

Baker Sanctuary

2014 - 2015 Annual Report

(October 1, 2014 - September 30, 2015)

prepared for the

Travis County Transportation and Natural Resources Department

Natural Resources Program

by

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**TRAVIS
AUDUBON**

Listen. Look. And Learn.

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Introduction

Baker Sanctuary is owned by Travis Audubon Society (TAS) with approximately 715 acres managed as part of the Balcones Canyonlands Preserve (BCP). As of March 2015 Travis County purchased a conservation easement on approximately 675 acres of the Sanctuary. Forty acres, the 'Headquarters Tract;' is excluded from the easement (**Appendix A**). The management agreement for the easement permits TAS to continue to manage Baker Sanctuary with oversight from Travis County.

Bisected by Lime Creek Road, the Sanctuary is within the Cypress Creek Macrosite and adjacent to several other BCP tracts including the City of Austin's Lime Creek and Austin Simon tracts to the northeast, the Lower Colorado River Authority's Wheless tract to the southwest, a small tract belonging to the City of Cedar Park to the south, and several recent additions to Travis County's Lime Creek Unit along the western boundary (**Appendix B**). The Sanctuary is composed of densely wooded uplands, slopes, and canyons dominated by mature oak-juniper woodlands with occasional pockets of open and semi-open savannah which are slowly being encroached by Ashe juniper (*Juniperus ashei*).

Golden-cheeked Warbler Surveys

During the spring of 2015 the annual 100-acre survey saw its fifth and final year of participation with Travis County and the City of Austin in a five year study to determine golden-cheeked warbler (*Setophaga chrysoparia*) population viability and habitat suitability throughout the BCP (**Appendix C**). Based on compiled observations including movement patterns, re-sighting of color banded individuals, counter-singing, and the presence of females and fledglings, it is estimated that eight golden-cheeked warbler males established territories substantially within plot boundaries (full) and seven males occupied territories

partially within the plot (edge). This distribution of territories yielded an adjusted total of 11.5 territories for the 100-acre plot located at Baker Sanctuary.

The 2015 season yielded an adjusted total of 11.5 territories present in and around the 100-acre plot. This result is slightly more than the average of 10 territories observed annually since the 2010 season and the on-set of color-banding, a pattern which was beginning to suggest that ten territories may be the norm for this 100-acre patch of habitat. There is no obvious reason why the total adjusted territory number was slightly elevated for 2015 compared to previous seasons. One factor may have been high productivity in the previous breeding season. During the 2014 survey a total of 22 fledglings were observed, the most detected since the 2012 breeding season. If productivity were elevated in 2014 there would likewise have been more individuals available to return for the 2015 season. Another explanation may simply be observer bias since the designation of 'full' or 'edge' status depends solely on the males' position when he is discovered and recorded by the observer. More importantly, the documented productivity of 26 fledglings for the 2015 season was the second highest amount recorded in the past nine years, surpassed only by the 38 fledglings recorded for the 2012 breeding season.

For the first time in the annals of Baker Sanctuary the southern portion of the preserve, excluding the 100-acre plot, was formally surveyed and territories mapped for GCWA (**Appendix D**). In total, 467 GCWA observations were recorded over the course of the survey effort. Fourteen full territories and four edge territories were delineated in the southern sanctuary for an adjusted total of 16 territories. Females were observed in nine territories and a total of 15 fledglings were observed in five territories. Three of the four edge territories were also recorded during the 2015 100-acre survey but data from the two studies were not combined.

Territory density was estimated at 5.3 territories per 100 acres. This calculation was based on the adjusted total of sixteen territories (fourteen full and four edge) in the 300 acres surveyed. The pairing success rate in the southern sanctuary was 50% (seven of the 14 full territories). The breeding success was estimated at 29%, based on four of the 14 full territories were observed to have fledglings. The average brood size was 3.3 fledglings based on the aforementioned criteria. Productivity was estimated at 0.9 based on the total of 13 fledglings observed in the 14 full territories.

In 2014 TAS obtained state and federal permits to band (plastic color-bands and USFWS aluminum bands) golden-cheeked warblers throughout the Sanctuary. Two golden-cheeked warbler males were captured and banded under the permits during the 2015 100-acre survey (**Table 1**) and it is anticipated banding will continue during the 2016 100-acre survey.

Whitetail Deer Management

Baker Sanctuary was closed from November 1, 2014 – January 18, 2015 for the annual whitetail deer (*Odocoileus virginianus*) management hunt (rifle hunting only). Seven primary hunters hunting at sites 3, 5, 10, 11, 12, 13, and 14 (**Figure 1**) harvested a total of seven deer (three bucks, three does, and one juvenile) during 362 hours of hunt effort, a decrease from the average harvest of twelve deer per season over the prior 13 recorded seasons (**Figure 2**). The Sanctuary will be closed for the 2015 - 2016 season from November 1, 2015 – January 17, 2016 for rifle hunting.

The Hatfield Tract is a 50-acre parcel deeded to TAS in 1986 with the following stipulation: “it will never lease any portion of the property for hunting or trapping purposes”; as a result, no hunting took place on this tract during the 2014 – 2015 whitetail deer season.

Vegetation Management

Approximately 269 cubic yards of vegetation was trimmed from trails, roads, shooting lanes, and structures when it impeded the movement of hikers, posed a safety or structural hazard, or compromised hunting efforts. Unless it posed an immediate safety concern, trimming was restricted to the golden-cheeked warbler non-breeding season (September 1 – February 28) and was performed so that canopy fragmentation, if it occurred, was kept to a minimum. When oaks (*Quercus spp.*) were trimmed, precautionary techniques such as disinfecting saws and painting wounds were utilized to prevent the spread of oak wilt fungus (*Ceratocystis fagacearum*). Due to tree mortality caused by the drought of 2011, especially with regard to Ashe juniper, more time was invested in slash removal than in previous years to keep trails open and ensure the safety of visitors.

Slash from cut vegetation was chipped prior to the onset of the golden-cheeked warbler breeding season yielding approximately 11 cubic yards of material. Approximately 60% of the mulch was donated to Chaetura Canyon for its trail system with the remainder utilized on Baker's trail system as well as to mulch individual tree seedlings which were planted in the fall of 2014.

During the fall of 2014, due to a generous donation by the City of Austin, 12 individuals of seven plant species were planted in the JAEC and Steward's residence areas. The following lists the species and total number of individuals planted: (1) Carolina buckthorn (*Rhamnus caroliniana*), (1) cedar elm (*Ulmus crassifolia*), (3) escarpment black cherry (*Prunus serotina*), (1) Eve's necklace (*Sophora affinis*), (2) Mexican plum (*Prunus rivularis*), (1) plateau live oak (*Quercus fusiformis*), and (3) shrubby boneset (*Eupatorium havanense*). In addition to seedlings, cardinal flower (*Lobelia cardinalis*), frostweed (*Verbesina virginica*), and Mexican buckeye (*Ungnadia speciose*) seeds were sown in the semi-open savannah area near the JAEC.

To create a less hazardous environment for outdoor educational activities, approximately 3.5 cubic yards of prickly pear (*Opuntia spp.*), an invasive native, was manually removed from the JAEC semi-open savannah and disposed off-site.

Baker Sanctuary is composed primarily of dense mature oak-juniper woodlands interspersed with pockets of open and semi-open savannah; there are nine Fire Behavior Prediction System fuel models that correspond with the habitats within the BCP. A fire management plan based upon these prediction systems is located in the Baker Sanctuary headquarters and is available to assist the Steward in monitoring for fire safety and response readiness. The Sanctuary is also equipped with a wildfire calldown list and basic wildfire response tools to expedite early response to wildfires.

Brown-headed Cowbird Trapping

TAS operated two brown-headed cowbird (*Molothrus ater*) traps from March 10 through May 29 of the 2015 season. Trap TAS1 was located on the south side of Lime Creek Road in the side yard of the Steward's residence and trap TAS2 in the semi-open savannah near hunt site 11. Traps were checked every other day and non-target species were released when discovered. This season trap TAS1 captured a total of eleven individuals (10 males and 1 female) while TAS2 did not trap any brown-headed cowbirds, results significantly lower than the average of 23 per season captured over the prior 11 seasons (**Figure 3**). Non-targets captured were one northern mockingbird (*Mimus polyglottos*), and one Carolina wren (*Thryothorus ludovicianus*). All non-target birds were released unharmed.

Exotics Control

Two extensive, distinct populations of Malta star-thistle (*Centaurea melitensis*) are known to occur at the Sanctuary, one centered near Baker Cabin to the north

of Lime Creek Road (LCR) and another centered at the Steward's residence to the south of LCR. While both populations occur in heavily disturbed, semi-open savannah habitat, the northern population is more established and extensive, typically forming a dense monoculture where it occurs. Due to vigorous growth triggered by the wet, mild fall, Malta star-thistle management began on October 2014 and continued through June 2015.

For the first time since star-thistle removal began in 2011, both populations (north and south of LCR) were effectively managed solely with the utilization of hand-removal techniques. In the past, the north population was selectively treated with glyphosate due to the extensive nature of the invasion. While plants continued to sprout in 2014-2015, they did so in a more 'patchy' fashion, which allowed effective control via hand-removal only. All removed plants were disposed off-site.

The extensive tree-of-heaven (*Ailanthus altissima*) grove discovered in December 2010 in a northern drainage of the Sanctuary is still being actively monitored and treated. Over the last year, 178 tree-of-heaven seedlings were hand pulled, many of which were root sprouts from trees previously treated with a 10% imazapyr solution. In the same area, five chinaberry (*Melia azedarach*), some root sprouts from trees treated in 2010, were manually removed. Since the grove was discovered in 2010, a total of 4813 tree-of-heaven and 45 chinaberry seedlings have been removed from the area.

The less extensive population of tree-of-heaven discovered in May 2012 approximately 1000 feet downstream from the original tree-of-heaven site is also being actively monitored and treated. Over the last year, 1013 seedlings and re-sprouts were manually removed. Since the grove was discovered in 2012, a total of 3225 seedlings have been removed from the area. Both populations will be actively monitored and managed until eradicated.

Various invasive plants were either manually removed or treated with a 10% imazapyr solution when encountered throughout the Sanctuary. Species treated included 546 chinaberry, one Chinese tallow (*Sapium sebiferum*), 87 heavenly bamboo (*Nandina domestica*), one small patch of Japanese honeysuckle (*Lonicera japonica*), two small patches of Johnsongrass (*Sorghum halepense*), 15 jujube (*Ziziphus zizyphus*), seven privet (*Ligustrum* species), 28 tree-of-heaven (*Ailanthus altissima*), and 50 yarrow (*Achillea millefolium*). In the Baker Cabin/JAEC area 333 common mullein (*Verbascum thapsus*) and eight common horehound (*Marrubium vulgare*) were also manually removed.

The 18 figs (*Ficus carica*) cut down July 2013 near Walnut Spring were monitored over the course of the year and re-sprouts were removed when encountered. Approximately 80% of the figs continue to re-sprout requiring continued monitoring of the site.

Over the past fiscal year, 49 boiling water treatments were applied to visible red imported fire ant (*Solenopsis invicta*) mounds which occurred in high traffic, disturbed areas such as the JAEC, Steward's residence, and the public parking lot.

Research

In an effort to achieve a more complete understanding of the composition, distribution, and density of avian species found throughout the Sanctuary, the fixed-radius point count methodology proposed by Hutto *et al.* (1986) has been employed in an annual breeding bird survey since 2011. From May 30 through June 4, the fifth annual count was performed at a total of 38 point count stations (**Figure 4**). In the past, the count had been performed over the course of one morning but due to a lack of volunteers, the count was extended over several weeks while the Steward performed the majority of the point counts. Of the 41 species recorded, the top three detected were northern cardinal (*Cardinalis*

cardinalis), black-crested titmouse (*Baeolophus bicolor*), and painted bunting (*Passerina ciris*). Golden-cheeked warblers were detected at 61% of the point count stations (**Table 2**) compared to 46% for the previous year.

From 2011 – 2014, 15 nest boxes, 14 of which are still functional, were installed throughout the Sanctuary (**Figure 5**) to provide additional nesting opportunities for cavity nesting birds. Of the 14 nest boxes, four were occupied during the 2015 breeding season by Carolina chickadees and three by either Carolina (*Thryothorus ludovicianus*) or Bewick's wrens (*Thryomanes bewickii*), judging by nest composition and egg shell fragments. In addition to the nest boxes, the chimney swift (*Chaetura pelagica*) tower adjacent to the Steward's residence (**Figure 5**) appears to have successfully fledged two young, judging by analysis of nesting detritus accumulated on the bottom plate of the tower.

To enhance survivorship and prevent browsing of seedling oaks by whitetail deer, an oak caging project was initiated in December 2013 which resulted in the caging of 19 plateau live oak, 17 shin oak (*Quercus sinuate*), and 32 Spanish oak (*Quercus texana*) throughout the southern half of the Sanctuary. The caging effort continued during 2015 with the protection of an additional three plateau live oak, 11 shin oak, and 35 Spanish oak (**Figure 6**). In addition to the caging effort, data such as habitat type, stem diameter, seedling height, percent cover, and distance to nearest mature individual were collected to better understand factors affecting seedling survival. All caged seedlings will be visited annually to collect data and, if necessary, determine and document causes of mortality. Of the oak cohort caged last season, only one mortality was documented, a shin oak, which died from an unknown cause.

Water quality tests were continued for Baker Spring on a monthly basis, flow permitting, and intermittently for Audubon Spring. Both sites have been documented to support populations of the threatened Jollyville plateau salamander (*Eurycea tonkawae*) although no formal surveys occurred during the

last fiscal year. As a participating member of the Colorado River Watch Network (CRWN), water quality data collection followed CRWN protocols. During FY 2014-2015, ten water quality tests were performed, one at Audubon Spring and nine at Baker Spring. Data were collected for water depth, water temperature, dissolved oxygen, specific conductance, pH, and nitrate nitrogen. All results fell well within expected values (**Table 3**).

Education and Outreach

From October 2014 through September 2015 Baker Sanctuary experienced a total of 346 visitations from day hikers. Of those visitations, 295 were by TAS members and 51 were by non-members. An additional 804 visitations occurred during organized activities such as educational programs, TAS events, and guided hikes. A total of 943.25 volunteer hours were logged at the Sanctuary on a variety of activities (see below).

October: Grounds and trail maintenance.

November: Invasive species removal and facilities maintenance.

December: Invasive species removal and grounds maintenance.

January: Invasive species removal and grounds maintenance.

February: Invasive species removal, facilities maintenance, and bird surveys.

March: Invasive species removal, facilities maintenance, and bird surveys.

April: Invasive species removal, grounds maintenance, education, bird surveys, community outreach, and trail maintenance.

May: Education, trails maintenance, bird surveys, facilities maintenance, annual point counts (see **Appendix E** for current vertebrate list), and grounds maintenance.

June: Invasive species removal, Cool House Tour participation, grounds maintenance, vegetation surveys, facilities maintenance, and education.

July: Invasive plant removal, vegetation surveys, and trail maintenance.

August: Facilities maintenance, vegetation surveys, grounds maintenance, and trail maintenance

September: Invasive species removal, trail maintenance, vegetation surveys, grounds maintenance, foot bridge construction, and education.

The Hiking Club with Whitestone Elementary of the Leander Intermediate School District (LISD) convened for sessions in both the spring and fall. For six consecutive weeks per session, approximately 20 fifth grade English Language Learner students spent two hours per session hiking the Sanctuary, learning about central Texas flora, fauna, and habitats. The program was developed with support from Linda Lippe, the former LISD elementary science curriculum coordinator, and Charlie Ciernia, an educator at Deer Creek Elementary. The program was designed to augment grade-appropriate science concepts as outlined in the Texas Essentials Skills and Knowledge.

Other activities to enhance community involvement and increase awareness of Baker Sanctuary and the BCP mission included Baker Open House, Great Backyard Bird Count, 18 guided hikes for various community groups, one BCP sponsored guided hike, two field trips for LISD fourth grade students, five GCWA presentations to a total of 604 LISD fifth grade students, one GCWA themed Youth Nature Camp for elementary students, two ecology presentations to a total of 127 LISD fourth grade students, participation in the Deer Creek Elementary Science Night, and one presentation to the Balcones Canyonlands Master Naturalist group.

Literature Cited

Hutto, R.L., Pletschet, S.M., and Hendricks, P. 1986. A fixed-radius point count for nonbreeding and breeding season use. *Auk* 103: 593-602.

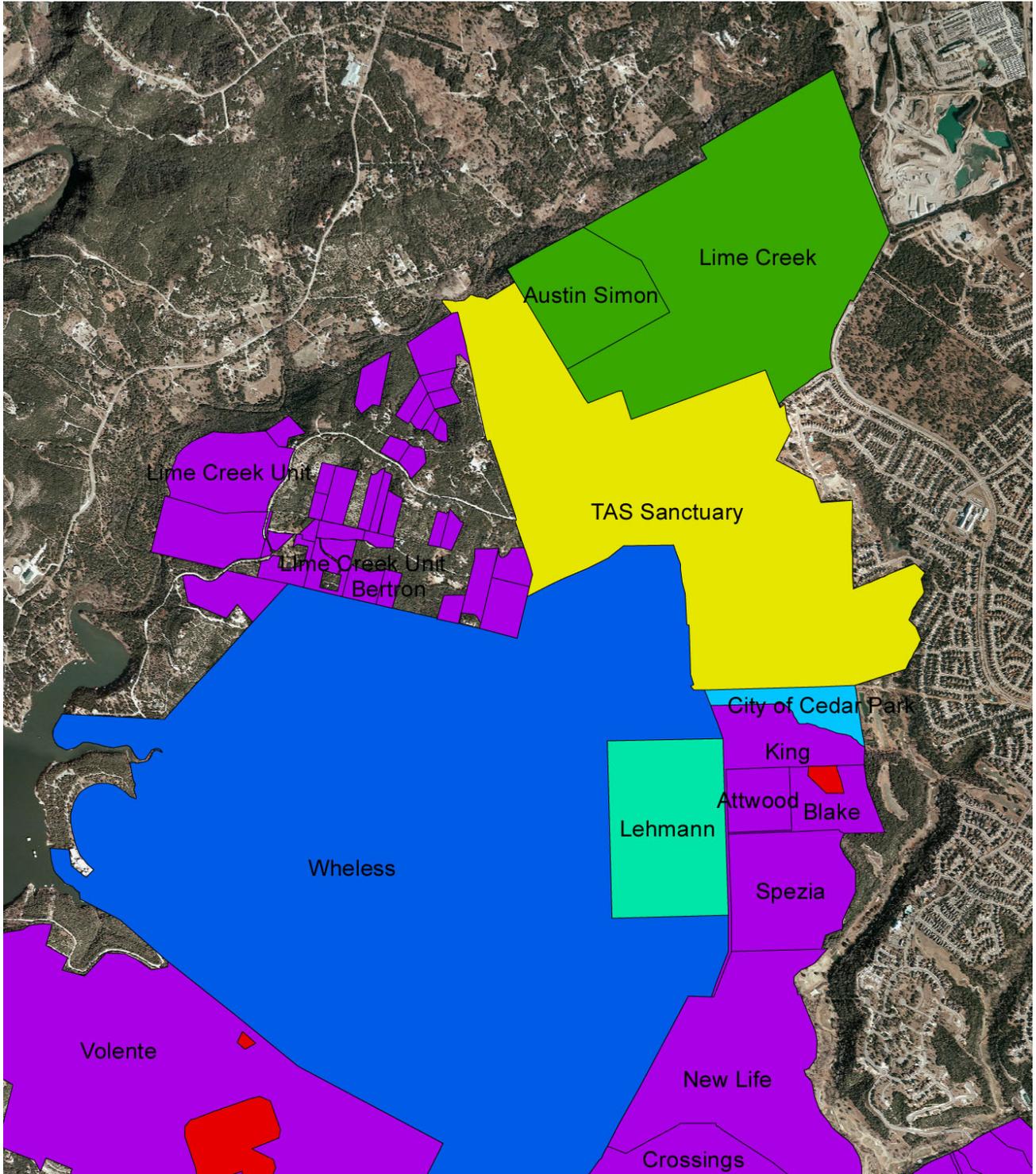
Appendix A

Baker Sanctuary 40-acre headquarters tract



Appendix B

Baker Sanctuary and BCP partner properties



Appendix C

**RESULTS OF THE GOLDEN-CHEEKED WARBLER SURVEY
FOR THE BAKER SANCTUARY 100-ACRE PLOT
SPRING 2015
TRAVIS COUNTY, TEXAS**



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**Results of the Golden-cheeked Warbler Survey
for the Baker Sanctuary 100-acre Plot
Spring 2015**

This season, the annual 100-acre survey saw its fifth year of participation with the City of Austin as a partner in a five year study to determine Golden-cheeked Warbler (*Setophaga chrysoparia*) population viability and habitat suitability in the Balcones Canyonlands Preserve (BCP). In accordance with the protocol adopted by BCP partners at the beginning of the viability and habitat suitability study in 2011, small crews continued to mist net and band males in addition to spot-mapping territories and searching for and monitoring nests. Captured birds were again aged into one of two categories based on plumage characteristics, second year (SY) or after second year (ASY). Second year birds fledged the previous breeding season whereas ASY birds are on their third season, at the least. While not specifically targeted, if females or juvenile Golden-cheeked Warblers (GCWA) were captured they were also banded. During the 2015 season, seven males and one female were captured and banded as well as four hatch-year birds (nestlings) of indeterminate gender for a total of 42 banded individuals over the last five seasons (**Table 1**). The banded hatch-year birds were all from the brood of WH/OR:PI/SI.

Similar to previous seasons, during the 2015 survey City of Austin wildlife biologist Cindy Sperry and I split survey duties, allowing us to more accurately document territories and locate nests as well as to determine breeding productivity. To accommodate two observers, each week the plot was split in half with each observer responsible for their assigned portion. The assigned portion was rotated on a weekly basis, effectively allowing each observer to survey the entire plot every three week cycle. For example, if the first week I surveyed the northern section, Cindy would cover the southern section. The following week I would survey the eastern section and Cindy the western, and so on, rotating through the plot in a clockwise fashion. When splitting the plot in half, no hard line was set as a boundary, rather each observer estimated where the halfway mark was located and used discretion if a GCWA needed to be pursued over the imaginary division. By splitting coverage in this fashion, observer bias should be lessened and a more accurate picture of territory distribution realized. In addition to covering the traditional 100-acres, the 100 meter buffer zone surrounding the plot was again routinely searched in an effort to detect additional banded males.

Beginning on March 20 and continuing through May 23 one half of the study plot was formally surveyed by Murray and the other half by Sperry each week with additional visits by Sperry to specifically search for and monitor nests and fledglings, of which the final visit was on June 5. In total, 195 hours were invested in monitoring the Baker 100-acre plot for the 2015 season, a 19% decrease from the 241 survey hours logged last year but still well above the 60 hours spent surveying annually prior to the population viability study. All surveys were conducted following the protocol outlined in the BCP Land Manager's Handbook. Locations of individual Golden-cheeked Warblers were mapped by hand in the field and GPS coordinates obtained for all detections. Due to the presence of color banded individuals, visual confirmation of GCWAs was attempted whenever

possible. Movements, counter-singing by males, and color bands were documented and used to distinguish individuals and identify territory boundaries. All survey observations were compiled and analyzed to obtain an estimate of established male territories within the plot as well as the buffer zone.

In an effort to consistently analyze the number of territories present in the 100-acre plot regardless of plot, year, or observer, beginning in the 2013 season the BCP partners adopted a method to enumerate territories based on observed patterns of occupation. Males found displaying territorial behavior (e.g. singing, carrying food, feeding fledglings) on at least 3 survey dates at least a week apart are considered to have established territories. To be classified as holding an 'edge' territory, a GCWA male must have been observed displaying territorial behavior on at least two surveys both inside and outside the plot. Otherwise, the territory will be designated as 'full' or 'out' depending on where the majority of the observations occur. To arrive at the 'adjusted total' of territories on the 100-acre plot, full territories were enumerated as 1.0, edge territories as 0.5, and out territories as zero. Based on compiled observations, including patterns of movement, re-sighting of color banded individuals, counter-singing, and the presence of females and fledglings, it is estimated that eight Golden-cheeked Warbler males established territories primarily within plot boundaries (full) and seven males occupied territories partially within the plot (edge), yielding an adjusted total of 11.5 territories for the 100-acre plot area (**Table 2**). While the presence of color banded GCWAs has eliminated some of the guesswork involved with attributing territories to males, some individuals remain unbanded. In the instances where males were not banded, territories were estimated in a conservative fashion to avoid overstating the number of territories associated with the plot.

Pairing success for 2015 was similar to that of prior seasons with all but two territory-holding males observed with a female; 26 fledglings were detected throughout the breeding season (**Table 4**). Prior to 2011 and the launch of the viability and habitat suitability project, surveyors documented females and fledglings, but the focus was on determining the density and distribution of territorial males. With the addition of the banding program, more personnel, and a substantial increase in the time spent in the field, a more accurate picture of fecundity has begun to emerge along with valuable data illuminating nest site preferences. For the five nests discovered during the 2015 survey, nest tree height was 6.8 meters, nest height was 5.8 meters, and nest tree diameter at breast height was 16.0 cm on average. Two nests were placed in Plateau Live Oak (*Quercus fusiformis*), two in Ashe Juniper (*Juniperus ashei*), and one in a Cedar Elm (*Ulmus crassifolia*) (**Table 3**).

The 2015 season yielded an adjusted total of 11.5 territories present in and around the 100-acre plot. This total is a bit higher than the approximately 10 territories observed since the 2010 season (**Table 4**), a pattern which suggests that ten territories may be the norm for this 100-acre patch of habitat. With a total of 26 fledglings observed in and around the 100-acre plot, observed fecundity was higher than the previous season. Nest searching efforts were not as successful for the 2015 season with a 33% discovery rate versus 50% for 2014. There is no obvious reason why the total adjusted territory number

was elevated for 2015 compared to previous seasons. One factor may have been high productivity in the previous breeding season, during the 2014 survey a total of 22 fledglings were observed, the most detected since the 2012 breeding season (**Table 4**). If productivity were elevated in 2014 there would likewise have been more individuals available to return for the 2015 season. Another explanation may simply be observer bias since the designation of ‘full’ or ‘edge’ status depends solely on the males’ position when he is discovered and recorded by the observer. If the total number of territories is considered regardless of status designation, the 100-acre plot supported fifteen territories in 2015, a number quite similar to the fifteen, twelve, fourteen, and twelve territories documented in 2011, 2012, 2013, and 2014 respectively (**Table 4**). More importantly, the observed productivity of 26 fledglings for the 2015 season was the second highest amount documented in the past nine years, surpassed only by the 38 fledglings recorded for the 2012 breeding season (**Table 4**).

The map on page four displays locations of all Golden-cheeked Warbler observations and estimated territory boundaries for 2015. Polygons surrounding the observations represent approximate boundaries of male territories, with each territory identified by color band combinations or an unbanded designation. Two territories are known to have produced two broods in 2015, UBBK2 and UBBK5. In addition to clarifying territory and fecundity data, the presence of color-banded individuals also allows recognition of males returning to the plot from previous seasons. The 2015 survey saw one banded individual (BK/SI:OR/BK) return to the 100-acre plot area from the 2014 season as well as one individual banded during the 2012 season (BL/WH:RD/SI). The rate of return for banded and unbanded ASY males seemed depressed for the 2015 season with only seven of the 100-acre territories occupied by ASY males and eight by SY males. However, six of the fifteen males eluded capture so age status could not be confirmed in-hand and may be inaccurate. Regardless of the ratio of ASY to SY males occupying the Baker site, all GCWA were approximately two weeks delayed on their return to central Texas this season, a phenomenon which was documented throughout all the BCP study plots. Severe weather is assumed to have caused the delay but it is not known if certain age classes were affected more than others during the event.

Table 5 lists the 46 bird species detected in or near the 100-acre plot during the 2015 surveys. In addition to Golden-cheeked Warblers, species detected on seven or more surveys included Mourning Dove, Ladder-backed Woodpecker, Western Scrub-jay, Carolina Chickadee, Black-crested Titmouse, Bewick’s Wren, Blue-gray Gnatcatcher, Cedar Waxwing, Northern Cardinal, Common Grackle, and Lesser Goldfinch. Passing migrants included Nashville Warbler and Black-throated Green Warbler. Commonly seen birds presumed to be nesting in or near the plot included Painted Bunting, Yellow-billed Cuckoo, Black-chinned Hummingbird, Summer Tanager, Northern Mockingbird, White-eyed Vireo, and Black-and-white Warbler. Brown-headed Cowbirds were detected once during the surveys.

Other vertebrates detected during the survey include Eastern Fox Squirrel (*Sciurus niger*), Whitetail Deer (*Odocoileus virginianus*), Eastern Black-necked Garter Snake (*Thamnophis cyrtopsis*), and Eastern Hog-nosed Snake (*Heterodon platirhinos*).

Figure 1. Baker Sanctuary Golden-cheeked Warbler 100-acre plot 2015.

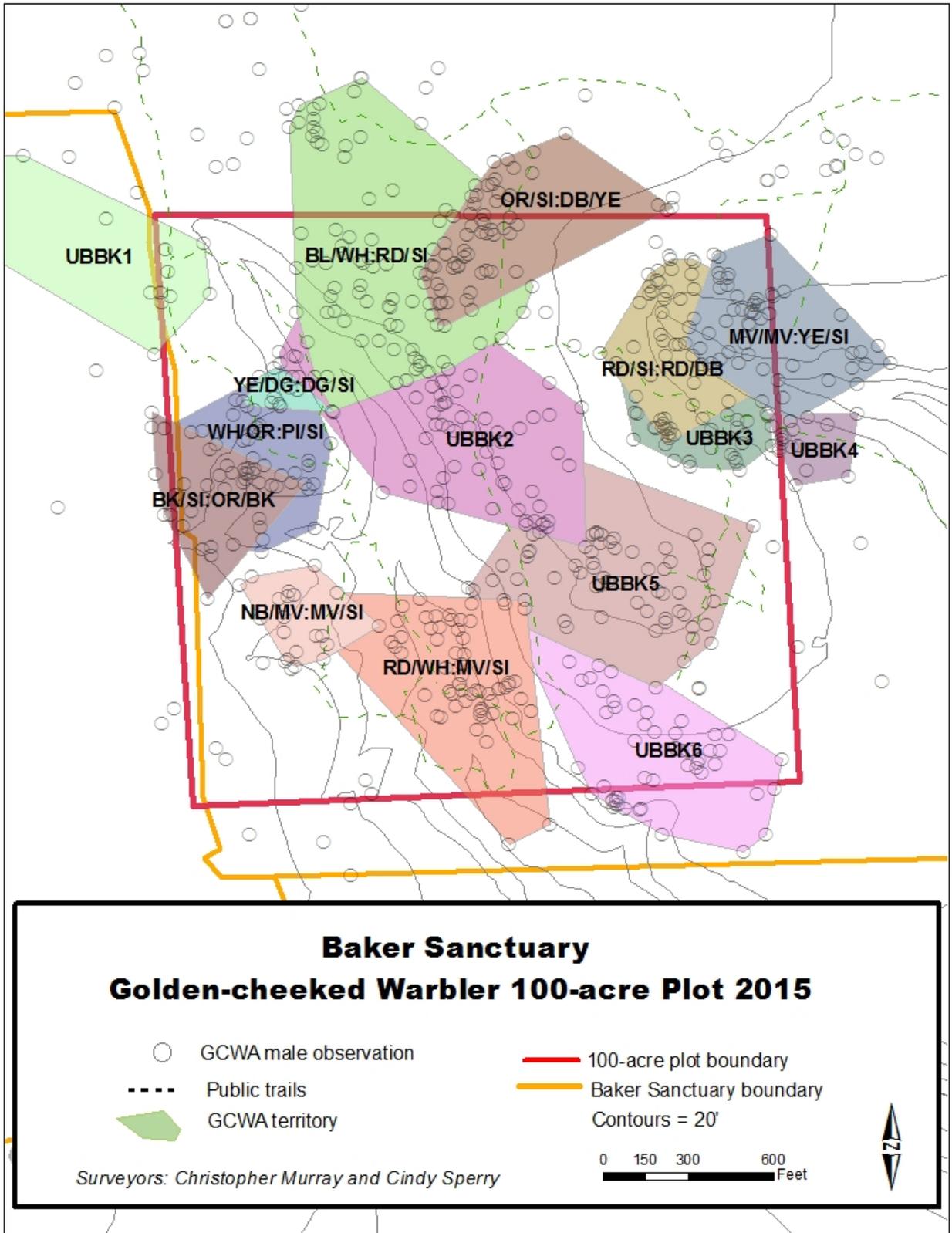


Table 1. GCWA individuals banded during the 2011- 2015 Baker Sanctuary 100-acre surveys.

Year Banded	Combo	Sex	Age	Year Banded	Combo	Sex	Age
2011	MV/SI:NB/YE	M	SY	2012	PI/SI:GR/YE	M	SY
2011	MV/BL:PI/SI	M	ASY	2012	PI/SI:NB/DG	M	ASY
2011	OR/OR:DG/SI	M	SY	2013	MV/SI:BL/MV	M	SY
2011	BK/YE:DG/SI	M	SY	2013	DB/SI/OR/YE	M	ASY
2011	YE/DG:DB/SI	M	ASY	2013	MV/SI:DG/DG	M	SY
2011	DB/BK:MV/SI	M	ASY	2014	BK/SI:OR/BK	M	ASY
2011	RD/SI:BK/DG	F	ASY	2014	BL/SI:OR/RD	M	ASY
2011	NB/SI:PI/MV	M	ASY	2014	OR/SI:DG/DB	M	ASY
2011	WH/SI:OR/BL	M	SY	2014	PI/DG:NB/SI	F	ASY
2011	NB/MV:GR/SI	M	SY	2015	RD/SI:RD/DB	M	SY
2011	WH/BK:WH/SI	M	SY	2015	WH/OR:PI/SI	M	SY
2011	OR/SI:MV/DG	F	ASY	2015	NB/MV:MV/SI	M	SY
2011	RD/SI:DB/YE	M	ASY	2015	YE/DG:DG/SI	M	ASY
2012	BL/DB:RD/SI	M	ASY	2015	MV/MV:YE/SI	M	ASY
2012	BK/SI:OR/PI	M	ASY	2015	OR/SI:DB/YE	M	ASY
2012	BL/WH:RD/SI	M	SY	2015	RD/WH:MV/SI	M	ASY
2012	BK/DG:DB/SI	M	SY	2015	YE/SI:PI/BL	F	SY
2012	WH/SI:DG/YE	M	SY	2015	DB/SI:RD/DB	U	HY
2012	RD/SI:BL/PI	F	ASY	2015	WH/SI:NB/YE	U	HY
2012	WH/DG:BK/SI	M	SY	2015	WH/YE:YE/SI	U	HY
2012	OR/SI:WH/RD	M	SY	2015	BL/SI:BL/MV	U	HY
Total Birds Banded: 42							

Table 2. Designation of Golden-cheeked Warbler territory status and number of females and fledglings detected per territory for the 2015 Baker Sanctuary 100-acre survey.

GCWA Designation	Territory Status	Female Detected	Number of Fledglings Detected
BL/WH:RD/SI	Edge	Yes	0
OR/SI:DB/YE	Edge	Yes	0
MV/MV:YE/SI	Edge	Yes	0
BK/SI:OR/BK	Edge	No	0
UBBK1	Edge	Yes	2
UBBK4	Edge	Yes	2
UBBK6	Edge	Yes	0
RD/SI:RD/DB	Full	Yes	3
WH/OR:PI/SI	Full	Yes	4
NB/MV:MV/SI	Full	No	0
RD/WH:MV/SI	Full	Yes	3
YE/DG:DG/SI	Full	Yes	0
UBBK2	Full	Yes	4*
UBBK3	Full	Yes	3
UBBK5	Full	Yes	5*

* Total fledglings from two broods.

Table 3. Nest tree data for Golden-cheeked Warbler nests discovered during the Baker Sanctuary 100-acre survey, 2015.

Nest ID	Nest Tree Height (m)	Nest Height (m)	Nest Tree DBH (cm)	Nest Tree Species
01CM15	7.6	7.2	12.0	Ashe Juniper
03CS15	7.7	6.3	15.0	Plateau Live Oak
06CS15	6.2	4.5	13.5	Ashe Juniper
07CS15	5.0	4.5	19.5	Plateau Live Oak
08CS15	7.3	6.7	20.0	Cedar Elm
Average	6.8	5.8	16.0	

Table 4. Adjusted total of Golden-cheeked Warbler territories, females and fledglings detected during Baker Sanctuary 100-acre plot surveys, 2006 - 2014.

Survey Date	Territories (full/edge)	Females	Fledglings
2006	24 (22/4)	18	17
2007	23.5 (20/7)	8	17
2008	17.5 (14/7)	10	16
2009	16 (14/4)	6	7
2010	10 (9/2)	6	11
2011	10.5 (6/9)	9	21
2012	10 (8/4)	12	38
2013	10 (6/8)	12	17
2014	8.5 (5/7)	11	22
2015	11.5 (8/7)	13	26
Average	14 (11/6)	11	19

Table 5. Bird species detected in the Baker Sanctuary 100-acre plot during the 2015 Golden-cheeked Warbler surveys.

SPECIES	WEEKS COUNTED										Weeks Detected
	3/20	3/22	3/27	3/31	4/17	4/24	5/01	5/08	5/23	5/29	
Northern Bobwhite				X	X					X	3
Turkey Vulture				X	X	X		X	X		5
Red-shouldered Hawk		X	X			X	X		X	X	6
Wild Turkey			X		X	X	X				4
Mourning Dove	X	X	X	X	X	X	X	X		X	9
Yellow-billed Cuckoo						X		X	X	X	4
Greater Roadrunner		X	X	X		X		X			5
Common Nighthawk								X			1
Chimney Swift					X		X	X		X	4

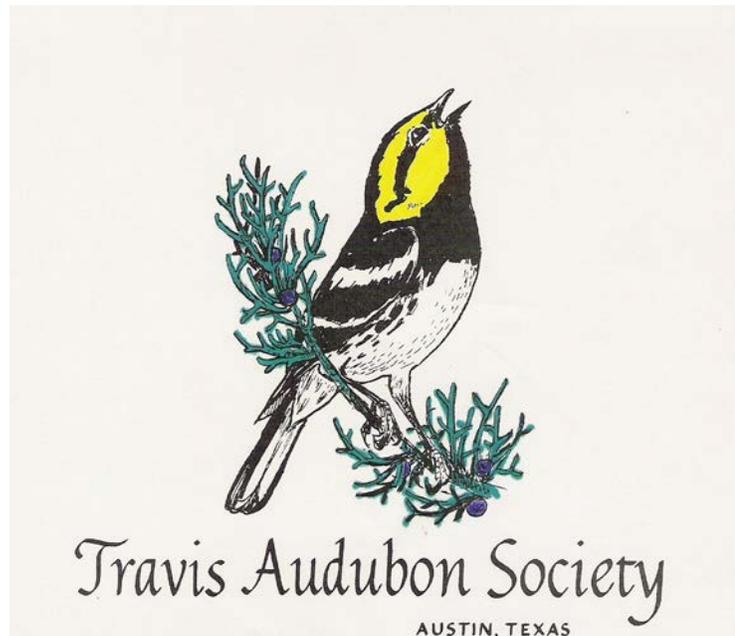
SPECIES	WEEKS COUNTED										Weeks Detected
	3/20	3/22	3/27	3/31	4/17	4/24	5/01	5/08	5/23	5/29	
Black-chinned Hummingbird						X	X		X	X	4
Ladder-backed Woodpecker		X		X		X	X	X	X	X	7
Eastern Phoebe			X								1
Great Crested Flycatcher					X			X	X		3
Ash-throated Flycatcher							X			X	2
White-eyed Vireo			X	X		X	X	X		X	6
Red-eyed Vireo					X	X		X	X	X	5
Hutton's Vireo					X	X	X	X			4
Blue Jay									X		1
Western Scrub-Jay		X	X	X	X		X	X	X	X	8
American Crow							X				1
Common Raven				X							1
Purple Martin						X	X	X	X		4
Carolina Chickadee	X	X	X	X	X	X	X	X	X	X	10
Black-crested Titmouse	X	X	X	X	X	X	X	X	X	X	10
Carolina Wren	X		X	X				X		X	5
Bewick's Wren	X	X	X	X	X	X	X	X	X	X	10
Blue-gray Gnatcatcher	X		X	X	X	X	X	X	X	X	9
Ruby-crowned Kinglet	X	X	X	X	X						5
Hermit Thrush	X										1
American Robin		X	X	X							3
Northern Mockingbird	X	X		X			X	X		X	6
Cedar Waxwing		X	X	X	X	X	X	X			7
Nashville Warbler					X	X	X				3
Yellow-rumped Warbler (Myrtle)					X						1
Golden-cheeked Warbler	X	X	X	X	X	X	X	X	X	X	10
Black-throated Green Warbler						X					1
Black-and-white Warbler	X	X	X	X	X			X			6
Rufous-crowned Sparrow									X		1
Field Sparrow								X	X	X	3

SPECIES	WEEKS COUNTED										Weeks Detected
	3/20	3/22	3/27	3/31	4/17	4/24	5/01	5/08	5/23	5/29	
Summer Tanager								X	X	X	3
Northern Cardinal	X	X	X	X	X	X	X	X	X	X	10
Dickcissel					X	X				X	3
Painted Bunting							X	X	X	X	4
Common Grackle	X		X		X		X	X	X	X	7
Brown-headed Cowbird				X							1
Lesser Goldfinch	X	X	X	X	X	X	X	X	X	X	10
TOTAL SPECIES	14	16	20	22	23	23	24	28	22	25	46

Acknowledgements: Once again, special thanks to Cindy Sperry for helping to collect data, verify data, and assisting in creating the final 2015 GCWA survey map. Cindy was always available to answer questions and her expertise and professionalism was a great help in the completion of this report. Not even a broken wrist could slow her down.

Appendix D

**RESULTS OF THE GOLDEN-CHEEKED WARBLER SURVEY
FOR THE SOUTHERN PORTION OF BAKER SANCTUARY
SPRING 2015
TRAVIS COUNTY, TEXAS**



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1.0 INTRODUCTION

Travis Audubon Society (TAS) owns and operates the 715-acre Baker Sanctuary and is a Managing Partner in the Balcones Canyonlands Preserve (BCP) system. The BCP was formed in 1996 with the adoption of the Balcones Canyonlands Conservation Plan (BCCP), a 30-year regional permit issued by the US Fish and Wildlife Service (USFWS) of which the City of Austin and Travis County are the joint Permit Holders. The BCCP set aside a minimum of 30,428-acres throughout Travis County for the protection of two federally endangered Neotropical passerine species, the Golden-cheeked Warbler (*Setophaga chrysoparia*) and the Black-capped Vireo (*Vireo atricapilla*). The Permit Holders are also required to protect six federally endangered karst invertebrate species as well as twenty-seven other species of concern. Baker Sanctuary is bordered primarily by BCP properties owned and managed by various partners, including the City of Austin, Travis County, City of Cedar Park, Lower Colorado River Authority (LCRA), and conservation easements held on privately owned land. In addition to preserve lands, Baker is bordered by several small rural lots to the west and north composed of Fisher Hollow and Red Wagon Estates, and a large suburban development to the southeast, Cypress Canyon. Lime Creek Road, which runs from east to west, effectively divides the Sanctuary into two roughly equal parcels. Baker Sanctuary contains approximately 690 acres of high-quality Golden-cheeked Warbler (GCWA) habitat.

The purpose of this report is to present the results of the 2015 GCWA territory survey which occurred on the southern half of the Sanctuary, excluding the 100-acre Intensive Study Plot (Figure 1). With the exception of the 100-acre plot, which has been surveyed for GCWA with various levels of intensity since at least 1984, the only surviving record of a GCWA survey occurring outside the 100-acre plot is from May 8, 1993. On that morning, Tom McCuller and Alma Barrera spent 3.75 hours surveying the southern sanctuary and recorded four visual sightings in the 100-acre plot but also two auditory observations outside the plot

boundaries, with one in what is now the Cypress Canyon neighborhood and the other on the border of the Hatfield tract (Figure 2). The only other formal observations of GCWA occurring on Baker Sanctuary derive from the annual Breeding Bird Survey, instituted in the spring of 2011, which provides presence/absence data (Hutto et al. 1986) for all breeding species found throughout the sanctuary but does not provide information on pairing success, productivity, or how the landscape is utilized spatially. Baseline data regarding GCWA territory distribution, pairing success, and productivity throughout the sanctuary will help inform land management decisions in the future, a practice that is recommended in the BCCP Tier II Land Management Plan (BCCP 2007).

The methods for the 2015 Baker Southern Sanctuary Survey followed the USFWS recommended minimum procedures for determining the presence/absence of GCWA (USFWS 2010), as outlined in TAS's Federal Fish and Wildlife Permit (Permit No. TE94739A-0), issued May 10, 2013. In addition, GCWA territory mapping followed procedures outlined in Bibby et al. (2003) and the BCCP Tier II Land Management Plan (BCCP 2007) unless otherwise stated.

2.0 DESCRIPTION OF SURVEY AREAS

The southern half of the sanctuary, as defined by the land south of Lime Creek Road, was split into three zones, excluding the 100-acre plot and a small strip of land south of the 100-acre plot which were not included in the survey (Figure 1). In general, the three zones shared a vegetation community that is typical of GCWA habitat throughout the central Texas Hill Country where mixed woodlands are dominated by Ashe juniper (*Juniperus ashei*) and plateau live oak (*Quercus fusiformis*) and interspersed primarily with Spanish oak (*Quercus buckleyi*), shin oak (*Quercus sinuata*), and cedar elm (*Ulmus crassifolia*). A limited variety of deciduous and evergreen understory species are distributed between upland areas, slopes, and canyon bottoms where plant species diversity increases.

Differences in the three zones were mostly limited to landscape level features and are described below.

2.1 Zone One

Zone One is composed of approximately 81 acres, per GoogleEarth estimate. Topography of Zone One is fairly uniform with the majority of the plot consisting of upland habitat and the only significant topographical relief being a small canyon located on the west sanctuary boundary. Elevations within Zone One range from approximately 1020 - 1060 feet above mean sea level (msl) in the uplands to 920 feet above msl near the canyon bottom. Zone One is bordered to the north by Lime Creek Road, to the south by the LCRA's 2,317-acre Wheless tract and the 100-acre plot, and to the west by small tracts in Travis County's Lime Creek Unit as well as several privately owned tracts located within Fisher Hollow. One whitetail deer (*Odocoileus virginianus*) hunt site, the steward's residence, and a public parking lot are also located in Zone One.

2.2 Zone Two

Zone Two is composed of approximately 97 acres, per GoogleEarth estimate. Topography of Zone Two is essentially flat upland habitat with elevations ranging from approximately 1000 – 1060 feet above msl. No canyons are found within the boundaries of Zone Two. Zone Two is bordered to the north by Lime Creek Road and to the east by the expansive Cypress Canyon subdivision which has thirty-eight single-family homes sited adjacent to the zone. In the drought of 2011, an approximate 20-acre swath of mostly Ashe juniper located near the center of Zone Two experienced significant mortality. The vegetation community in that area is now composed mostly of grasses, a scattering of understory plants such as Texas persimmon (*Diospyros texana*) and flameleaf sumac (*Rhus lanceolate*), seedling Ashe juniper, clumps of extant plateau live oak, and many standing and toppled Ashe juniper snags.

2.3 Zone Three

Zone Three is composed of approximately 122 acres, per GoogleEarth estimate. Topography of Zone Three is the most varied of the plots with a portion of upland habitat in the northern section of the plot and large canyons to the south and east. Two small, ephemeral creeks drain the canyons with Kutac Creek flowing roughly southeast where it joins Hatfield Creek at the southern sanctuary boundary. Hatfield Creek flows in from the north and drains the Cypress Canyon neighborhood. These tributaries flow to the southeast and ultimately into the Cypress Creek arm of Lake Travis. Elevations within Zone Three range from 1000 feet above msl in the northern section of the plot to 880 feet above msl in the canyon bottoms to the south and east. Zone Three is bordered to the east by the Cypress Canyon subdivision which has twenty-eight single-family homes sited adjacent to the zone. Zone To the south Zone Three is bordered by the Twin Creeks Golf Course and BCP land owned by the City of Cedar Park and to the west by the 100-acre plot. Zone Three has one whitetail deer hunt site located within its boundary.

3.0 METHODS

Surveys began on March 25 and concluded on May 31. Surveys occurred in the morning hours and were not conducted if wind speeds were greater than 15 mph or during precipitation. Two volunteers, Beth Samuelson and Thom Marshall, rotated survey effort through all three zones in an effort to reduce observer bias. Zone One was surveyed six times for a total of 32.5 hours, Zone Two five times for 29.25 hours, and Zone 3 seven times for 39.25 hours. In total, 101 survey hours were performed on the approximately 300 acres of the southern sanctuary study area, or 8.4 hours per 25 acres. Surveyors used spot-mapping techniques as outlined in the USFWS protocol for GCWA presence/absence surveys

(USFWS 2010) as well as Bibby et al. (2003) and the Tier II Land Management Plan (2007).

During each visit, the surveyors hiked through the survey area and searched for GCWA by sight and/or sound. If a GCWA was detected, the surveyors recorded the location of the bird on a field map and also with a Garmin eTrex GPS receiver. GPS locations were designated as precise or imprecise with precise locations designating a visual and/or auditory observation within 30 feet of the observer. Imprecise locations were auditory detections only and were estimated locations extending 30 to 120 feet from the observer. At each location surveyors also recorded the time of day, song type (A or B), whether the GCWA was banded, presence of a female or fledglings, territorial interactions such as counter-singing or chases between males, and whether the detected male was an After Second Year (ASY) or Second Year (SY) bird. Auditory recordings were not utilized during any surveys.

After the surveys were complete, data were compiled with GPS Trackmaker and uploaded into GoogleEarth for analysis. Territories were determined primarily by utilizing defensive cues, such as counter-singing and chases, exhibited by males at or near boundary zones. In addition to territorial behavior, sequential movement patterns, presence of females and fledglings, and age of fledglings were used to conservatively estimate the amount and distribution of territories throughout the survey area.

Reproductive success was determined as follows:

1. Territory density: number of territories per 100 acres (edge territories counting as 0.5 territory);
2. Calculation of edge territories: each territory that straddles plot boundary counted as a half territory (i.e., 0.5 territory) (Verner 1985); and

3. Productivity measures (Anders 2000) - calculated for full territories ONLY, as follows:
 - a. Pairing success: pairing success of male GCWA determined by observing one or more of the following conditions: a territorial male observed with a female and/or a male tending at least one fledgling. Pairing success rate = number of territories determined to have pairing success / total number of full territories;
 - b. Breeding success: breeding success rate = number of territories that successfully fledged at least one young / total number of full territories;
 - c. Estimated brood size: average brood size per successful pair (based on "breeding success"); and
 - d. Productivity = sum of the highest number of fledglings recorded at any one time for each full territory / total number of full territories.

While the southern sanctuary study area was divided into three zones to facilitate the survey effort, analysis was of the entire 300-acre study area and not the individual zones.

4.0 RESULTS

In total, 467 GCWA observations were taken over the course of the survey effort. Fourteen full territories and four edge territories were delineated in the southern sanctuary (Figure 3) for an adjusted total of 16 territories. Females were observed in nine territories and a total of 15 fledglings were observed in five territories (Table 1). Three of the four edge territories were also recorded during the 2015 100-acre survey but data from the two studies were not combined for this analysis.

Territory density was estimated at 5.3 territories per 100 acres. This calculation was based on the adjusted total of sixteen territories (fourteen full and four edge) in the 300 acres surveyed.

The pairing success rate in the southern sanctuary was 50% (seven of the 14 full territories). The breeding success was estimated at 29%, based on four of the 14 full territories were observed to have fledglings. The average brood size was 3.3 fledglings based on the aforementioned criteria. Productivity was estimated at 0.9 based on the total of 13 fledglings observed in the 14 full territories.

Table 1. Designation of Golden-cheeked Warbler territory status and number of females and fledglings detected per territory for the 2015 Baker Southern Sanctuary Survey.

Territory Designation	Full/Edge Territory	Female Detected	# Fledglings Detected	2015 100-acre Designation
A	Full	Yes	3	NA
B	Full	Yes	4	NA
C	Edge	Yes	2	NA
D	Full	Yes	2	NA
E	Full	No	0	NA
F	Full	No	0	NA
G	Full	No	0	NA
H	Edge	No	0	UBBK1
I	Full	No	0	NA
J	Full	Yes	4	NA
K	Full	Yes	0	NA
L	Full	Yes	0	NA
M	Edge	Yes	0	OR/SI:DB/YE
N	Edge	No	0	UBBK4
O	Full	No	0	NA
P	Full	No	0	NA
Q	Full	No	0	NA
R	Full	Yes	0	NA

Lime Creek Road seemed to act as a real barrier with regard to GCWA territory distribution. On four separate surveys counter-singing was documented occurring between males on opposite sides of the road, with two occasions involving a male north of Territory A and two occasions a male north of Territory E. GCWA were not documented to hold any territories that crossed Lime Creek Road (Figure 3). The same was not true for interior hiking trails, maintenance roads, and hunt sites which GCWA were frequently observed crossing during their territory defense.

5.0 DISCUSSION

The 2015 Baker Southern Sanctuary Survey was the first known attempt to delineate GCWA territory density and distribution as well as productivity outside of the 100-acre plot. As such, it will be important baseline data as similar surveys are undertaken in the future throughout the sanctuary. With the exception of the male located in the edge Territory M (OR/SI:DB/YE) on the border with the 100-acre plot (Figure 2), all GCWA were unbanded. With an unmarked population it is sometimes difficult to delineate territories so care was taken during the analysis to conservatively estimate territory size and distribution, erring on the side of fewer rather than more territories when interpreting the data. With more surveyors and/or increased time in the field it would not be surprising to see an increase in the number of territories, especially in areas such as the Hatfield Tract of Zone Three which did not experience an equivalent amount of surveyor effort due to its relatively more remote location.

It is recommended that future survey efforts include another observer, one per zone, and that surveyors rotate their zone of coverage every other week. By doing so, survey effort would increase by at least a third. Spending two consecutive weeks in the same zone would allow for more complete coverage, allowing the surveyor to return to an area in the zone which may need additional attention. With an increase in field time and a modified rotation schedule it would

not be surprising to witness an increase in observed pairing success rate, breeding success, productivity, and total amount of territories.

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7.0 ACKNOWLEDGEMENTS

Many thanks go out to Beth Samuelson and Thom Marshall, the two volunteer surveyors who made the study possible. They spent a great deal of their free time during the spring traipsing about the sanctuary, enduring the heat and braving chiggers, the scratchy embrace of ubiquitous Ashe juniper, uneven terrain, and the occasional venomous snake.

Figure 1. Location of 100-acre plot and survey Zones 1 – 3.

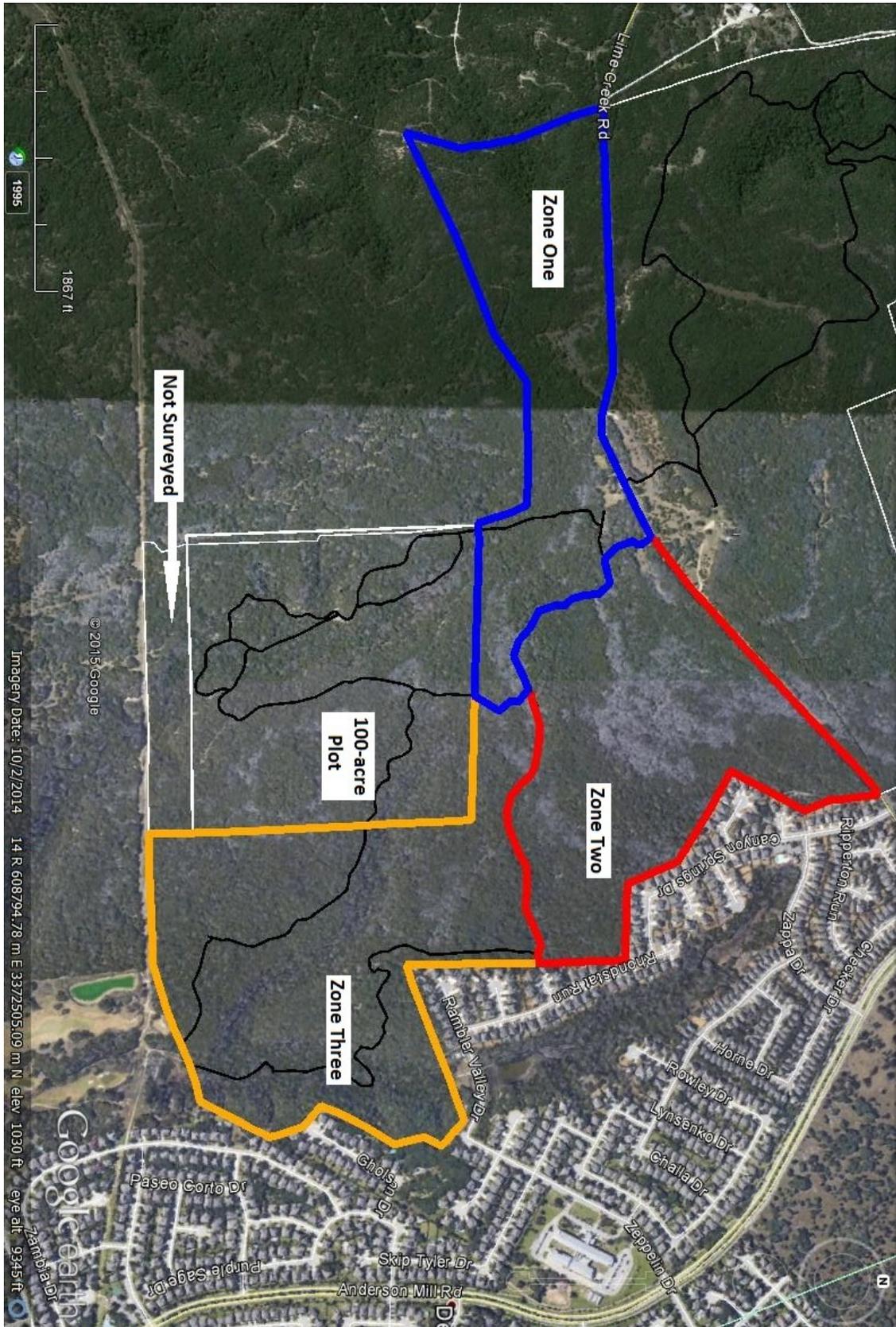
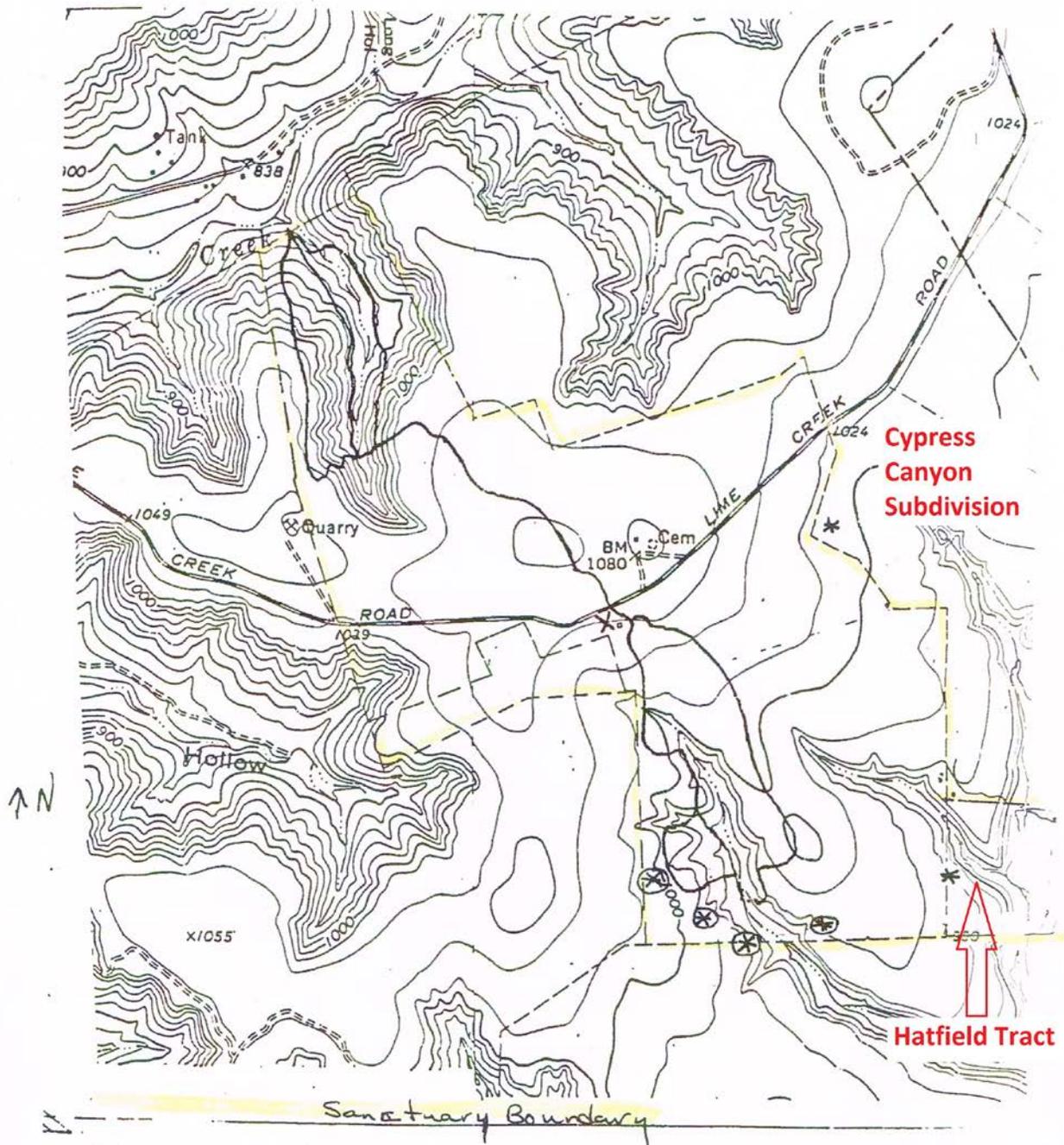


Figure 2. 1993 Golden-cheeked Warbler survey



- * Golden-cheeked Warbler singing.
- ⊗ Golden-cheeked Warbler singing (with visual confirmation)

7:30-11:15 a.m., May 8, 1993
TAS Wildlife Sanctuary

Tom McCuller
Alma Barrera

Figure 3. 2015 Baker Southern Sanctuary Survey Golden-cheeked Warbler Territory Map



Appendix E

Baker Sanctuary vertebrates list

Family	Common Name	Scientific Name
Birds		
Pelecanidae	American White Pelican	<i>Pelecanus erythrorhynchos</i>
Phalacrocoracidae	Double-crested Cormorant	<i>Phalacrocorax auritus</i>
Ardeidae	Great Blue Heron	<i>Ardea herodias</i>
Ardeidae	Great Egret	<i>Casmerodius albus</i>
Ardeidae	Green Heron	<i>Butorides striatus</i>
Ardeidae	Black-crowned Night-heron	<i>Nycticorax nycticorax</i>
Ardeidae	Yellow-crowned Night-heron	<i>Nyctanassa violacea</i>
Threskiornithidae	White-faced Ibis	<i>Plegadis chihi</i>
Cathartidae	Black Vulture	<i>Coragyps atratus</i>
Cathartidae	Turkey Vulture	<i>Cathartes aura</i>
Anatidae	American Wigeon	<i>Anas americana</i>
Anatidae	Mallard	<i>Anas platyrhynchos</i>
Accipitridae	Osprey	<i>Pandion haliaetus</i>
Accipitridae	Mississippi Kite	<i>Ictinia mississippiensis</i>
Accipitridae	Bald Eagle	<i>Haliaeetus leucocephalus</i>
Accipitridae	Sharp-shinned Hawk	<i>Accipter striatus</i>
Accipitridae	Cooper's Hawk	<i>Accipiter cooperii</i>
Accipitridae	Red-shouldered Hawk	<i>Buteo lineatus</i>
Accipitridae	Broad-winged Hawk	<i>Buteo platypterus</i>
Accipitridae	Swainson's Hawk	<i>Buteo swainsoni</i>
Accipitridae	Red-tailed Hawk	<i>Buteo jamaicensis</i>
Falconidae	Crested Caracara	<i>Polyborus plancus</i>
Falconidae	American Kestrel	<i>Falco sparverius</i>
Falconidae	Merlin	<i>Falco columbarius</i>
Phasianidae	Wild Turkey	<i>Meleagris gallopavo</i>
Odontophoridae	Northern Bobwhite	<i>Colinus virginianus</i>
Gruidae	Sandhill Crane	<i>Grus canadensis</i>
Charadriidae	Killdeer	<i>Charadrius vociferus</i>
Scolopacidae	Upland Sandpiper	<i>Bartramia longicauda</i>
Laridae	Ring-billed Gull	<i>Larus delawarensis</i>
Columbidae	Rock Dove	<i>Columba livia</i>
Columbidae	White-winged Dove	<i>Zenaida asiatica</i>
Columbidae	Mourning Dove	<i>Zenaida macroura</i>
Columbidae	Eurasian Collared-dove	<i>Zenaida chinensis</i>
Columbidae	Inca Dove	<i>Columbina inca</i>
Columbidae	Common Ground-Dove	<i>Columbina passerina</i>
Cuculidae	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
Cuculidae	Greater Roadrunner	<i>Geococcyx californianus</i>
Tytonidae	Barn Owl	<i>Tyto alba</i>
Strigidae	Eastern Screech-Owl	<i>Otus asio</i>
Strigidae	Great Horned Owl	<i>Bubo virginianus</i>
Strigidae	Long-eared Owl	<i>Asio otus</i>

Caprimulgidae	Common Nighthawk	Chordeiles minor
Caprimulgidae	Common Poorwill	Phalaenoptilus nuttallii
Caprimulgidae	Chuck-will's-widow	Caprimulgus carolinensis
Caprimulgidae	Whip-poor-will	Caprimulgus vociferus
Apodidae	Chimney Swift	Chaetura pelagica
Trochilidae	Ruby-throated Hummingbird	Archilochus colubris
Trochilidae	Black-chinned Hummingbird	Archilochus alexandri
Trochilidae	Rufous Hummingbird	Selasphorus rufus
Alcedinidae	Belted Kingfisher	Ceryle alcyon
Picidae	Golden-fronted Woodpecker	Melanerpes aurifrons
Picidae	Red-bellied Woodpecker	Melanerpes carolinus
Picidae	Ladder-backed Woodpecker	Picoides nuttallii
Picidae	Downy Woodpecker	Picoides pubescens
Picidae	Northern Flicker	Colaptes auratus
Tyrannidae	Eastern Wood-Pewee	Contopus virens
Tyrannidae	Least Flycatcher	Empidonax minimus
Tyrannidae	Eastern Phoebe	Sayornis phoebe
Tyrannidae	Ash-throated Flycatcher	Myiarchus cinerascens
Tyrannidae	Great Crested Flycatcher	Myiarchus crinitus
Tyrannidae	Western Kingbird	Tyrannus verticalis
Tyrannidae	Scissor-tailed Flycatcher	Tyrannus forficatus
Laniidae	Loggerhead Shrike	Lanius ludovicianus
Vireonidae	White-eyed Vireo	Vireo griseus
Vireonidae	Blue-headed Vireo	Vireo solitarius
Vireonidae	Hutton's Vireo	Vireo huttoni
Vireonidae	Red-eyed Vireo	Vireo olivaceus
Corvidae	Blue Jay	Cyanocitta cristata
Corvidae	Western Scrub Jay	Aphelocoma californica
Corvidae	American Crow	Corvus brachyrhynchos
Corvidae	Common Raven	Corvus corax
Hirundinidae	Purple Martin	Progne subis
Hirundinidae	Cliff Swallow	Hirundo fulva
Hirundinidae	Barn Swallow	Hirundo rustica
Paridae	Carolina Chickadee	Poecile carolinensis
Paridae	Tufted Titmouse	Baeolophus bicolor
Paridae	Black-crested Titmouse	Baeolophus atricristatus
Aegithalidae	Bushtit	Psaltriparus minimus
Sittidae	Red-breasted Nuthatch	Sitta canadensis
Sittidae	White-breasted Nuthatch	Sitta carolinensis
Certhiidae	Brown Creeper	Certhia americana
Troglodytidae	Canyon Wren	Catherpes mexicanus
Troglodytidae	Carolina Wren	Thryothorus ludovicianus
Troglodytidae	Bewick's Wren	Thryomanes bewickii
Troglodytidae	House Wren	Troglodytes aedon
Regulidae	Golden-crowned Kinglet	Regulus satrapa
Regulidae	Ruby-crowned Kinglet	Regulus calendula
Sylviidae	Blue-gray Gnatcatcher	Polioptila caerulea
Turdidae	Eastern Bluebird	Sialia sialis

Turdidae	Swainson's Thrush	<i>Catharus ustulatus</i>
Turdidae	Hermit Thrush	<i>Catharus guttatus</i>
Turdidae	American Robin	<i>Turdus migratorius</i>
Mimidae	Gray Catbird	<i>Dumetella carolinensis</i>
Mimidae	Northern Mockingbird	<i>Mimus polyglottos</i>
Sturnidae	European Starling	<i>Sturnus vulgaris</i>
Bombycillidae	Cedar Waxwing	<i>Bombycilla cedrorum</i>
Parulidae	Tennessee Warbler	<i>Vermivora peregrina</i>
Parulidae	Orange-crowned Warbler	<i>Vermivora celata</i>
Parulidae	Nashville Warbler	<i>Vermivora ruficapilla</i>
Parulidae	Yellow Warbler	<i>Dendroica petechia</i>
Parulidae	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>
Parulidae	Magnolia Warbler	<i>Dendroica magnolia</i>
Parulidae	Yellow-rumped Warbler	<i>Dendroica coronata</i>
Parulidae	Golden-cheeked Warbler	<i>Setophaga chrysoparia</i>
Parulidae	Black-throated Green Warbler	<i>Dendroica virens</i>
Parulidae	Pine Warbler	<i>Dendroica pinus</i>
Parulidae	Black-and-white Warbler	<i>Mniotilta varia</i>
Parulidae	Blackburnian Warbler	<i>Dendroica fusca</i>
Parulidae	American Redstart	<i>Setophaga ruticilla</i>
Parulidae	MacGillivray's Warbler	<i>Oporornis tolmiei</i>
Parulidae	Wilson's Warbler	<i>Wilsonia pusilla</i>
Parulidae	Canada Warbler	<i>Wilsonia canadensis</i>
Parulidae	Yellow breasted Chat	<i>Icteria virens</i>
Thraupidae	Summer Tanager	<i>Piranga rubra</i>
Emberizidae	Green-tailed Towhee	<i>Pipilo chlorurus</i>
Emberizidae	Spotted Towhee	<i>Pipilo maculatus</i>
Emberizidae	Eastern Towhee	<i>Pipilo erythrophthalmus</i>
Emberizidae	Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>
Emberizidae	Chipping Sparrow	<i>Spizella passerina</i>
Emberizidae	Clay-colored Sparrow	<i>Spizella pallida</i>
Emberizidae	Field Sparrow	<i>Spizella pusilla</i>
Emberizidae	Lark Sparrow	<i>Chondestes grammacus</i>
Emberizidae	Savannah Sparrow	<i>Passerculus sandwichensis</i>
Emberizidae	Fox Sparrow	<i>Passerella iliaca</i>
Emberizidae	Song Sparrow	<i>Melospiza melodia</i>
Emberizidae	Lincoln's Sparrow	<i>Melospiza lincolni</i>
Emberizidae	White-throated Sparrow	<i>Zonotrichia albicollis</i>
Emberizidae	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Emberizidae	Dark-eyed Junco	<i>Junco hyemalis</i>
Cardinalidae	Northern Cardinal	<i>Cardinalis cardinalis</i>
Cardinalidae	Pyrrhuloxia	<i>Cardinalis sinuatus</i>
Cardinalidae	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
Cardinalidae	Blue Grosbeak	<i>Guiraca caerulea</i>
Cardinalidae	Lazuli Bunting	<i>Passerina amoena</i>
Cardinalidae	Indigo Bunting	<i>Passerina cyanea</i>
Cardinalidae	Painted Bunting	<i>Passerina ciris</i>
Cardinalidae	Dickcissel	<i>Spiza americana</i>

Icteridae	Red-winged Blackbird	<i>Aegialius phoeniceus</i>
Icteridae	Eastern Meadowlark	<i>Sturnella magna</i>
Icteridae	Common Grackle	<i>Quiscalus quiscula</i>
Icteridae	Great-tailed Grackle	<i>Quiscalus mexicanus</i>
Icteridae	Bronzed Cowbird	<i>Molothrus aenus</i>
Icteridae	Brown-headed Cowbird	<i>Molothrus ater</i>
Icteridae	Orchard Oriole	<i>Icterus spurius</i>
Icteridae	Baltimore Oriole	<i>Icterus galbula</i>
Fringillidae	House Finch	<i>Carpodacus mexicanus</i>
Fringillidae	Pine Siskin	<i>Carduelis pinus</i>
Fringillidae	Lesser Goldfinch	<i>Carduelis psaltria</i>
Fringillidae	American Goldfinch	<i>Carduelis tristis</i>
Passeridae	House Sparrow	<i>Passer domesticus</i>
Amphibians		
Plethodontidae	Jollyville Plateau Salamander	<i>Eurecea tonkawae</i>
Hylidae	Green Tree Frog	<i>Hyla cineria</i>
Hylidae	Strecker's Chorus Frog	<i>Pseudacris streckeri streckeri</i>
Bufo	Gulf Coast Toad	<i>Bufo valliceps valliceps</i>
Reptiles		
Emydidae	Three-toed Box Turtle	<i>Terrapene carolina triunguis</i>
Emydidae	Red-eared slider	<i>Trachemys scripta elegans</i>
Gekkonidae	Mediterranean Gecko	<i>Hemidactylus turcicus</i>
Polychridae	Green Anole	<i>Anolis carolinensis</i>
Phrynosomatidae	Texas Spiny Lizard	<i>Sceloporus olivaceous</i>
Scinidae	Ground Skink	<i>Scinella lateralis</i>
Teiidae	Texas Spotted Whiptail	<i>Cnemidophorus gularis gularis</i>
Teiidae	Six-lined Racerunner	<i>Cnemidophorus sexlineatus sexlineatus</i>
Anguillidae	Texas Alligator Lizard	<i>Gerrhonotus liocephalus infernalis</i>
Colubridae	Eastern Yellowbelly Racer	<i>Coluber constrictor flaviventris</i>
Colubridae	Texas Rat Snake	<i>Elaphe obsoleta lindheimerii</i>
Colubridae	Eastern Hognose Snake	<i>Heterodon platirhinos</i>
Colubridae	Rough Green Snake	<i>Opheodrys aestivus</i>
Colubridae	Texas Patchnose Snake	<i>Salvadora grahamiae lineata</i>
Colubridae	Eastern Blackneck Garter Snake	<i>Thamnophis cyrtopsis ocellatus</i>
Elaphidae	Texas Coral Snake	<i>Micrurus fulvius tener</i>
Viperidae	Broad-banded Copperhead	<i>Agkistrodon contortrix laticinctus</i>
Viperidae	Western Diamondback Rattlesnake	<i>Crotalus atrox</i>
Mammals		
Didelphidae	Virginia Opossum	<i>Didelphis virginiana</i>
Dasyopodidae	Nine-banded Armadillo	<i>Dasyopus novemcinctus</i>
Leporidae	Eastern Cottontail	<i>Sylvilagus floridanus</i>
Leporidae	Black-tailed Jackrabbit	<i>Lepus californicus</i>
Sciuridae	Rock Squirrel	<i>Spermophilus variegatus</i>
Sciuridae	Eastern Fox Squirrel	<i>Sciurus niger</i>
Muridae	Hispid Cotton Rat	<i>Sigmodon hispidus</i>
Muridae	House Mouse	<i>Mus musculus</i>
Canidae	Feral Dog	<i>Canis familiaris</i>
Canidae	Coyote	<i>Canis latrans</i>

Canidae	Common Gray Fox	<i>Urocyon cinereoargenteus</i>
Procyonidae	Ringtail	<i>Bassariscus astutus</i>
Procyonidae	Common Raccoon	<i>Procyon lotor</i>
Felidae	Feral Cat	<i>Felis catus</i>
Felidae	Bobcat	<i>Felis rufus</i>
Suidae	Feral pig	<i>Sus scrofa</i>
Cervidae	Whitetail Deer	<i>Odocoileus virginianus</i>

Figure 2. Summary of Baker Sanctuary whitetail deer harvest, 2000-2015. Juvenile deer are a year or less in age.

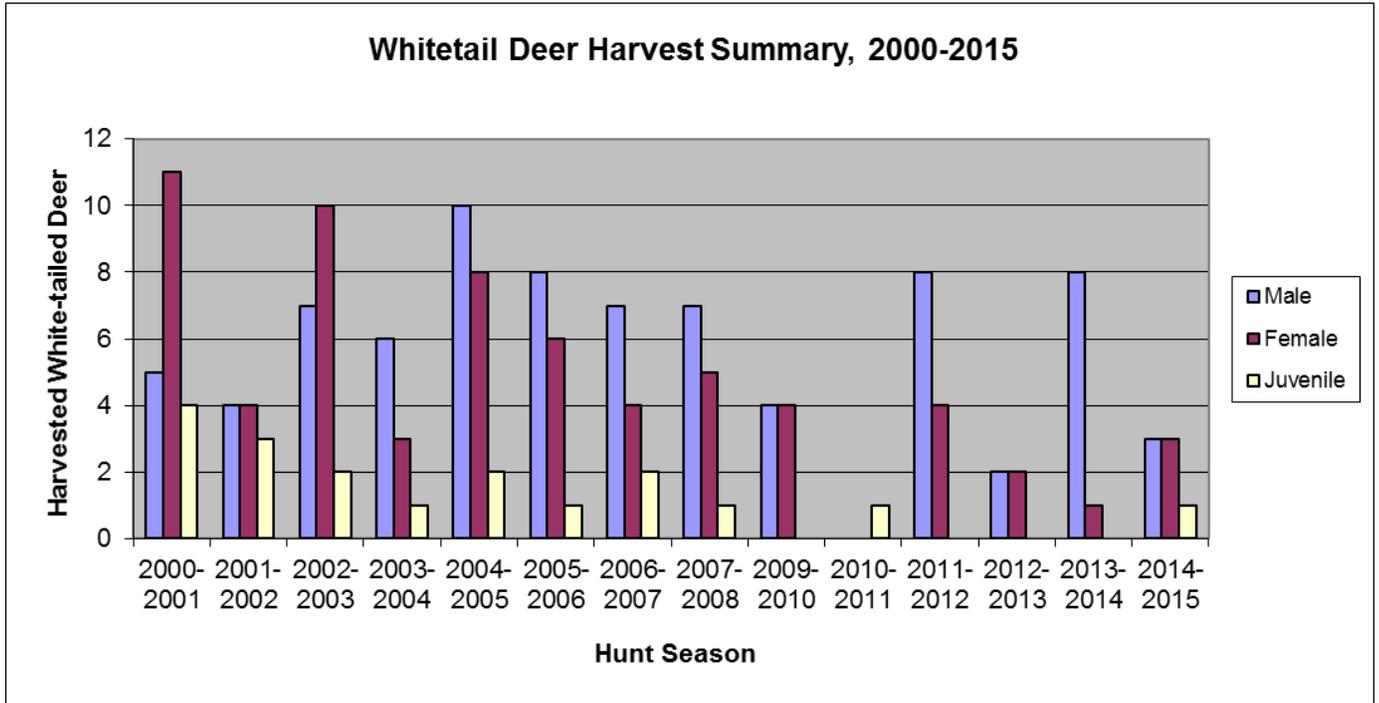


Figure 3. Summary of brown-headed cowbird trapping results, 1986-2015.

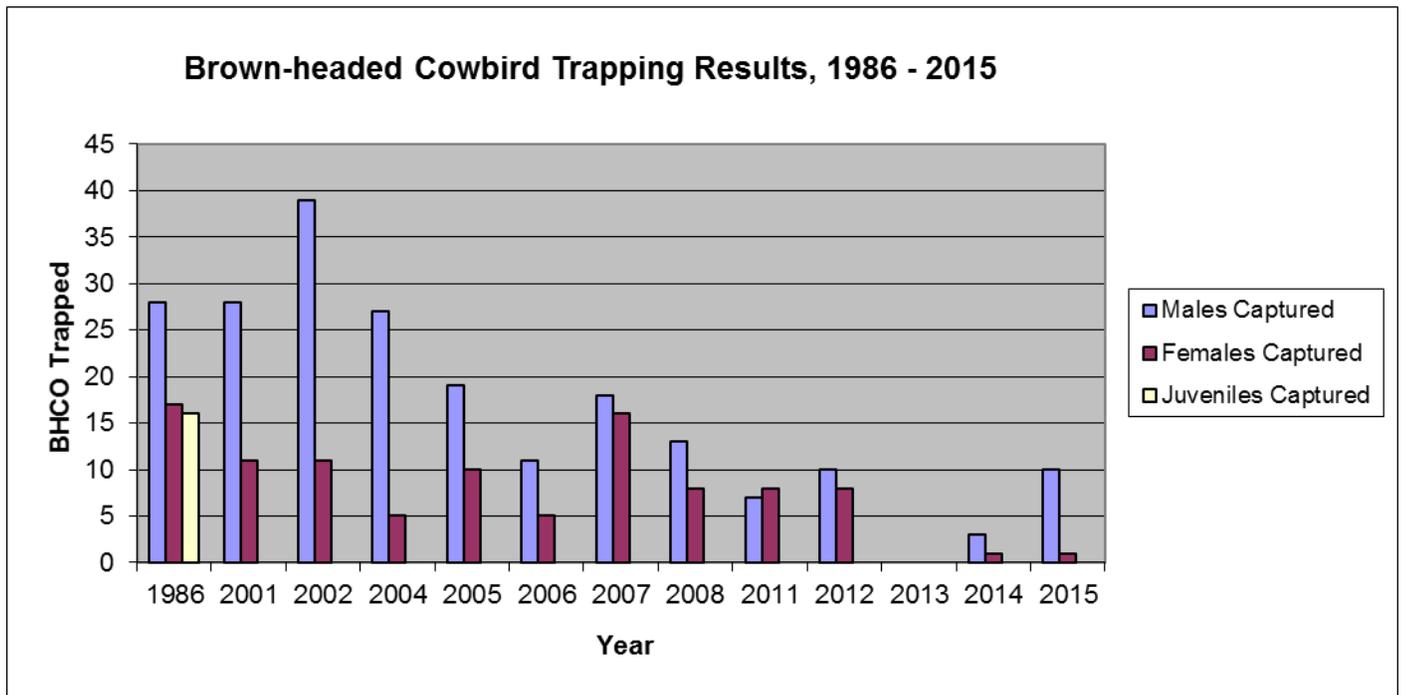


Figure 4. Baker Sanctuary avian point count stations.



Figure 5. Baker Sanctuary nest box locations.

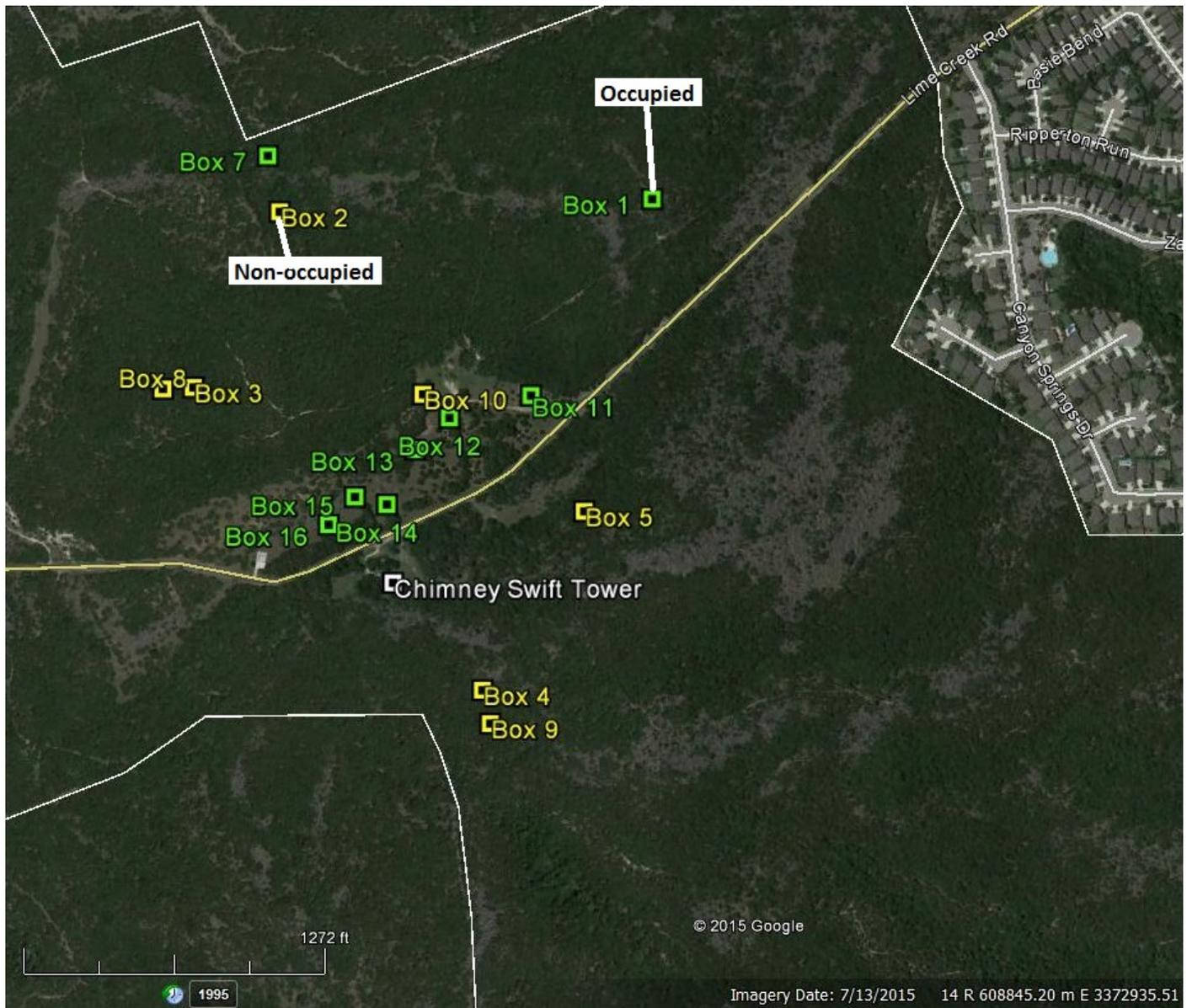


Figure 6. Baker Sanctuary caged oak locations.

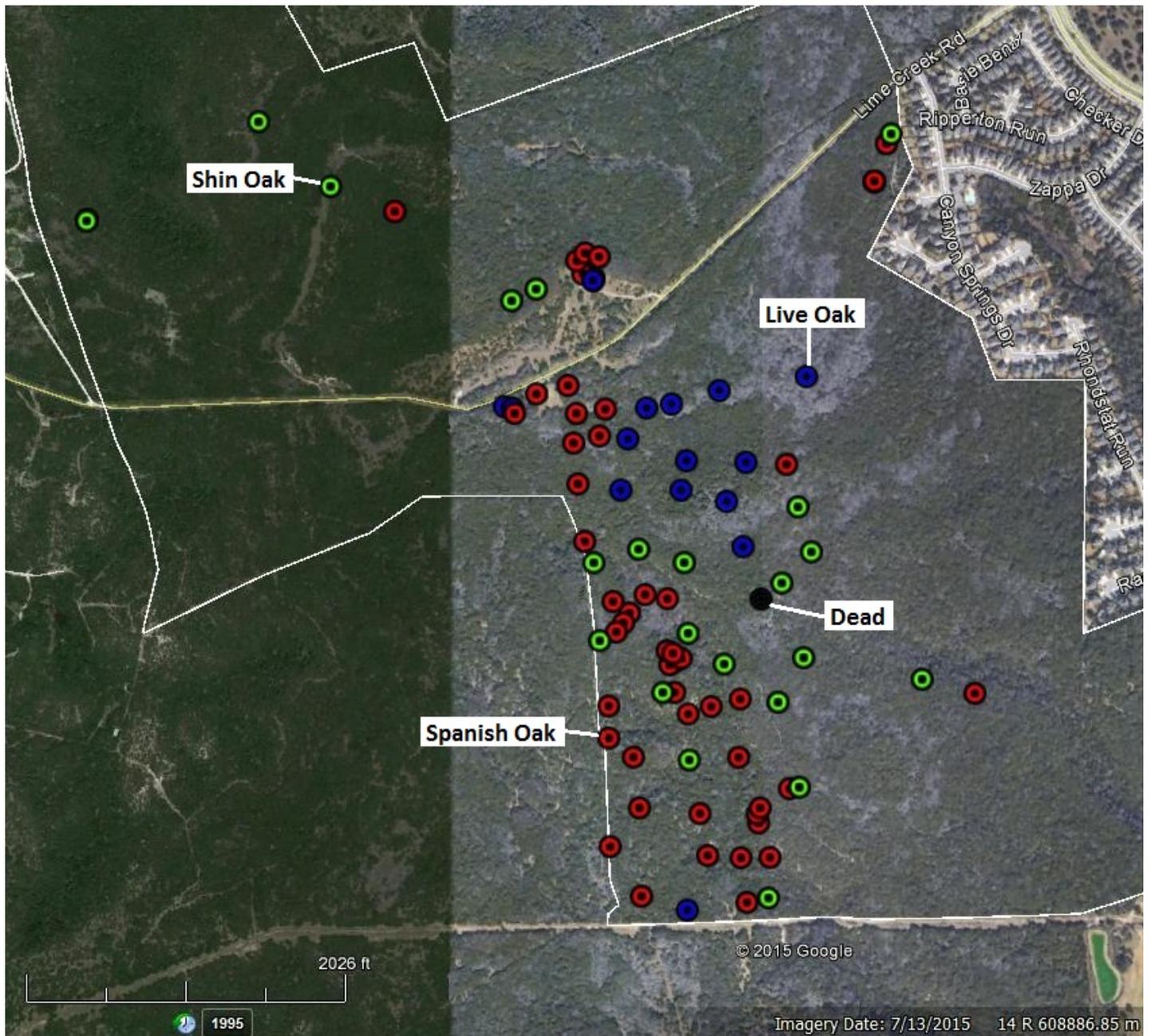


Table 1. Golden-cheeked warblers (*Setophaga chrysoparia*) banded at Baker Sanctuary.

Year Banded	USFWS Serial Number	Color Band Combination	Sex	Age
2015	2770-41201	RD/SI:RD/DB	Male	SY
2015	2770-41202	MV/MV:YE/SI	Male	ASY

Table 2. Baker Sanctuary avian point count survey, 2015

Common Name	Scientific Name	Number Observed	Mean	Frequency (%) (25 yd radius)	Frequency (%) (unlimited radius)
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	4	0.11	11	16
Barn Swallow	<i>Hirundo rustica</i>	0	0.00	0	3
Bewick's Wren	<i>Thryomanes bewickii</i>	12	0.32	26	58
Black-and-white Warbler	<i>Mniotilta varia</i>	4	0.11	11	16
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	6	0.16	16	18
Black-crested Titmouse	<i>Baeolophus atricristatus</i>	16	0.42	32	84
Blue-headed Vireo	<i>Vireo solitarius</i>	1	0.03	3	3
Blue Jay	<i>Cyanocitta cristata</i>	2	0.05	3	11
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	21	0.55	45	45
Brown-headed Cowbird	<i>Molothrus ater</i>	2	0.05	5	5
Canyon Wren	<i>Catherpes mexicanus</i>	0	0.00	0	3
Carolina Chickadee	<i>Poecile carolinensis</i>	29	0.76	47	58
Carolina Wren	<i>Thryothorus ludovicianus</i>	3	0.08	8	13
Chimney Swift	<i>Chaetura pelagica</i>	0	0.00	0	3
Common Grackle	<i>Quiscalus quiscula</i>	3	0.08	8	21
Eastern Phoebe	<i>Sayornis phoebe</i>	0	0.00	0	3
Eastern Screech-owl	<i>Megascops asio</i>	0	0.00	0	3
Field Sparrow	<i>Spizella pusilla</i>	1	0.03	3	11
Golden-cheeked Warbler	<i>Setophaga chrysoparia</i>	13	0.34	26	61
Greater Roadrunner	<i>Geococcyx californianus</i>	1	0.03	3	11
House Finch	<i>Haemorhous mexicanus</i>	1	0.03	3	8
House Sparrow	<i>Passer domesticus</i>	1	0.03	3	3
Hutton's Vireo	<i>Vireo huttoni</i>	0	0.00	0	3
Ladder-backed Woodpecker	<i>Picoides scalaris</i>	4	0.11	8	21
Lesser Goldfinch	<i>Carduelis psaltria</i>	9	0.24	13	58
Mourning Dove	<i>Zenaida macroura</i>	7	0.18	13	42
Northern Bobwhite	<i>Colinus virginianus</i>	1	0.03	3	8
Northern Cardinal	<i>Cardinalis cardinalis</i>	25	0.66	47	89
Northern Mockingbird	<i>Mimus polyglottos</i>	10	0.26	18	37
Painted Bunting	<i>Passerina ciris</i>	14	0.37	34	63
Purple Martin	<i>Progne subis</i>	0	0.00	0	18

Red-shouldered Hawk	<i>Buteo lineatus</i>	1	0.03	3	11
Red-eyed Vireo	<i>Vireo olivaceus</i>	4	0.11	8	13
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>	1	0.03	3	3
Summer Tanager	<i>Piranga rubra</i>	0	0.00	0	5
Turkey Vulture	<i>Cathartes aura</i>	0	0.00	0	3
Western Kingbird	<i>Tyrannus vociferans</i>	2	0.05	3	3
Western Scrub-jay	<i>Aphelocoma californica</i>	1	0.03	3	8
White-eyed Vireo	<i>Vireo griseus</i>	5	0.13	13	18
White-winged Dove	<i>Zenaida asiatica</i>	2	0.05	5	21
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	5	0.13	13	39

Table 3. Baker Sanctuary water quality test results.

Site	Test Date (mdy)	Water Depth (cm)	Water Temperature (°C)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	pH	Nitrate Nitrogen (mg/L)
Baker Spring	10/14/2014	24.0	14.5	58.4	660	7.0	<0.25
Baker Spring	01/26/2015	45.0	14.0	75.5	630	7.0	0.25
Baker Spring	03/12/2015	43.0	16.0	87.7	630	7.0	0.25
Baker Spring	04/20/2015	37.0	15.0	55.6	650	7.0	0.00
Baker Spring	05/26/2015	52.0	19.5	48.0	590	7.0	<0.25
Baker Spring	06/25/2015	50.0	20.0	69.8	640	7.0	0.5
Baker Spring	07/20/2015	47.0	21.0	62.7	650	7.0	0.5
Baker Spring	08/19/2015	48.0	21.0	66.6	660	7.0	0.5
Baker Spring	09/22/2015	48.0	21.0	62.7	660	7.0	0.5
Baker Spring Average		43.8	18.0	65.2	641	7.0	
Audubon Spring	04/20/2015	15.0	18.5	55.6	630	6.5	0.25