wild Basin from Oct 2014-Sept 2015



APPENDIX D: Locations of invasive species removal at Wild Basin from Oct 2014-Sept 2015



APPENDIX E: Golden-cheeked Warbler Survey Summary 2015

Summary of 2015 Golden-cheeked Warbler surveys at Wild Basin Wilderness Preserve by Darrell Hutchinson

A total of fifty-one surveys were conducted at Wild Basin and Vireo Preserve between March 5 - June 11 by Darrell Hutchinson and Laurel Moulton for a total of 255 survey hours.

Four banded males and one unbanded male occupied a total of five territories inside and on the edge of the Wild Basin Preserve boundary (see 2015 VPWB Territory Polygons). Two color-banded males returned to occupy their same territory from previous years. NB/WH:MV/SI was banded at Vireo Preserve on 3/25/11 and returned for the fifth year in a row. OR/YE:NB/SI was banded at Vireo Preserve on 4/8/14. This year, City of Austin biologists Mark Sanders and John Chenoweth banded two second-year birds PI/SI:NB/DB and DG/SI:PI/OR on April 24. On May 16, Jennifer Reidy banded two nestlings belonging to NB/WH:MV/SI, but the nest was predated on May 18 by Western scrub jays and no fledglings were observed.

Golden-cheeked warblers arrived on their breeding grounds late this spring, compared to other years. The earliest males at Wild Basin, including the two older banded males, were first detected on March 17. The younger males didn't arrive until March 27, and the first females weren't detected until April 3. This protracted arrival was observed across the Balcones Canyonlands Preserve. Possible explanations include low insect availability due to cooler than average temperatures in February and March and/or the occurrence of several cold fronts that inhibited northward migration.

Five Golden-cheeked warbler nests were found by City of Austin biologists. One pair bred successfully, four pairs were unsuccessful, and one second year male failed to attract a mate and departed the plot in mid-April:

- OR/YE:NB/SI fledged four on May 7, although their nest was not found. OR/YE:NB/SI was also the only pair to fledge successfully in 2014.
- A second attempt nest was found for NB/WH:MV/SI during nestling stage on May 12. This nest was located in open woodland at an elevation higher above the

creek than expected. Western scrub jays were observed in the vicinity of the nest on three occasions during the nestling period, including May 18, the day it was predated.

- Both first and second nests for DG/SI:PI/OR were found, and both failed. The first nest was found during building stage on April 6. On April 13, the nest was smeared across a horizontal branch, presumably eggs taken by an arboreal mammal, likely Fox squirrel. The female soon began to rebuild and the second nest was found on April 18. On May 14, that nest was observed predated close to the predicted fledging date.
- A first nest for PI/SI:NB/DB was discovered during building stage on April 9 and subsequently abandoned. On April 21, the female was observed collecting material for a second nest. The renest was not found and presumed predated.
- The nest for UBWBVP1 was found on April 29 during nestling stage. On May 7, the nest was predated on the predicted fledging date.

At Vireo Preserve, three males established territories, but only one pair was confirmed breeding. WH/DG:PI/SI's nest was predated May 14 on the predicted fledging date.

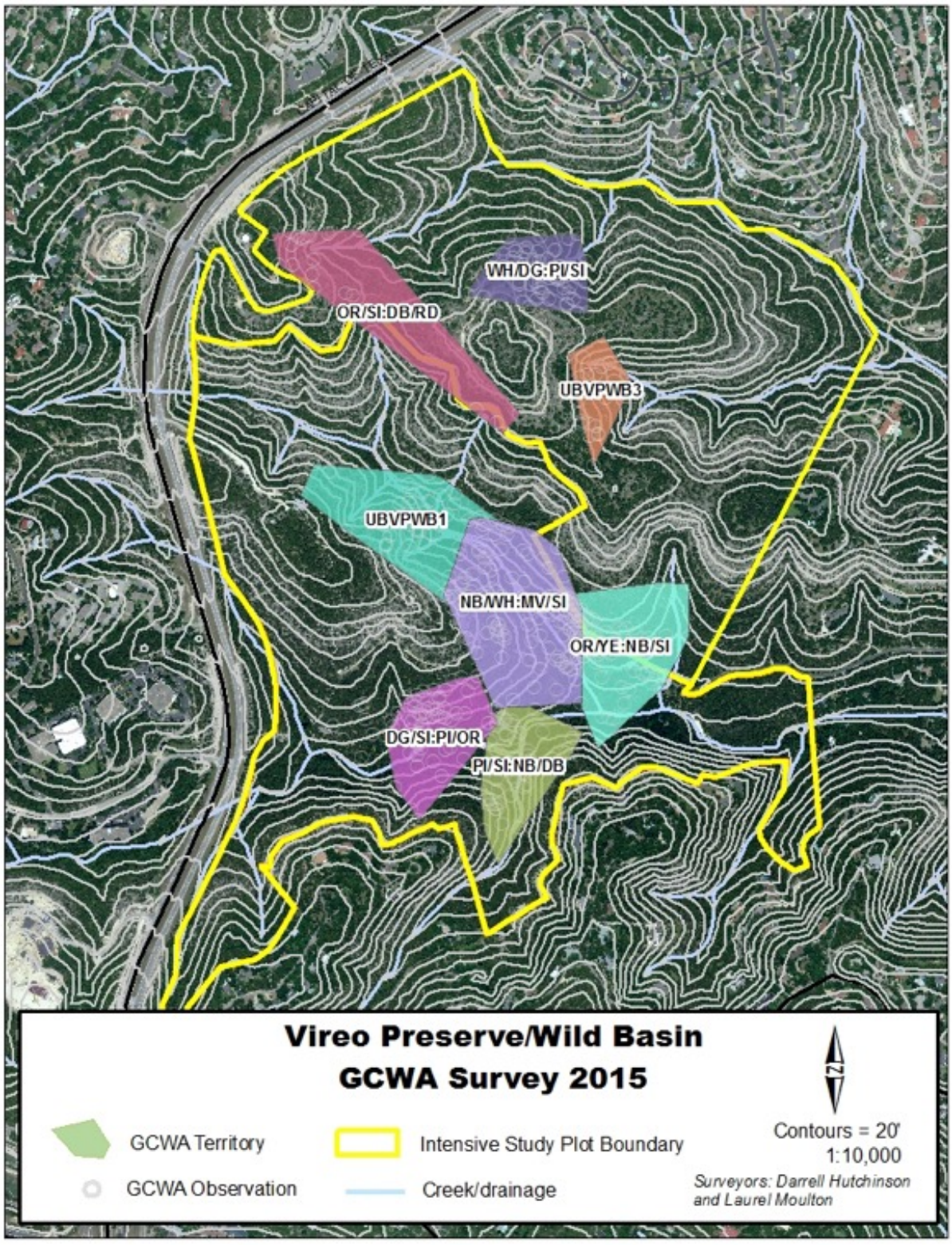
In general, territory occupancy was comparable to other years, although no partial territories were detected along the boundary of Wild Basin. For the first year since 2011, the male occupying the territory along the southeast drainage by Warbler Trail failed to attract a mate.

Compared to other plots on the BCP, the breeding success rate at Wild Basin/Vireo Preserve (13%) is low. Out of 8 territorial males, 6 mated, and only one pair reproduced successfully. This same pair was the only one to reproduce successfully in 2014.

Predation pressure on avian nests by jays was documented in a separate study conducted at Wild Basin in 2015. Eleven artificial nests were each baited with one quail and one clay egg and placed in Ashe juniper trees. Nest activity was monitored by video camera. Blue jays visited 2 nests with 50% of visits resulting in predation; Western scrub jays visited 3 nests with 100% of visits resulting in predation; and squirrels visited to 2 nests with 50% of visits resulting in predation. 6/11 total nests were visited by one of these 3 species.

This year, 4/4 monitored Golden-cheeked warbler nests that reached the nestling stage were predated on or very near the predicted fledging date. Parental visits to the nest increase as nestlings become larger and require more food. Although increased feeding frequency makes the nest more conspicuous to predators, at least one warbler nest was observed with Scrub jays nearby early in the nestling stage. Given the timing of all four nest predation events, it's tempting to ponder whether the jays are effectively cacheing food by waiting for the nestlings to grow larger before consuming them.

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.


WH/DG:PI/SI
OR/SI:DB/RD
UBVPWB3
UBVPWB1
NB/WH:MV/SI
OR/YE:NB/SI
DG/SI:PI/OR
PI/SI:NB/DB
Vireo Preserve/Wild Basin
GCWA Survey 2015
GCWA Territory
GCWA Observation
Intensive Study Plot Boundary
Creek/drainage
Contours = 20'
1:10,000
Surveyors: Darrell Hutchinson and Laurel Moulton

APPENDIX F: Results of white-tailed deer (*Odocoileus virginianus*) surveys in the neighborhoods south of Wild Basin, October 2014

Deer Population Summary using BCP Template									
Macrosite	**Wild Basin Preserve**				Survey Technique	**Modified Hahn Line**			
County	**Travis**				Year	**2014**			
		Deer Observed					Acres	Per	per
Survey Rout	Date	Bucks	Does	Fawns	Unkn	Total	Sampled*	Deer	1,000
Wild Basin	10/9/2014	3	8	0	0	11	69.0	6.3	159.4
Wild Basin	10/13/2014	0	0	0	0	0	69.0	-	0.0
Wild Basin	10/23/2014	0	7	1	0	8	69.0	8.6	115.9
Survey Total		**3**	**15**	**1**	**0**	19	**207.0**	**3.3**	**91.8**
Preserve Size = 227 acres									