2008 ANNUAL REPORT

for the period 1 January 2008 – 31 December 2008
from the Committee for Wild Basin Wilderness, Inc.

presented to

TRAVIS COUNTY COMMISSIONERS COURT AND TRANSPORTATION and NATURAL RESOURCES

This annual report on the management and environmental education activities conducted for Wild Basin Wilderness Preserve is submitted in compliance with the contract between The Committee for Wild Basin Wilderness, Inc. and Travis County.

TABLE OF CONTENTS

PRESERVE MANAGEMENT…3-4

Building Infrastructure…3
Security…4

EDUCATIONAL & EDUCATIONAL OUTREACH PROGRAMS…5-6

Environmental Education and Interpretation & Summer Programs…5
Public and Group Tours…5
Training Programs…5-6
Public Outreach…6
Affiliations & Publications…6

LAND MANAGEMENT PROGRAMS…7-12

Land Management Vision and Charges…7
Habitat Mosaic Assessment…7
Biological and other Surveys…7-9
Public Outreach…9-10
Visitation…10
Habitat Maintenance & Restoration…10-11
Equipment & Materials...11
Affiliations & Publications…11-12

THE COMMITTEE FOR WILD BASIN WILDERNESS, INC….13-14

Structure…13
Board Members…13
Staff…13
Aerial View of Wild Basin Wilderness Preserve…14

APPENDIX…15

Wild Basin Golden-cheeked Warbler (GCWA) Survey Results 2008
Wild Basin Species and Items of Interest 2006
Wild Basin Plant List "The Vegetation of Wild Basin"
Wild Basin Animal List "The Vertebrates of Wild Basin"
Wild Basin Amphibian Watch 2008
Wild Basin Bird Checklist 2006
Wild Basin Deer Census 2008
Wild Basin Self-Guided Visitors 2008
Wild Basin Emergency Plan 2008

PRESERVE MANAGEMENT

The Wild Basin staff implements the policies and priorities as set forth by the Committee for Wild Basin Wilderness, Inc., with guidance from St. Edward's University, and in accordance with BCP and Travis County rules and regulations. The Wild Basin Wilderness Preserve, in its role as an interdisciplinary laboratory of St. Edward's University, exists to protect and maintain its urban wilderness, and to promote the importance of environmental education, research, conservation and preservation. Collaboration between Wild Basin and St. Edward's enables the creation of programs and initiatives that serve to fulfill the mission.

In 2008, staff devoted their time to the day-to-day management of the preserve, including scheduling and supervising all educational programs, land management activities and programs and other work performed within its boundaries. They also supervised, coordinated and trained all volunteers and tour guides. All staff renewed their CPR and First Aid training and certifications in 2008.

Wild Basin's education and land management programs offered to schools and to the community are designed to promote awareness of environmental preservation, and encourage wise stewardship of the land. Through guided hikes, specialized study and volunteer opportunities, visitors to Wild Basin discover the many pressures on the natural quality of the preserve. From outside the preserve, residential and commercial development brings invasive, non-native plants and soil and watershed pollution. In addition, domestic animals, air, sound and light pollution can impact the preserve as well. Through outdoor study, experimentation, and hands-on opportunities, Wild Basin continues to bring awareness and an appreciation of the natural environment to the Central Texas community.

Building Infrastructure

1. Environmental Education Center (EEC)
    a. General - under the direction of preserve staff, community service restitution (CSR) volunteers regularly cleaned and maintained the EEC's interior and performed exterior maintenance work on an as-needed basis. When required, other maintenance was performed by qualified maintenance professionals/technicians, including pest/vermin control.
    b. Solar-power array—throughout the year, staff consulted with an Austin Energy technician regarding maintenance and efficiency of our solar-power collection apparatus.
    c. Scout Projects--An Eagle Scout candidate performed a valuable land management project on a volunteer basis for the preserve. Chris Webb covered the EEC wooden-lattice underskirt with sheetmetal for wildfire protection. He was supervised by staff in consultation with his scout leaders and parents:
    d. Wild Basin Garden—As a joint project with our education staff, volunteers refined the native-plants garden on the west and south sides of the EEC. Labeling many of the plants serves as interpretive information for visitors. The project, supported financially and manually by NPSOT, will continue into 2009.

2. Information Technology (IT) – staff enlisted the volunteer services of Garry Child and a qualified CSR to stabilize and upgrade the EEC's IT and telephone infrastructure. Mr. Child donated 45 hours of his time toward this effort in 2008; the CSR, approximately 25 hours.

Security

1. Emergency Procedures– preserve staff maintains an emergency-policies-and-procedures manual to be followed in case of emergency on/adjacent to/threatening the preserve. This manual covers staff, volunteers, and visitors at the preserve. Please see Appendix for the complete manual.
2. Preserve perimeter—staff and volunteers performed annual perimeter walks to check the integrity of fencing and boundary markers. Brush was cleared to provide easier patrolling on line-of-sight pathways along all boundaries. New identification tags were provided for survey pins where necessary, especially on the northern, unfenced perimeter. Pin locations along that perimeter were also recorded by GPS equipment.
3. General – preserve caretaker continued to provide overnight security by patrolling the grounds and discouraging overnight illegal entry into the preserve by locking the gate overnight. Sonitrol was once again contracted to provide silent alarm services and notification to staff in event of attempted break-ins to the EEC.
4. Visitors – signage and interpretive media warned about
    a. fire danger
    b. personal safety in extreme heat
    c. potential threats to automobile security in the parking lot
    d. potential encounters with wildlife and related precautions.

EDUCATIONAL & EDUCATIONAL OUTREACH PROGRAMS

Volunteers donated approximately 955 hours of their time to the preserve's Educational and Educational Outreach Programs, which were supported by a grant from the Moody Foundation. The following summarizes these programs:

1. *Environmental Education & Interpretation –*
    a. School Tours – Over 1,500 students from public, private and parochial schools, as well as a small number of home-school groups in Bastrop, Hays, Travis and Williamson counties attended education programs at the preserve in 2008. Group size limits are restricted and held to maximums of 60 per visit. Over 700 volunteer hours were donated in assisting in these education programs.
    b. Family & Public Programs –500 adults and children attended public programs at the preserve; programs offered in 2008 again including Moonlighting, Stargazing, Flintknapping, Indian Lore, and Weekend Hikes. Over 80 volunteer hours were donated to enable Wild Basin to host these programs.
    c. Maplewood Elementary – This AISD elementary school has an after-school science club called Caterpillars & Tadpoles which is in its fifth year with Wild Basin staff as volunteer educator. This year, 15 students learned about the life cycle through this interactive program led by Wild Basin educator, Sally Scott.
    d. Wild Afternoons – Thanks to a generous grant from the Moody Foundation, the Wild Afternoons program enabled 1,020 children to visit the preserve, enjoy guided hikes, and achieve youth group-specific goals. The participants included 380 students whose hikes were sponsored by grant-funded scholarships. Groups participating in the program included Girl Scouts, Boy Scouts, Communities in Schools, Big Brothers Big Sisters, AISD Go-Project and Alternative Learning Centers, and the Travis County Day Treatment Center. 100 volunteer hours were donated to this program.
    e. Tiny Footprints – In 2008, this program enabled more than 200 young children, ages 3-5, to experience high quality, small-group guided hikes designed specifically for early learning. Over 70 volunteer hours were donated to assist with these tours for very young children.

2. *Family & Public Programs and Group Tours –*
    a. Moonlighting and Stargazing – In its 20th year, the Moonlighting and Stargazing program again provided 2 public tours each month, guided by volunteers from the Austin Astronomical Society. Despite the inclement weather that was common in 2007, 300 visitors learned how to use telescopes and interpret the night sky.
    b. Other Tours - Other public tours led by Wild Basin volunteers and staff included Wild Basin Walks, Indian Lore, Flintknapping, and Spider Walks.
    c. BCP Hike & Lecture Series – On Dec. 13th, Wild Basin hosted 2 public hikes as part of the BCP Hike & Lecture Series. Approximately 15 visitors, guided by volunteers, were introduced to Wild Basin and the BCP.

3. *Training Programs -*
    a. Guide Training – In 2008, Wild Basin once again offered 2 sessions of Weekday & Weekend Guide Training for 20 new volunteer trail guides. At the September training, 14 guides participated along with 5 rangers from Hamilton Pool Preserve. 40 hours were donated by key preserve volunteers in assisting staff with training.

b. Tiny Footprints Training – In 2008, 2 sessions of Tiny Footprints Training were offered for 4 new volunteer Tiny Footprints guides. 16 hours were donated for training.
c. Other – Community Service Restitution volunteers continued to receive educational training in 2008 as part of their orientation to the preserve before proceeding with work assignments.

4. *Public Outreach* –
   a. Austin Museum Day – Wild Basin participated in the city-wide free museum day with a Wild About Insects-themed exhibit and hike. Over 450 people participated in this program, which was a success due to almost 100 volunteer hours donated to the program.
   b. Wee Trails – Wild Basin staff held the Wee Trails program at Lake Travis Elementary School, where approximately 60 children discovered nature in their own schoolyard.
   c. 3M Program- Wild Basin had an exhibit hosted by Sally Scott at this event where participants had the opportunity to discover Wild Basin Wilderness Preserve.
   d. Austin Butterfly Forum—staff member Sally Scott volunteered as a docent for the Dinoland Exhibit at the Zilker Botanical Gardens.
   e. Maplewood Elementary School—staff member Sally Scott volunteered as facilitator for their After-School Science Club.
   f. Balcones Canyonlands National Wildlife Refuge – Again in 2008, preserve staff member Sally Scott coordinated the children's activities for the refuge's Bridges-to-Birding program and Spring Songbird Festival, which is sponsored by Travis Audubon Society.

5. *Affiliations & Publications* –

Association of Nature Centers of America (ANCA)
Austin Astronomical Society
Austin Independent School District
Austin Museum Partnership
Bastrop Independent School District
Big Brothers Big Sisters
Camp Fire USA Balcones Council
Capital Area Council, Boy Scouts of America
Communities in Schools
Lake Travis Independent School District
Girl Scouts of Central Texas
Maplewood Elementary
Moody Foundation
Spiral Scouts
St. Edward's University
Tuktawa Foundation

The preserve staff continued writing Wild Basin's column in our local weekly newspaper, the Westlake *Picayune's* "Distinct" section.
Each quarter, Wild Basin staff produced the *Wild Ways Newsletter*.

LAND MANAGEMENT ACTIVITIES & PROGRAMS

Land Management Vision and Charges (a restatement for overview purposes)

Our vision is to preserve a piece of the Texas Hill Country in its native condition and to educate school children and the general public in the natural laboratory of Wild Basin Preserve by:

- Managing and, where necessary, restoring a mosaic of habitats that are indigenous to Wild Basin, including (but not limited to) oak-juniper woodlands, riparian areas, semi-open grasslands and cedar breaks (please note that "juniper" and "cedar" refer to the same plant species: *Juniperus ashei*)
- 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 to visitors a variety of habitats while leaving a majority of the preserve undisturbed

Charges to the Land Management Committee:

- Provide expert advice to the land management program. Review plans and recommend actions regarding proposed changes or projects that would result in alteration or possible adverse impacts to the preserve.
- Ensure that in all our planning and decision-making processes, the health of Wild Basin Preserve is the highest priority. Above all, do no damage.

Among the highlights of our 2008 Land Management activities and programs:

Land Management volunteers donated 926.25 hours of their time to the preserve's land management efforts in 2008, an approximately 50% increase over 2007. The following summarizes these efforts as performed both by staff and by volunteers:

Habitat – Mosaic Assessment
Since January 2007, the Land Management Committee has assessed various habitat components to develop an overall preserve management plan for the future. So far, we have analyzed the following components: riparian zones/features, GCWA, Texas Madrone, vegetative communities, invasive/exotic plants, and plant species of interest/concern.

Biological and other Surveys

1. Golden-cheeked warbler (GCWA – *Dendroica chrysoparia*)
   Contract wildlife biologists Jennifer Brown and Paul Fushille performed presence/absence surveys for this federally endangered songbird in the preserve. Between 30 March and 1 June 2008, they recorded sightings of five (5) GCWA males but no mating pairs during seven (7) survey days, totaling 48 hours. No female or fledgling/juvenile GCWA were sighted. This

data represents an unusually low number of GCWA sighted in the preserve. (The 2007 survey, for example, recorded 6-7 mating pairs, the highest since 2001.)

Other comments:

a. Obviously, no breeding territories were established.
b. Speculation regarding low results has focused on various factors, e.g. weather, interspecies competition, and predation.

For the full GCWA report, see Appendix.

2. Bee Creek Watershed
    a. Our Land Management Committee created a subcommittee for watershed management chaired by Sue Anderson, a volunteer retired aquatic biologist.
    b. Volunteer personnel assisted with water-quality testing at various sites on Bee Creek and its tributaries.
    c. Preserve staff and volunteers pursued information related to (1) commercial development in our contributing watershed west of Loop 360, namely projects by Brandywine Realty and the Munson Park project, and (2) home sites on our southern perimeter. Earlier this year, the Munson Park developers requested a variance from the City of Austin's Zoning & Platting Commission regarding a modification of their planned driveway access off Loop 360. During November, our staff and volunteers attended three separate ZAPCO hearings, sometimes testifying. On November 18, the commission approved Munson's variance request.
3. White-tailed deer (O*docoileus virginianus*)
    For the second consecutive year, Wild Basin successfully performed a census of the preserve's deer population. Volunteer wildlife biologists Kris Thorne and Janet Reed conducted the activity. Data analysis from their report reveals approximately 2.54-4 acre/deer. Healthy regional population density is considered no less than 15-20 acres/deer. Data therefore supports the same conclusion as 2007, i.e. the preserve does not have a healthy deer population. Texas Parks & Wildlife Department requires a minimum of two consecutive years of good data for a removal permit. We will consider application for fall 2009.

    We appreciate the technical assistance from TPWD game wardens and Travis County wildlife biologists. For the full report, see Appendix.
4. Texas Madrone (*Arbutus xalapensis*)
    With the assistance of several Texas State University students and other volunteers, we have continued GIS documentation our population of eighteen (18) individual trees. As the only Madrone species in Texas, it represents the easternmost population of the species within the U.S.
5. Shooting Star (*Dodecatheon meadia*)
    In April 2007, Brad Oberle, a graduate student from Washington University in St. Louis, MO performed research on our Shooting Star population. He collected data and tissue samples under a BCP permit and preserve staff supervision. In January 2008, he reported to Rose Farmer at Travis County Natural Resources that his research has so far strongly indicated that our population may represent a new taxon/subspecies. A final determination will be forthcoming at an unspecified date. This past spring, we visited our sites and reported our observations to Mr. Oberle.

    For the preserve's complete plant inventory, see Appendix
6. Amphibian Watch
    Volunteer Dana Spontak provided data from his three (3) nocturnal Amphibian Watch surveys, recording four (4) frog species, June-August. For data, see Appendix.
7. Photo Points
    Photographs were taken seasonally by preserve volunteers at each of the ten (10) photo points in the preserve. This project began in 2005.

8. Rain Gauge
   In April, preserve staff mounted a rain gauge near the southern side of the EEC. Measureable data has since been collected following precipitation events. Between the installation date, April 17, and the date of this annual report, December 19, we received 15.25 inches of measureable precipitation. From other regional sources, we know that rainfall from January 1 until April 17 was negligible. Regionally, average annual rainfall is approximately 25 inches. Drought conditions, therefore, have existed most of the year. Only 2008's unusually high rainfall has kept regional ground and surface water levels as high as they are under these conditions. Our own Bee Creek has been "ephemeral" at best since July.
9. Contaminant Assessment
   In early January, two technicians from Terracon Consultants Inc. assessed contaminants, e.g. asbestos, in the EEC and in the former trash dump between the old driveway and North Hollow. This survey was requested by St. Edward's University in relation to the 63.5 acres owned by Wild Basin Inc. No serious problems were observed.
10. Horned Lizard sighting
    In April, a reliable observer spotted a horned lizard on the north side of Arroyo Vista near the EEC. This represents the first preserve sighting in a decade.

Public Outreach

1. Balcones Canyonlands Preserve (BCP)—(a) Again in 2008, Wild Basin preserve staff attended and participated in quarterly meetings of the BCP Land Managers informal group. In April, we hosted the meeting; (b) in January, the land manager and a volunteer attended a habitat-restoration tour at the Balcones Canyonlands National Wildlife Refuge; (c) in June, the land manager and a volunteer attended an oak-wilt lecture and tour at COA's Reicher Ranch facility; in November, our preserve hosted a presentation on Urban Wildlands Issues, attended by the land manager.
2. Texas State University—In March, the land manager delivered a preserve presentation to the Wildlife Society, composed mostly of wildlife biology students, to solicit interns and other volunteers.
3. College interns—During the fall semester, Sara Weaver (from Texas State University's wildlife biology program) as well as Adrian Sanchez and Kadence Hampton (both St. Edward's University service-learning students from the environmental science & policy program) volunteered a total of 123 hours of their time assisting preserve staff in various land management and education activities.
4. Donations-in-Kind—During 2008, several individuals donated various materials, particularly rebar for erosion-bar pins and juniper timber for the bars themselves.
5. UT Brackenridge Field Laboratories—In June, the land manager attended a fire-ant management conference sponsored by the Karst Conservation Initiative Group.
6. Community Groups
   a. Central Texas Trail Tamers (CTTT) – CTTT again hosted bi-monthly meetings open to the public at the preserve. Their volunteers contributed 17 hours to trail maintenance projects. In March, they conducted crew-leader classes at the preserve, admitting our volunteers gratis.
   b. Bright Leaf Preserve – Wild Basin staff member Sally Scott currently serves as board president of the Friends of Bright Leaf Preserve.
   c. Capital Area Master Naturalists (CAMN) – Wild Basin staff member Sally Scott currently serves as program committee chair for CAMN. WB land manager Mike Powers is also a CAMN member and uses five others as crew leaders for our land management projects. Their volunteers donated 150.25 hours of their time to our land management projects.

d. Native Plant Society of Texas, Austin chapter (NPSOT) – Again in 2007, Wild Basin land manager Mike Powers hosted the regular monthly meetings of the Austin chapter of this statewide group. NPSOT volunteers donated approximately 85.5 hours of time to our land management projects.
e. Hill Country Conservation Conference—In June, the land manager attended the HCCC's first organizational conference.

Preserve staff wrote several articles for the local weekly newspaper, the *Westlake Picayune.* Originals and copies of these articles are on file in the main offices in the EEC. Land management staff members also wrote articles for the preserve's *Wild Ways* newsletter.

Visitation
In 2007, preserve staff tracked the number of self-guided visitors, using the two (2) trailhead sign-in boxes located near the Environmental Education Center (EEC). While this is by no means a perfect record of every visitor on a self-guided hike, it at least provides us baseline data of 3031 recorded this year (897 children and 2134 adults). The overall total is only slightly less than 2007. See Appendix for breakdown of visitors by month.

Habitat Maintenance and Restoration
Please note that land management activities use only native Ashe juniper for trail/water bars and native limestone for boulders, steps and gravel where needed on or off the preserve's trails. No old-growth junipers or other native hardwoods are cut down in the preserve for such use. All trail maintenance and other land management activities avoid impact or disturbance of the preserve's cultural/archeological resources.

1. Trail Maintenance
    a. General – nearly all 3.2 miles of trails in the preserve received maintenance. (No trail maintenance was performed during GCWA breeding season, 15 March – 15 July, along trail sections where the warblers were sighted.) This work included maintaining, replacing and/or installing nine (9) water bars and twenty-four (24) checkdams; building eight (8) steps in steep areas; constructing and maintaining various water-diversion channels to carry water off the trails; replacing/repairing six (6) creek-crossing step stones following flashflood events; pruning trees and brush from trail corridors; clearing downed trees and fallen limbs from trails; and rebuilding/repairing trail surfaces. Volunteers donated approximately 308 hours of their time performing trail maintenance in 2008.
    b. Throughout the year, staff consulted with various individuals concerning a future reroute of Creek Trail from the upper creek crossing to Woodland Trail, due to erosive problems.
    c. Pond Trail remained closed for the third year due to silting problems at the retention pond.
    d. Volunteers from the community and area high schools donated approximately 50 hours of their time. Under staff supervision, selected CSR volunteers also performed trail maintenance.
2. Habitat Restoration
    a. General--Preserve staff and volunteers continued to aggressively remove invasive, non-native species such as Japanese honeysuckle, Chinese tallow, chinaberry, pyrocantha, ligustrum, nandina, King Ranch bluestem, Johnson grass, vitex, Georgia Cane and others. With herbicidal-treatment assistance from Travis County field biologists Paul Fushille and Amber Gosselin, preserve staff and volunteers have

continued to suppress the few persistent Georgia cane (*Arundo donax*) and also combat some of the aforementioned invasives. The Native Plant Society of Texas also assisted in these efforts. Overall, volunteers donated approximately 616 hours of their time performing habitat restoration in 2008.

b. Deer exclosures – In consultation with Texas Parks & Wildlife and Travis County biologists, preserve staff continued installing "deer exclosures" of hog wire/wire cages around stands of native trees and shrubs (such as Shin oaks and Texas red oaks, escarpment black cherries, Texas persimmon, coralroot orchids and twisted-leaf yucca, among others) to prohibit excessive browse by deer and other animals.
c. Red Imported Fire Ants (Solenopsis invicta) –No nests of these invasive, non-native insects were found within the preserve boundaries this year. Along the shoulder of Loop 360, however, several dozen were observed in late spring. Somehow, they mysteriously disappeared in late summer.
d. Wildfire Defense – In consultation with Texas Forest Service Urban-Wild Lands Interface specialists and the Westlake Hills Fire Department, preserve staff continued performing recommended measures related to creating a defensible-space around the EEC and along the driveway perimeter by (1) reducing nearby flammable vegetation and (2) installing a metal underskirt on the building. WLH asst. fire chief Mike Elliot agreed that the driveway was now sufficiently cleared to risk a fire vehicle's entering the preserve to fight a fire at the EEC.
e. Fire Management—In April, the land manager toured the neighboring City of Austin Black-Capped Vireo Preserve with their staff to assess possible future prescribed burns. This collaboration will help prepare us for possibly using fire as a management tool, never previously done in our preserve. The last wildfire here occurred in 1961.

Equipment & Materials

Tuktawa Foundation Grant—at the end of July, an acquisitions grant expired. During the previous months, we were able to use the land management portion to purchase approximately $6,000 worth of equipment and materials, e.g. GPS handheld devices & software, manual & power tools, fire-fighting equipment, optical range-finder for surveys, safety equipment, etc.

Affiliations and Publications

The preserve in 2008 continued development of relationships and partnerships with like-minded groups and selected individuals in the community. These relationships and partnerships were pursued to strengthen the preserve's land management and educational activities. They included the following:

Ann Molineux, PhD
Austin Astronomical Society
Austin Butterfly Forum
Austin Gem & Mineral Society
Austin Geological Society
Balcones Canyonlands Conservation Project
Balcones Canyonlands Preserve Land Managers
Balcones Canyonlands National Wildlife Refuge
Bob Harms, PhD
Capital Area Council, Boy Scouts of America
Capital Area Master Naturalists
Central Texas Trail Tamers
City of Austin Water Utility Wildland Conservation Division
Loomis Partners—Austin

Lower Colorado River Authority
Native Plant Society of Texas, Austin chapter
REI
Rob Roy Homeowners Association
Rob Roy on the Canyon Homeowners Association
Texas Commission on Environmental Quality
Texas Forest Service
Texas Ornithological Society
Texas Parks & Wildlife
Travis Audubon Society
Travis County Transportation & Natural Resources
Tuktawa Foundation
University of Texas Archeological Research Laboratory
University of Texas Bureau of Economic Geology
University of Texas Nonvertebrate Paleontology Laboratory
Westlake Chamber of Commerce
Westlake Hills City Inspector
Westlake Hills Fire Department
Westlake Picayune newspaper

THE COMMITTEE FOR WILD BASIN WILDERNESS, INC.

The Committee for Wild Basin Wilderness, Inc., is a registered, non-profit organization dedicated to promoting responsible environmental stewardship through education. The mission of The Committee for Wild Basin Wilderness, Inc., is to protect and maintain its urban wilderness, and to promote the importance of environmental education, research, conservation and preservation. Collaboration between Wild Basin and St. Edward's enables the creation of programs and initiatives that serve to fulfill the mission.

Structure

The Board of Directors of the Committee for Wild Basin Wilderness, Inc., is comprised of thirteen members. Under the direction of Board members are three standing committees: Executive, Education and Land Management.

Board Members

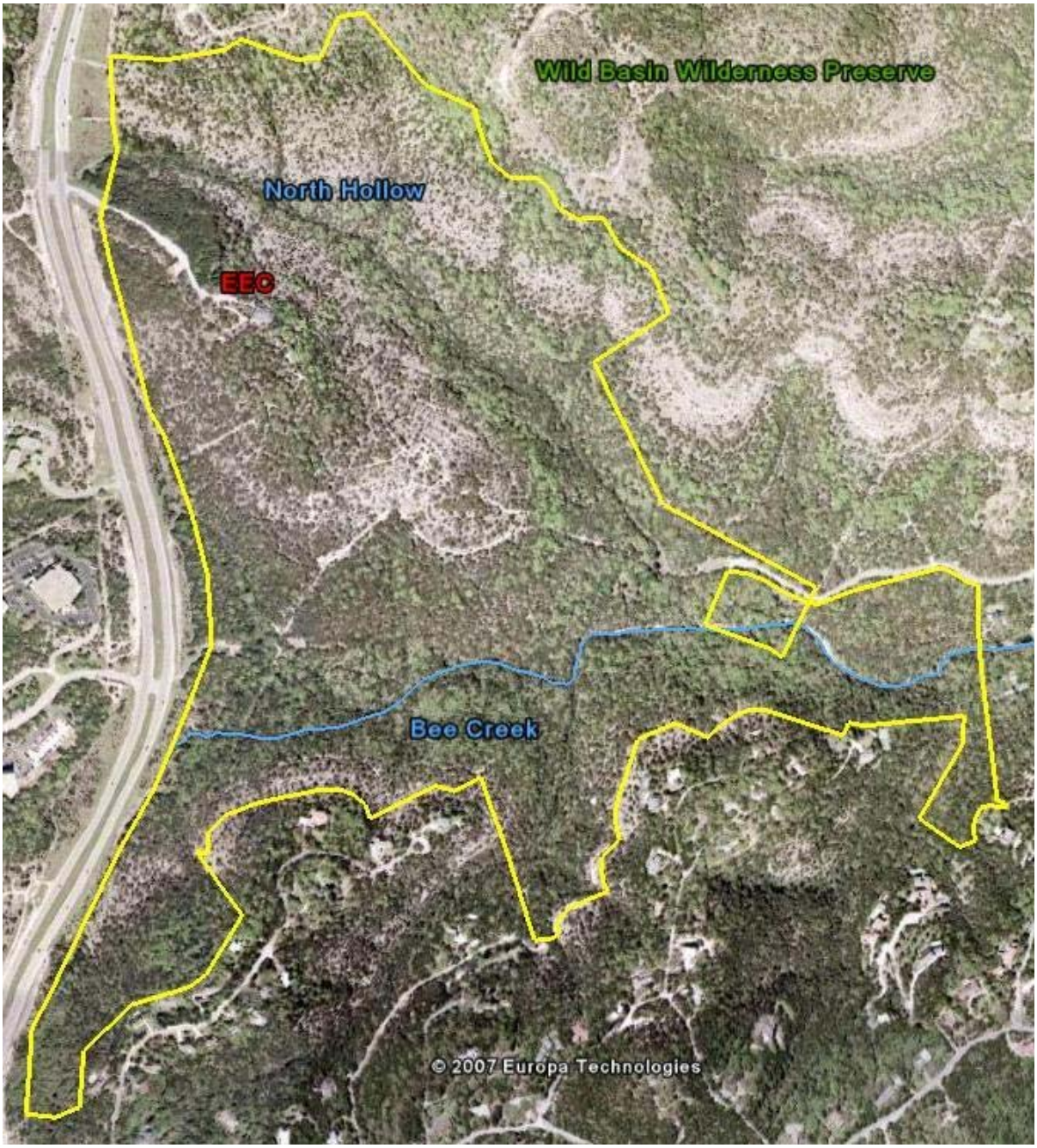
President – Charlie Bicak, Ph.D.
Vice President – Linda Edwards .
Treasurer – Rhonda Cartwright
Secretary – Robert Manzer
John Abbott, Ph.D.
Sally Davenport
Joe DeMedeiros
Carol Dwyer
Allan Hook, Ph.D.
Flo Macklin, Founder
Ed McHorse, J.D.

Advisors to Board Members

Martha Hudson, Founder
Flora McCormick, Founder

Staff

Ebby Green – Executive Director
Linda Leal – Ranger (part-time)
Genevieve Lung – Volunteer Coordinator, Office Manager
Echo Machuca – Ranger (part-time)
Elizabeth Pardue – Education Assistant
Mike Powers – Land Manager, Facilities Manager, Caretaker
Sally Scott – Ranger (part-time)
Carrie Welch – Ranger (part-time)



AERIAL VIEW OF WILD BASIN WILDERNESS PRESERVE

APPENDIX

Wild Basin Golden-cheeked Warbler (GCWA) Survey Results 2008
Wild Basin Species and Items of Interest 2006
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Wild Basin Animal List "The Vertebrates of Wild Basin"
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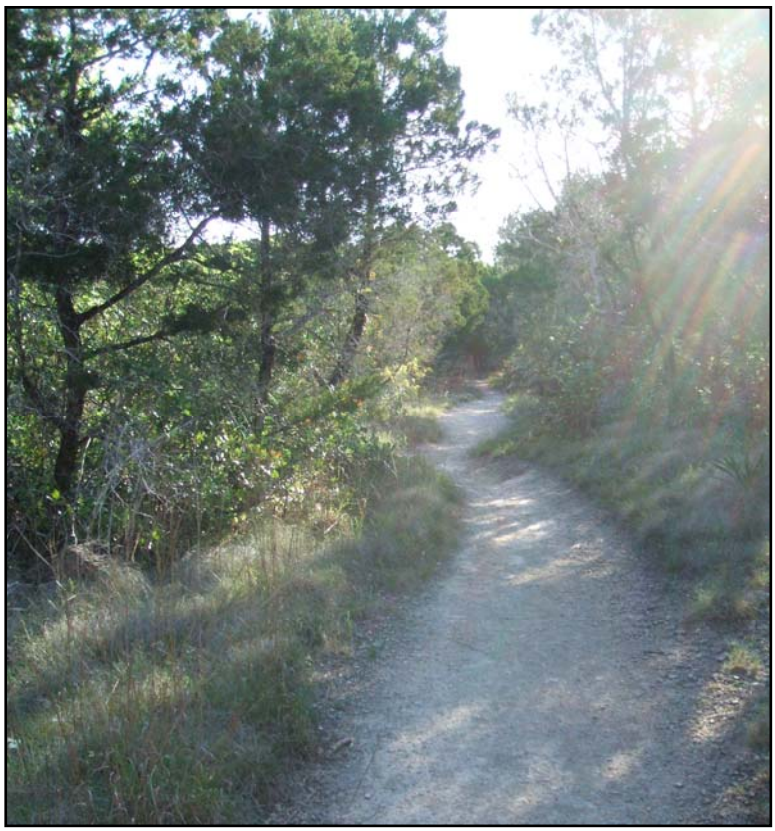
Wild Basin Emergency Plan 2008

RESULTS OF GOLDEN-CHEEKED WARBLER SURVEYS

WILD BASIN WILDERNESS PRESERVE

TRAVIS COUNTY, TEXAS

SPRING 2008



Jennifer Brown and Paul Fushille

August 2008

TABLE OF CONTENTS

INTRODUCTION **1**
SITE DESCRIPTION **1**
METHODOLOGY **2**
DATA COLLECTION 2
DATA ANALYSIS 3
RESULTS **4**
DISCUSSION **5**
LITERATURE CITED **8**

LIST OF TABLES

TABLE 1. SUMMARY OF 2008 FIELD DATA, INCLUDING SURVEY TIMES, WEATHER CONDITIONS, PERSONNEL AND NUMBER OF GOLDEN-CHEEKED WARBLERS DETECTED. **4**
TABLE 2. GCWA SURVEY EFFORT BY YEAR AND NUMBER OF SURVEY DAYS PER MONTH. **5**
TABLE 3. GCWA SURVEY RESULTS BY YEAR AND DETECTIONS BY SEX FOR EACH MONTH TO ESTIMATE ABUNDANCE. **6**

LIST OF FIGURES

FIGURE 1, Location Map
FIGURE 2, 30 March 2008 GCWA Survey Results at Wild Basin
FIGURE 3, 13 April 2008 GCWA Survey Results at Wild Basin

LIST OF APPENDICES

APPENDIX A
Birds observed at Wild Basin Wilderness Preserve during the 2008 survey period.

INTRODUCTION

The golden-cheeked warbler is a neotropical migrant that breeds only in central Texas where suitable oak-juniper (*Quercus spp.-Juniperus ashei*) woodlands are present (Ladd and Gass 1999, Pulich 1976). The U.S. Fish and Wildlife Service (USFWS) listed the golden-cheeked warbler (*Dendroica chrysoparia*) in 1990 as federally endangered, as a result of habitat loss and fragmentation due to suburban development, reservoir construction, and agricultural use (U.S. Fish and Wildlife Service 1990, Ladd and Gass 1999). This loss of habitat is apparent in western Travis County, Texas where urbanization and development has rapidly spread over the last two decades.

In 1996, the Balcones Canyonlands Conservation Plan was approved by the USFWS to mitigate for the loss of habitat and to facilitate the local recovery of the golden-cheeked warbler and seven other endangered species (Balcones Canyonlands Preserve 2007). A minimum of 30,428 acres of endangered species habitat in western Travis County will be set aside as preserve land. Wild Basin Wilderness Preserve, hereafter Wild Basin, is part of the greater Balcones Canyonlands Preserve (BCP). The BCP is managed and owned by various governmental and private entities, including Travis County, the City of Austin and the Nature Conservancy.

This report contains the results of golden-cheeked warbler (GCWA) surveys conducted at Wild Basin during the 2008 breeding season. The primary objective was to conduct presence/absence surveys for these warblers, and if present, map territories to determine abundance and general distribution within the Wild Basin. Late season surveys were also scheduled to best capture productivity. Secondary objectives include noting all avian observations to create a species list, and to record any instances of cowbird parasitism.

SITE DESCRIPTION

Wild Basin (227 ac/91 ha) is located in western Travis County, approximately 6 miles northwest of downtown Austin (**Figure 1, Location Map**). Wild Basin is included within the West Austin macrosite of the BCP (Balcones Canyonlands

Preserve 2007). Neighborhoods bound the preserve to the south and east, City of Austin preserve land is to the north and Capital of Texas Highway (Loop 360) is to the west.

Wild Basin is on the eastern edge of the Edwards Plateau and is dissected by Bee Creek and several side tributaries. It is comprised of steep ridges that slope into mesic canyons draining into Bee Creek and flowing eastward toward Lake Austin, a reservoir on the Colorado River. Elevations range from approximately 690 ft msl to 910 ft msl. The dominant soil types found at Wild Basin are Brackett soils and limestone rock outcrop (SCS 1974). Vegetation is typical of western Travis County dominated by oak-juniper woodlands on the ridges and slopes and riparian woodlands along creeks and drainages. Dominant woody vegetation includes: plateau live oak (*Quercus fusiformis*), Texas red oak (*Quercus buckleyi*), Ashe juniper (*Juniperus ashei*), cedar elm (*Ulmus crassifolia*), Texas persimmon (*Diospyros texana*), Lindheimer's silktassel (*Garrya ovata*), agarita (*Berberis trifoliolata*), and several varieties of both sumac (*Rhus* spp), and holly (*Ilex* spp.).

METHODOLOGY

Data collection

Golden-cheeked warbler surveys at Wild Basin were conducted over seven visits, spanning from the end of March to the beginning of June. Surveys were spread throughout the breeding season in an attempt to capture abundance, distribution and productivity data. Six of the surveys were conducted in morning hours while a seventh visit was made prior to sunset. All surveys were conducted under ideal weather conditions and times coinciding with peaks in avian activity to maximize the potential for detecting warblers.

Presence/absence surveys followed protocol as determined by the USFWS *minimum procedures for golden-cheeked warbler and black-capped vireo presence/absence surveys* (USFWS 1994). Vegetation communities throughout the preserve were evaluated during early surveys allowing subsequent visits to be primarily targeted on areas that were determined to have the most suitable GCWA habitat.

Once presence was determined, territory mapping was used to estimate territory density, male abundance and distribution. All observations (both visual and auditory) of GCWAs were plotted on hard-copy digital orthophoto maps. Mapping methods generally followed IBCC guidelines (1970).

The use of playback tapes of GCWA vocalizations was used in an effort to elicit responses during the final survey. Any observations of brown-headed cowbirds (*Molothrus ater*) and any signs of nest parasitism were also noted. Avian species detected throughout the survey period were also noted and are listed in **Appendix A.**

Data analysis

Abundance was calculated as the sum of all unique male GCWAs detected including those observed adjacent to Wild Basin. Species distribution comprises all locations where warblers, regardless of sex or age, were observed.

One or more of the following criteria were used to define whether, or not, a male GCWA had established breeding territory: 1) a male was observed with a female; 2) a nest was located for an individual male; 3) a male was observed with fledglings; and/or 4) a male was observed on at least three instances, with a minimum of at least one week between observations, and using the same general location. These criteria were adopted from those used by Travis County Natural Resources and Environmental Quality when determining breeding territories.

Pairing status of male GCWAs is determined by observing a male associating with a female, locating a nest for that male, and/or observing a male tending at least one fledgling. Observations of fledglings tended by a parent and the greatest number of fledglings observed at any one time provided data for breeding success and productivity.

RESULTS

A total of 48 hours, between March 31 and June 1, were spent at Wild Basin surveying GCWAs. Table 1 contains a summary of the field data by survey date and includes a daily sum of GCWAs detected. A total of 25 observations of GCWAs were recorded. All observations were of males. Observations include multiple detections of the same individual. No females or young GCWAs were observed or detected during the 2008 survey.

Table 1. Summary of 2008 field data, including survey times, weather conditions, personnel and number of golden-cheeked warblers detected.

Date	Time Begin/End	Temp. (°F) Begin/End	Wind Direction	Wind Speed	Cloud Cover	Surveyor	GCWAs Detected
30 Mar	0730-1200	71˚/ 74˚	Southwest	2-8 mph	90%	JB, PF	5 males
13 Apr	0700-1200	48˚/ 75˚	Northwest	2-10 mph	10%	JB, PF	3 males
10 May	0630-1130	73˚/ 85˚	South	5-8 mph	90%	JB, PF	0
17 May	0645-1115	75˚/ 84˚	South	0-5 mph	40%	JB, PF	0
18 May	1015-1145	64˚/ 66˚	Northwest	0-5 mph	40%	PF	0
22 May	1915-2030	77˚/ 88˚	South	5-10 mph	20%	JB, PF	0
1 June	0630-0930	76˚/ 93˚	South	5-8 mph	10%	JB, PF	0

GCWAs were observed on two of seven survey dates. **Figures 2** and **3** illustrate survey results and species distribution. Male GCWAs were found primarily utilizing areas along Bee Creek and northwest of the confluence of North Hollow and Bee Creek. One male was also detected near the northern boundary adjacent to the City of Austin's Vireo Preserve. GCWA abundance totaled five. It was determined that no breeding territories were ever established, although counter singing between males was detected consistently during the first two site visits.

DISCUSSION

Survey strategies for the 2008 GCWA breeding season at Wild Basin addressed abundance, distribution and productivity. For this reason survey effort was intended to be spread through out the breeding season months with a focus on detecting productivity. In 2008, surveyors were able to determine simultaneous identification of five individual GCWAs. This determination was made through the presence of two surveyors in radio communication and counter singing on both days where GCWAs were detected. Similar survey methods on subsequent visits, with both surveyors, revealed no other warblers.

The results of the 2008 survey were compared to pervious surveys (2001 to 2007) to evaluate survey effort and results (See **Tables 2 and 3** below). By the definition of "Territory" as discussed in the Methods Section of this report we determined that no territories had been established. **Table 2** illustrates that previous season's surveys were targeted in March and April to maximize detection rates. Had the 2008 survey been conducted similarly, with a focus during the height of GCWA territory establishment (March – April), data may have indicated that as many as five territories could have been established (**Table 3**). This assessment is based on the assumption that there would have been an increase in the number of detections with at least one week's separation (five days) in accordance with USFWS survey protocol.

Table 2. GCWA Survey Effort by Year and Number of Survey Days per Month.

Year	Total Survey Hours	Number of Survey days by Month				
		March	April	May	June	July
2001	30	2	3	1	No survey	No survey
2002	20+	1	2	2	No survey	No survey
2003	20	1	2	2	No survey	No survey
2004	24	1	3	2	No survey	No survey
2005	40	2	5	1	No survey	No survey
2006	59	3	4	1	No survey	No survey
2007	51.25	3	3	1	2	No survey
2008	48	1	1*	4	1	No survey

* A second survey day was planned but rescheduled in early May due to inclement weather.

Table 3. GCWA Survey Results by Year and Detections by Sex for Each Month to Estimate Abundance.

Year	Month					Potential GCWA Abundance
	March	April	May	June	July	
2001	5 male	8 male, 2 female	4 male, 1 female	No survey	No survey	2
2002	2 male	5 male	2 male	No survey	No survey	2
2003	2 male	5 male	2 male	No survey	No survey	2 to 3*
2004	2 male	6 male	0	No survey	No survey	2 to 3*
2005	5 male	12male, 1 female	1male, 1female, 1fledgling	No survey	No survey	3 to 5
2006	10 male	11male, 3 female	9male, 11 female	12male, 14 female	0	4 to 5
2007	10 male	15male, 8 female	5male, 3 female	4male, 4female, 5fledgling	No survey	6 to 7
2008	18 male	7 male	0	0	No survey	4 to 5

* Abundance interpretation based on male GCWA location data

Based on the results of the 2008 survey we can only speculate as to why no GCWAs were detected after April 13th. One primary assumption is that there was no pairing success, as evident by the lack of female GCWA detections, and therefore male GCWAs did not establish breeding territories and possibly moved to other habitat outside Wild Basin. This could be attributed to the assumption that Wild Basin has a limited amount of suitable habitat and may have attracted younger, less successful males in 2008. GCWA mating success frequency for second year males (79%) has been documented to be consistently and significantly less than after second year males (97%). This difference has been attributed to the difficulty for second year males in finding, securing or defending a mate (Jetté 1998). The presence of both females and young in recent years (2005-2007) suggests this might

only be a yearly variance and not a trend. It is also worth noting that City of Austin staff mentioned that there were only two detections of GCWAs on the adjacent BCP property and no territories had been established.

Other potential negative impacts on territory establishment or nesting success, although most likely of secondary importance, include severe weather conditions (heavy rain and hail) in late April, as well as the frequent detections and observations of fox squirrels (*Sciurus niger*) and jays (*Cyanocitta* sp.). An elevated abundance of jay species associated with increased residential development in close proximity to GCWA habitat could be detrimental to productivity of GCWAs. Additionally, residential areas typically support higher numbers of mast-producing trees which has been shown to artificially inflate populations of fox squirrels, a known nest predator of GCWAs (Reidy 2007).

Regardless of the lack of territory establishment and no indication of pairing success during the 2008 survey, recent year's data suggest that Wild Basin can, on a short term, support a small, successful population of GCWAs. Surveys conducted since 2001 also suggest a gradual increase in GCWA abundance. Interpretation of this data is difficult and factors for the increase may include, but are not limited to range-wide changes in breeding habitat availability as well as the possibility that habitat in Wild Basin is becoming structurally mature. Future research oriented on Wild Basin's habitat structure and GCWA population, including age classification could provide additional insight toward these types of questions.

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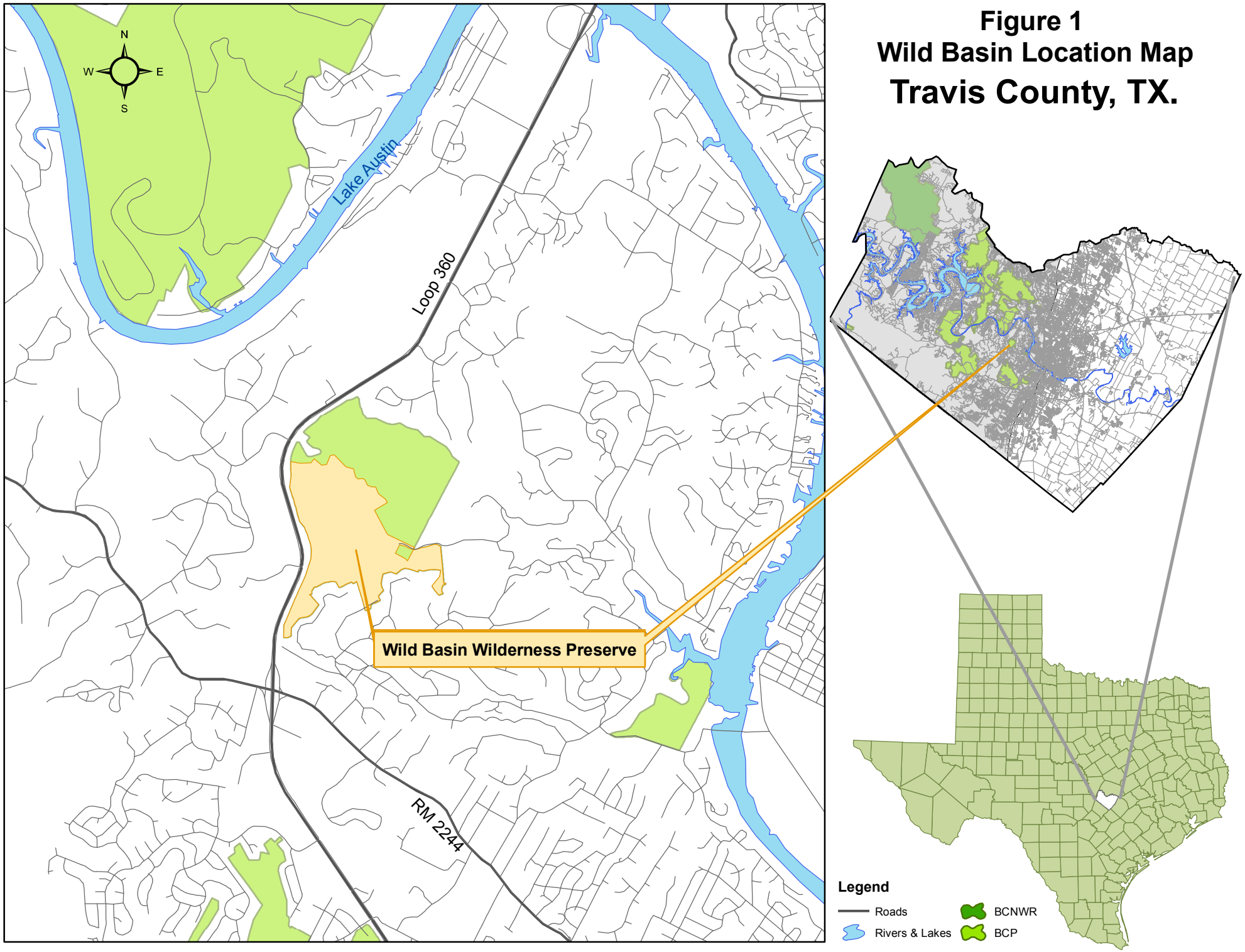
APPENDIX A

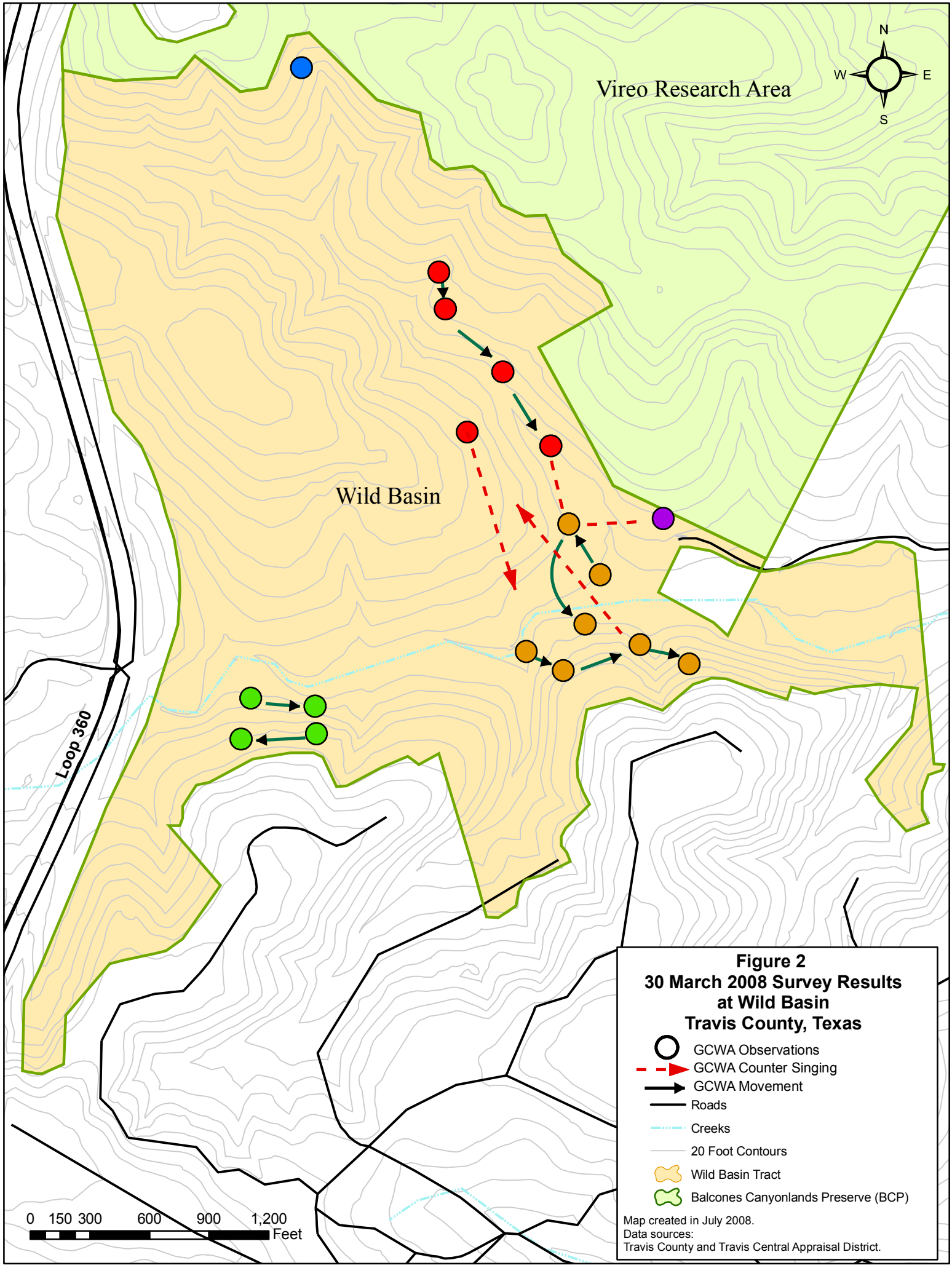
Birds observed at Wild Basin Wilderness Preserve during the 2008 survey period. This list totals 64 species. Taxonomic and nomenclatural changes are updated through the 49th supplement (AOU, 2008) to the AOU *Check-list of North American Birds (7th ed.)*.

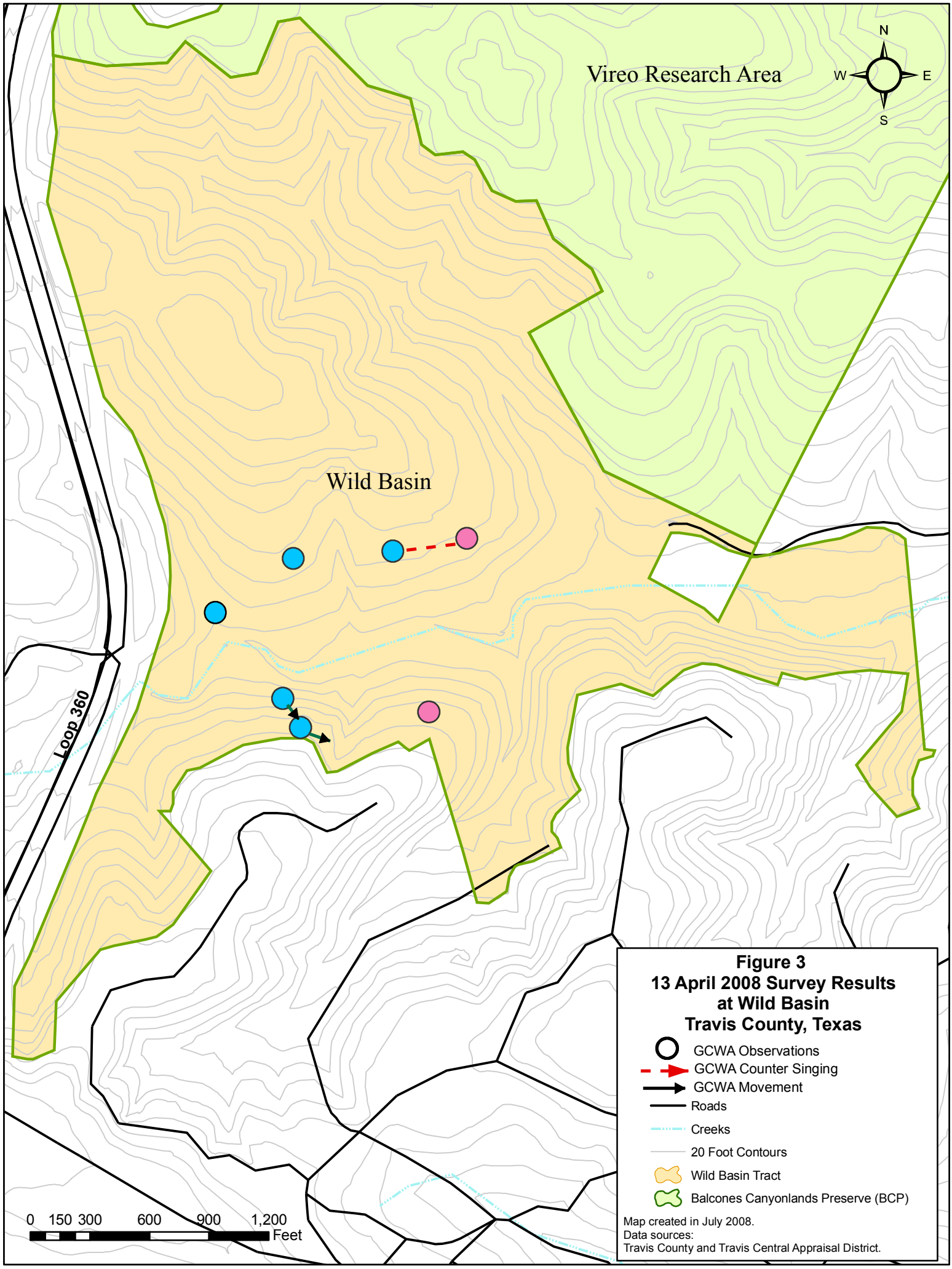
Great Blue Heron	*Ardea herodias*
Black Vulture	*Coragyps atratus*
Turkey Vulture	*Cathartes aura*
Red-shouldered Hawk	*Buteo lineatus*
Red-tailed Hawk	*Buteo jamaicensis*
White-winged Dove	*Zenaida asiatica*
Mourning Dove	*Zenaida macroura*
Yellow-billed Cuckoo	Coccyzus americanus
Greater Roadrunner	*Geococcyx californianus*
Eastern Screech-Owl	*Megascops asio*
Common Nighthawk	*Chordeiles minor*
Chimney Swift	*Chaetura pelagica*
Black-chinned Hummingbird	*Archilochus alexandri*
Ladder-backed Woodpecker	*Picoides scalaris*
Red-bellied Woodpecker	*Melanerpes carolinus*
Least Flycatcher	*Empidonax minimus*
Empidonax Flycatcher	*Empidonax sp.*
Eastern Phoebe	*Sayornis phoebe*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Western Kingbird	*Tyrannus verticalis*
Red-eyed Vireo	*Vireo olivaceus*
White-eyed Vireo	*Vireo griseus*
Blue-headed Vireo	*Vireo solitarius*
Blue Jay	*Cyanocitta cristata*
Western Scrub-Jay	*Aphelocoma californica*
Purple Martin	*Progne subis*
Cliff Swallow	*Petrochelidon pyrrhonota*
Carolina Chickadee	*Poecile carolinensis*
Black-crested Titmouse	*Baeolophus atricristatus*

Carolina Wren	*Thryothorus ludovicianus*
Bewick's Wren	*Thryomanes bewickii*
Ruby-crowned Kinglet	*Regulus calendula*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Northern Mockingbird	*Mimus polyglottos*
European Starling	*Sturnus vulgaris*
Cedar Waxwing	*Bombycilla cedrorum*
Tennessee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*Dendroica coronata*
Golden-cheeked Warbler	*Dendroica chrysoparia*
Black-throated Green Warbler	*Dendroica virens*
Black-and-white Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Summer Tanager	*Piranga rubra*
Spotted Towhee	*Pipilo maculates*
Rufous-crowned Sparrow	*Aimophila ruficeps*
Chipping Sparrow	*Spizella passerina*
Clay-colored Sparrow	*Spizella pallida*
Field Sparrow	*Spizella pusilla*
White-throated Sparrow	*Zonotrichia albicollis*
Northern Cardinal	*Cardinalis cardinalis*
Painted Bunting	*Passerina ciris*
Brown-headed Cowbird	*Molothrus ater*
Common Grackle	*Quiscalus quiscula*
Great-tailed Grackle	*Quiscalus mexicanus*
Orchard Oriole	*Icterus spurius*
House Finch	*Carpodacus mexicanus*
Lesser Goldfinch	*Carduelis psaltria*
House Sparrow	*Passer domesticus*

Figure 1
Wild Basin Location Map
Travis County, TX.




Vireo Research Area
N
W
E
S
Wild Basin
Loop 360
0 150 300 600 900 1,200
Feet
Figure 2
30 March 2008 Survey Results
at Wild Basin
Travis County, Texas
GCWA Observations
GCWA Counter Singing
GCWA Movement
Roads
Creeks
20 Foot Contours
Wild Basin Tract
Balcones Canyonlands Preserve (BCP)
Map created in July 2008.
Data sources:
Travis County and Travis Central Appraisal District.


Vireo Research Area
N
W
E
S
Wild Basin
Loop 360
0 150 300 600 900 1,200
Feet
Figure 3
13 April 2008 Survey Results
at Wild Basin
Travis County, Texas
GCWA Observations
GCWA Counter Singing
GCWA Movement
Roads
Creeks
20 Foot Contours
Wild Basin Tract
Balcones Canyonlands Preserve (BCP)
Map created in July 2008.
Data sources:
Travis County and Travis Central Appraisal District.

2006 List of Wild Basin Species & Items of Interest

We should all note when and where we see any of these species/items of interest and take measures to preserve them (*e.g.*, exclosures, labeling them or the closest "common" plant/tree to them, rerouting trails, etc.). This list includes species currently found in or historically found in Wild Basin. This list is a dynamic document and is updated as necessary/required by reliable observations by staff and/or experts and/or Travis County Natural Resources.

- * = Hypothetical listing (no current or historical records of this species being found in Wild Basin)
- [h] = Historical listing of (no current or recent records of this species being found in Wild Basin)

Bird Species (from Joe Beach and Rose Farmer; and from *Annotated County List of Rare Species for travis.doc* from Texas Parks & Wildlife, 2005 edition. Hereinafter referred to as TPWD 2005 document)

- *Primary Species of Interest* (these 3 species are currently on Endangered Species List)
  1. [h] Black-capped Vireo (*Vireo atricapilla*)
  2. Golden-cheeked Warbler (*Dendroica chrysoparia*)
  3. *Bald Eagle (*Haliaeetus leucocephalus*)
- *Secondary Species of Interest* (none of these is on Endangered Species List)
  1. Golden-fronted Woodpecker (*Centurus aurifrons)*
  2. Common Raven (*Corvus corax;* first recorded in 2006 at Wild Basin as this bird expands its range east and south)
  3. *Henslow's Sparrow (*Ammodramus henslowii*)
  4. Belted Kingfisher (*Megaceryle alcyon;* an indicator of stream health)
  5. *Green Kingfisher (*Chloroceryle americana;* no sightings yet in Wild Basin but recorded elsewhere in Travis County as this bird expands its range)

Insect and Arachnid Species

All BCP endangered insect species are cave-dwellers, and though we all know the dangers of never saying "never," those species are not listed here since we are not aware of nor are we trying to find or preserve caves on Wild Basin property. The following **Insect** species are listed as indicators of stream health, and are taken from TCEQ's *Water Education Field Guide* (TCEQ: Austin, TX, 6/2003 edition; publication number GI-026) and the national Save Our Streams group of the Izaak Walton League of America (http://www.ikes.org/)

Group One Taxa (most sensitive to any pollution or increase in sedimentation &/or turbidity in water quality. Only found in good quality water)

1. Mayfly (Order: *Ephemeroptera*)
2. Stonefly (Order: *Plecoptera*)
3. Caddisfly (Order: *Trichoptera*)
4. Water Penny (Order: *Coleoptera*)
5. Riffle Beetle (Order: *Coleoptera*)
6. Whirligig Beetle (Order: *Coleoptera*)
7. Dobsonfly (*Hellgrammite*; Family: *Corydalidae*)

Group Two Taxa (somewhat pollution tolerant organisms; can be found in good or fair quality water)

1. Sowbug (Order: *Isopoda*)
2. *Alderfly (Family: *Sialidae*)
3. Fishfly (Family: *Corydalidae*)
4. Damselfly (Suborder: *Zygoptera*)
5. *Watersnipe Fly (Family: *Athericidae [Atherix]*)
6. Crane Fly (Suborder: *Nematocera*)
7. Dragonfly (Suborder: *Anisoptera*)
8. Beetle Larva (Order: *Coleoptera*)
9. Diving Beetle (Order: *Coleoptera*)
10. Water Boatman

Mammal Species

1. ***Plains Spotted Skunk (*Spilogale putorius interrupta*)
2. Bobcat (*Lynx rufus*)

Mollusks, Crustaceans, Worms, Leeches and Fishes – After consulting with Elisabeth Welsh of Austin Youth RiverWatch and TCEQ about how best to monitor, identify, preserve and learn from species of interest here, the following species are listed in order of their sensitivity to pollution. For example, Group One taxa are the most sensitive to any pollution and/or sudden increase in sediment load in streams; Group Two taxa are somewhat sensitive and Group Three taxa are considered "pollution tolerant" according to TCEQ's *Water Education Field Guide* and the national Save Our Streams group of the Izaak Walton League of America (http://www.ikes.org/)

Group One Taxa (most sensitive to any pollution or increase in sedimentation &/or turbidity in water quality. Only found in good quality water)

1. *Grass Shrimp
2. Gilled Snail (Class: *Gastropoda*)

Group Two Taxa(somewhat pollution tolerant organisms; can be found in good or fair quality water)

1. Scud (Order: *Amphipoda*)
2. Crayfish (Order: *Decapoda*)
3. Coiled Snail (Class: *Gastropoda*)

Group Three Taxa (pollution tolerant organisms that can be found in any quality of water)

1. Freshwater Clam (Class: *Bivalvia*)
2. Grilled Snail, Pouch Snail and Pond Snail (Class: *Gastropoda*)
3. *Aquatic Worm (Class: *Oligochaeta*)
4. Leeches (Order: *Hirudinea*)

Plant Species of Interest for Wild Basin:

- *Primary Species of Interest*
  1. Sycamore-leafed Snowbell (*Styrax platanifolius*)
  2. Bracted Twistflower (*Streptanthus bracteatus*)
  3. Naked broom-rape (*Orobanche uniflora*)
  4. Shooting-star (*Dodecatheon meadia*)
  5. Texas Madrone (*Arbutus xalapensis*)

- *Secondary Species of Interest*
    1. Two-flower Anemone (*Anemone edwardsiana*)
    2. Texabama croton (*Croton alabamensis* var. *texensis*)
    3. Canyon mock-orange (*Philadelphus ernestii*)
    4. Texas amorpha (*Amorpha roemerana*)
- *Tertiary Species of Interest*
    1. Glass Mountains coral-root (*Hexalectris nitida*)
    2. Crested coral-root (*Hexalectris spicata*)
    3. Heller's marbleseed (*Onosmodium helleri*)
    4. Buckley tridens (*Tridens buckleyanus*)
    5. *Correll's false dragon-head (*Physostegia correllii)*
    6. Louisiana broom-rape (*Orobanche ludoviciana*)

Reptile and Amphibian Species

- *Primary Species of Interest* (these two species are listed as "threatened" in TPWD 2005 document)
    1. [h] Texas Horned Lizard (*Phrynosoma cornutum;* introduced into the Preserve ~1990 but unable to establish permanent residency. No recent confirmed reports or sightings)
    2. *Timber/Canebrake Rattlesnake (*Crotalus horridus*)
- *Secondary Species of Interest* (again, this is taken from TPWD 2005 document)
    1. *Spot-tailed Earless Lizard (*Holbrookia lacerate*)
    2. *Texas Garter Snake (*Thamnophis sirtalis annectens*)

Rocks/Mineral Resources of Interest

- This includes archeological, anthropological and geological resources of interest. As Wild Basin contains two sites are of archeological value, we do not make their locations known to the general public. Please contact preserve staff for more information on these resources.

THE VEGETATION OF WILD BASIN

By John E. Williams

The vegetation along the eastern escarpment of the Edwards Plateau has been likened unto a coastline whereat a “sea” of vegetation from the Gulf coastal plain to the east, dominated by tall grasses and primarily eastern species of trees, crashes up against the higher plateau which is dominated by shorter grasses and scrub (Tharp, 1926). While the analogy may not be entirely accurate, the Balcones Fault zone does represent a broad belt of transition between two distinct floristic regions.

A large proportion of the species that grow on the coastal plain do disappear from the scene as one moves from east to west across the faulted belt, but then again, some “eastern” species are able to grow well onto the plateau or even all the way across it, especially along river valleys and streams. Conversely, a large proportion of the “desert” and “great plains” species occur all the way up to the escarpment but no further east, while some of these species range considerably further eastward.

There are many pairs of closely related species, one member of which occurs on the coastal plain while the other member occurs on the Edwards Plateau. And, as with any transition or tension zone between major regions or vegetation types, there are species adapted to existence in the transition zone and no where else.

The Wild Basin of Bee Creek is located on the eastern edge of the Edwards Plateau along this zone of transition. The dominant arborescent vegetation consists mostly of Edwards Plateau species related to, and probably derived from, nearby species of the coastal plain, while the frutescent and herbaceous strata reflect a considerable intermixing of

“eastern,” “western,” “broadly distributed,” as well as endemic species.

On the upper slopes of the hills at Wild Basin there exists a cedar (= juniper) grassland in which the tree canopy is not continuous, the shrub layer is sparse, and grasses dominate the open spaces. On the lower, less dolomitic slopes, there is a denser cedar-oak woodland with an almost continuous overstory, a dense understory, and a sparse ground cover. The latter plant association is represented by a more mesic variation along the stream bottoms while the former association is represented by a wide-open successional grassland along slopes recently subjected to fire. (NOTE: Throughout this report the common name “cedar” will be used in preference to the common name “juniper.” Both names are locally used to refer to the same plant, Juniperus ashei.)

METHODS

Collections of plants were made only when field identifications were uncertain. The complete list of species observed and collected was then combined with the list compiled by Dr. Marshall C. Johnston and others in 1974 and 1975. The combined list is Table VI of this report.

The arborescent, overstory vegetation was analyzed statistically using the plotless sampling technique developed and modified by Cottam and Curtis (1949, 1955: see also Rice and Penfound, 1955). This technique was judged superior considering the time available for the study.

Information was collected at 100 sampling points along seven transects (see map). These transects were (1) roughly parallel to the low road, (2) roughly parallel to a portion of Wild Basin Ledge Road, (3) roughly parallel to the south fenceline of the old Robinson Ranch, (4) roughly parallel to the

west fenceline of the old Robinson Ranch, (5) along the northwest trail (not shown on map), (6) along the Noack Hill trail, and (7) along Bee Creek.

At each sampling point, two poles were laid down roughly parallel and perpendicular to the line of travel. The distance (d) to the closest tree in each of the four quadrants marked by the poles was recorded, along with their species and crown radius (r). In addition, the number of individuals of each species of shrub, woody vine, and seedling tree occurring in a four-by-four meter area centered on the sampling point was recorded.

For the purposes of this investigation, any woody plant greater than 3 meters in height (9 feet 10 inches, or about twice shoulder-height of the investigator) and emergent (i.e., not overshaded by any adjacent tree) was eligible for inclusion in the overstory data. Only woody plants less than 3 meters in height were included in the shrub counts.

The raw information collected in the field was then combined to show the information presented in Tables I through V. The combined data from the 19 sampling points along the Bee Creek transect are presented in Table II. The criterion for classifying the remaining 81 sampling points into communities with closed (Table I), semi-open (Table III), or wide-open (Table IV) canopies was the mean distance($\bar{D}$)measured at each point. Since the mean distance for all the 100 points measured could be subject to bias (i.e., by the number of points taken in areas with a closed canopy versus the number in areas with an open canopy, etc.), it was decided to base cutoff values for $\bar{D}$ on some factor of the mean tree size of all trees measured($\bar{R}$) (i.e., at all 100 points).

If all trees were of exactly mean size and were perfectly evenly distributed in an area (on a hexagonal rather than a square grid) such that no additional mean-sized trees could be inserted in the open areas between the existing trees without the crowns overlapping, then the maximum mean distance measured by the Cottam and Curtis method would be less than $2.37\bar{R}$. At measured distances of greater than $3.61\bar{R}$ the existing trees are more than two tangential tree diameters apart (measuring from edge of crown to edge of crown). These two values, arrived at theoretically, were then taken as the cutoff values for $\bar{D}$, but only after all the raw data were collected were the sampling points sorted accordingly.

For each of the four areas represented by Tables I through IV, the raw data were manipulated in the following manner.

N = the number of sampling points in each of the four areas
- = 42 for Table I
- = 19 for Table II
- = 24 for Table III
- = 15 for Table IV

$\bar{d}$ = mean distance measured to all trees in each area (i.e., in each table, not to be confused with $\bar{D}$ which is the mean distance to all trees at each point)

(NOTE: $(\bar{d})^2 \neq \overline{d^2}$)

$\bar{r}$ = mean radius of crown of each species in each area (i.e., in each table, not to be confused with $\bar{R}$ which is the mean radius of all trees at all 100 points)

(NOTE: $\overline{r^2} \neq (\bar{r})^2$)

Raw frequency = number of points at which a species occurs

Raw density = number of individuals of each species encountered

$$\text{Frequency} = \frac{\text{raw frequency}}{N} \times 100\%$$

$$\text{Relative frequency} = \frac{\text{raw frequency}}{\text{sum of the raw frequencies}} \times 100\%$$

$$\text{Density of trees} = \text{total density} \times \frac{\text{relative density}}{100\%}$$

$$\text{Total density of trees} = (10{,}000\ m^2/ha)/(\bar{d})^2 \text{ for distance measured in meters}$$

$$= (43{,}560\ ft^2/A)/(\bar{d})^2 \text{ for distance measured in feet}$$

$$\text{Relative density of trees} = \frac{\text{raw density}}{4N} \times 100\%$$

$$\text{Density of shrubs} = \frac{\text{raw density}}{16N} \times 100$$

NOTE: this is not a percentage calculation

$$\text{Relative density of shrubs} = \frac{\text{raw density}}{\text{total raw density}} \times 100\%$$

$$\text{Cover} = \text{pi} \times \overline{r^2} \times \text{density}$$

$$\text{Relative cover} = \frac{\text{cover}}{\text{total cover}} \times 100\%$$

$$\text{Importance value of trees} = \frac{\text{relative frequency} + \text{relative density} + \text{relative cover}}{3}$$

$$\text{Importance value of shrubs} = \frac{\text{relative frequency} + \text{relative density}}{2}$$

NOTE: The ecological literature usually refers to what is here called cover as “dominance.” While it is generally correct to assume that species with more cover will be more important in the community, this theoretically need not be the case. Yet, because of its widespread, utilitarian, and almost habitual usage, the term “dominance” and its derivatives will, in this report, refer either to cover or to the importance value. The context of each usage will hopefully clarify the intended meaning.

RESULTS AND DISCUSSION

Cedar-Oak Woodland

The lower slopes of Wild Basin support a woodland dominated by *Juniperus ashei* and *Quercus texana* (Table I). *Quercus fusiformis* is a significant secondary element not only of this woodland, but of all the vegetation areas sampled in the basin. The wide difference in density between *J. ashei* and *Q. texana* is not reflected in an equally wide difference in amount of cover since the crown of the average Texas oak is over 50% larger than that of the average cedar tree. Also, cedars tend to be more clumped together as shown by the lower frequency relative to density. The overstory is virtually continuous and, with overlapping of adjacent trees, total cover is over 60% more than total land area. In such cases, relative cover is a more realistic representation of the amount of actual dominance of each species.

In the shrub layer, no equally small number of species dominated the woodland. Four species account for just over half the importance value, seven species a total of two-thirds, and ten species just over three-fourths. Nearly half of the shrub layer consists of tree seedlings, vines, or cacti and agavaceous plants (roughly 30%, 15%, and 4% respectively).

The ground level is sparsely populated compared to the grasslands and underneath the cedar brakes (pure stands of mature cedars) ground cover is almost non-existent. The shrub layer in the cedar brakes is also considerably less dense.

Cedar-Hardwood Bottomland

Along the major streamsides and in the southern hollows a major variation of the cedar-oak woodland occurs (Table II). The average *Juniperus ashei* is some 60% larger here than in the

normal woodland and so the species dominates a larger relative area with some 15% fewer trees per unit area. Quercus fusiformis still occupies a position of comparable importance as in the woodland, but the average individual is over twice as large. The niche occupied by Q. texana in the woodland is apparently almost completely preempted along the streamsides, and its relative importance in the community is replaced by Fraxinus texensis, Platanus occidentalis, and Juglans microcarpa. Trees are on the whole one-third larger along the streams than in the woodland and thus, though their density is only three-fourths that of the woodland, their total cover is 6% greater (but again, due to overlapping, relative cover is a better estimate of dominance).

Shrub densities are only about 10% less along the streamsides than in the woodland, but the streamsides are more diverse; six species account for just over half the importance value, nine just under two-thirds, and twelve nearly three-fourths. Over half of the shrub layer consists of tree seedlings, vines, or agavaceous plants (roughly 28%, 22%, and 3% respectively) with vines more important here than in the woodland.

The ground layer is equally as sparse as in the woodland except right at streamside or in the streambed itself at even the slightest of openings there is usually found dense stands of switchgrass, big muhly, teosinte, and Johnson grass. In the deeper, denser, moister localities along the creeks can be found maidenhair fern, Mexican-fern, and often other ferns, and nearly everywhere along the streams are the ever-present sedges and rushes.

Cedar Grassland

On the upper slopes, the dominant trees are the same and in the same relative order as in the woodland, but total cover, even ignoring the possibility of overlap between trees in a clump, is less than 50% of the land area. Overall tree densities are markedly less, less than a quarter that of the lower slopes. Trees on the whole are some 30% larger here, and this is almost entirely due to one species, Juniperus ashei, which is over 55% larger here than in the woodland. Texas oaks are roughly equal in size in the two areas. Again, cedar trees exhibit a tendency to be clumped, i.e., have a lower frequency relative to their density.

Shrub densities are just over half of what they are in the woodlands. Four species account for over half the importance value, six for two-thirds, and eight for three-fourths, but generally the most important species are the same as in the woodlands but with more persimmons. Less than half of the shrub layer is made up of tree seedlings, vines, or succulents (roughly 25%, 12%, and 8% respectively).

Grasses (the bluestems, the gramas, buffalo grass, and lovegrass) are the dominant ground cover. Where this cover has been disturbed or removed, channelization of water runoff follows. Owing to the shallowness of the soil, this could become a serious erosional problem, but under natural conditions a minor disturbance would allow for the growth of either of the muhlys or switchgrass, thus stabilizing the erosion. However, under continuous disturbance, not even these can survive and the soil is completely removed aggravating the condition even more. This latter situation has occurred along many of the trails and roadways on the upper slopes and especially in the area indicated on the map as the “Washouts.”

Subclimax Grassland

A fire burned parts of the basin some eleven years ago according to local residents. This fire is still evident by the large, charred cedar stumps, by the blackened and partly destroyed fence posts, and by the structure of the vegetation in the area involved. The burned areas should be cedar grassland as per their position on the upper slopes but tree densities are only a quarter what they should be and total cover less than one-fifth. The wide discrepancy in importance between Juniperus ashei and Quercus texana in the cedar grassland (19.6%) is not in evidence here (only 2.1%). Although the data and tables do not show it, the Texas oaks nearly all grow in tight clusters of five or more main trunks approximately in a circle. This latter observation bears out reports by local residents that Texas oaks grow back quickly after a fire from the root crowns of former trees.

The shrub layer is also markedly sparse (less than 40% that of the unburned slopes) and less diverse. Only three species account for half the importance value, four species almost two-thirds, and five species almost three-fourths. Tree seedlings, vines, and succulents comprise over half of what is there (roughly 25%, 9%, and 18% respectively). Texas oak seedlings are noticeably lacking and succulents are most numerous here.

Ground cover in the areas affected by fire is similar, if not identical, to that of the cedar grassland.

General Observations

In all, 317 species of vascular plants are reported from Wild Basin. Only 18 species, 5.7% of the total, are not native, and of these all but one are restricted either to a few individuals or to a small locality within the basin. The one

exception is Johnson grass which is common but not obnoxious along streams.

Two species at Wild Basin are on the list of rare and endangered plants native to Texas. On a scale of 1 to 7 ranging from abundance to extinction, both are rated as "5" i.e., "scarce, endangered in Texas." Onosmodium helleri, Heller's marbleseed, is known only from Bexar, Kendall, Kerr, and Travis counties in Texas. In Wild Basin this herb is found on the alluvial bottoms, near, but not immediately alongside, the streams, underneath thick growths of shrubs. Pavonia lasiopetala, the Texas or rose mallow, is known from only the eastern and southern edges of the Edwards Plateau in Texas, but is apparently considerably more broadly distributed, if not common, in Mexico. This species was observed by Dr. Johnston as occurring in Wild Basin but not during this study owing to the time of year and the severity of the drought (June and July, 1977).

One well-known species not on the rare and endangered list since it is common and widespread elsewhere in Texas but is nevertheless uncommon on the eastern plateau is Arbutus xalapensis, the Texas madrone. Three mature individuals are known from upper, but sheltered, north-facing slopes below the Noack home. They are doing about as well as can be expected for madrone trees, but there is no evidence of successful reproduction.

Since essentially the same three species of cedar and oaks dominate the basin in all areas except the streamsides, the question can be raised as to the validity of distinguishing the cedar grasslands from the cedar-oak woodlands. The two community types are not sharply or dramatically delineated in the field but gradually blend, one into the other, over a topographic gradient. Could not the extreme regimes, one drier

and the other more mesic, be classified as preclimactic and postclimactic respectively and the true, singular climax community be sought in some intermediate position?

In mapping these two major vegetational types it was observed that the distinction between the more open cedar grassland and the closed-canopy cedar-oak woodland is much more dramatically pronounced in aerial photographs than on the ground. Those areas designated as cedar grassland are light with uniformly scattered, dark, roundish blotches, relatively equal in size. Those areas of cedar-oak woodland are continuously a mottled dark gray with only small, widely scattered light patches corresponding to areas cut by cedar choppers. The boundary between the two as seen from the air (i.e., the zone of transition or ecocline), although still arbitrary (as are all ecological boundaries) is remarkably abrupt and narrow in most places.

Furthermore, the boundary so drawn between the two communities corresponds very closely with the mapped division between the second and third members of the Glen Rose Formation. Now it can be argued that since geologic maps are oftentimes constructed from distinguishing different vegetation types observed in aerial photographs, then this argument has little validity. But it should be emphasized that the initial distinction between the two communities was made in the field on the ground, the statistical differentiation between the two and the mapping of the two were all made without any prior knowledge of the geology of the area. The cedar-oak woodland occurs on north- and south-facing slopes with little variation in general composition between the two directional slopes, and it occurs on tops of lower hills to the east from which the third member of the Glen Rose has been eroded. The cedar grassland occurs on north- and south-facing slopes with little change in tree

density down to approximately the contact between the two rock members.

It is concluded, therefore, that the cedar-oak woodland and the cedar grassland are each edaphic climaxes in their own right, and that the streamside cedar-hardwood woodland represents a postclimax of the former (although it too might be considered as an edaphic climax, being partly restricted by the alluvial flood-prone areas) and the burned-over grassland represents a subclimax of the latter.

There still remains the question of the cedar brakes, of which there are two types, the few, small, widely-scattered brakes hidden among the cedar-oak woodland, and the few, larger brakes on the upper slopes among the cedar grassland. Having presented the argument that the woodland and grassland are climax communities in their own right, the possibility (but only that) will now be argued that the cedar brakes represent the true, ultimate climax situation. The evidence however is indirect and not conclusive and therefore the argument is suspect.

In both types of brakes the cedar trees are very large and hence presumably very old. In both, other woody species, whether shrubs, small trees, or other tree species are generally scarce or even totally lacking. The brakes on the lower slopes and streamsides exhibit a closed canopy with considerable overlapping of adjacent crowns, and extreme paucity of even an herbaceous ground cover, and death of the lower branches of the cedar trees probably due to intense shading. The upper-slope brakes are more open (but tree densities are markedly higher than the surrounding cedar grassland), the branches of the cedars are nearly all living even near ground level, and the small spaces between trees, where they exist, are covered with grasses.

As already noted, Texas oaks germinate from root crowns following a fire. Without the ability to do so, this species would be at a great disadvantage in the race to repopulate the burned-over areas. Cedar trees are much more effective at seedling repopulation; the seedling ratio of cedars to Texas oaks on the burned slopes is nearly 40 to 1, while on the unburned upper slopes the seedling ratio is only 2.9 to 1. In the cedar-oak woodland the seedling ratio is more nearly even, 1.15 to 1, still slightly in favor of the cedars.

While there are large/old Texas oaks that rival the largest/oldest cedar trees, there are, nonetheless, considerably more large/old cedars than Texas oaks in the basin. It is then altogether possible that cedars have a longer statistical life expectancy than do Texas oaks.

This, coupled with the seedling ratios just mentioned, plus the fact that no two trees can occupy exactly the same space, plus the probability that an older tree can out-compete a younger tree (especially seedlings) would indicate that over time and barring disturbance there should be a statistical increase in the mean density, cover, and importance value of Juniperus ashei and a corresponding decrease in those of Quercus texana until some sort of equilibrium is reached. Such a change would proceed faster on the drier slopes than on the lower slopes.

This argument is, however, purely speculative. Until further research indicates otherwise, the basin should be treated as consisting of four major plant communities, two climax, one postclimax, and one subclimax.

TABLE I

Cedar-Oak Woodland

Trees

Species	Frequency	Density[1]	Cover[2]
Juniperus ashei (mountain cedar)	78.6	419.0/ha (169.8/A)	8173
Quercus texana (Texas oak)	57.1	225.6/ha (91.4/A)	6128
Quercus fusiformis (plateau live oak)	21.4	55.2/ha (22.4/A)	905
Ulmus crassifolia (cedar elm)	7.1	23.0/ha (9.3/A)	294
Ilex vomitoria (yaupon)	7.1	13.8/ha (5.6/A)	136
Diospyros texana (Texas persimmon)	2.4	9.2/ha (3.7/A)	147
Miscellaneous 6 species	14.3	27.6/ha (11.2/A)	401
Total	(3)	773.4/ha (313.4/A)	16184[4]

Miscellaneous species:
Arbutus xalapensis, Texas madrone
Bumelia lanuginosa, gum elastic
Celtis reticulata, netleaf hackberry
Cercis canadensis, redbud
Garrya lindheimeri, Lindheimer silktassel
Rhus lanceolata, lance-leaf sumac

(1) ha = hectare, A = acre (1 ha = 2.471 A).
(2) Cover is presented as square meters per hectare (1 ha = 10,000 sq m).
(3) The sum of the frequencies is meaningless.
(4) Values in excess of 10,000 sq m/ha are due to overlapping crowns of adjacent trees.

TABLE I (continued)

Cedar-Oak Woodland

Trees

Species	Relative Frequency	Relative Density	Relative Cover	Importance Value
J. ashei	41.8	54.2	50.5	48.8
Q. texana	30.4	29.2	37.9	32.5
Q. fusiformis	11.4	7.1	5.6	8.0
U. crassifolia	3.8	3.0	1.8	2.9
I. vomitoria	3.8	1.8	.8	2.1
D. texana	1.3	1.2	.9	1.1
Misc. 6 spp.	7.6	3.6	2.5	4.6
Total	100.1(5)	100.1(5)	100.0	100.0

(5) Whenever values are rounded off, a cumulative discrepancy occurs which becomes apparent in the sum of those values.

Shrubs

Species	Type(6)	Frequency	Density(7)
Garrya lindheimeri (Lindheimer silktassel)	LS	73.8	104.5
Juniperus ashei (mountain cedar)	T	85.7	57.3
Quercus texana (Texas oak)	T	69.0	49.7
Rhus toxicondendron (poison ivy)	V	38.1	46.0
Rhus aromatica (fragrant sumac)	S	40.5	25.6
Rhus virens (evergreen sumac)	S	47.6	9.4
Ilex vomitoria (yaupon)	LS	35.7	12.9
Forestiera pubescens (elbowbush)	S	23.8	19.5
Smilax bona-nox (saw greenbriar)	V	31.0	9.5

TABLE I (continued)

Cedar-Oak Woodland

Shrubs

Species	Type[6]	Frequency	Density[7]
Yucca rupicola (Texas yucca)	A	28.6	6.2
Bumelia lanuginosa (gum elastic)	ST	23.8	9.2
Quercus fusiformis (plateau live oak)	T	23.8	8.3
Eysenhardtia texana (Texas kidneywood)	S	16.7	5.7
Ptelea trifoliata (hoptree)	ST	19.0	3.3
Vitis berlandieri (Spanish grape)	V	14.3	5.4
Ulmus crassifolia (cedar elm)	T	16.7	3.6
Eupatorium havanense (shrubby boneset)	SS	16.7	3.3
Cercis canadensis (redbud)	ST	11.9	4.2
Diospyros texana (Texas persimmon)	ST	11.9	2.1
Miscellaneous 18 species		64.3	11.8
Total		(3)	397.5

Miscellaneous species:

Berberis trifoliolata, agarito (S)
Celtis reticulata, netleaf hackberry (T)
Cocculus carolinus, Carolina snailseed (V)
Croton fruticulosus, bush croton (SS)
Fraxinus texensis, Texas ash (T)
Ilex decidua, possumhaw (S)
Mimosa borealis, fragrant mimosa (SS)
Nolina lindheimeriana, devil’s-shoestring (A)
Opuntia lindheimeri, Texas pricklypear (C)
Opuntia macrorhiza, grassland pricklypear (C)
Parthenocissus heptaphylla, sevenleaf creeper (V)
Parthenocissus quinquefolia, Virginia creeper (V)
Quercus sinuata var. breviloba, white shin oak (T)

TABLE I (continued)

Cedar-Oak Woodland

Shrubs

Rhamnus caroliniana, Carolina buckthorn (S)
Sophora secundiflora, Texas mountain laurel (S)
Ungnadia speciosa, Mexican buckeye (ST)
Vitis mustangensis, mustang grape (V)
Zanthoxylum hirsutum, tickle-tongue (LS)

(6) Types T = normally a tree species, but only seedlings or individuals under 3 meters tall were included in the shrub counts
ST = small trees with a single trunk, occasional individuals will be included in the overstory date
LS = large shrubs without a single trunk or with many trunks clustered together at ground level
S = shrubs
SS = small shrubs, or larger weakly woody plants
V = woody vines
C = cacti
A = agavaceous plants

(7) Shrub densities are expressed as number of individuals per are (1 are = 100 square meters = 0.01 hectare). To compare tree seedlings in the shrub tables with density of mature trees, multiply the seedling densities by 100.

TABLE I (continued)

Cedar-Oak Woodland

Shrubs

Species	Relative Frequency	Relative Density	Importance Value
G. lindheimeri	10.7	26.3	18.5
J. ashei	12.4	14.4	13.4
Q. texana	10.0	12.5	11.2
R. toxicodendron	5.5	11.8	8.6
R. aromatica	5.8	6.4	6.1
R. virens	6.9	2.4	4.6
I. vomitoria	5.2	3.3	4.2
F. pubescens	3.4	4.9	4.2
S. bona-nox	4.5	2.4	3.4
Y. rupicola	4.1	1.6	2.8
B. lanuginosa	3.4	2.3	2.8
Q. fusiformis	3.4	2.1	2.8
Ey. texana	2.4	1.4	1.9
P. trifoliata	2.7	.8	1.8
V. berlandieri	2.1	1.3	1.7
U. crassifolia	2.4	.9	1.6
Eu. havanense	2.4	.8	1.6
C. canadensis	1.7	1.0	1.4
D. texana	1.7	.5	1.1
Misc. 18 spp.	9.3	3.0	6.2
Total	100.0	100.1(5)	99.9(5)

TABLE II

Cedar-Hardwood Bottomland

See Table I for explanation of footnotes.

Trees

Species	Frequency	Density[1]	Cover[2]
Juniperus ashei (mountain cedar)	100.0	359.9/ha (145.9/A)	10655[4]
Fraxinus texensis (Texas ash)	42.1	76.6/ha (31.0/A)	2626
Quercus fusiformis (plateau live oak)	31.6	45.9/ha (18.6/A)	1687
Platanus occidentalis (American sycamore)	15.8	23.0/ha (9.3/A)	1117
Juglans microcarpa (little walnut)	15.8	23.0/ha (9.3/A)	493
Ulmus crassifolia (cedar elm)	15.8	23.0/ha (9.3/A)	315
Quercus texana (Texas oak)	10.5	15.3/ha (6.2/A)	115
Rhus lanceolata (lance-leaf sumac)	5.3	15.3/ha (6.2/A)	158
Total	(3)	582.0/ha (235.8/A)	17166[4]

Species	Relative Frequency	Relative Density	Relative Cover	Importance Value
Jun. ashei	42.2	61.8	62.1	55.4
F. texensis	17.8	13.2	15.3	15.4
Q. fusiformis	13.3	7.9	9.8	10.3
P. occidentalis	6.7	3.9	6.5	5.7
Jug. microcarpa	6.7	3.9	2.9	4.5
U. crassifolia	6.7	3.9	1.8	4.1
Q. texana	4.4	2.6	.7	2.6
R. lanceolata	2.2	2.6	.9	1.9
Total	100.0	99.8[5]	100.0	99.9[5]

TABLE II (continued)

Cedar-Hardwood Bottomland

Shrubs

Species	Type[6]	Frequency	Density[7]
Garrya lindheimeri (Lindheimer silktassel)	LS	73.7	59.5
Smilax bona-nox (saw greenbriar)	V	84.2	43.4
Juniperus ashei (mountain cedar)	T	78.9	29.6
Fraxinus texensis (Texas ash)	T	57.9	31.2
Forestiera pubescens (elbowbush)	S	42.1	28.0
Ulmus crassifolia (cedar elm)	T	63.2	18.4
Ilex vomitoria (yaupon)	LS	57.9	20.1
Rhus aromatica (fragrant sumac)	S	42.1	17.1
Rhamnus caroliniana (Carolina buckthorn)	S	52.6	9.5
Rhus toxicodendron (poison ivy)	V	31.6	11.8
Vitis berlandieri (Spanish grape)	V	31.6	10.9
Bumelia lanuginosa (gum elastic)	ST	31.6	7.6
Quercus texana (Texas oak)	T	36.8	4.6
Eupatorium havanense (shrubby boneset)	SS	21.1	7.2
Parthenocissus quinquefolia (Virginia creeper)	V	15.8	4.9
Ptelea trifoliata (hoptree)	ST	21.1	2.3
Quercus fusiformis (plateau live oak)	T	15.8	4.6
Rubus trivialis (southern dewberry)	V	10.5	6.6
Eysenhardtia texana (Texas kidneywood)	S	21.1	2.0

TABLE II (continued)

Cedar-Hardwood Bottomland

Shrubs

Species	Type[6]	Frequency	Density[7]
Diospyros texana (Texas persimmon)	ST	15.8	3.9
Callicarpa americana (American beautyberry)	S	5.3	6.9
Nolina lindheimeriana (devil's-shoestring)	A	5.3	6.6
Yucca rupicola (Texas yucca)	A	10.5	4.3
Ilex decidua (possumhaw)	S	10.5	3.6
Miscellaneous 9 species		84.2	9.2
Total		(3)	353.8

Miscellaneous species:

Carya illinoinensis, pecan (T)
Celtis reticulata, netleaf hackberry (T)
Cocculus carolinus, Carolina snailseed (V)
Croton fruticulosus, bush croton (SS)
Juglans microcarpa, little walnut (T)
Lonicera japonica, Japanese honeysuckle (V)
Nolina texana, sacahuista (A)
Rhus virens, evergreen sumac (S)
Vitis mustangensis, mustang grape (V)

Species	Relative Frequency	Relative Density	Importance Value
G. lindheimeri	8.0	16.8	12.4
S. bona-nox	9.1	12.3	10.7
J. ashei	8.6	8.4	8.5
Fr. texensis	6.3	8.8	7.6
Fo. pubescens	4.6	7.9	6.2
U. crassifolia	6.9	5.2	6.0

TABLE II (continued)

Cedar-Hardwood Bottomland

Shrubs

Species	Relative Frequency	Relative Density	Importance Value
I. vomitoria	6.3	5.7	6.0
Rhus aromatica	4.6	4.8	4.7
Rha. caroliniana	5.7	2.7	4.2
Rhus toxicodendron	3.4	3.3	3.4
V. berlandieri	3.4	3.1	3.2
B. lanuginosa	3.4	2.1	2.8
Q. texana	4.0	1.3	2.6
Eu. havanense	2.3	2.0	2.2
Pa. quinquefolia	1.7	1.4	1.6
Pt. trifoliata	2.3	.7	1.5
Q. fusiformis	1.7	1.3	1.5
Ru. trivialis	1.1	1.9	1.5
Ev. texana	2.3	.6	1.5
D. texana	1.7	1.1	1.4
C. americana	.6	2.0	1.3
N. lindheimeriana	.6	1.9	1.2
Y. rupicola	1.1	1.2	1.2
I. decidua	1.1	1.0	1.0
Misc. 9 spp.	9.1	2.6	5.8
Total	99.9(5)	100.1(5)	100.0

TABLE III

Cedar Grassland

See Table I for explanation of footnotes.

Trees

Species	Frequency	Density[1]	Cover[2]
Juniperus ashei (mountain cedar)	79.2	94.9/ha (38.5/A)	2707
Quercus texana (Texas oak)	58.3	55.8/ha (22.6/A)	1507
Quercus fusiformis (plateau live oak)	29.2	18.6/ha (7.5/A)	376
Diospyros texana (Texas persimmon)	8.3	3.7/ha (1.5/A)	16
Miscellaneous 3 species	12.5	5.6/ha (2.3/A)	30
Total	(3)	178.6/ha (72.4/A)	4636

Miscellaneous species:
Bumelia lanuginosa, gum elastic
Ilex vomitoria, yaupon
Ulmus crassifolia, cedar elm

Species	Relative Frequency	Relative Density	Relative Cover	Importance Value
J. ashei	42.2	53.1	58.4	51.2
Q. texana	31.1	31.2	32.5	31.6
Q. fusiformis	15.6	10.4	8.1	11.4
D. texana	4.3	2.1	.3	2.2
Misc. 3 spp.	6.7	3.1	.6	3.5
Total	99.9[5]	99.9[5]	99.9[5]	99.9[5]

TABLE III (continued)

Cedar Grassland

Shrubs

Species	Type[6]	Frequency	Density[7]
Garrya lindheimeri (Lindheimer silktassel)	LS	54.2	57.3
Juniperus ashei (mountain cedar)	T	79.2	30.7
Rhus virens (evergreen sumac)	S	75.0	21.9
Rhus toxicodendron (poison ivy)	V	33.3	28.4
Quercus texana (Texas oak)	T	33.3	10.7
Yucca rupicola (Texas yucca)	A	41.7	7.3
Ilex vomitoria (yaupon)	LS	29.2	10.7
Diospyros texana (Texas persimmon)	ST	29.2	6.0
Rhus aromatica (fragrant sumac)	S	20.8	8.3
Bumelia lanuginosa (gum elastic)	ST	20.8	5.5
Quercus fusiformis (plateau live oak)	T	20.8	3.6
Forestiera pubescens (elbowbush)	S	16.7	2.3
Eysenhardtia texana (Texas kidneywood)	S	16.7	1.6
Smilax bona-nox (saw greenbriar)	V	8.3	3.1
Nolina lindheimeriana (devil’s-shoestring)	A	8.3	1.6
Ulmus crassifolia (cedar elm)	T	4.2	2.6
Miscellaneous 9 species		45.8	5.7
Total		(3)	207.3

TABLE III (continued)

Cedar Grassland

Shrubs

Miscellaneous species:
Baccharis neglecta, Roosevelt weed (S)
Berberis trifoliolata, agarito (S)
Cercis canadensis, redbud (ST)
Colubrina texensis, Texas snakewood (S)
Opuntia lindheimeri, Texas pricklypear (C)
Opuntia macrorhiza, grassland pricklypear (C)
Ungnadia speciosa, Mexican buckeye (ST)
Vitis berlandieri, Spanish grape (V)
Zanthoxylum hirsutum, tickle-tongue (LS)

Species	Relative Frequency	Relative Density	Importance Value
G. lindheimeri	10.1	27.6	18.8
J. ashei	14.7	14.8	14.8
R. virens	14.0	10.6	12.3
R. toxicodendron	6.2	13.7	10.0
Q. texana	6.2	5.2	5.7
Y. rupicola	7.8	3.5	5.6
I. vomitoria	5.4	5.2	5.3
D. texana	5.4	2.9	4.2
R. aromatica	3.9	4.0	4.0
B. lanuginosa	3.9	2.6	3.2
Q. fusiformis	3.9	1.8	2.8
F. pubescens	3.1	1.1	2.1
E. texana	3.1	.7	1.9
S. bona-nox	1.6	1.5	1.6
N. lindheimeriana	1.6	.7	1.2
U. crassifolia	.8	1.3	1.0
Misc. 9 spp.	8.5	2.8	5.6
Total	100.2[5]	100.0	100.1[5]

TABLE IV

Subclimax Grassland

See Table I for explanation of footnotes.

Trees

Species	Frequency	Density[1]	Cover[2]
Juniperus ashei (mountain cedar)	66.7	18.9/ha (7.7/A)	429
Quercus texana (Texas oak)	73.3	18.9/ha (7.7/A)	346
Quercus fusiformis (plateau live oak)	40.0	6.1/ha (2.5/A)	73
Miscellaneous 2 species	13.3	1.5/ha (0.6/A)	26
Total	(3)	45.4/ha (18.5/A)	874

Miscellaneous species:
Quercus sinuata var. breviloba, white shin oak
Rhus lanceolata, lance-leaf sumac

Species	Relative Frequency	Relative Density	Relative Cover	Importance Value
J. ashei	34.5	41.7	49.1	41.8
Q. texana	37.9	41.7	39.5	39.7
Q. fusiformis	20.7	13.3	8.4	14.1
Misc. 2 spp.	6.9	3.3	3.0	4.4
Total	100.0	100.0	100.0	100.0

Shrubs

Species	Type[6]	Frequency	Density[7]
Juniperus ashei (mountain cedar)	T	53.3	15.8
Rhus virens (evergreen sumac)	S	40.0	15.0

TABLE IV (continued)

Subclimax Grassland

Shrubs

Species	Type[6]	Frequency	Density[7]
Yucca rupicola (Texas yucca)	A	40.0	11.2
Garrya lindheimeri (Lindheimer silktassel)	LS	20.0	17.1
Rhus toxicodendron (poison ivy)	V	13.3	7.5
Eysenhardtia texana (Texas kidneywood)	S	26.7	2.1
Ilex vomitoria (yaupon)	LS	6.7	4.6
Nolina lindheimeriana (devil's-shoestring)	A	13.3	2.5
Quercus fusiformis (plateau live oak)	T	13.3	2.1
Rhamnus caroliniana (Carolina buckthorn)	S	6.7	1.2
Vitis berlandieri (Spanish grape)	V	6.7	.8
Miscellaneous 4 species		26.7	1.7
Total		(3)	81.6

Miscellaneous species:
Baccharis neglecta, Roosevelt weed (S)
Quercus texana, Texas oak (T)
Rhus aromatica, fragrant sumac (S)
Rhus lanceolata, lance-leaf sumac (LS)

Species	Relative Frequency	Relative Density	Importance Value
J. ashei	20.0	19.4	19.7
Rhus virens	15.0	18.4	16.7
Y. rupicola	15.0	13.8	14.4
G. lindheimeri	7.5	20.9	14.2

TABLE IV (continued)

Subclimax Grassland

Shrubs

Species	Relative Frequency	Relative Density	Importance Value
Rhus toxicodendron	5.0	9.2	7.1
E. texana	10.0	2.6	6.3
I. vomitoria	2.5	5.6	4.0
N. lindheimeriana	5.0	3.1	4.0
Q. fusiformis	5.0	2.6	3.8
Rha. caroliniana	2.5	1.5	2.0
V. berlandieri	2.5	1.0	1.8
Misc. 4 spp.	10.0	2.0	6.0
Total	100.0	100.1(5)	100.0

TABLE V

Mean Tree Size

Diameters

Species	Woodland	Bottomland	Cedar Grassland	Subclimax Grassland	All areas
Diospyros texana	4.32 m (14′2″)	X	2.31 m (7′7″)	X	3.31 m (10′10″)
Fraxinus texensis	X	5.00 m (16′5″)	X	X	5.00 m (16′5″)
Ilex vomitoria	3.44 m (11′3″)	X	(8)	X	3.26 m[9] (10′8″)
Juglans microcarpa	X	5.00 m (16′5″)	X	X	5.00 m (16′5″)
Juniperus ashei	4.51 m (14′9″)	5.71 m (18′9″)	5.65 m (18′6″)	5.13 m (16′10″)	5.12 m (16′9″)
Platanus occidentalis	X	7.38 m (24′3″)	X	X	7.38 m (24′3″)
Quercus fusiformis	4.01 m (13′2″)	5.91 m (19′5″)	4.79 m (15′8″)	3.75 m (12′4″)	4.48 m (14′8″)
Quercus texana	5.59 m (18′4″)	3.05 m (10′)	5.49 m (18′)	4.56 m (15′)	5.27 m (17′4″)
Rhus lanceolata	(8)	3.33 m (10′11″)	X	(8)	3.63 m[9] (11′11″)
Ulmus crassifolia	3.08 m (10′1″)	3.83 m (12′7″)	(8)	X	3.32 m[9] (10′11″)
Miscellaneous species	3.53 m (11′7″)	X	2.49 m (8′2″)	4.47 m (14′8″)	3.64 m[10] (11′11″)
All species	4.69 m (15′5″)	5.47 m (17′11″)	5.34 m (17′6″)	4.69 m (15′5″)	4.99 m (16′5″)

X = absence of that species from that area.
(8) Included under miscellaneous species for that area.
(9) Including all individuals sampled of that species.
(10) Excluding *Ulmus crassifolia*, *Rhus lanceolata*, and *Ilex vomitoria*.

TABLE VI

Vascular Plants of Wild Basin

Scientific nomenclature, common names of families, and sequence of families follows those found in Correll & Johnston (1970), while common names mostly follow those found in Gould (1975).

i = introduced species
r = species on the official list of rare and endangered plants native to Texas
s = species encountered in the watershed of Bee Creek by M. C. Johnston & collaborators during 1974 and/or 1975 but not encountered on the property under study during 1977

FERNS AND FERN ALLIES

SELAGINELLACEAE	SPIKEMOSS FAMILY
Selaginella wrightii Hieron.	Wright selaginella
SCHIZAEACEAE	CURLY-GRASS FAMILY
Anemia mexicana Kl.	Mexican-fern
POLYPODIACEAE	TRUE FERN FAMILY
Adiantum capillus-veneris L.	Southern maidenhair, culantrillo
Pellaea ovata (Desv.) Weath.	Cliffbrake
Thelypteris kunthii (Desv.) Morton	Southern shield-fern

GYMNOSPERMS

TAXODIACEAE	TAXODIUM FAMILY
s)*Taxodium distichum* (L.) Rich.	Bald cypress
CUPRESSACEAE	CYPRESS FAMILY
Juniperus ashei Buchh.	Mountain cedar, Ashe juniper, post cedar, rock cedar, Mexican juniper

TABLE VI (continued)

Vascular Plants of Wild Basin

FLOWERING PLANTS – MONOCOTS

GRAMINEAE (POACEAE)		GRASS FAMILY
	Andropogon glomeratus (Walt.) B.S.P.	Bushy bluestem, bushy beardgrass
	Aristida glauca (Nees) Walp.	Blue threeawn
	A. purpurea Nutt.	Purple threeawn
	A. wrightii Nash	Wright threeawn
	Bothriochloa hybrida (Gould) Gould	Hybrid bluestem
i)	B. ischaemum (L.) Keng var. songarica (Fisch. & Mey.) Celarier & Harlan	King Ranch bluestem
	B. saccharoides (Sw.) Rydb.	Silver bluestem
	Bouteloua curtipendula (Michx.) Torr.	Side-oats grama
	B. hirsuta Lag.	Hairy grama
	B. pectinata Featherly	Tall grama
	B. rigidiseta (Steud.) Hitchc.	Texas grama
	B. trifida Thurb.	Red grama
i)	Bromus japonicus L.	Japanese brome, Japanese chess
i)	B. unioloides H.B.K.	Rescue grass
	Buchloe dactyloides (Nutt.) Engelm.	Buffalo grass
s)	Cenchrus incertus M. A. Curtis	Common sandbur, grassbur
	Chasmanthium latifolium (Michx.) Yates	Inland sea oats
	Chloris cucullata Bisch.	Hooded windmill grass, hooded fingergrass
i)	Cynodon dactylon (L.) Pers.	Bermuda grass
	Digitaria adscendens (H.B.K.) Henr.	Southern crabgrass
i)	Eleusine indica (L.) Gaertn.	Goosegrass
	Elymus virginicus L.	Virginia wild-rye
	Eragrostis lugens Nees	Mourning lovegrass
	Leptoloma cognatum (Schult.) Chase	Fall witchgrass
	Melica nitens (Scribn.) Piper	Threeflower melic
	Muhlenbergia lindheimeri Hitchc.	Lindheimer muhly
	M. reverchonii Vasey & Scribn.	Seep muhly

TABLE VI (continued)

Vascular Plants of Wild Basin

	Panicum lindheimeri Nash (Dichanthelium l. (Nash) Gould)	Lindheimer panicum (Lindheimer dichanthelium)
	P. oligosanthes Schult. (D. o. (Schult.) Gould)	
	P. pedicellatum Vasey (D. p. (Vasey) Gould)	Cedar panicum (cedar dichanthelium)
	P. virgatum L.	Switchgrass
i)	Paspalum dilatatum Poir.	Dallis grass
	P. pubiflorum Fourn.	Hairy-seed paspalum
i)	P. urvillei Steud.	Vasey grass
	Schizachyrium scoparium (Michx.) Nash var. frequens (F. T. Hubb.) Gould	Little bluestem
	Setaria scheelei (Steud.) Hitchc.	Southwestern bristlegrass
	Sorghastrum avenaceum (Michx.) Nash	Yellow Indian grass
i)	Sorghum halepense (L.) Pers.	Johnson grass
	Sporobolus asper (Michx.) Kunth	Tall dropseed
	S. vaginaeflorus (Torr.) Wood	Poverty dropseed, southern poverty-grass
	Stipa leucotricha Trin. & Rupr.	Texas winter-grass, Texas speargrass
	Tridens flavus (L.) Hitchc.	Purpletop
	Tripsacum dactyloides (L.) L.	Eastern gamagrass
CYPERACEAE		SEDGE FAMILY
	Carex microdonta T. & H.	Littletooth sedge
	C. planostachys Kunze	Cedar sedge
	Cladium jamaicense Crantz.	Jamaica saw-grass
i)	Cyperus rotundus L.	Nut-grass
	Dichromena nivea (Boeck.) Britt.	Snowy whitetop
	Eleocharis montevidensis Kunth	Sand spikesedge
	E. obtusa (Willd.) Schult.	Blunt spikesedge
	Fuirena simplex Vahl.	Western umbrella-sedge
BROMELIACEAE		PINEAPPLE FAMILY
	Tillandsia recurvata L.	Small ballmoss
s)	T. usneoides (L.) L.	Spanish moss

TABLE VI (continued)

Vascular Plants of Wild Basin

COMMELINACEAE	SPIDERWORT FAMILY
Commelina erecta L.	Erect dayflower, hierba del pollo
Commelinantia anomala (Torr.) Tharp	False dayflower
Tradescantia gigantean Rose	Giant spiderwort
T. ohioensis Raf.	Ohio spiderwort
JUNCACEAE	RUSH FAMILY
Juncus interior Wieg.	Inland rush
J. texanus (Engelm.) Cov.	Texas rush
J. torreyi Cov.	Torrey rush
LILIACEAE	LILY FAMILY
Allium canadense L.	Canada garlic
A. drummondii Regel	Drummond onion
Nolina lindheimeriana (Scheele) Wats.	Devil’s shoestring, Lindheimer nolina
N. texana Wats.	Sacahuista
Nothoscordum bivalve (L.) Britt.	Yellow false-garlic, crow-poison
Smilax bona-nox L.	Saw greenbriar, car-brier
Yucca rupicola Scheele	Texas yucca, twisted-leaf yucca
AMARYLLIDACEAE	AMARYLLIS FAMILY
Cooperia drummondii Herb.	Eveningstar rainlily, cebolleta
IRIDACEAE	IRIS FAMILY
Sisyrinchium ensigerum Bickn.	Swordleaf blue-eyed grass
S. pruinosum Bickn.	Dotted blue-eyed grass

FLOWERING PLANTS – DICOTS

SALICACEAE	WILLOW FAMILY
Salix nigra Marsh.	Black willow
JUGLANDACEAE	WALNUT FAMILY
Carya illinoinensis (Wang.) K. Koch	Pecan
Juglans major (Torr.) Heller	Arizona walnut

TABLE VI (continued)

Vascular Plants of Wild Basin

J. microcarpa Berl.	Little walnut
FAGACEAE	BEECH FAMILY
Quercus fusiformis Small	Plateau live oak
Q. sinuata Walt. var. *breviloba* (Torr.) C. H. Mull.	White shin oak
Q. texana Buckl.	Texas oak, Texas red oak, Spanish oak
ULMACEAE	ELM FAMILY
Celtis laevigata Willd.	Sugar hackberry, Texas sugarberry
C. reticulata Torr.	Netleaf hackberry
Ulmus americana L.	American elm
U. crassifolia Nutt.	Cedar elm
MORACEAE	MULBERRY FAMILY
i)*Ficus carica* L.	Common fig
Morus microphylla Buckl.	Texas mulberry, mountain mulberry
URTICACEAE	NETTLE FAMILY
Parietaria floridana Nutt.	Florida pellitory, cucumber pellitory
VISCACEAE	MISTLETOE FAMILY
Phoradendron tomentosum (DC.) Gray	Common mistletoe
RANUNCULACEAE	CROWFOOT FAMILY
Anemone heterophylla Nutt.	Tenpetal anemone
Clematis drummondii T. & G.	Texas virgin’s bower
Delphinium carolinianum Walt.	Carolina larkspur, blue larkspur
BERBERIDACEAE	BARBERRY FAMILY
Berberis trifoliolata Moric.	Agarito, algerita
MENISPERMACEAE	MOONSEED FAMILY
Cocculus carolinus (L.) DC.	Carolina snailseed

TABLE VI (continued)

Vascular Plants of Wild Basin

PAPAVERACEAE	POPPY FAMILY
Argemone polyanthemos (Fedde) G. Ownbey	Prickly poppy
CRUCIFERAE (BRASSICACEAE)	MUSTARD FAMILY
Descurainia pinnata (Walt.) Britt.	Pinnate tansy-mustard
Draba cuneifolia T. & G.	Wedgeleaf draba, whitlow-grass, whitlow-wort
D. platycarpa T. & G.	Broadpod draba
Lepidium austrinum Small	Southern pepperweed
L. virginicum L.	Virginia pepperweed, peppergrass
Lesquerella gracilis (Hook.) Wats.	Lax bladderpod
i)*Rorippa nasturtium-aquaticum* (L.) Hayek	Watercress
CRASSULACEAE	ORPINE FAMILY
Sedum nuttallianum Raf.	Yellow stonecrop
PLATANACEAE	PLANE-TREE FAMILY
Platanus occidentalis L.	American sycamore
ROSACEAE	ROSE FAMILY
Geum canadense Jacq.	White avens
Prunus mexicana Wats.	Mexican plum
P. serotina Ehrh.	Black cherry
Rubus trivialis Michx.	Southern dewberry
LEGUMINOSAE (FABACEAE)	LEGUME FAMILY
Amorpha fruticosa L.	Indigobush, bastard indigo
Astragalus crassicarpus Nutt.	Ground plum milkvetch
Cassia lindheimeriana Scheele	Lindheimer senna
C. roemeriana Scheele	Two-leaf senna
Cercis canadensis L. var. *texensis* (Wats.) Rose	Texas redbud
Dalea frutescens Gray	Black dalea
D. nana Torr.	Dwarf dalea
Desmanthus virgatus (L.) Willd. Var *depressus* (Willd.) B. L. Turner	Bundleflower

TABLE VI (continued)

Vascular Plants of Wild Basin

Desmodium psilophyllum Schlecht.	Simple-leaf tick-clover
Eysenhardtia texana Scheele	Texas kidney wood
Galactia volubilis (L.) Britt.	Downy milkpea
Indigofera miniata Ort. var. leptosepala (Nutt.) B. L. Turner	Western indigo, scarlet pea
Lespedeza texana Britt.	Texas lespedeza, Texas bushclover
Lupinus texensis Hook.	Texas bluebonnet
Mimosa borealis Gray	Fragrant mimosa, pink mimosa
i)Parkinsonia aculeata L.	Retama, Jerusalem thorn
Prosopis glandulosa Torr.	Honey mesquite
Psoralea cyphocalyx Gray	Turniproot scurfpea
P. latestipulata Shinners var. appressa Ockendon	
Rhynchosia texana T. & G.	Texas snoutbean
Sophora secundiflora (Ort.) DC.	Mescalbean, Texas mountain laurel
Vicia ludoviciana Nutt.	Louisiana vetch, deer pea vetch
KRAMERIACEAE	RATANY FAMILY
Krameria lanceolata Torr.	Trailing ratany
GERANIACEAE	GERANIUM FAMILY
Erodium texanum Gray	Texas filaree, stork’s-bill, heronbill
OXALIDACEAE	WOOD-SORREL FAMILY
Oxalis dillenii Jacq.	Yellow wood-sorrel
O. drummondii Gray	Drummond oxalis
O. violacea L.	Violet wood-sorrel
LINACEAE	FLAX FAMILY
Linum rigidum Pursh	Stiff-stem flax
L. rupestre (Gray) Engelm.	Rock flax
RUTACEAE	CITRUS FAMILY
Ptelea trifoliata L.	Hop-tree, wafer ash, skunk-bush, nickels-dimes-and-quarters, money tree

TABLE VI (continued)

Vascular Plants of Wild Basin

Thamnosma texana (Gray) Torr.	Texas desert-rue, Dutchman's-breeches
Zanthoxylum hirsutum Buckl.	Prickly ash, tickle-tongue, toothache tree
MELIACEAE	MAHOGANY FAMILY
i)Melia azedarach L.	Chinaberry
MALPIGHIACEAE	MALPIGHIA FAMILY
Thryallis angustifolia (Senth.) O. Ktze.	Narrow-leaf thryallis
POLYGALACEAE	MILKWORT FAMILY
Polygala alba Nutt.	White milkwort
P. lindheimeri Gray	Shrubby milkwort
EUPHORBIACEAE	SPURGE FAMILY
Acalypha lindheimeri Muell. Arg.	Lindheimer copperleaf
Argythamnia simulans J. Ingram	Plateau wild-mercury
s)Bernardia myricaefolia (Scheele) Wats.	Brush myrtle-croton, oreja de ratón, rat's-ears
s)Cnidoscolus texanus (Muell. Arg.) Small	Texas bull nettle, mala mujer
Croton fruticulosus Torr.	Bush croton, encinilla
C. monanthogynus Michx.	One-seed croton, prairie tea
C. texensis (Kl.) Muell. Arg.	Texas croton
Euphorbia cyathophora Murr. (Poinsettia c. (Murr.) Kl. & Garcke)	Painted euphorbia
E. dentata Michx. (Poinsettia d. (Michx.) Small)	Toothed spurge
E. fendleri T. & G. (Chamaesyce f. (T. & G.) Small)	Fendler euphorbia
E. longicruris Scheele (Tithymalus l. (Scheele) Small)	Wedgeleaf euphorbia
E. villifera Schelle (Chamaesyce v. (Schelle) Small)	Hairy euphorbia

TABLE VI (continued)

Vascular Plants of Wild Basin

Phyllanthus polygonoides Spreng.	Knotweed leaf-flower
i)*Sapium sebiferum* (L.) Roxb.	Chinese tallow tree
Stillingia texana I. M. Johnst.	Texas stillingia, Queen's delight
Tragia ramosa Torr.	Noseburn
ANACARDIACEAE	SUMAC FAMILY
Rhus aromatica Ait.	Fragrant sumac
R. lanceolata (Gray) Britt.	Lance-leaf sumac
R. toxicodendron L. (*Toxicondendron radicans* (L.) O. Ktze.)	Poison ivy
R. virens Gray	Evergreen sumac
AQUIFOLIACEAE	HOLLY FAMILY
Ilex decidua Walt.	Possum haw, deciduous holly
I. vomitoria Ait.	Yaupon
ACERACEAE	MAPLE FAMILY
s)*Acer negundo* L.	Box elder, black maple
HIPPOCASTANACEAE	BUCKEYE FAMILY
Aesculus pavia L.	Red buckeye
SAPINDACEAE	SOAPBERRY FAMILY
Sapindus saponaria L. var. *drummondii* (H. & A.) L. Benson	Western soapberry
Ungnadia speciosa Ednl.	Mexican buckeye
RHAMNACEAE	BUCKTHORN FAMILY
Berchemia scandens (Hill) K. Koch	Alabama supplejack, rattan-vine
Ceanothus herbaceus Raf.	Inland ceanothus
Colubrina texensis (T. & G.) Gray	Texas colubrina, Texas snakewood
s)*Condalia hookeri* M. C. Johnst.	Brasil
Rhamnus caroliniana Walt.	Carolina buckthorn, Indian cherry
VITACEAE	GRAPE FAMILY
Ampelopsis arborea (L.) Koehne	Peppervine

TABLE VI (continued)

Vascular Plants of Wild Basin

Cissus incisa (Nutt.) Des Moul.	Ivy treebine, possum grape
Parthenocissus heptaphylla (Buckl.) Small	Sevenleaf creeper
P. quinquefolia (L.) Planch.	Virginia creeper
Vitis berlandieri Planch.	Spanish grape, winter grape
V. mustangensis Buckl.	Mustang grape
V. rupestris Scheele	Sand grape
MALVACEAE	MALLOW FAMILY
Abutilon incanum (Link) Sweet	Indian mallow
Callirhoe involucrata (Torr.) Gray	Low poppymallow, common winecup, cowboy rose
C. leiocarpa Martin	Tall poppymallow
rs)Pavonia lasiopetala Scheele	Texas mallow
Sida filicaulis T. & G.	Spreading sida
Wissadula holosericea (Scheele) Gke.	Velvet-leaf
VIOLACEAE	VIOLET FAMILY
Viola missouriensis Greene	Missouri violet
PASSIFLORACEAE	PASSION-FLOWER FAMILY
Passiflora lutea L.	Yellow passion-flower
P. tenuiloba Engelm.	Spread-lobe passion-flower
CACTACEAE	CACTUS FAMILY
Opuntia leptocaulis DC.	Pencil cactus
O. lindheimeri Engelm.	Texas prickly pear
O. macrorhiza Engelm.	Plains prickly pear
ONAGRACEAE	EVENING PRIMROSE FAMILY
Calylophus drummondianus Spach	Drummond sundrops
Oenothera laciniata Hill	Cutleaf evening primrose
O. missouriensis Sims	Missouri primrose, flutter-mill
UMBELLIFERAE (APIACEAE)	PARSLEY FAMILY
Daucus pusillus Michx.	Southwestern carrot, rattlesnake-weed
Sanicula canadensis L.	Canada snakeroot
Spermolepis inermis (DC.) Math. & Const.	Scaleseed

TABLE VI (continued)

Vascular Plants of Wild Basin

i)	Torilis arvensis (Huds.) Link	Tickseed, hedge-parsley
CORNACEAE		DOGWOOD FAMILY
	Cornus drummondii C. A. Mey.	Roughleaf dogwood
	Garrya lindheimeri Torr.	Lindheimer silktassel
ERICACEAE		HEATH FAMILY
	Arbutus xalapensis H.B.K.	Texas madrone
PRIMULACEAE		PRIMROSE FAMILY
	Samolus cuneatus Small	Limerock brookweed
	S. parviflorus Raf.	Small-flowered water-pimpernel
SAPOTACEAE		SAPODILLA FAMILY
	Bumelia lanuginosa (Michx.) Pers.	Gum elastic, ironwood, coma, chittamwood
EBENACEAE		EBONY FAMILY
	Diospyros texana Scheele	Texas persimmon
OLEACEAE		OLIVE FAMILY
	Forestiera pubescens Nutt.	Elbow-bush, spring herald
s)	Fraxinus pensylvanica Marsh	Red ash
	F. texensis (Gray) Sarg.	Texas ash
i)	Ligustrum japonicum Thunb.	Japanese privet
LOGANIACEAE		LOGANIA FAMILY
s)	Buddleja racemosa Torr.	Wand butterfly-bush
	Cynoctonum mitreola (L.) Britt.	Lax hornpod, miterwort
	Polypremum procumbens L.	Juniperleaf
GENTIANACEAE		GENTIAN FAMILY
	Centaurium beyrichii (T. & G.) Robins.	Rock centaury, mountain pink
	C. texense (Griseb.) Fern.	Texas centaury, Lady Bird’s centaury
APOCYNACEAE		DOGBANE FAMILY
	Amsonia ciliata Walt.	Fringe slimpod, blue-star

TABLE VI (continued)

Vascular Plants of Wild Basin

ASCLEPIADACEAE	MILKWEED FAMILY
Asclepias asperula (Dene.) Woods. subsp. capricornu (Woods.) Woods.	Spider antelope-horn
A. oenotheroides Cham. & Schlecht.	Hierba de zizotes
A. texana Heller	Texas milkweed
Cynanchum barbigerum (Scheele) Shinners	Bearded swallow-wort
Matelea reticulata (Gray) Woods.	Milkvine
CONVOLVULACEAE	MORNING GLORY FAMILY
Convolvulus equitans Benth.	Texas bindweed
Dichondra carolinensis Michx.	Ponyfoot
Ipomoea lindheimeri Gray	Blue morning glory
I. trichocarpa Ell.	Sharp-pod morning glory
POLEMONIACEAE	PHLOX FAMILY
Gilia incisa Benth.	Splitleaf gilia
Phlox roemeriana Scheele	Roemer phlox, gold-eye phlox
HYDROPHYLLACEAE	WATERLEAF FAMILY
Nemophila phacelioides Nutt.	Baby blue-eyes
Phacelia congesta Hook.	Blue curls, blue pearls
BORAGINACEAE	BORAGE FAMILY
Heliotropium tenellum (Nutt.) Torr.	Pasture heliotrope
Lithospermum incisum Lehm.	Narrowleaf gromwell, puccoon
r)Onosmodium helleri Small	Heller marbleseed, Heller false gromwell
VERBENACEAE	VERBENA FAMILY
Callicarpa americana L.	American beautyberry, French mulberry, filigrana
Lantana horrida H.B.K.	Common lantana, Texas lantana
Phyla incisa Small	Texas frog-fruit
Verbena bipinnatifida Nutt.	Dakota vervain
V. canescens H.B.K.	Gray vervain

TABLE VI (continued)

Vascular Plants of Wild Basin

V. neomexicana (Gray) Small	Hillside vervain, New Mexico vervain
i)*Vitex agnus-castus* L.	Chaste tree, lavender tree
LABIATAE (LAMIACEAE)	MINT FAMILY
Brazoria scutellarioides Engelm. & Gray	Prairie Brazoria
Hedeoma drummondii Benth.	Limoncillo
Monarda citriodora Cerv.	Lemon beebalm
Salvia roemeriana Scheele	Cedar sage
S. texana (Scheele) Torr.	Texas blue sage
Scutellaria drummondii Benth.	Drummond skullcap
Teucrium canadense L.	American germander
SOLANACEAE	NIGHTSHADE FAMILY
Bouchetia erecta DC.	Erect bouchetia
Chamaesaracha coronopus (Dun.) Gray	Green false nightshade
Physalis viscosa L.	Ground cherry
SCROPHULARIACEAE	FIGWORT FAMILY
Agalinis edwardsiana Penn.	Plateau gerardia, plateau remarkable-flax
Bacopa monnieri (L.) Wettst.	Coastal water-hyssop
Castilleja purpurea (Nutt.) G. Don, var. *lindheimeri* (Gray) Shinners	Lindheimer paintbrush, orange paintbrush
s)*Leucophyllum frutescens* (Berl.) I. M. Johnst.	Cenizo, purple sage, Texas silverleaf, barometer-bush
Maurandya antirrhiniflora Willd.	Snapdragon vine
ACANTHACEAE	ACANTHUS FAMILY
Justicia americana (L.) Vahl	American water-willow
Ruellia humilis Nutt.	Low ruellia
R. occidentalis (Gray) Tharp & Barkl.	False petunia
PLANTAGINACEAE	PLANTAIN FAMILY
Plantago helleri Small	Cedar plantain
P. rhodosperma Dene.	Red-seeded plantain

TABLE VI (continued)

Vascular Plants of Wild Basin

RUBIACEAE	MADDER FAMILY
Cephalanthus occidentalis L.	Common buttonbush
Galium virgatum Nutt.	Southwest bedstraw
Hedyotis nigricans (Lam.) Posb.	Prairie bluets, star-violet
CAPRIFOLIACEAE	HONEYSUCKLE FAMILY
i)*Lonicera japonica* Thunb.	Japanese honeysuckle
L. sempervirens L.	Trumpet honeysuckle
Viburnum rufidulum Raf.	Southern black-haw
VALERIANACEAE	VALERIAN FAMILY
Valerianella radiata (L.) Dufr.	Beaked cornsalad
CUCURBITACEAE	GOURD FAMILY
Ibervillea lindheimeri (Gray) Greene	Lindheimer globe-berry, balsam gourd, balsam apple
CAMPANULACEAE	BLUEBELL FAMILY
Triodanis coloradoensis (Buckl.) McVaugh	Colorado Venus' looking-glass
COMPOSITAE (ASTERACEAE)	SUNFLOWER FAMILY
Achillea millefolium L.	Common yarrow
Ambrosia psilostachya DC.	Western ragweed
A. trifida L.	Giant ragweed
Aster spinosus Benth.	Mexican devil-weed
A. subulatus Michx.	Hierba del marrano
A. texanus Burgess	Texas aster
Baccharis neglecta Britt.	Roosevelt weed, New Deal weed, poverty weed
Brickellia cylindracea Gray & Engelm.	Gravelbar brickle-bush
Calyptocarpus vialis Less.	Prostrate lawnflower
Centaurea americana Nutt.	American basketflower, powderpuff thistle
Chaptalia nutans (L.) Polak var. *texana* (Greene) Burk.	Silverpuff
Cirsium texanum Buckl.	Texas thistle
C. undulatum (Nutt.) Spreng.	Wavyleaf thistle
Conyza canadensis (L.) Cronq.	Horse-weed

TABLE VI (continued)

Vascular Plants of Wild Basin

Erigeron modestus Gray	Plains fleabane
Eupatorium havanense H.B.K.	Shrubby boneset
E. rugosum Houtt.	White snakeroot
E. serotinum Michx.	Late eupatorium
Gaillardia pulchella Foug.	Indian blanket, firewheels
Gnaphalium purpureum L.	Purple cudweed
Gymnosperma glutinosum (Spreng.) Less.	Tatalencho
Helenium microcephalum DC.	Smallhead sneezeweed
Hellianthus annuus L.	Common sunflower
Hymenopappus scabiosaeus L'Her. var. corymbosus (T. & G.) B. L. Turner	Old plainsman
Hymenoxys linearifolia Hook.	Fineleaf bitterweed
H. scaposa (DC.) Parker	Plains bitterweed
Iva angustifolia DC.	Narrowleaf sumpweed
I. annua L.	Marsh-elder
Lygodesmia texana (T. & G.) Greene	Texas skeleton-plant
Melampodium leucanthum T. & G.	Plains black-foot
Palafoxia callosa (Nutt.) T. & G.	Small palafoxia
Perezia runcinata (D. Don) Gray	Peonía
Pinaropappus roseus (Less.) Less.	White rock-lettuce
Pyrrhopappus multicaulis DC.	Many-stemmed false dandelion
Ratibida columnaris (Sims) D. Don	Mexican hat, prairie coneflower
Rudbeckia hirta L.	Brown-eyed susan
Tetragonotheca texana (Gray) Engelm. & Gray	Plateau nerve-ray
Thelesperma simplicifolium (Hook.) Gray	Slender greenthread
Verbesina encelioides (Cav.) Gray	Cowpen daisy, golden crownbeard
V. lindheimeri Robins. & Greenm.	Lindheimer crownbeard
V. virginica L.	Frostweed, white crownbeard
Vernonia lindheimeri Gray & Engelm.	Woolly ironweed

TABLE VI (continued)

Vascular Plants of Wild Basin

Viguiera dentata (Cav.) Spreng.	Plateau golden-eye, sunflower golden-eye
Zexmenia hispida (H.B.K.) Gray	Hairy zexmenia

LISTING of WILD BASIN VERTEBRATES

For birds, please see Appendix: *Birds of Wild Basin Wilderness Preserve Checklist*, updated 2006

These vertebrates are known to be currently living or have been sighted in the Wild Basin Wilderness Preserve as of 31 December 2006. This is knowledge gathered through either actual encounters or indirect signs such as tracks or droppings.

Amphibia (Amphibians)

- Smallmouth Salamander – *Ambystoma texanum*
- Dwarf Salamander – *Eurycea quadridigitata***
- Rio Grande Chirping Frog – *Syrrhophus cystignathoides campi***
- Cliff Chirping Frog – *Syrrophus marnocki*
- Blanchard's Cricket Frog – *Acris crepitans blanchardi*
- Copes Gray Tree Frog – *Hyla chrysoscelis*
- Spotted Chorus Frog – *Pseudacris clarki*
- Spring Peeper – *Pseudacris crucifer*
- Strecker's Chorus Frog – *Pseudacris streckeri*
- Upland Chorus Frog – *Pseudacris triseriata feriarum*
- Eastern Green Toad – *Bufo debilis debilis*
- Rio Grande Leopard Frog – *Rana berlandieri*
- Great Plains Narrowmouth Toad – *Gastrophyryne carolinensis*

**These species, according to Dixon and other herpetologists, do not occur in this area. Their presence in Wild Basin was confirmed in 2001, but the reason is unknown at this time.

Mammalia (Mammals)

Didelphimorphia (Opossums and allies)

- Virginia Opossum – *Didelphis virginiana*

Xenarthra (Armadillos, Sloths and allies)

- Nine-banded Armadillo – *Dasypus novemcinctus*

Chiroptera (Bats)

- Mexican Free-tailed Bat – *Tadarida brasiliensis*

Carnivora (Carnivores)

- Coyote – *Canis latrans*
- Common Gray Fox – *Urocyon cinereoargenteus*
- Ringtail – *Bassariscus astutus*
- Northern Raccoon – *Procyon lotor*
- Western spotted skunk – *Spilogale gracilis*
- Striped Skunk – *Mephitis mephitis*
- Bobcat – *Lynx rufus*

Artiodactyla (Even-toed Ungulates)

- White-tailed Deer – *Odocoileus virginianus*

Rodentia (Rodents)

- Rock Squirrel – *Spermophilus variegatus*
- Eastern Fox Squirrel – *Sciurus niger*
- Texas Mouse – *Peromyscus attwateri*
- White-footed Mouse – *Peromyscus leucopus*
- White-ankled Mouse – *Peromyscus pectoralis*
- Hispid Cotton Rat – *Sigmodon hispidus*
- Eastern Woodrat – *Neotoma floridana*
- North American Porcupine – *Erethizon dorsatum*

Lagomorpha (Hares and rabbits)

- Eastern Cottontail – *Sylvilagus floridanus*
- Black-tailed Jackrabbit – *Lepus californicus*

Osteichthyes (Bony Fish)

- Channel catfish – *Ictalurus punctatus*
- Green sunfish – *Lepomis cyanellus*
- Mosquitofish - *Gambusia affinis*
- Texas shiner – *Notropis amabilis*

Reptilia (Reptiles)

- Common Snapping Turtle – *Testudo serpentina serpentina*
- Texas River Cooter – *Pseudemys texana*
- Eastern Box Turtle – *Terrapene carolina*
- Red-eared Slider – *Trachemys scripta elegans*
- Mediterranean Gecko – *Hemidactylus turcicus*
- Texas Earless Lizard – *Cophosaurus texanus texanus*
- Texas Spiny Lizard – *Sceloporus olivaceus*
- Southern Prairie Lizard – *Sceloporus undulatus consobrinus*
- Green Anole – *Anolis carolinensis*
- Southern Prairie Skink – *Eumeces septentrionalis obtusirostris*
- Four-lined Skink – *Eumeces tetragrammus tetragrammus*
- Ground Skink – *Scincella lateralis*
- Texas Spotted Whiptail – *Cnemidophorus gularis gularis*
- Six-lined Race Runner – *Cnemidophorus sexlineatus sexlineatus*
- Eastern Yellow-bellied Racer – *Coluber constrictor flaviventris*
- Bull Snake – *Pituophis catenifer sayi*
- Red-striped Ribbon Snake – *Thamnophis proximus rubilineatus*
- Eastern Garter Snake – *Thamnophis sirtalis sirtalis***
- Western Cottonmouth – *Agkistrodon piscivorus leucostom*

**This species, according to Dixon and other herpetologists, does not occur in this area. Its presence in Wild Basin was confirmed in 2001, but the reason is unknown at this time.

Amphibian Watch at Wild Basin Pre

Date: 08/12/2008 **Observers:** Dana Spontak **Location:** W

Time			
Start	End	Differential (min./person)	Total Effort (min.)
2100	2110	10	10

General Comments: St

sighting of the 5th lightin

Atmospheric Data: Open/Shaded

Time	Temp.(oC)	Wind Speed (m/s)	Relative Humidity (%)
Start	27.8/27.3	0.3 / 0.3	
End	27.2/27.0	0.3 / 0.3	

calls (eg. Northern Carc

night sky (very few cloud

Anurans Heard

Common Name	Scientific Name	Approximate Numbers	Approximate Distance
Blanchard's Cricket Frog	Acris crepitans blanchardi	15+	50 m mostly in pond
Rio Grand Leopard Frog	Rana berlandieri	1 to 5	50m mostly in pond

Anurans Spott

Common Name	Scientific Name
Blanchard's Cricket Frog	Acris crepitans blanchardi
Rio Grand Leopard Frog	Rana berlandieri

serve

Waterfall Overlook

tart time began at the

ging bug. Several bird

dinal). Partially cloudy

s in the area ~4).

ed

Location
In the fountain next to the office and in the pond
In the fountain next to the office and in the pond

Name of Bird	SP	SU	F	W
Pelicans PELECANIDAE				
American White Pelican	R-O		R-O	
Cormorants PHALACROCORACIDAE				
Double-crested Cormorant	R-O			R - O
Herons, Egrets ARDEIDAE				
Great Blue Heron	U	U	U	U
Snowy Egret	R	R		
Little Blue Heron				R
Cattle Egret				R - O
Green Heron	U	U		
Ducks, Geese ANATIDAE				
Wood Duck	U	U	U	U
Vultures CATHARTIDAE				
Turkey Vulture	A-O	A-O	A-O	A-O
Black Vulture	A-O	A-O	A-O	A-O
Hawks, Kites, Ospreys ACCIPITRIDAE				
Mississippi Kite	R-O		R-O	
Sharp-shinned Hawk	R-O		R-O	R - O
Cooper's Hawk	R-O		R-O	R - O
Red-shouldered Hawk	R-O			
Broad-winged Hawk	U-O		U-O	
Swainson's Hawk	U-O		U-O	
Red-tailed Hawk	C-O	U-O	C-O	C-O
Bald Eagle				R - O
Osprey	R-O		U-O	
Kestrels, Caracara FALCONIDAE				
American Kestrel	U-O		U-O	U-O
Turkeys, Quail PHASIANIDAE				
Northern Bobwhite	U	U	U	U
Cranes GRUIDAE				
Sandhill Crane	R-O		R-O	R - O
Plovers CHARADRIIDAE				
Killdeer	C	C	C	C
Sandpipers, Woodcocks SCOLOPACIDAE				
Solitary Sandpiper	R	R		
Upland Sandpiper	R	R		
Long-billed Curlew	R			
American Woodcock	R			
Gulls LARIIDAE				
Franklin's Gull	U-O			
Doves COLUMBIDAE				
Mourning Dove	C	C	C	C
White-winged Dove	U-O			
Inca Dove	U	U	U	U
Common Ground Dove	R			
Rock Dove	R-O			

Roadrunners, Cuckoos CUCULIDAE				
Yellow-billed Cuckoo	U	U		
Black-billed Cuckoo	R			
Greater Roadrunner	U	U	U	U
Owls STRIGIDAE				
Great Horned Owl	U	R	R	U
Eastern Screech-Owl	U	U	U	U
Goatsuckers and Nightjars CAPRIMULGIDAE				
Common Poorwill	R	R		
Chuck-will's-widow	U	C	U	
Whip-poor-will	R			
Common Nighthawk	C	C	U	

Swifts APODIDAE				
Chimney Swift	C-O	C-O	C-O	
Hummingbirds TROCHILIDAE				
Black-chinned Hummingbird	C	C	U	
Ruby-throated Hummingbird	U	U	U	
Kingfishers ALCEDINIDAE				
Belted Kingfisher	C	C	U	
Woodpeckers PICIDAE				
Golden-fronted Woodpecker	U			
Red-bellied Woodpecker	U	U	U	U
Yellow-bellied Sapsucker	U			R
Downy Woodpecker	U	U	U	U
Ladder-backed Woodpecker	C	C	C	C
Northern Flicker	U		C	C
Flycatchers, Phoebes TYRANNIDAE				
Olive-sided Flycatcher	U		R	
Eastern Wood-Pewee	U	R	R	
Empidonax species	U	R	R	
Yellow-bellied Flycatcher	R	R		
Least Flycatcher	U		R	
Eastern Phoebe	C	C	C	R
Ash-throated Flycatcher	U	C	R	
Great Crested Flycatcher	U	U	U	
Western Kingbird		R		
Scissor-tailed Flycatcher	U	U		
Shrikes LANIIDAE				
Loggerhead Shrike	R	R	R	R
Vireos VIREONIDAE				
Red-eyed Vireo	R	R		
Philadelphia Vireo	R			
Bell's Vireo	R	R		
Black-capped Vireo	U	U		
White-eyed Vireo	C	C	R	R
Blue-headed Vireo	R		R	R
Jays, Crows, Ravens CORVIDAE				
Blue Jay	C	C	C	C
Western Scrub-Jay	C	C	C	C
Common Raven	C	R	U	U
American Crow	C	C	U	C
Swallows, Martins HIRUNDINIDAE				
Purple Martin	C	C		
N. Rough-winged Swallow	C	U	C	
Cliff Swallow	U	U		
Barn Swallow	U	U		

White-tailed Deer Census of Wild Basin Wilderness Area Using Modified Hahn Line Technique

Kirstine M. Thorne
December 2008

ABSTRACT

Census data for white-tailed deer (*Odocoileus virginianus*) utilizing Wild Basin Wilderness, Travis County, Texas was collected in two consecutive years (2007 and 2008. The estimated population density for the Wild Basin Wilderness herd is between 2.5 - 4 acres per deer. The ratio does per buck is between 3.8 - 7.7 and the ratio fawns to does is between 0.2 - 0.3. Both of these ratios support the conclusion that the Wild Basin Preserve does not have a healthy white-tailed deer population.

INTRODUCTION

The objective of the Deer Censuses of the Wild Basin Wilderness area is to evaluate the health of white-tailed deer (*Odocoileus virginianus*) herd that utilizes Wild Basin Wilderness in Travis County, Texas.

METHOD

Before beginning a census, the number of acres along the census route upon which deer may be observed is calculated. The previously selected route is driven and at regular intervals (0.10 mile), the vehicle is stopped and the distances to the right and left at which a deer could be seen are measured in yards (line of sight or LOS). Line of sight is not measured across an open draw of gully and cannot exceed 250 yards.

The LOS distances are added together and then divided by the number of stops to provide an average width (in yards) of the census strip. Then, the average width is multiplied by the length of the census route (also in yards) giving the census area in square yards. This number is divided by 4,840 sq. yds per acre to arrive at a final number of acres censused.

There are three types of census methods that are recommended by Texas Parks and Wildlife: Hahn Line, Spotlight Census and Mobile Line (*Deer Census*

Techniques, M Shult and B. Armstong, Texas Parks and Wildlife). A Modified Hahn Line was used:

1. The census route was laid out to follow the route used in 2007, with the exception of Wild Basin Road (east perimeter), which was omitted in order to concentrate on the central area of the wilderness area.
2. LOS measurements were taken at 0.10 mile intervals (as measured using the odometer on the research vehicle). An electronic rangefinder was used to measure the visibility distance. If a LOS was at a driveway or other non-habitat area, the vehicle rolled forward until a measurement could be taken.
3. The census route was surveyed five times by two researchers; a driver and a passenger.
4. The census was conducted between September 1 and October 31, the day before the opening of white-tailed deer season.
5. A census was conducted only when winds were less than 20 miles per hour, relative humidity was less than 70 percent (as measured using a Kestrel® 3000 Pocket Weather ® Meter with Backlight) and cloud cover was less than 50 percent (as estimated by researchers).
6. The census began 30 minutes prior to official sunset.
7. The research vehicle did not exceed 10 miles per hour.
8. Whenever deer were spotted, the driver stopped the vehicle. The driver counted and identified the deer to the left of the vehicle and the passenger counted and identified the deer to the right of the vehicle.
9. All deer observed within the census area were recorded. Deer were not recorded if they were across a draw or gully.
10. Binoculars were used as necessary to identify sex and age. Spotlights were not used.
11. The Wild Basin Wilderness Land Manager notified local fire and police dispatch centers before each survey and provided the description and license plate of the research vehicle. The vehicle also had magnetic signs on the sides and back identifying it as a Wild Basin Wilderness survey vehicle.

RESULTS

Wild Basin Wilderness totals 227 acres. The area surveyed in 2008 totaled 74 acres. The linear distance covered added up to 3.5 miles with line of sight (LOS) measurements taken 35 times. The average LOS distance was 29 yards per side (for a total average LOS width of 58 yards).

Five census surveys were completed (September 4, 5, 6, 19 and 27, 2008) and a total of 145 deer were observed (23 bucks, 96 does, 24 fawns and 2 unknown.) Based on the first 100 deer that were counted, the buck : doe : fawn ratio in 2008 is 1 : 3.76 : 1.12.

DISCUSSION

The total number of deer observed in 2008 was less than that observed in 2007 (145 in 2008 versus 540 in 2007). This is due to a number of reasons. There were fewer survey days in 2008 (5 in 2008 versus 13 in 2007). Although the driven distance surveyed remained the same (3.5 miles or 6160 yards), there were fewer stops in 2008 (35 stops in 2008 versus 43 stops in 2007). The average line of sight measurement was significantly less in 2008, also (58 yards in 2008 versus 122 yards in 2007), which leads to lower estimate of acres surveyed in 2008 than in 2007 (74 acres in 2008 versus 155 acres in 2007)

However, when the overall percent deer by sex is compared, 2008 and 2007 are similar:

2008 Total	Buck	Doe	Fawn	Unkn
145	23	96	24	2
Percent	16%	66%	17%	1%

2007 Total	Buck	Doe	Fawn	Unkn
540	50	390	100	0
Percent	9%	72%	19%	0%

Based on the first 100 deer recorded, sex ratios can be estimated:

2008	Buck	Doe	Fawn
100	17	64	19
Ratios	1.00	3.76	1.12
	0.27	1.00	0.30
	0.89	3.37	1.00

2007	Buck	Doe	Fawn
100	10	77	13
Ratios	1.00	7.70	1.30
	0.13	1.00	0.17
	0.77	5.92	1.00

Based on the table above, it appears that the number of does per buck has decreased from 8 does per buck to 4 does per buck (number rounded) – a 100% increase in the number of bucks. At the same time, the number of fawns per doe has increased from 1 fawn for every 6 does to 1 fawn for ever 3 does (numbers rounded) – also almost a 100% increase in the number of fawns.

In 2008 there were 2.55 acres per deer, down from 2007 when there were 3.69 acres per deer. However, neither year is close to the optimum carry capacity for deer in Travis County which is 15 - 20 acres per deer (J. Kuhl in *Playing Whack-a-Deer at Pace Bend Park*, The Austin Chronicle, February 2, 2007).

CONCLUSION

The preferred diet of white-tailed deer is forbs (broadleaf herbaceous plants) then browse (leaves and twigs of living woody plants). Grasses are less than 15% of a deer's diet (Armstrong, WE and EL Young; White-tailed Deer Management in the Texas Hill Country, Texas Parks and Wildlife, September 2000). When deer population density is greater than 10 - 20 acres per deer, the habitat will be negatively impacted. The estimated population density for the Wild Basin Wilderness herd is between 2.5 - 4 acres per deer.

A good ratio for a deer population is 1.2 - 1.5 does per buck. A healthy herd will have a ratio of 0.8 - 1.20 of fawns to does. (Armstrong, 2000) The ratio at Wild Basin is between 3.8 - 7.7 does per buck and between 0.2 - 0.3 fawns to does. Both of these ratios support the conclusion that the Wild Basin Preserve does not have a healthy white-tailed deer population.

WILD BASIN DEER CENSUS
DATA COMPARISON
2007, 2008

	2007	2008	2009		
Total number of census dates	13	5			
Begin Date	9-Aug	4-Sep			
End Date	7-Sep	27-Sep			
Average width per stop (yds)	122	58			
Distance of survey line (yds)	6160	6160			
Number of stops	43	35			
Total area surveyed (sq yds)	708,507	357,280			
Acres observed	155	74			
Total number of deer seen	540	145			
Bucks	50	23			
Does	390	96			
Fawns	100	24			
Unknown	0	2			
Average number deer per census	42	29			
Bucks	4	5			
Does	30	19			
Fawns	8	5			
Unknown	0	0			
Average acres per deer	3.69	2.55			
Average deer per acre	0.27	0.39			
Population estimate*	40	29			
Sex of first 100 deer					
Bucks	10	17			
Does	77	64			
Fawns	13	19			

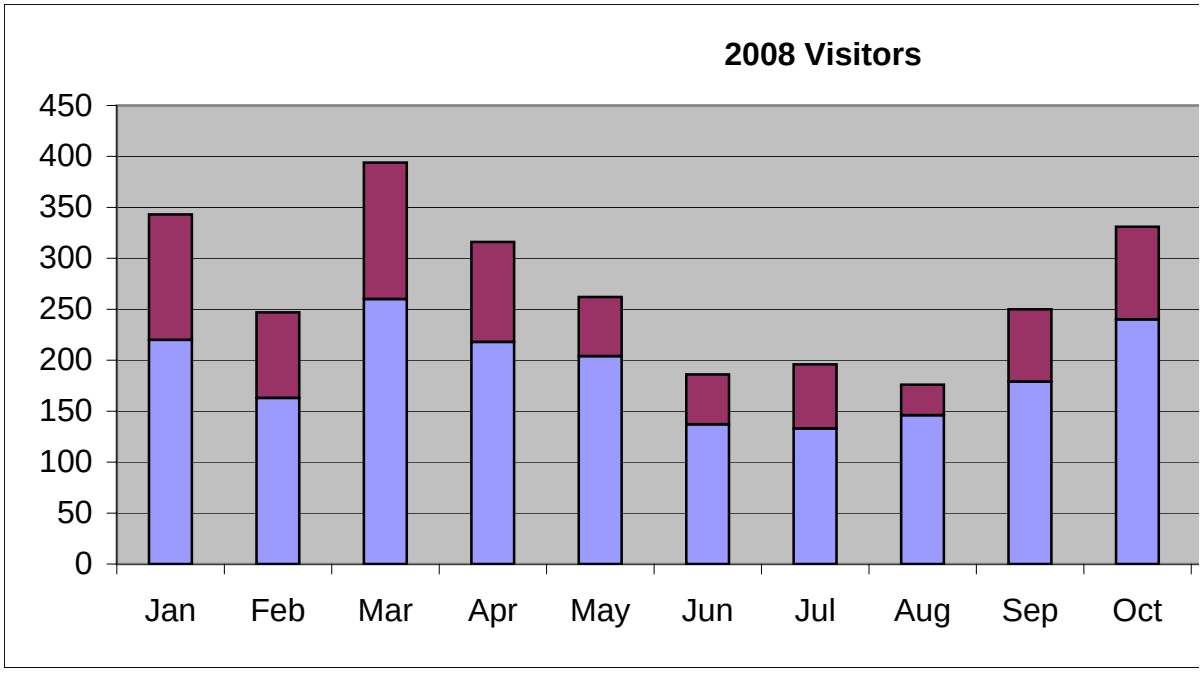
* Formula: $\frac{\text{(total area of study) x (number deer flushed)}}{\text{2 (average flushing distance) x (length of strip)}}$

2008 Rain Gauge Data

Start Date: April 17, 2008

April	3.55
May	1.65
June	1.4
July	2.6
August	2.25
September	0
October	2.65
November	0.6
December	0.55
TOTAL	15.25

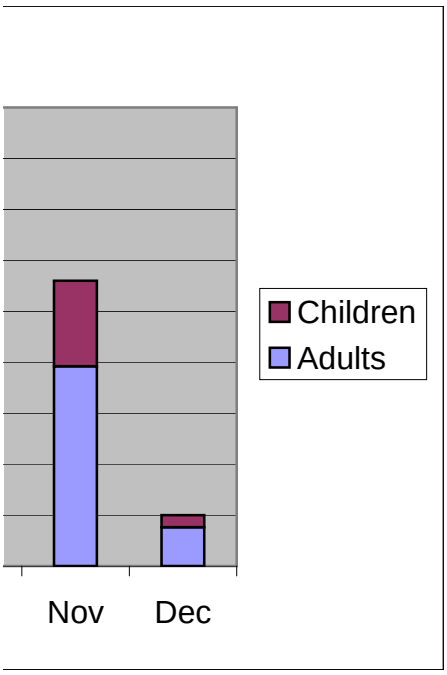
End Date: December 18, 2008



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Children	123	84	134	98	58	49	63	30	71	91
Adults	220	163	260	218	204	137	133	146	179	240
Total	343	247	394	316	262	186	196	176	250	331

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Adults	220	163	260	218	204	137	133	146	179	240
Children	123	84	134	98	58	49	63	30	71	91

343	247	394	316	262	186	196	176	250	331



Nov	Dec	Total
84	12	897
196	38	2134
280	50	3031

Nov	Dec	Total
196	38	2134
84	12	897

280	50	3031

Wild Basin Wilderness Preserve
Emergency Response Plan 2008

Wild Basin Wilderness Preserve reaffirms the principle that the safety and well being of visitors, members, and staff are the primary concern. No plan is a fixed instrument, nor all-inclusive. As situations arise not covered in this plan, remember that the safety of all persons is the primary concern. Protection of facilities and equipment is the secondary concern.

Emergency Numbers

Westlake Fire/EMS	911
Wild Basin EE Center	327-7622
Trail guide cell numbers	xxx-xxxx
Mike Powers	328-1009
Ebby Green cell	940-5069
Genevieve Lung cell	203-7095
Security Alarm Co.	327-1469

Accident/Sudden Illness - Emergency

In building:
Call 911. Identify the problem, exact location, and person's name.
Notify the Wild Basin office: 327-7622. Identify the problem, exact location, and person's name.
Care for the injured/ill person until emergency services arrive. Do not move an injured person unless absolutely necessary. If a person is found unconscious, follow accident/sudden illness procedures until relieved by emergency personnel.
Move bystanders or other group members away.
Office will send a person at the 360 gate, to direct the emergency personnel to the injured or ill person.
If school or other groups are here, the teacher or leader should have Emergency Medical Forms or information. Try to make their Emergency Medical Authorization information available to emergency personnel on arrival. Make sure an adult from the group is with an injured or ill child at all times. Teachers or leaders should call their superintendent, council office, or other central authority as soon as possible. A leader from the group should also supervise any other children in the group.
File an accident report.

On the trail:
Call 911. Identify the problem, exact location, and person's name.
Call the Wild Basin office, 327-7622. Identify the problem, exact trail location, and person's name.
Care for the injured/ill person until emergency services arrive. Do not move an injured person unless absolutely necessary. If a person is found unconscious, follow accident/sudden illness procedures until relieved by emergency personnel.
Office will send a person at the 360 gate, to direct the emergency personnel to the injured or ill person.
Move bystanders or other group members away.

If school or other groups are here, the teacher or leader should have Emergency Medical Forms or information. Try to make their Emergency Medical Authorization information available to emergency personnel on arrival. Make sure an adult from the group is with an injured or ill child at all times. Teachers or leaders should call their Superintendent, Council Office, or other central authority as soon as possible. A leader from the group should also supervise any other children in the group.
File an accident report.

Note: adults make the decisions for themselves and any children they brought. Wild Basin can recommend a course of action, but cannot prevent any adult or the children in their care from any actions or from leaving at any time.

Non-emergency
(Accident or illness and non-critical condition)

In building:
Notify the Wild Basin office: 327-7622. Identify the problem, exact location, and person's name.
Care for the injured/ill person if requested.
Move bystanders or other group members away.
Call any contacts on request. Identify the problem, get instructions.
Have group leaders take attendance and account for their group. Ask family groups to do the same. A leader from each group should also supervise all children in the group.
File an accident report.

On the trail:
Notify the Wild Basin office: 327-7622. Identify the problem, exact location, and person's name.
Care for the injured/ill person if requested. Return to the EE center as soon as possible.
Move bystanders or other group members away.
Call any contacts on request. Identify the problem, get instructions.
Have group leaders take attendance and account for their group. Ask family groups to do the same. A leader from each group should also supervise all children in the group.
File an accident report.

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Fire

In building:
Call 911.
Pull the fire alarm.
Evacuate all persons from the building involved, using emergency exits.
If it is safe, walk through the building, checking restrooms, closets, kitchen, caretaker's apartment and all rooms for people.
If the fire is small and fairly contained, use a hand extinguisher to put it out. The building has an extinguishing system—if the fire is larger, leave it for the automatic system. Leave the system on until the fire department comes.
Move visitors and groups away from the building, but out of the path of emergency vehicles, to the brick area near the portable restrooms.
Call camp teachers/guides on trail to advise. Have them keep groups away from the building, and meet up with all near the portable restrooms.

Have group leaders take attendance and account for their group. Ask family groups to do the same.
Keep people away from driveways and building.
Wild Basin staff should stay with all visitors and groups.
Office will send a person to the 360 gate, to direct the emergency personnel to the fire.
File an accident report.

On the preserve:
Call 911.
Call the Wild Basin office, 327-7622.
Specify which trail and approximately where on the trail the fire is located.
Call camp teachers/guides on trail to advise. Have them move all persons away from and upwind of the fire area. They should stay with the group, and move groups to building as quickly as possible.
Office will send a person to the 360 gate, to direct the emergency personnel to the fire.
File an accident report.

If a sprinkler head goes off accidentally for obvious reasons, not a fire:
Evacuate all persons from the building, using emergency exits.
Make a quick check of the building for possible fires.
Call the alarm company to report the false alarm: 327-1469

Power Outage in Building

Procedure:
Do not use the composting toilets in the restrooms.
Close restroom doors; if outage is for a long period of time place plastic bags over composting toilets.
Post "Closed – Do Not Use" signs on restroom doors. Two portable toilets in the parking lot will still be available for use.
Land line phone service will be out. Use cell phones instead.
Ask visitors not to use any water. Water will be limited to what's in the tank at the time of power outage, since the well pump will not function.
Whenever power goes out, the fire alarm calls the alarm company. Since they cannot call us, staff should call the alarm company on a cell phone and explain the power outage: 327-1469.
Shut down and turn off all computers and electronic equipment within 5 minutes.
Don't forget to remove restroom signs and restart all electronic equipment when power returns.
File an accident report.

Tornado

Tornado watch:
Office staff will monitor internet radar, radio, and sky for signs of a tornado.
Call camp teachers/guides on trail to advise.
Advise visitors and groups in and around building. Keep organized groups in or near the building.

Tornado warning:
Call camp teachers/guides on trail to advise. Move groups to building as quickly as possible.
Move all persons to main floor interior rooms (kitchen, main office) away from doors and windows.
Office staff will monitor internet radar, radio, and sky for signs of a tornado.
Do not leave the interior shelter until the all-clear.

Have group leaders take attendance and account for their group. Ask family groups to do the same. A leader from each group should also supervise all children in the group.

Tornado touchdown:
Call 911.
Call camp teachers/guides on trail to advise. Move groups to building as quickly as possible.
Care for any injured until emergency services arrive. Do not move any injured person unless not moving them will cause further injury or to reach someone else who needs immediate first aid.
Office will send a person to the 360 gate, to direct the emergency personnel to the injured or ill.
If school or other groups are here, the teacher or leader should have Emergency Medical Forms or information. Try to make their Emergency Medical Authorization information available to emergency personnel on arrival. Make sure an adult from the group is with an injured or ill child at all times. Teachers or leaders should call their Superintendent, Council Office, or other central authority as soon as possible. A leader from each group should also supervise all children in the group.
Move uninjured persons away from the damaged areas. File an accident report.

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Thunderstorm

Thunderstorm watch:
Office staff will monitor internet radar, radio, and sky for signs of a thunderstorm.
Call camp teachers/guides on trail to advise.
Advise visitors and groups in and around building. Keep organized groups in or near the building.

Thunderstorm warning/occurence:
Call camp teachers/guides on trail. Move groups to building as quickly as possible.
Office staff will continue to monitor internet radar, radio, and sky for signs of a thunderstorm.
If the power goes out, see Power Outage/Brownout and follow procedure.

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Hazardous Winter Conditions

Winter storm watch:
Office staff will monitor internet radar, radio, and sky for signs of a winter storms.
Call camp teachers/guides on trail to advise.
Advise visitors and groups in and around building. Keep organized groups in or near the building.

Winter storm warning/occurence:
Call camp teachers/guides on trail. Move groups to building as quickly as possible.
Office staff will continue to monitor internet radar, radio, and sky for signs of a winter storm.
If the power goes out, see Power Outage/Brownout and follow procedure.
If ice forms on stairs, porch, and trailhead, sprinkle sand to help diminish the danger.

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Lost / Missing Person

The WB office should send someone through the parking lot to the 360 gate to record all vehicle make, model, and license plate numbers. Note the time as they arrive or leave. This person can also direct emergency personnel when they arrive.

In building:

Call 911. Identify the problem, exact location, name and a description of the missing person.
Notify the Wild Basin office: 327-7622. Identify the problem, exact location, name and a description of the missing person. Note the name and phone number of the reporting person.
Have the reporting person stay in the main office.
Walk through the building, checking restrooms, upstairs rooms and closets, main hall, porch, under porch storage, private staff rooms, and all offices for the missing person. If the missing person is possibly sighted, attempt to bring the missing person to the reporting person, ask the missing person to remain with you or, if he/she will not, follow and continue to report the missing person's location.
Station a volunteer or staff member outside the building, to watch the building entrance and exit. That person should look for the missing person leaving or entering the building. If the missing person is possibly sighted, attempt to bring the missing person to the reporting person, ask the missing person to remain with you or, if he/she will not, follow and continue to report the missing person's location.
If the missing person is not found after a thorough search of the building, begin searching trails (see below). When emergency personnel arrive, the person at the gate should tell them what has been done. Assist the emergency personnel as they lead the search.
If school or other groups are here, the teacher or leader should have Emergency Medical Forms or information. Try to make their Emergency Medical Authorization information available to emergency personnel on arrival. Teachers or leaders should call their superintendent, council office, or other central authority as soon as possible. A leader from the group should also supervise any other children in the group.
Ask family groups to account for their members.
Keep people away from driveways and building.
One staff member should stay with all visitors and groups.
File an accident report.

On the trail:

Call 911. Identify the problem, exact location, name and a description of the missing person.
Call the Wild Basin office, 327-7622. Identify the problem, exact location, name and a description of the missing person. Note the name and phone number of the reporting person. Have the reporting person stay in the main office.
Quickly search the building, evacuate all the people, then lock the building and organize any volunteers and staff to begin a search of the trails.
Leave one volunteer or staff member outside the building, to watch the building entrance and exit. That person should look for the missing person leaving or entering the building.
Each search team should have at least two people, and should take a cell phone. Begin with the most likely trail (where he/she was last seen or those closest to the building). Call for the missing person while searching.
If the missing person is possibly sighted, attempt to bring the missing person to the reporting person, ask the missing person to remain with you or, if he/she will not, follow and continue to report the missing person's location.
When emergency personnel arrive, the person at the gate should tell them what has been done. Assist the emergency personnel as they lead the search.
If school or other groups are here, the teacher or leader should have Emergency Medical Forms or information. Try to make their Emergency Medical Authorization information available to

emergency personnel on arrival. Teachers or leaders should call their superintendent, council office, or other central authority as soon as possible. A leader from the group should also supervise any other children in the group.
Ask family groups to account for their members.
Keep people away from driveways and building.
One staff member should stay with all visitors and groups.

File an accident report.

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Threatening Person

Call 911. Identify the problem and exact location.
Get as many people to safety and away from the threat as possible. In a hold up, give whatever the person wants.
If possible office will send a person to the 360 gate, to direct the emergency personnel.

If the threat is inside the building:
Evacuate as many people as possible. Move visitors and groups away from the building, but out of the path of emergency vehicles, to the brick area near the portable restrooms.
Call camp teachers/guides on trail to advise them not to return to the building. Have them keep groups away from the building, and walk off trail to meet near the portable restrooms.
Lock as many interior doors as possible.
Have group leaders take attendance and account for their group. Ask family groups to do the same. A leader from each group should also supervise all children in the group.
If possible office will send a person to the 360 gate, to direct the emergency personnel.

If the threat is outside the building:
Keep all visitors and groups inside, away from windows.
Call camp teachers/guides on trail to advise them not to return to the building. Have them keep groups away from the building, and meet at the east side access of the preserve if necessary.
Lock as many exterior doors as possible.
Have group leaders take attendance and account for their group. Ask family groups to do the same. A leader from each group should also supervise all children in the group.

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