Monitoring of the Golden-cheeked Warbler: 2004 Field Season



Photo: The Nature Conservancy, Ft. Hood, 1998

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INTRODUCTION

The golden-cheeked warbler (*Dendroica chrysoparia*) is a neotropical migrant passerine whose breeding range is restricted to the oak-juniper (*Quercus-Juniperus*) woodlands and forests of central Texas. In response to declining populations and accelerated habitat loss, this species was listed as federally endangered by the U.S. Fish and Wildlife Service in 1990 (U.S. Fish and Wildlife Service 1990). Major threats to this species' survival are habitat loss and fragmentation (Ladd and Gass 1999).

Travis County is one of only 25 counties in central Texas in which the warbler is known to breed (Ladd and Gass 1999). In the last two decades, development has expanded westward from the city of Austin at a rapid pace, accelerating loss and fragmentation of warbler breeding habitat in Travis County. In 1996, the Balcones Canyonlands Conservation Plan was approved by the USFWS to facilitate local recovery of the warbler and seven other endangered species. The plan calls for setting aside 30,428 acres of endangered species habitat in western Travis County. This preserve system, the Balcones Canyonlands Preserve (BCP), is managed and owned by various governmental and private entities, including Travis County.

In 1996, Travis County began monitoring the golden-cheeked warbler on all County-managed properties, and surveys have since been conducted annually (Travis County Natural Resources 1996; 1997; 1998; 1999; 2000; 2001; 2002; 2003). In 2004, Travis County Natural Resources monitored golden-cheeked warblers on twelve different tracts covering 1084 acres. Territory mapping of entire preserve tracts was conducted on five newly acquired preserve properties: Beck, Cuevas, and King-Attwood-Blake (3 adjacent tracts surveyed together), as well as on one previously acquired preserve property: Steiner Ranch (tracts 4 and 5). On each tract, data were collected on four warbler population parameters: male abundance, species distribution, territory density, and territory location.

In addition to these efforts, territory and productivity data were collected on three permanent 100-acre (40.4 ha) study plots that are monitored annually. On these plots, data were collected on territory density and location, pairing success, breeding success, and productivity. The 100-acre study plots are located on Hamilton Pool Preserve, Lake Perspectives and Bunten.

A presence/absence survey was conducted on the Greenshores tract. Although an official presence/absence survey was not conducted at Hippie Hollow Park, indcidental sightings of

golden-cheeked warblers were recorded; this was the first time in many years that golden-cheeked warblers were sighted in this park. A summary of Travis County parks and preserves surveyed for golden-cheeked warblers from 2000 through 2004 is presented in Table 1.

Table 1. Travis County preserve and park tracts surveyed for golden-cheeked warblers in 2000, 2001, 2002, 2003, and 2004, and the methods used on each tract. (P/A = presence/ absence survey; TM = territory mapping on entire tract; 100 ac plot = territory mapping on permanent 100 acre plot; NS = not surveyed; "—" = property not yet acquired.) See "Methods" section for explanation of different methods used.

	2000	2001	2002	2003	2004
Travis Co. Preserves(ac)					
Hamilton Pool (232)	100 ac plot	100 ac plot	100 ac plot	100 ac plot	100 ac plot
Cypress Creek Unit (469)					
Attwood (31)	—	—	—	—	TM
Beck (175)	—	—	—	—	TM
Blake (38)	—	—	—	—	TM
King (55)	—	—	—	—	TM
Toops (170)	—	—	NS	TM	NS
Greenshores (52)	—	—	—	—	P/A
Jollyville Unit (1799)					
Bunten (141)	—	P/A	TM	100 ac plot	100 ac plot
Cuevas (141)	—	—	—	—	TM
N. Grandview Hills (160)	—	—	TM	NS	NS
S. Grandview Hills (127)	—	—	NS	TM	NS
Lake Perspectives (124)	TM	TM	100 ac plot	100 ac plot	100 ac plot
Vireo Ridge (616)	—	TM	NS	TM	NS
Vista Point (490)	—	—	TM	NS	NS
Romberg (40)	P/A	NS	NS	P/A	NS
Steiner Ranch (819):					
Tract 1 "J-Canyon"	—	TM	NS	TM	NS
Tract 2 "L-Bend"	—	NS	P/A	TM	NS
Tract 3 "Middle"	—	NS	P/A	TM	NS
Tract 4 Vireo Mgmt Area	—	TM	TM	TM	TM
Tract 5 "Northeast"	—	NS	P/A	TM	TM
Travis Co. Parks(ac)					
Cypress Creek (21)	P/A	NS	NS	P/A	NS
Hippie Hollow (31)	P/A	NS	NS	P/A	P/A
Sandy Creek (49)	P/A	NS	NS	P/A	NS
Selma Hughes (6)	NS	NS	NS	P/A	NS

STUDY SITES

The Jollyville Unit Preserve (1799 ac) and Cypress Creek Unit Preserve (469 ac) are located in northwest Travis County (**Figure 1**) in the Cypress Creek macrosite (Balcones Canyonlands Preserve 1999). The landscape is dominated by oak-juniper (*Quercus* spp.-*Juniperus Ashei*) woodlands and forests on hilly terrain and is dissected by numerous spring-fed streams. Karst habitat occurs on the Jollyville Plateau that juts into Vireo Ridge, South Grandview Hills, and Bunten. A detailed physical description of these preserves can be found in the Jollyville Unit Land Management Plan (BCP 1999) and the Romberg Land Management Plan (BCP 1999).

Steiner Ranch Preserve (819 ac) is located off RM 620 (**Figure 1**) in the North Lake Austin macrosite (BCP 1999). Topography is characterized by gently sloping terrain incised by a number of draws. Steeper, mesic canyons are located at the south end of the property. Dominant vegetation type is oak-juniper woodlands with a more or less closed canopy. A detailed physical description can be found in the Steiner Ranch Land Management Plan (BCP 1999).

Hamilton Pool Preserve (232 ac) is located in far southwestern Travis County near the Hays County boundary in the Pedernales macrosite (BCP 1999). River and creek terrain supports a mixed, evergreen-deciduous woodland dominated by *J. Ashei, Quercus buckleyi*, and *Ulmus crassifolia* (Carr 1996) that provides habitat for the golden-cheeked warbler. A detailed description can be found in the Hamilton Pool Preserve Land Management Plan (BCP 1999).

Greenshores (55 ac) is located in the North Lake Austin macrosite (**Figure 1**) near City Park Road. This tract is bisected by an intermittent creek that drains southward to Lake Austin (Colorado River). Gently sloping uplands are dominated by mature oak-juniper woodlands and give way to a steep, mesic canyon.

Hippie Hollow Park (31 ac) is located on Lake Travis (**Figure 1**). This park experiences year-round recreational use. Vegetation is typical of western Travis County, i.e. hilly topography dominated by oak-juniper woodlands, and contains potential warbler habitat.

METHODS

TRACT TERRITORY MAPPING

Data Collection. Territory mapping of golden-cheeked warblers was conducted from 13 March to 26 June 2004 on the following Travis County preserve tracts: Beck, Cuevas, King-Attwood-Blake, and Steiner Ranch (tracts 4 and 5). Territory mapping was used to estimate territory density and male abundance for each tract. All observations (both visual and auditory) of male, female, and juvenile warblers were plotted on hard-copy digital orthophoto maps with a resolution of 2' (scale 1:5,000 or less). For each observation, the following demographic data were recorded: sex, age, presence of a mate, and number of fledglings observed. Avian locations were later recorded in an ArcView (Esri, Inc., Redlands, California) database using the Texas State Plane Coordinate System. Spatial and demographic data were entered into the database via an ArcView script.

Mapping methods generally followed IBCC guidelines (1970). Improvements in this method suggested by Verner (1985) and Bibbey (1992) were incorporated to increase accuracy in assigning observations to specific territories (clusters). Bibbey's consecutive flush was modified to be less intrusive with no more than five sequential movements attempted at one time to minimize influencing bird behavior. Field observations (e.g., bird behavior, phenology) and general knowledge of the species (e.g., territory size, habitat requirements) were also relied upon to help differentiate individual males and delineate their territories. Any male that could be differentiated from surrounding males was given a unique number for further tracking. Females or fledglings associating with a unique male were given the same unique number.

Observations of warblers that could not be differentiated from surrounding individuals with any confidence were designated as "unknown." Playback tapes of warbler vocalizations were not used to elicit warbler responses. Systematic nest searching was not conducted during this field season. However, incidental observations of any warbler nests were noted and mapped. All observations of brown-headed cowbirds (*Molothrus ater*) and any signs of nest parasitism were noted. Brown-headed cowbird fledglings seen being tended by a warbler were dispatched as soon as possible.

All potential warbler habitat at each site was surveyed repeatedly throughout the breeding season. Total survey hours varied according to tract size and terrain. Total survey hours spent at each tract were as follows: Beck: 59.75; Cuevas: 100.25; King-Attwood-Blake: 33.5; and Steiner Ranch (tracts 4 and 5 combined): 32.5. Due to limitations inherent to territory

mapping methods, including but not limited to differences in observer ability and the stability of exclusive territories of the target species, results of all surveys should be interpreted as indices, rather than complete counts (Verner 1985).

Data analysis. Abundance is the sum of all individual male warblers detected at a given survey site, including those observed outside of tract boundaries. Individual males using areas outside of tract boundaries were also included in the abundance index. Species distribution comprises all locations where warblers were observed. This includes males, females, and fledglings and may include multiple sightings of the same individual.

An individual male was considered to have established a breeding territory if one or more of the following conditions was observed: 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 at least three times (on different days with at least one week between observations) using the same general location. Males that only used areas outside of tract boundaries were not included in the territory analysis.

In calculating territory number, territories that fell entirely within the tract boundaries were considered "full" territories. Territories that fell at least partially outside the tract were considered "edge" territories. In order to avoid an upward bias in calculating territory number, Verner (1985) has suggested counting each edge territory as half (0.5) of a territory. In the results section, both a high estimate of territory number (all territories are weighted the same, i.e., 1.00) and an estimate based on Verner's (1985) method are given.

Territory density is calculated as the number of territories (based on Verner's (1985) method) divided by the number of acres for that tract. A conversion to hectares is also given.

100-ACRE PLOTS

Data collection. In 2004, territory mapping was conducted on three 100-acre permanent plots on the following preserves: Bunten, Lake Perspectives, and Hamilton Pool, all of which are classified as "prime" sites, i.e., more than 75% of the plot contains excellent warbler habitat. 100-acre plots were surveyed following the same procedure as outlined above with some exceptions. Territory mapping was conducted only between 25 March and 25 May 2003, with 2–3 survey days after this date to gather productivity data. Surveys started one half hour after sunrise on days when the temperature was > 55° F, wind was < 15 mph, and precipitation was light to none. Prime study plots were visited a total of ten times distributed evenly throughout the season, with each survey totaling six hours. No playback tapes were

used to elicit responses. Systematic nest searching was not undertaken. A plot was surveyed by two or three different observers for the entire season. A general study protocol for 100-acre plots is outlined in the BCP Land Management Plan (BCP 1999).

All territories, including edge territories, were monitored repeatedly to collect pairing, breeding, and productivity data. Pairing status of male warblers was determined by observing one or more of the following conditions: a territorial male associating with a female; the nest of a territorial male; and/or a male tending at least one fledgling. Observations of fledglings tended by a parent and the total number of fledglings observed at any one time provided data on breeding success and productivity.

Data analysis. An individual male was considered to have established a breeding territory if one or more of the following conditions was observed: 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 at least three times (on different days with at least one week between observations) using the same general location. Males that only used areas outside of tract boundaries were not included in the territory analysis.

In calculating territory number, territories that fell entirely within the 100-acre plot boundary were considered "full" territories. Territories that fell at least partially outside the plot were considered "edge" territories. In order to avoid an upward bias in calculating territory number, Verner (1985) has suggested counting each edge territory as half (0.5) of a territory. In the results section, a high estimate of territory number (all territories are weighted the same, i.e., 1.00) and a low estimate (only full territories are counted) are given along with an estimate based on Verner's (1985) method. Territory density is calculated as the number of territories (based on Verner, 1985) per 100 acres and converted to territories per 100 hectares.

Pairing success rate was calculated as the number of territorial males determined to have paired with a female divided by the total number of territories (Anders 2000a). Breeding success rate was determined as follows. A territory was considered to have breeding success if at least one fledgling was observed with either the male or female parent. Thus, the breeding success rate was calculated as the number of territories that successfully bred divided by the total number of territories. (Koloszar and Becker 2000).

Productivity was measured in two ways. The first parameter, "productivity," is based on the number of territories that successfully bred and was calculated by summing the highest

number of fledglings recorded at any one time for each territory and dividing by the number of territories that successfully bred. The second figure, "total productivity," was calculated by summing the highest number of fledglings recorded at any one time for each territory and dividing by the total number of territories.

PRESENCE/ABSENCE SURVEYS

Presence/absence surveys followed U.S. Fish and Wildlife Service minimum procedures for golden-cheeked warbler and black-capped vireo presence/absence surveys (USFWS 1994).

RESULTS AND DISCUSSION

In field season 2004, a total of 2194 observations of warblers were recorded on twelve Travis County-managed properties: Attwood, Beck, Blake, Bunten Cuevas, Greenshores, Hamilton Pool, Hippie Hollow, King, Lake Perspectives, Steiner Ranch (tracts 4 & 5). This total comprises observations of 2110 males, 67 females, and 17 warblers for which sex was not determined.

TRACT TERRITORY MAPPING

Abundance of male warblers on the Cuevas tract was 27 (**Table 2**). Twenty of these males established territories within the tract or along its boundary (**Figure 2**; see Methods section for definition of "territory"). Male abundance at Beck equaled 21 and at King-Attwood-Blake totaled 9 (**Table 2**). Of the 21 males detected at Beck, 18 males established territories (**Figure 3**), while 6 males established territories at King-Attwood-Blake (**Figure 4**).

On the Steiner Ranch Preserve, 11 males were detected on Tract 5, of which 4 established territories either within the tract or along the tract boundaries (**Table 2; Figure 5**). Two males were detected and established territories on Tract 4 (**Table 2; Figure 5**).

Table 2. Results of golden-cheeked warbler territory mapping on surveyed preserves. Golden-cheeked warbler male abundance, territory number, and territory density are summarized for breeding season 2004.

Preserve tract (ac)	Abundance	No. of Territories	No. full Territories + (0.5 x no. edge Territories)[a]	Territory Density (ac)[b]	Territory Density (ha)[b]
Beck (175[c])	21	18	16	0.08	0.19
Cuevas (141)	27	20	15.5	0.11	0.27
King-Attwood-Blake (124)	9	6	4	0.03	0.08
Steiner Ranch, total (819)					
Tract 4, VMA (126)	2	2	1.5	0.01	0.03
Tract 5, NE (101)	11	4	4	0.04	0.10

[a] Based on Verner (1985)
[b] Based on calculation of territory number given in column 3
[c] Territory density based on 209 acres

Based on Verner's (1985) method of summing territories, Cuevas had the highest territory density with 0.11 territories per acre (**Table 2**). Beck had territory densities comparable to Cuevas with 0.08 territories per acre, respectively. King-Attwood-Blake had the lowest territory denisty (0.03) of tracts in the Cypress Creek macrosite. Mean territory density of Beck, Cuevas, and King-Attwood-Blake was 0.07 territories per acre or 13.6 acres per male (5.5 ha/male).

Territory density on Steiner Ranch (both tracts combined) was 0.03 territories per acre or 40 acres per male (16.2 ha/male). Tracts 5 had a greater territory density (0.04) than Tract 4 (0.01).

Territory locations on Beck, Cuevas, King-Attwood-Blake, and Steiner Ranch are shown in **Figures 2-5**. Recent research from Ft. Hood (Anders 2000b) conducted on a large population of golden-cheeked warblers demonstrated that calculations of territory size are unreliable even when as many as 30 locations are recorded for a territorial male. Thus, we choose not to estimate territory size based on male warbler observations. Territorial male observations indicate only the general location of a territory relative to other territories and to tract features and are not meant to represent actual territorial boundaries or territory sizes.

At Cuevas, 13 males were observed paired with females, and at least 13 territories produced young. Seven males were observed associating with females at Beck and 12 fledgling groups were detected. Additionally, one nest was found at Beck on 6 May 2004. This nest was actually seen as the hatch years were fledging, and produced four fedglings. On Tract 5 of Steiner Ranch, two males were observed paired with females, and 4 territories were observed to have successfully fledged young. On Tract 4 of Steiner Ranch, no females were observed associating with males, however one territory produced fledglings. No females or fledglings were observed on the King-Attwood-Blake tract.

100-ACRE PLOTS

In field season 2004, 27 male warblers established territories on the Bunten 100-acre study plot, 13 males established territories on the Lake Perspectives study plot, and 9 males established territories on the Hamilton Pool study plot (see Methods for definition of "territory"). These totals include territories both within the plot ("full territories") and those that straddle the boundary ("edge territories") (**Table 3**). On the Bunten study plot, 15 territories fell entirely within plot boundaries and twelve were edge territories. Eight territories were located entirely within the study plot boundary on Lake Perspectives, with five additional territories straddling the boundary. Finally, at Hamilton Pool, 7 out of 9 territories fell entirely within the boundary of the study plot.

Territory locations for the Bunten, Lake Perspectives and Hamilton Pool study plots are shown in **Figures 6-8**. Territorial male observations indicate the general location of a territory relative to other territories and to tract features and are not meant to represent actual territorial boundaries or territory sizes (see Anders 2000b).

Based on Verner's (1985) method for calculating territory number, territory density was highest at Bunten with 51.9 territories per 100 hectares (1.9 ha/male; **Table 3**). Territory density at Lake Perspectives was almost half of that, with 25.9 territories per 100 hectares (3.9 ha/male). Territory density at Hamilton Pool was 19.8 territories per 100 hectares (5.1 ha/male). Mean density of all 100-acre plots was 32.5 territories per 100 hectares (3.1 ha/male).

Table 3. Results of golden-cheeked warbler territory mapping on the Bunten, Lake Perspectives, and Hamilton Pool 100-acre study plots. Territory number and density are summarized for breeding season 2004.

Study Plot	No. of full territories	No. of full and edge territories	No. of full territories plus edge territories @ 0.5[a]	Territory density per 100ha[b]
Bunten	15	27	21	51.9
Hamilton Pool	7	9	8	19.8
Lake Perspectives	8	13	10.5	25.9

[a] Based on Verner (1985)
[b] Based on calculation of territory number given in column 3

Differences in territory density between prime plots may be attributed to site-specific characteristics, although other, untested covariates may have affected densities (e.g., age structure of the local population, inter-specific competition). Although both Bunten and Lake Perspectives contain excellent warbler habitat, there are differences between plots in the ratios of excellent to marginal habitat as well as the amount of edge on plot boundaries. (See Campbell 1995 for descriptions of *excellent* and *marginal* warbler habitat.) The Bunten study plot comprises 100% excellent warbler habitat. Lake Perspectives, on the other hand, contains areas of marginal habitat with approximately 75% excellent warbler habitat. Perhaps more importantly, however, the Bunten study plot is situated entirely within a much larger block of continuous excellent warbler habitat, while Lake Perspectives is bounded to the east by Bullick Hollow Road and to the southeast by open uplands unsuitable for breeding warblers. Studies have indicated that densities of forest-dwelling migrant songbirds tend to be higher on larger blocks of continuous habitat and that this may be a function of decreasing edge effects (Biological Advisory Team 1990; Friesen et al. 1995; Wahl 1990).

Hamilton Pool study plot had the lowest warbler territory density. Only 50% of the study plot contains excellent warbler habitat; the remaining percent is marginal to poor breeding habitat. In 1996, Hamilton Pool was designated a prime plot in the Balcones Canyonlands Preserve Handbook (BCP 1999) and has been surveyed as such over the years. However, it does not fit the criteria for prime plots (i.e., >75% of the plot must contain excellent warbler habitat) as outlined in the handbook. However, since the Hamilton Pool study plot is

officially designated as a prime plot, it will continue to be surveyed and analyzed as prime for the sake of consistency.

Pairing success was high at all three 100-acre study plots. At Bunten, 78% of all males were determined to have paired with females; 89% of all males paired with females at Hamilton Pool; and at Lake Perspectives, 77% of all males were paired (**Table 4**). The breeding success rate for all three plots ranged from 0.54 to 0.66; Bunten had the highest rate (**Table 4**). Mean productivity for all plots was 2.32 fledglings per successful territory (range: 2.00, 2.86). Mean total productivity for all plots was 1.35 fledglings per all observed territories (range: 1.11, 1.54).

Table 4. Results of golden-cheeked warbler surveys on 100-acre study plots. Pairing success, breeding success, and productivity data are summarized for breeding season 2004. Raw numbers are given in parentheses.

Study Plot	Pairing success	Breeding success	Productivity (Average no. of fledglings per successful pair)	Total productivity (Average no. of fledglings per all territories)
Bunten	0.78 (21)	0.66 (18)	2.11 (38)	1.41 (38)
Hamilton Pool	0.89 (8)	0.56 (5)	2.00 (10)	1.11 (10)
Lake Perspectives	0.77 (10)	0.54 (7)	2.86 (20)	1.54 (20)

On Lake Perspectives, both pairing success and breeding success in 2004 (**Table 4**) were slightly greater than in 2003 (0.66 and 0.50, respectively; Travis County Natural Resources 2003), but similar to 2002 (0.80 and 0.66, respectively; Travis County Natural Resources 2002). However, total productivity in 2004 was greater than 2003 (1.08) and 2002 (1.27). Total number of territories (full and edge) has ranged from 12 in 2003 to 15 in 2002; 2004 was an intermediate year with 13 territories (**Table 3**). These differences may or may not be statistically significant.

At the Hamilton Pool study plot, the total number of territories has remained relatively steady; there were 8 territories in 2002 (Travis County Natural Resources 2002) and 9 territories in 2003 (Travis County Natural Resources 2003) and 2004 (**Table 3**). Pairing success in 2004 (**Table 4**) was greater than 2003 (0.78) but similar to 2002 (0.86). The drastic increases in breeding success and total productivity that were seen from 2002 to 2003

were maintained in 2004, likely due to the sucessful cowbird trapping efforts on the preserve.

On the Bunten tract, there were more territories in 2004 (**Table 3**) than in 2003 (24; Travis County Natural Resources 2003). However, pairing success and breeding success were nearly identical during the two years (**Table 4**; Travis County Natural Resources 2003). Total productiviy increased slightly, from 1.20 in 2003 to 1.41 in 2004.

Three nests were located on the Bunten study plot. On 27 April 2004, one active nest was found in a juniper. Subsuquent visits did not ascertain whether the nest was successful or failed. The second nest, also in a juniper, was found on 18 May 2004. One week later the female was seen on the nest. However, a few weeks later the male and female were seen near the nest but were not carrying food; there were no signs of hatch years and it is likely the nest failed. The last nest was found late in the season on 16 June 2004. At this time, an older hatch year was seen hanging out with the female, which makes one wonder whether this female was on her second successful nest of the season. This late-season nest was successful; one week after discovering the nest at least one fledgling was seen nearby. There were many instances of young hatch years late in the season (i.e., June). The cause of late season nests is uncertain, but could be due to failed nesting attempts early in the season, second nest attempts, or delayed mating. No nests were found on the Hamilton Pool or Lake Perspectives study plots.

PRESENCE/ABSENCE SURVEYS

In field season 2004, fivegolden-cheeked warbler males were present on the Greenshores tract between 17 April and 16 June (**Figure 9**). At least one male were detected at Hippie Hollow Park on 4 April and 18 April 2004 (**Figure 10**). No females of fledglings were located at either tract.

Brown-headed Cowbird Parasitism

There were no observations of brown-headed cowbird nest parasitism of golden-cheeked warblers during the 2004 breeding season. For a summary of brown-headed cowbird parasitism for 2004 see the "2004 Summary of Wildlife Management Activities on Travis County Tracts of the BCP" (Travis County Natural Resources 2004).

RECOMMENDATIONS

- Natural Resources staff should continue to make cowbird trapping at Hamilton Pool Preserve a high priority. The success of cowbird trapping may be critical to golden-cheeked warbler survival on Hamilton Pool Preserve. Cowbird parasitism affects not only golden-cheeked warblers but also other neotropical migrant species for which Hamilton Pool provides habitat, such as Northern Parulas, Black-and-White Warblers, and Painted Buntings.

- Abundance of cowbirds presents a similar problem for both golden-cheeked warblers and other migrant songbirds on Steiner Ranch Preserve. Although productivity data have not been gathered systematically at Steiner Ranch, it is probable that warbler productivity rates are very low, as they were at Hamilton Pool Preserve in 2002 prior to effective cowbird trapping. Cowbird trapping is problematic at Steiner Ranch due to accessibility, as well as its distance from other trap locations and preserves. Efforts could be made to hire Natural Resources interns as early as February so that they could learn to maintain cowbird traps independently for the majority of trapping season.

- It is also recommended that Travis County Natural Resources continue to add additional 100-acre study plots with the goal of adding one per year during years when acquisition of new properties is low or of minimal acreage. Because they provide systematic data to measure population and productivity trends, 100-acre study plots are critical to the BCP golden-cheeked warbler monitoring program. The accuracy of the monitoring program increases with the number of plots surveyed.

- After field season 2005, there will be four years of data for Hamilton Pool and Lake Perspectives and three years of data for Bunten. Staff should consider conducting a statistical analysis on the data set, most likely using a repeated measures analysis of variance (ANOVA).

DATA MANAGEMENT

Information regarding data sets compiled for field season 2004 is provided below. All data sets are currently stored in the Travis County Natural Resources office, 1010 Lavaca Street, Austin, Texas.

File Names:

2004 GCWA data.xls
2004 gcwa data beck.xls
2004 gcwa data bunten.xls
2004 gcwa data cuevas.xls
2004 gcwa data hippie.xls
2004 gcwa data hp.xls
2004 gcwa data kab.xls
2004 gcwa data lp.xls
2004 gcwa data steiner & greenshores.xls

Description: Avian location databases for 2004 field season

Software: Microsoft Windows NT, Excel 2000

Archive Location: T:\Park_NR\NatRes\Common\Gcwa\GCWA 04

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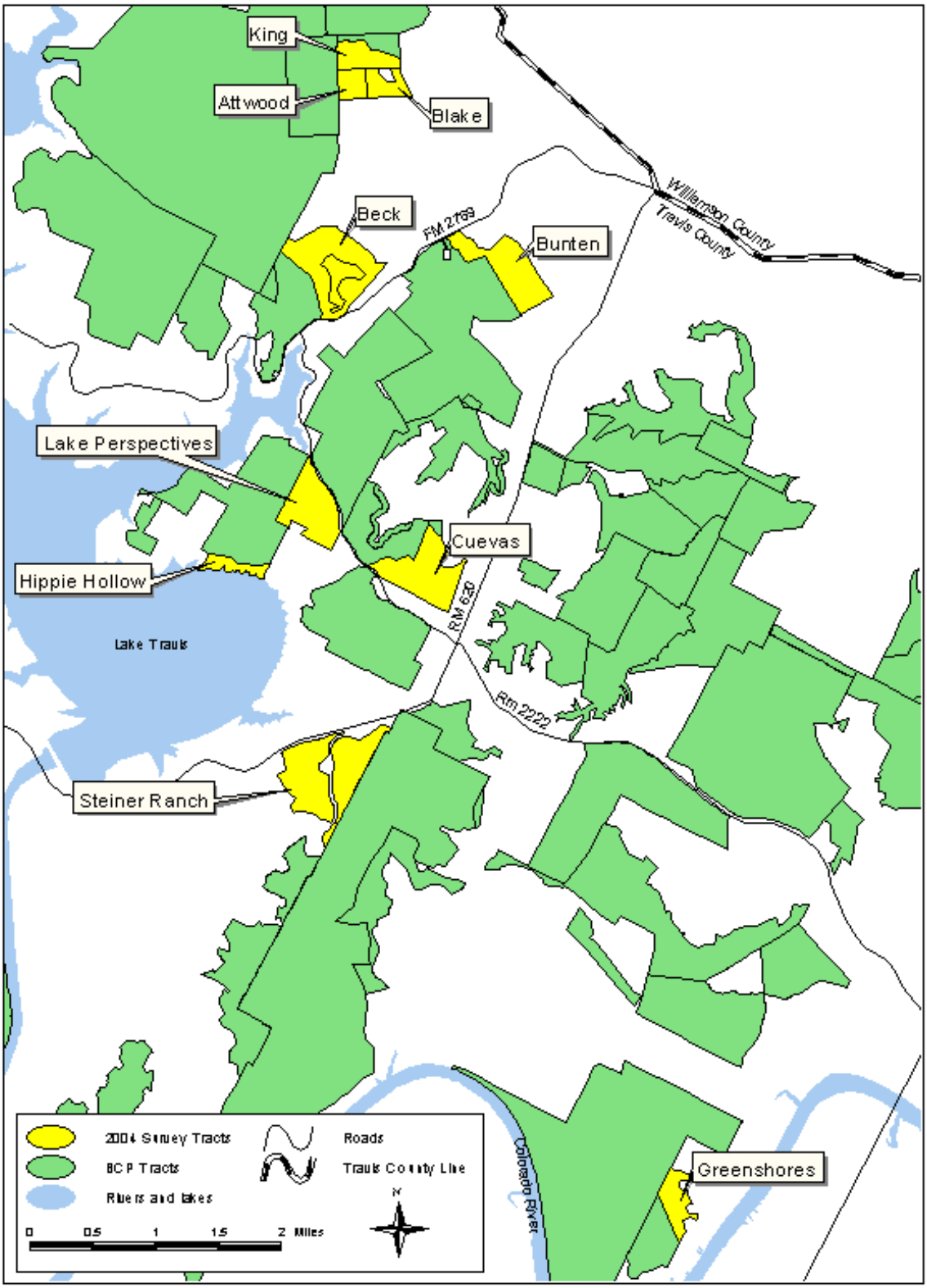


Figure 1. Location of Travis County preserve tracts surveyed for golden-cheeked warblers in 2004.

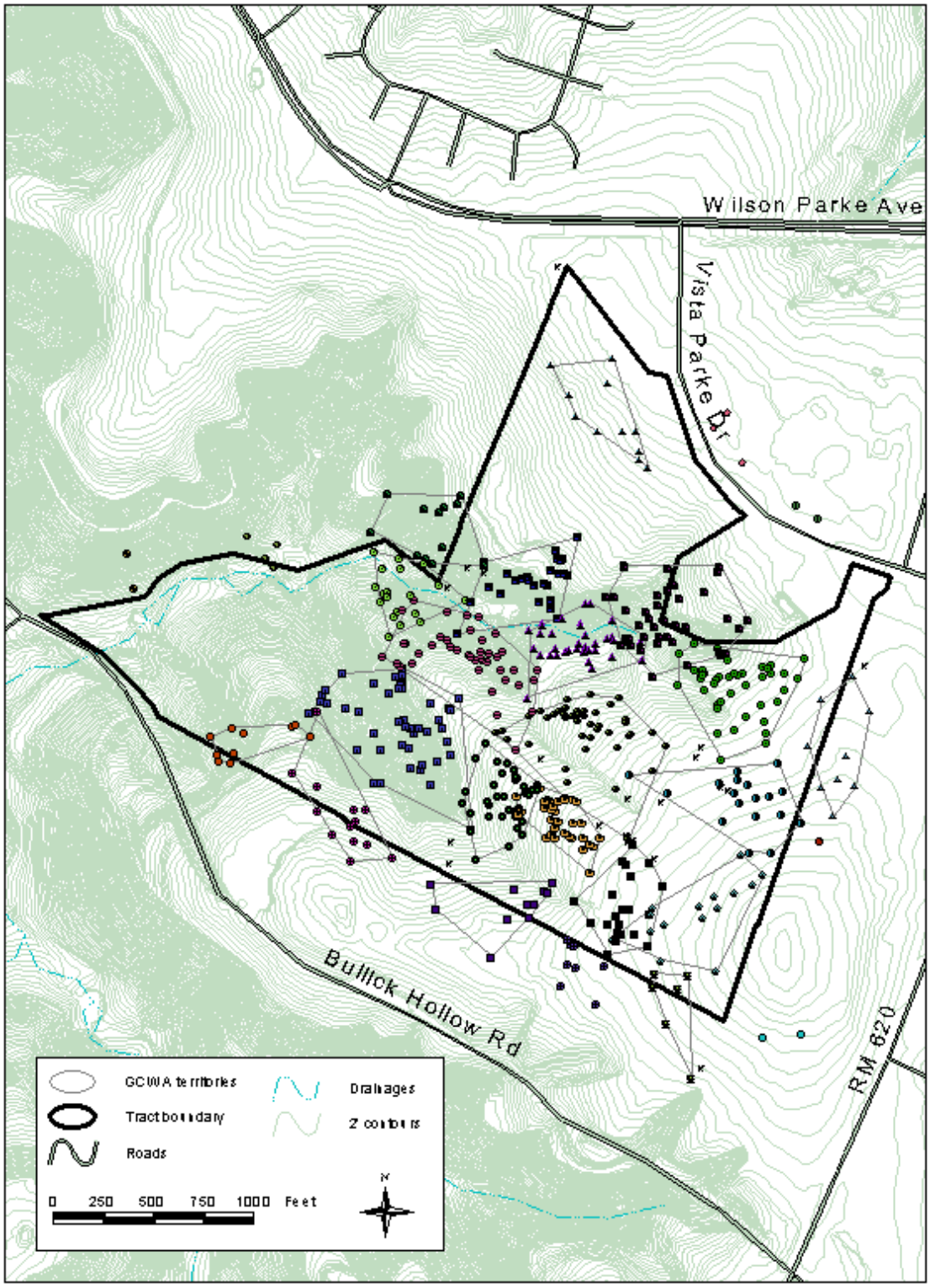


Figure 2. 2004 GCWA territory locations on the Cuevas Tract. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female or fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

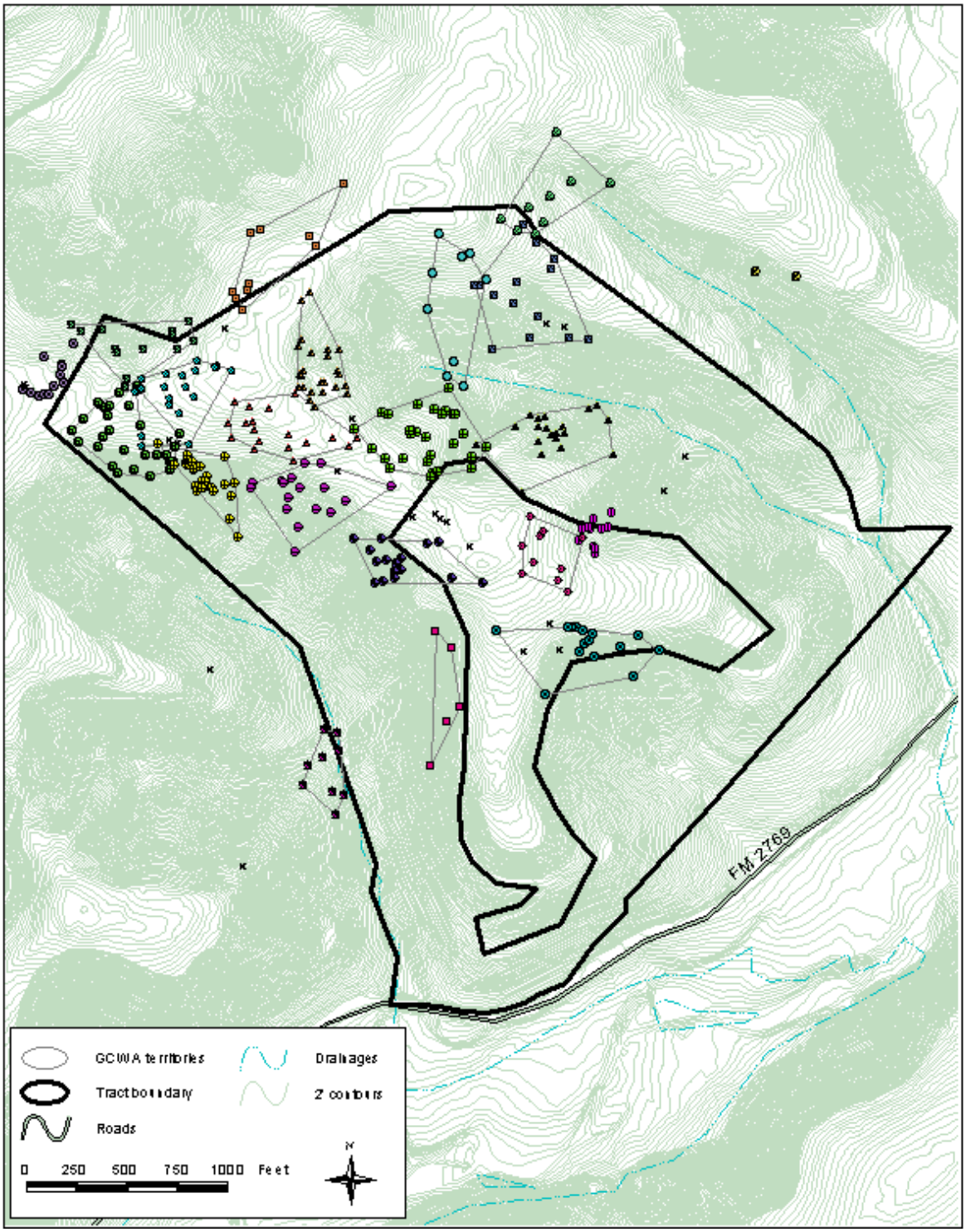


Figure 3. 2004 GCWA territory locations on the Beck Tract. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female or fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

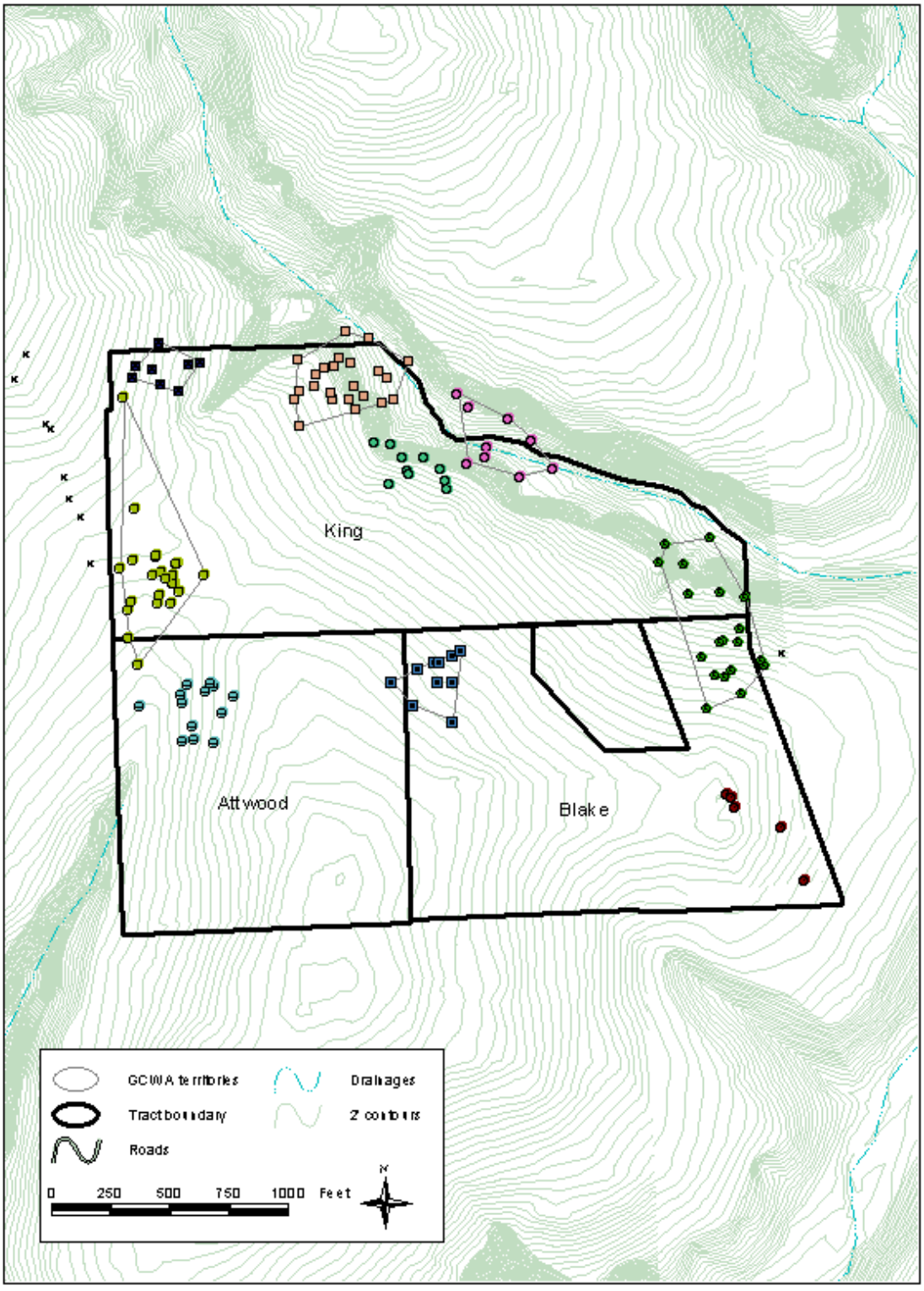


Figure 4. 2004 GCWA territory locations on the King-Attwood-Blake tracts. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female or fledglings associating with that male. Like-symbols not enclosed by a

polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

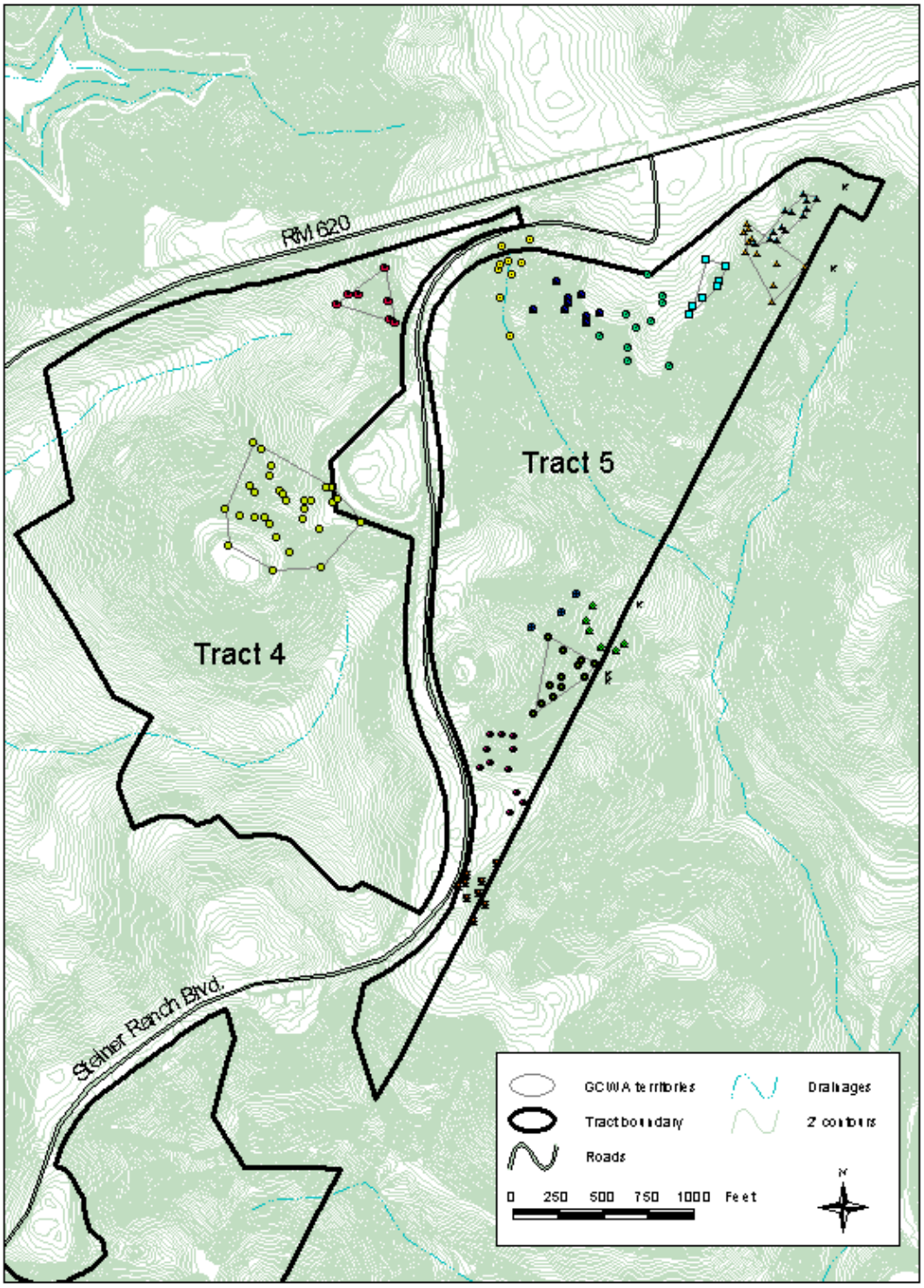


Figure 5. 2004 GCWA territory locations on Steiner Ranch, Tracts 4 & 5. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female or fledglings associating with that male. Like-symbols not

enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

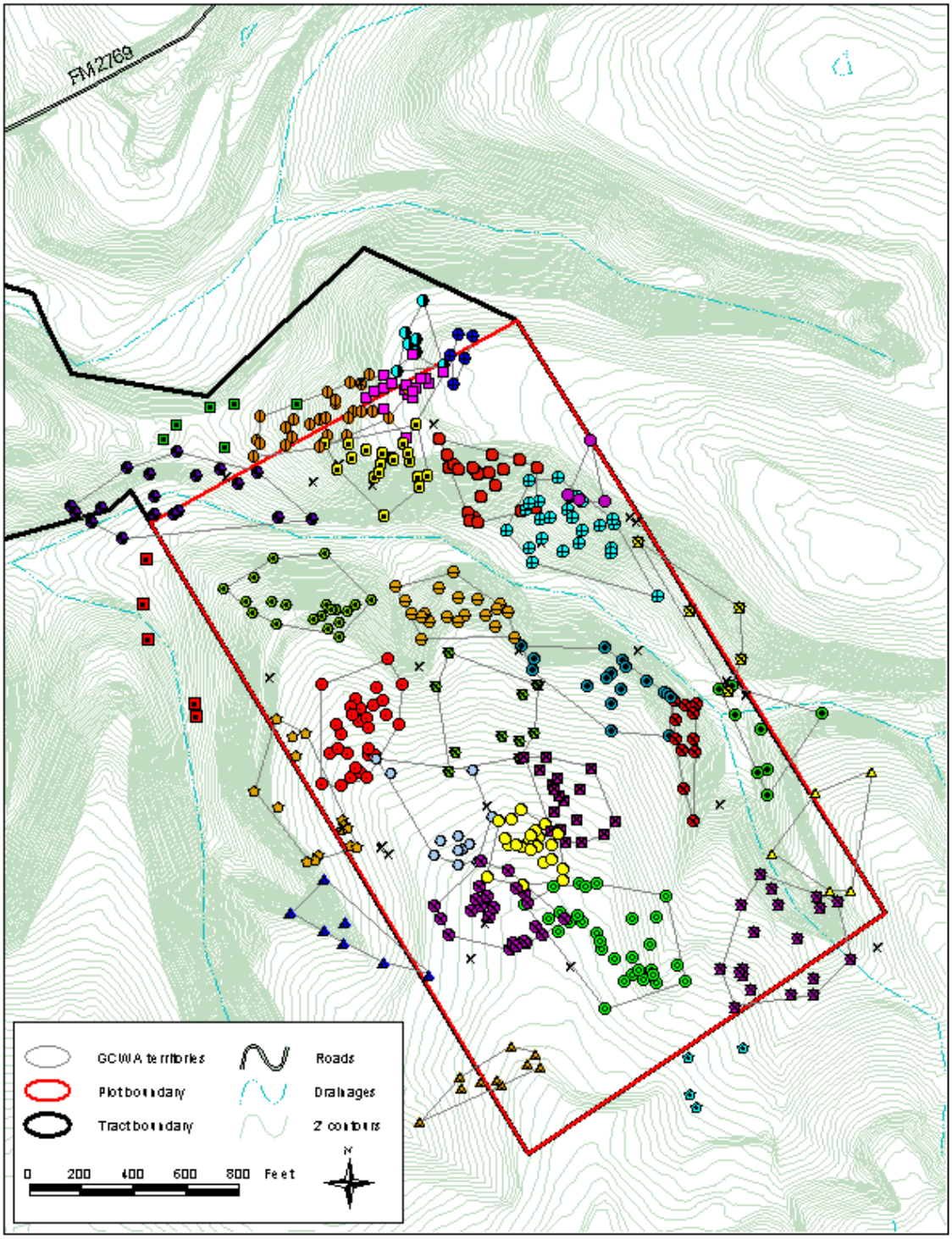


Figure 6. 2004 GCWA territory locations on the Bunten 100-acre study plot. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female and fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observations of a warbler not assigned to a territory.

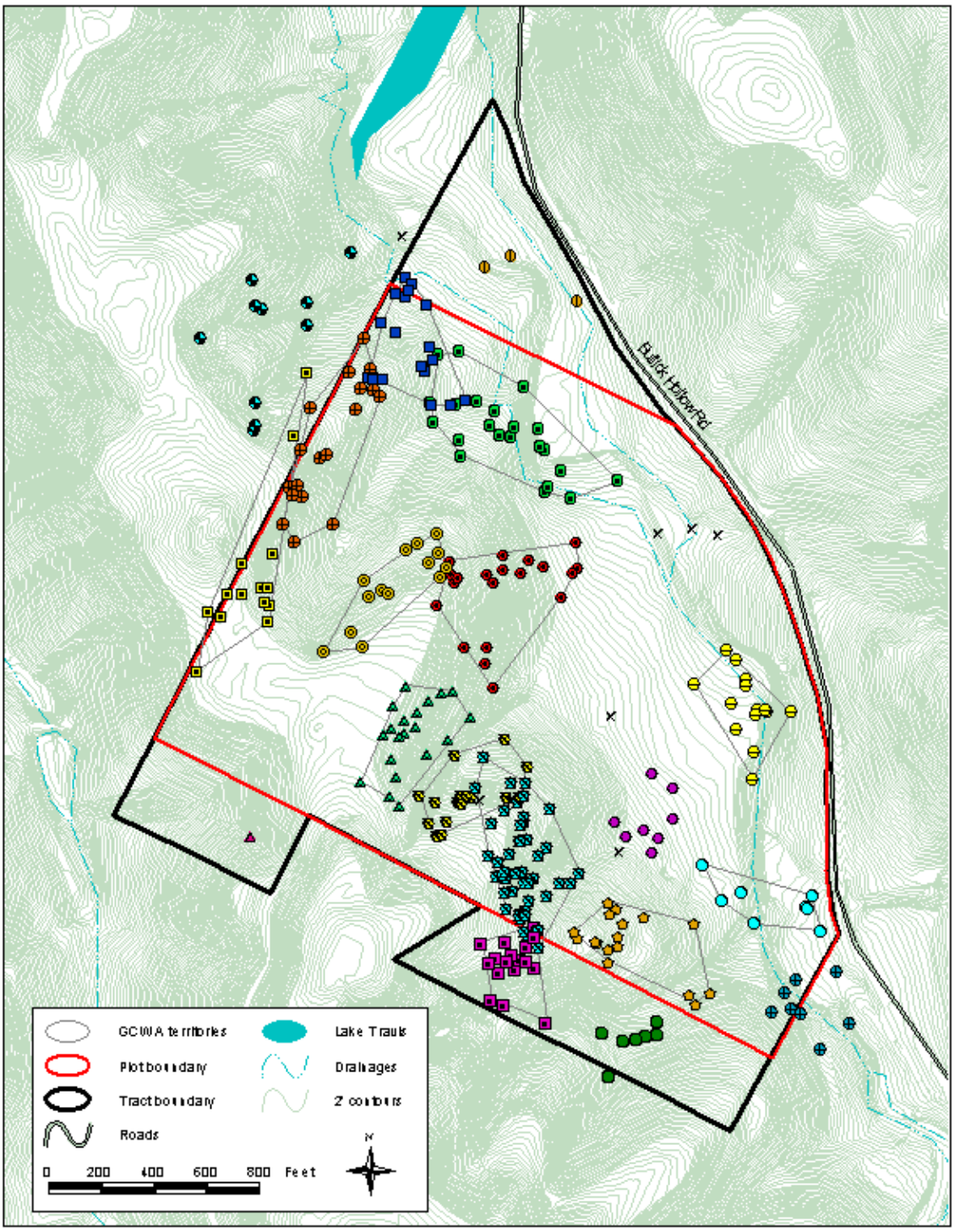


Figure 7. 2004 GCWA territory locations on the Lake Perspectives 100-acre study plot. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female and fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

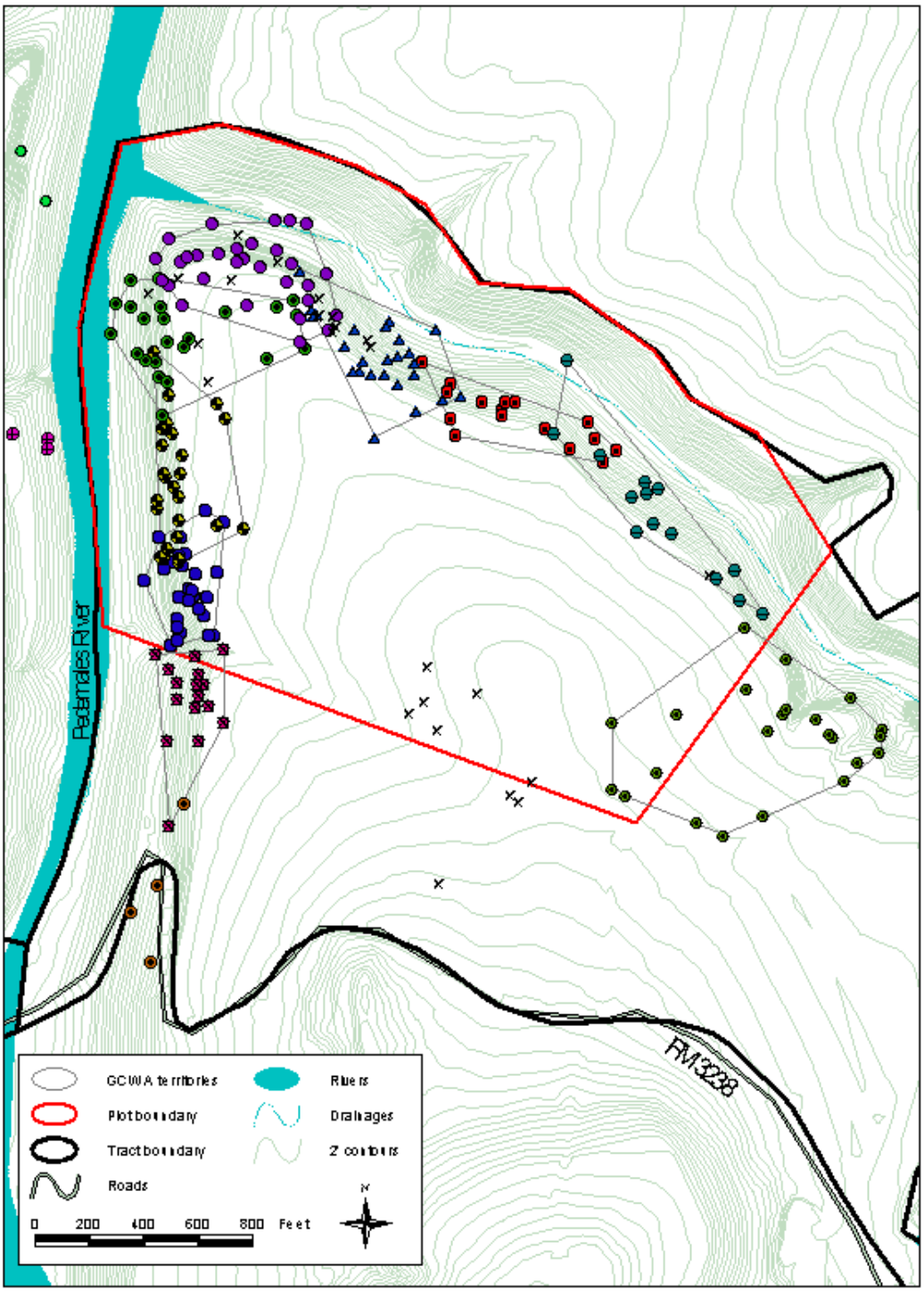


Figure 8. 2004 GCWA territory locations on the Hamilton Pool Preserve 100-acre study plot. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female and fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observations of a warbler not assigned to a territory.

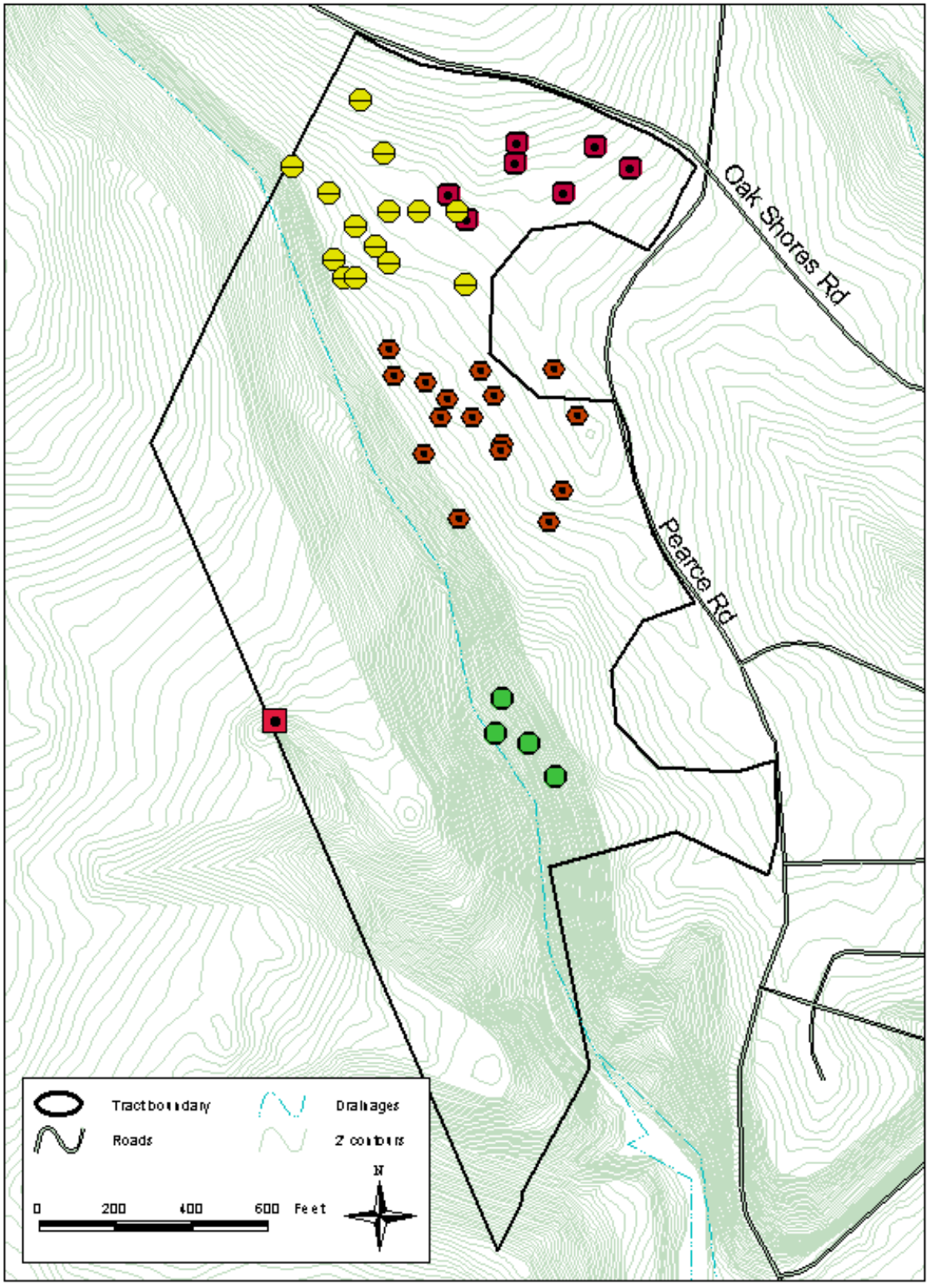

Oak Shores Rd
Pearce Rd
Tract boundary
Roads
Drainages
2' contours
0
200
400
600
Feet
N

Figure 9. Locations of GCWA males on the Greenshores tract, presence/absence surveys, April 17 – June 16, 2004.

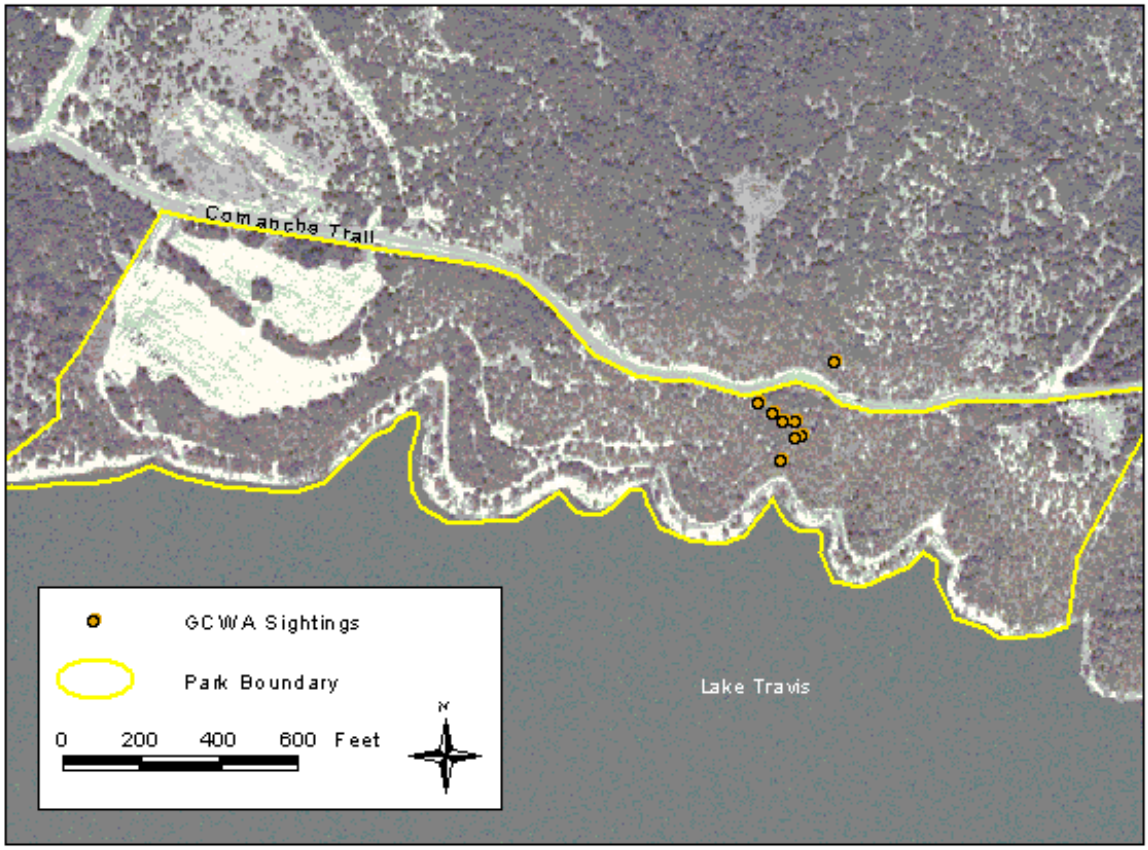


Figure 10. Locations of GCWA male(s) at Hippie Hollow Park, presence/absence surveys, April 4 – 18, 2004.