Monitoring of the Golden-cheeked Warbler: 2003 Field Season



Photo: The Nature Conservancy, Ft. Hood, 1998

Transportation and Natural Resources Department
Natural Resources Division

Project Numbers:
0810-0301
0905-0312
0905-0313
0905-0314
0905-0315
0905-0317
0905-0318
0905-1319

December 2003

TABLE OF CONTENTS

INTRODUCTION……3

STUDY SITES ……5

METHODS ……..6

RESULTS AND DISCUSSION ……..9

RECOMMENDATIONS ……. 16

DATA MANAGEMENT ……17

LITERATURE CITED ……18

FIGURES ……..20

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 species' survival are habitat loss and habitat 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 the 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). At the beginning of field season 2003, county-managed Balcones Canyonlands Preserve land totaled 2,327 acres and included the following properties: Hamilton Pool Preserve, Toops Preserve, Romberg Preserve and the Jollyville Unit. The Jollyville Unit comprises six preserve tracts: Vireo Ridge, Bunten, Lake Perspectives, Vista Point, North Grandview Hills and South Grandview Hills. Travis County also manages the 819-acre Steiner Ranch Preserve, as well as four parks (totaling 107 acres) that contain potential warbler habitat.

In 2003, Travis County Natural Resources monitored golden-cheeked warblers on twelve different properties covering 2,180 acres. Territory mapping of entire preserve tracts was conducted on two newly acquired preserve properties: South Grandview Hills and Toops, as well as on two previously acquired preserve properties: Vireo Ridge and Steiner Ranch. 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.

Presence/absence surveys were conducted on four Travis County parks this year: Selma Hughes, Hippie Hollow, Sandy Creek, and Cypress Creek. A presence/absence survey was also conducted on the Romberg Preserve. A summary of Travis County parks and preserves surveyed for golden-cheeked warblers from 2000 through 2003 is presented in Table 1.

Table 1. Travis County preserve and park tracts surveyed for golden-cheeked warblers in 2000, 2001, 2002 and 2003 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
Travis Co. Preserves(ac)				
Hamilton Pool (232)	100 ac plot	100 ac plot	100 ac plot	100 ac plot
Jollyville Unit (1658)				
Bunten (141)	—	P/A	TM	100 ac plot
N. Grandview Hills (160)	—	—	TM	NS
S. Grandview Hills (127)	—	—	NS	TM
Lake Perspectives (124)	TM	TM	100 ac plot	100 ac plot
Vireo Ridge (616)	—	TM	NS	TM
Vista Point (490)	—	—	TM	NS
Romberg (40)	P/A	NS	NS	P/A
Steiner Ranch (819):				
Tract 1 "J-Canyon"	—	TM	NS	TM
Tract 2 "L-Bend"	—	NS	P/A	TM
Tract 3 "Middle"	—	NS	P/A	TM
Tract 4 Vireo Mgmt Area	—	TM	TM	TM
Tract 5 "Northeast"	—	NS	P/A	TM
Toops (170)	—	—	NS	TM
Travis Co. Parks(ac)				
Cypress Creek (21)	P/A	NS	NS	P/A
Hippie Hollow (31)	P/A	NS	NS	P/A
Sandy Creek (49)	P/A	NS	NS	P/A
Selma Hughes (6)	NS	NS	NS	P/A

STUDY SITES

The Jollyville Unit Preserve (1658 ac), Toops Preserve (170 ac), and Romberg Preserve (40 ac) are all 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 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 (819ac) 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 (232ac) 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).

Cypress Creek (21ac), Sandy Creek (49ac), and Hippie Hollow (31ac) Parks are located on Lake Travis; Selma Hughes Park (6ac) is located on Lake Austin (**Figure 2**). All parks experience year-round recreational use. Vegetative characteristics vary from park to park, but all parks are heavily impacted by non-native species. Further inland, vegetation is typical of western Travis County, i.e. hilly topography dominated by oak-juniper woodlands, and contains potential warbler habitat with patches ranging in size from approximately one to 20 acres.

METHODS

TRACT TERRITORY MAPPING

Data Collection. Territory mapping of golden-cheeked warblers was conducted from 20 March to 19 June 2003 on the following Travis County preserve tracts: South Grandview Hills, Vireo Ridge, Steiner Ranch, and Toops. 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: South Grandview Hills: 80.00; Vireo Ridge: 213.00; Steiner Ranch: 151.75; and Toops: 46.00. Due to limitations inherent in 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 2003, territory mapping was conducted on three 100-acre permanent plots on the following preserves: Bunten, Lake Perspectives, and Hamilton Pool. Bunten and Lake Perspectives are "prime" sites, i.e., more than 75% of the plot contains excellent warbler habitat. Hamilton Pool is a "transitional" site, containing <75% 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 no more than two 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 2003, 3,207 observations of warblers were recorded on nine Travis County-managed properties: Vireo Ridge, Toops, South Grandview Hills, Hamilton Pool, Bunten, Lake Perspectives, Steiner Ranch, Selma Hughes Park and Sandy Creek Park. This total comprises observations of 3,071 males, 107 females, and 29 warblers for which sex was not determined. No warblers were recorded on Romberg Preserve, Cypress Creek Park, or Hippie Hollow Park. Distribution of golden-cheeked warblers in the Cypress Creek macrosite is shown in **Figure 3.** Distribution of warblers on Steiner Ranch, Tracts 1-5, is shown in **Figure 4**. Distribution for Hamilton Pool, Sandy Creek Park and Selma Hughes Park is depicted in **Figures 13-15.**

TRACT TERRITORY MAPPING

Abundance of male warblers on the Toops Tract was 24 (**Table 2**). Sixteen of these males established territories within the tract or along its boundary (see Methods section for definition of "territory"). Male abundance at Vireo Ridge equaled 91 and at South Grandview Hills totaled 20 (**Table 2**). Of the 91 males detected at Vireo Ridge, 73 males established territories, while 19 males established territories at South Grandview Hills.

On the 819-acre Steiner Ranch Preserve, 32 males were detected, of which 24 established territories either within the tract or along the tract boundaries (**Table 2**). Nineteen males held territories on tract 1 (J-Canyon), and five males held territories on Tract 5 (Northeast). One male was detected on two occasions at Tract 4 (L-Bend), however it did not establish a

territory. On the remaining two tracts that comprise Steiner Ranch, the Vireo Management Area and Middle (Tracts 3 and 4), no warblers were detected on any survey.

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 2003.

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]
Toops (170)	24	16	15.5	0.09	0.23
Vireo Ridge (616)	91	73	65.0	0.11	0.27
South Grandview Hills (127)	20	19	15.0	0.10	0.26
Steiner Ranch, total (819)	32	24	17.5	0.02	0.05
Tract 1, J-Canyon (317)	23	19	13.0	0.04	0.10
Tract 2, L-Bend (201)	1	0	0.0	0.00	0.00
Tract 3, Middle (76)	0	0	0.0	0.00	0.00
Tract 4, VMA (126)	0	0	0.0	0.00	0.00
Tract 5, NE (101)	8	5	4.5	0.04	0.11

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

Based on Verner's (1985) method of summing territories, Vireo Ridge had the highest territory density with 0.11 territories per acre (**Table 2**). Toops and South Grandview Hills had territory densities comparable to Vireo Ridge with 0.09 and 0.10 territories per acre, respectively. Mean territory density of Vireo Ridge, Toops, and South Grandview Hills was 0.10 territories per acre or 9.6 acres per male (3.9 ha/male). Territory density on Steiner Ranch (all tracts combined) was 0.02 territories per acre or 51.2 acres per male (20.7 ha/male). Both Tracts 1 and 5 had a density of 0.04 territories per acre, while the density of territories on the other three tracts was 0.00.

Territory locations on Toops, South Grandview Hills, Vireo Ridge and Steiner Ranch are shown in **Figures 5-10**. 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.

Warbler territory density was considerably lower on Steiner Ranch compared to Toops, South Grandview Hills and Vireo Ridge. The latter three properties contain large blocks of "excellent" (see Campbell 1995), and relatively unfragmented, warbler habitat, and all have a much lower edge to area ratio than Steiner Ranch. Additionally, much of the Steiner Ranch Preserve contains habitat unsuitable for warblers. Tract 3 contains no suitable warbler habitat, while, only ca. 15% (estimated from aerial imagery and site visits) of Tract 2 contains warbler habitat. Habitat on Tract 2 is located at the far southern end of the tract at the head of a draw. Tract 4 contains both excellent and marginal warbler habitat, although limited, and warblers have been located there in the past. However, since 2002, development immediately adjacent to Tract 4 has been intense and did continue throughout the 2003-breeding season. Noise from building and clearing activities abutting tract boundaries during breeding season may have precluded establishment of territories.

At Toops, seven males were observed paired with females, and at least four territories produced young. Thirty-three males were observed associating with females at Vireo Ridge and 40 fledgling groups were detected. On the South Grandview Hills tract, 13 males were observed paired with females, and nine territories were observed to have successfully fledged young. On Tract 1 of Steiner Ranch, six females were observed associating with males and five territories produced one or more fledglings. Two males that were observed entirely outside J-Canyon boundaries were also paired with females and one of these territories produced fledglings. No females or fledglings were observed on Tracts 2, 3, 4, or 5 of Steiner Ranch.

100-ACRE PLOTS

In field season 2003, 24 male warblers established territories on the Bunten 100-acre study plot, and twelve males established territories on the Lake Perspectives 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, twelve 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 four additional territories straddling the boundary.

Nine territories were observed on the Hamilton Pool study plot, of which six were completely within plot boundaries (**Table 3**). Territory locations for the Bunten, Lake Perspectives and Hamilton Pool study plots are shown in **Figures 11-13**. 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 44.5 territories per 100 hectares (2.2 ha/male) (**Table 3**). Territory density at Lake Perspectives was almost half of that, with 24.7 territories per 100 hectares (4.0 ha/male). Mean density of both prime plots was 34.6 territories per 100 hectares (2.9 ha/male). Territory density at Hamilton Pool, a transitional plot, was 18.5 territories per 100 hectares (5.4 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 2003.

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]
Prime sites				
Bunten	12	24	18	44.5
Lake Perspectives	8	12	10	24.7
Transitional sites				
Hamilton Pool	6	9	7.5	18.5

[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 unsuitable 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. Since 2002, the Hamilton Pool study plot has been treated as a transitional plot for purposes of data analysis, although it continues to be surveyed following the protocol for prime plots.

Pairing success was high at both the Bunten and Hamilton Pool study plots. At Bunten, 75% of all males were determined to have paired with females; 78% of all males paired with females at Hamilton Pool (**Table 4**). At Lake Perspectives, two-thirds of all males were paired. The breeding success rate for all three plots ranged from 0.50 to 0.63; Bunten had the highest rate (**Table 4**). Mean productivity for all plots was 2.00 fledglings per successful territory (range: 1.93, 2.17). Mean total productivity for all plots was 1.16 fledglings per all observed territories (range: 1.08, 1.20).

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 2003. 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)
Prime sites				
Bunten	0.75 (18)	0.63 (15)	1.93 (29)	1.20 (29)
Lake Perspectives	0.66 (8)	0.50 (6)	2.17 (13)	1.08 (13)
Transitional sites				
Hamilton Pool	0.78 (7)	0.56 (5)	2.00 (10)	1.12 (10)

On Lake Perspectives, pairing success, breeding success and productivity decreased slightly in 2003 compared with data collected in 2002. This difference may or may not be significant. At the Hamilton Pool study plot, there was a marked increase in 2003 in breeding success and productivity compared with data from 2002. In 2002, the breeding success rate was 0.25, and productivity was 0.38 fledglings per territory. Following field season 2002, staff biologists concluded that brown-headed cowbird parasitism was the most likely factor affecting warbler breeding success and productivity. At the beginning of field season 2003, a cowbird mega-trap was opened on 1 March 2003 along a powerline corridor with high cowbird activity. The trapping effort was very successful and may explain the rebound in productivity numbers (see *Parasitism* below; TNR 2003).

Two nests were located on the Bunten study plot. On 24 April 2003, one active nest was found in an Ashe juniper. Both parents were feeding at least two nestlings. This territory was later determined to have successfully fledged at least two young. The second nest was located on the same day, also in an Ashe juniper. The male and female were observed flying to and from the nest and the female was later seen sitting on the nest. Contents of the nest could not be determined. Two fledglings were subsequently detected for this territory. No nests were found on the Hamilton Pool or Lake Perspectives study plots.

PRESENCE/ABSENCE SURVEYS

In field season 2003, golden-cheeked warblers were absent at Cypress Creek Park, Hippie Hollow Park and at the Romberg Preserve. One to two males were detected at Sandy Creek Park on 30 April 2003 at the north end of the park (**Figure 14**). One male warbler was observed on 1 May 2003 at Selma Hughes Park (**Figure 15**). No females of fledglings were located at either park.

Brown-headed Cowbird Parasitism

On 30 April 2003, a male golden-cheeked warbler was seen feeding a fledged brown-headed cowbird at South Grandview Hills. Warbler fledglings were not detected for this territory. No other confirmed incidents of parasitism of golden-cheeked warblers were recorded during avian surveys conducted in 2003.

Other cowbird host species in 2003 included a white-eyed vireo, whose nest was found abandoned and parasitized on 20 May 2003. On the same survey, two older, fledgling cowbirds were observed. One was being fed by a blue-gray gnatcatcher, and the second was observed begging loudly, and tended by an unknown host parent, which was not believed to be a golden-cheeked warbler.

Anecdotal information from field biologists indicated a decrease in cowbird activity in 2003 on Lake Perspectives, Vireo Ridge and Hamilton Pool compared with surveys conducted in 2002. However, brown-headed cowbirds were clearly abundant at Steiner Ranch Tract 1 based on the frequency of sightings and vocalizations noted anecdotally by field biologists. Cowbirds were not detected on the Bunten Preserve in either 2002 or 2003. The decrease in cowbird activity at Hamilton Pool Preserve was pronounced and most likely attributable to successful cowbird trapping at Hamilton Pool during field season 2003 (see TNR 2003).

RECOMMENDATIONS

- The Hamilton Pool study plot was originally designated a prime study plot in 1996 and has been surveyed as such since that time. Because the Hamilton Pool plot does not fit the criteria for a prime study plot, it was redesignated in 2002 as a transitional plot. However, field staff should continue to survey Hamilton Pool following the same protocol as before, i.e., following the monitoring protocol for prime plots, in order to facilitate assessment of population trends. Intensive monitoring and collection of productivity data is further warranted in light of the decrease in golden-cheeked warbler productivity observed in 2002.

- 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.

DATA MANAGEMENT

Information regarding data sets compiled for field season 2003 is provided below. All data sets are currently stored in the Travis County Natural Resources office, 1010 Lavaca Street, Austin, Texas.

File Names:

BU_gcwa_03.xls
GVHS_gcwa_03.xls
HP_gcwa_03.xls
LP_gcwa_03.xls
TP_gcwa_03.xls
VR_gcwa_03.xls
SR_Canyon_gcwa_03.xls
SR_LBend_gcwa_03.xls
SR_NE_gcwa_03.xls

Description: Avian location databases for 2003 field season

Software: Microsoft Windows NT, Excel 2000

Archive Location: C:/Helen/GCW/GCWA 2003/Final Data 2003

Storage Location: Computer #113537

LITERATURE CITED

Anders, A. D. 2000a. Demography of golden-cheeked warblers on Fort Hood, Texas in 2000: productivity, age structure, territory density, and adult return rates. *In* Endangered species monitoring and management at Fort Hood, Texas: 2000 annual report. Fort Hood Project, The Nature Conservancy of Texas, Fort Hood, Texas.

Anders, A. D. 2000b. Population trends of the golden-cheeked warbler on Fort Hood: 1999-2000 and an overview from 1992-2000. *In* Endangered species monitoring and management at Fort Hood, Texas: 2000 annual report. Fort Hood Project, The Nature Conservancy of Texas, Fort Hood, Texas.

Balcones Canyonlands Preserve. 1999. Balcones Canyonlands Preserve Land Management Plan. Unpublished document. Austin, Texas.

Bibbey, C. J., N.D. Burges, and D.A. Hill. 1992. Bird Census Techniques. Academic Press. San Diego, California. 257pp.

Biological Advisory Team. 1990. Comprehensive report of the Biological Advisory Team of the Austin Regional Habitat Conservation Plan. Unpublished report. US Fish and Wildlife Service. Austin, Texas.

Campbell, L. 1995. Endangered and Threatened Animals of Texas: Their Life History and Management. Texas Parks and Wildlife. Austin, Texas. 130pp.

Carr, W. B. 1996. Botanical inventory of Travis County parks, summer 1996. Unpublished document. Travis County Division of Parks and Natural Resources. Austin, Texas.

Friesen, L. E., P.F. Eagles, and R.J. MacKay. 1995. Effects of residential development on forest-dwelling neotropical migrant songbirds. Conservation Biology 9(6): 1408-1414.

IBCC (International Bird Census Committee). 1970. An international standard for a mapping method in bird census work, recommended by the International Bird Census Committee. Audubon Field Notes 24 (6):722-726.

Koloszar, J. A., and H.M. Becker. 2000. Monitoring of the black-capped vireo during 2000 on Fort Hood, Texas. *In* Endangered species monitoring and management at Fort Hood, Texas: 2000 annual report. Fort Hood Project, The Nature Conservancy of Texas, Fort Hood, Texas.

Ladd, C., and L. Gass. 1999. Golden-cheeked warber (*Dendroica chrysoparia*). *In* A. Poole and F. Gill, eds. The Birds of North America, no. 420. The Birds of North America, Inc., Philadelphia, Pennsylvania.

Pulich, W. M. 1976. The Golden-cheeked warbler: A bioecological study. Texas Parks and Wildlife Department, Austin, Texas, USA.

Travis County Natural Resources. 1996. 1996 endangered species survey reports, project number 0805-96001. Unpublished report. Austin, Texas.

Travis County Natural Resources. 1997. 1997 endangered species survey reports, project number 0805-97001. Unpublished report. Austin, Texas.

Travis County Natural Resources. 1998. 1998 endangered species survey reports, project number 0805-98001. Unpublished report. Austin, Texas.

Travis County Natural Resources. 1999. 1999 endangered species survey reports, project number 0805-99001. Unpublished report. Austin, Texas.

Travis County Natural Resources. 2000. Monitoring of the golden-cheeked warbler: 2000 field season, project number 0810-00001. Unpublished report. Austin, Texas.

Travis County Natural Resources. 2001. Monitoring of the golden-cheeked warbler: 2001 field season, project number 0810-00001. Unpublished report. Austin, Texas.

Travis County Natural Resources. 2002. Monitoring of the golden-cheeked warbler: 2002 field season, project number 0810-00001. Unpublished report. Austin, Texas.

Travis County Natural Resources. 2003. 2003 Summary of Wildlife Management Activities on Travis County Tracts of the BCP, project numbers 0905-00220 and 0905-00226. Unpublished report. Austin, Texas.

U.S Fish and Wildlife Service. 1990. Endangered and threatened wildlife and plants; emergency rule to list the golden-cheeked warbler as endangered. Federal Register 55(87): 18844-18845.

U.S Fish and Wildlife Service. 1994. Minimum Procedures for Determining the Presence/Absence of Golden-cheeked Warblers and Black-capped Vireos. Unpublished document. Austin, Texas. 2pp.

Verner, J. 1985. Assessment of counting techniques. Current Ornithology 2:247-302.

Wahl, R., D.D. Diamond, and D. Shaw. 1990. The golden-cheeked warbler: a status review. Final report submitted to office of Endangered Species, US Fish and Wildlife Service. Albuquerque, New Mexico.

FIGURES

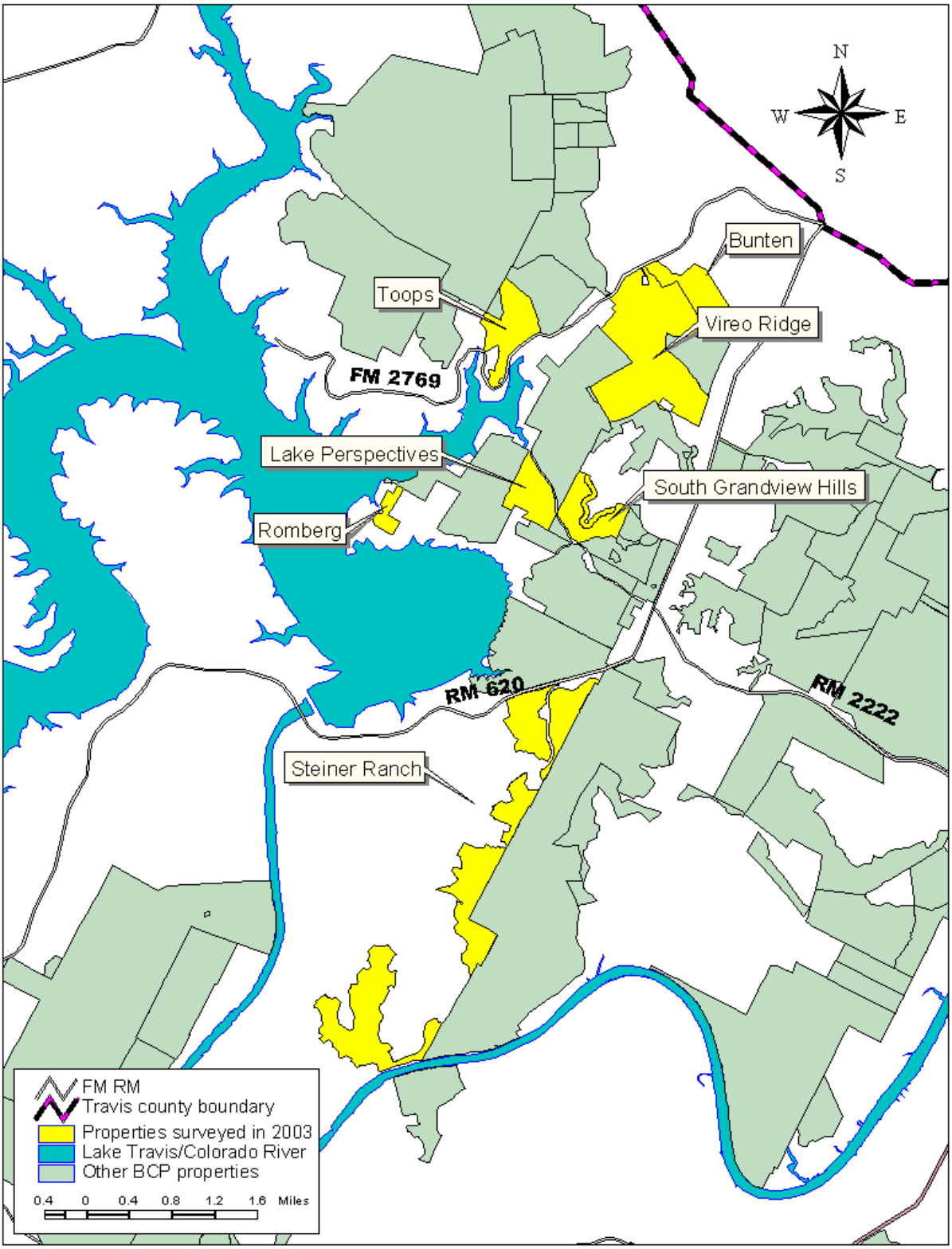

Figure 1. Location of Travis County preserve tracts surveyed for golden-cheeked warblers in 2003.

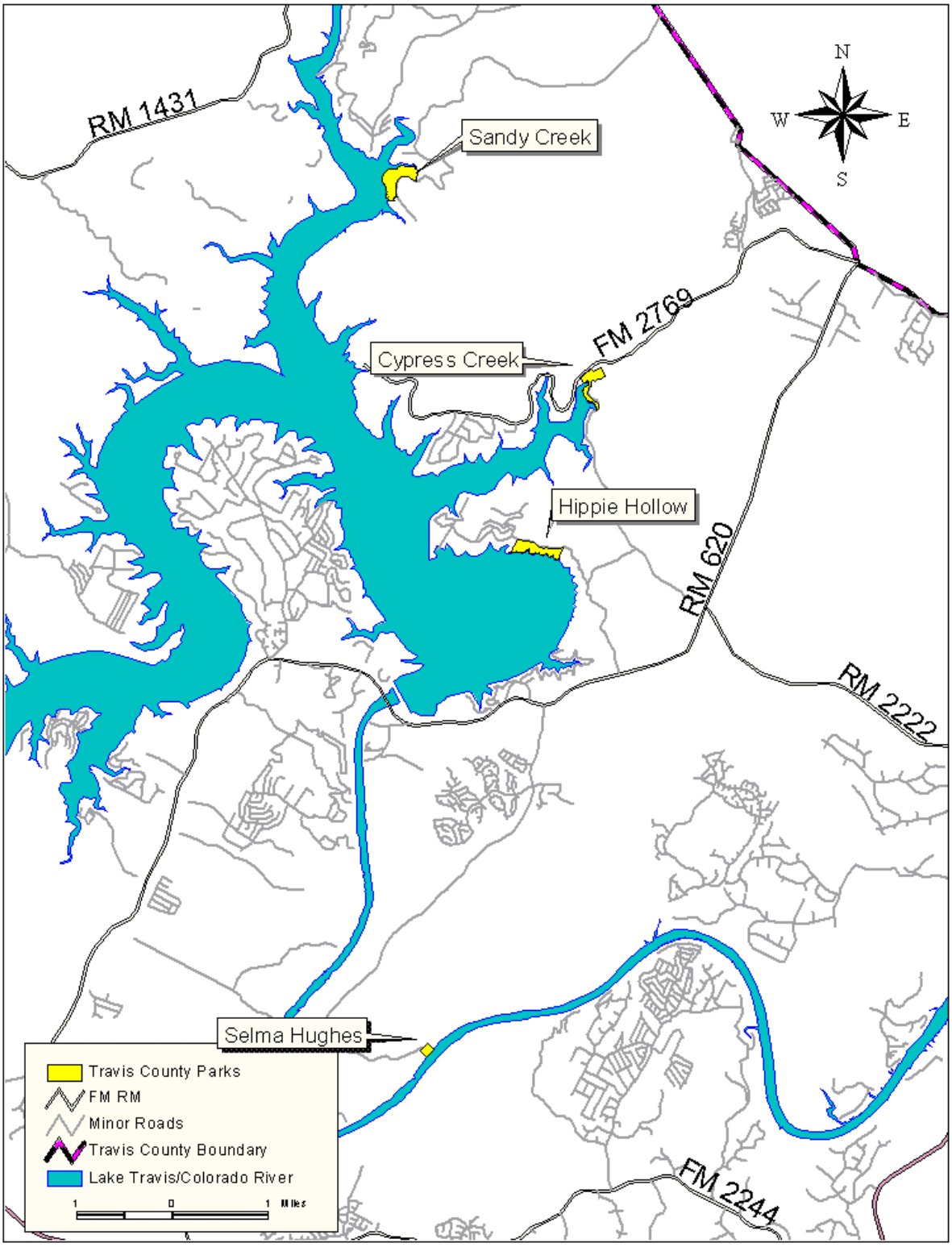

Figure 2. Location of Travis County parks surveyed for golden-cheeked warblers in 2003.

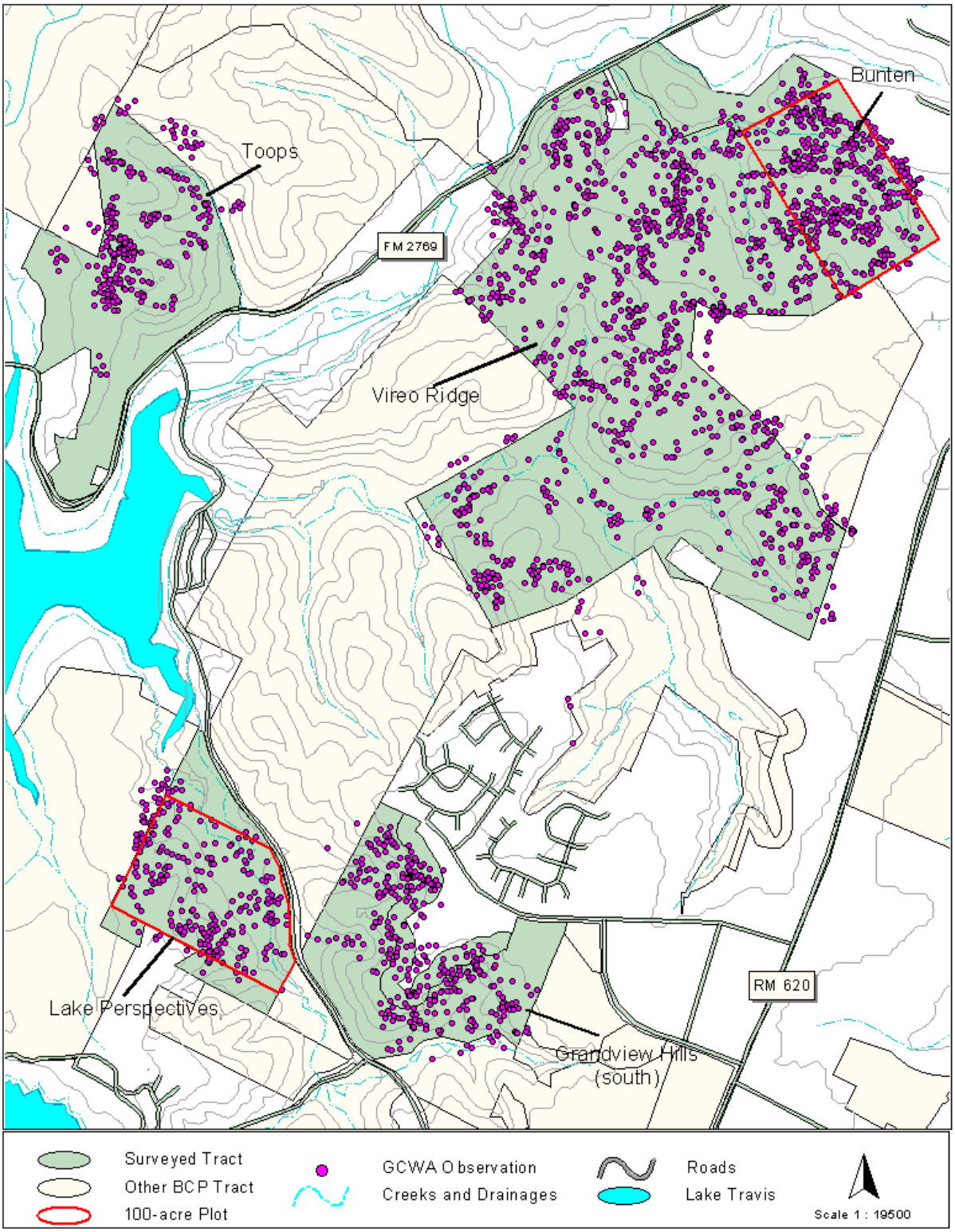

Figure 3. 2003 distribution of GCWA observations on surveyed tracts in the Cypress Creek macrosite.

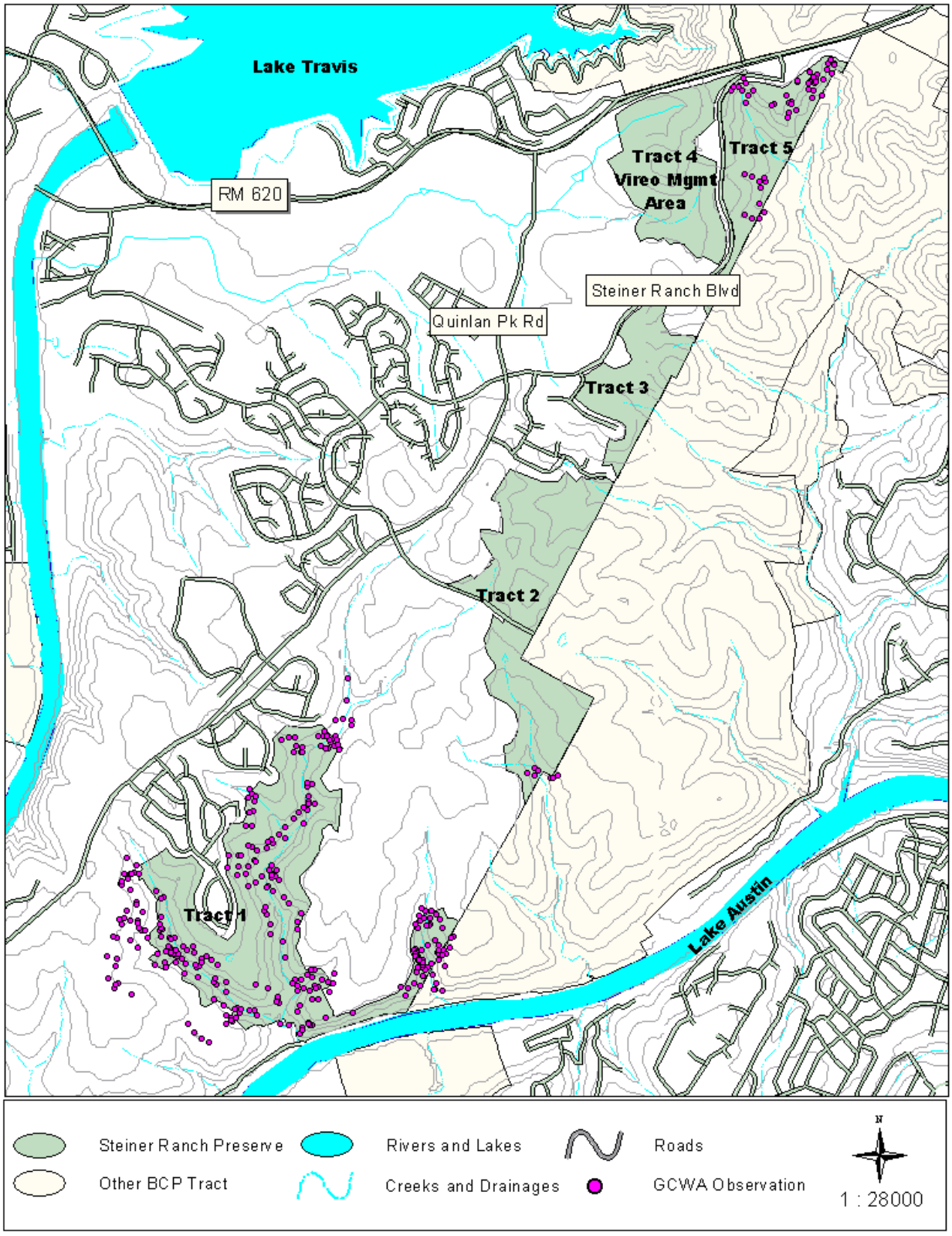

Figure 4. 2003 distribution of GCWA observations on the Steiner Ranch Preserve.

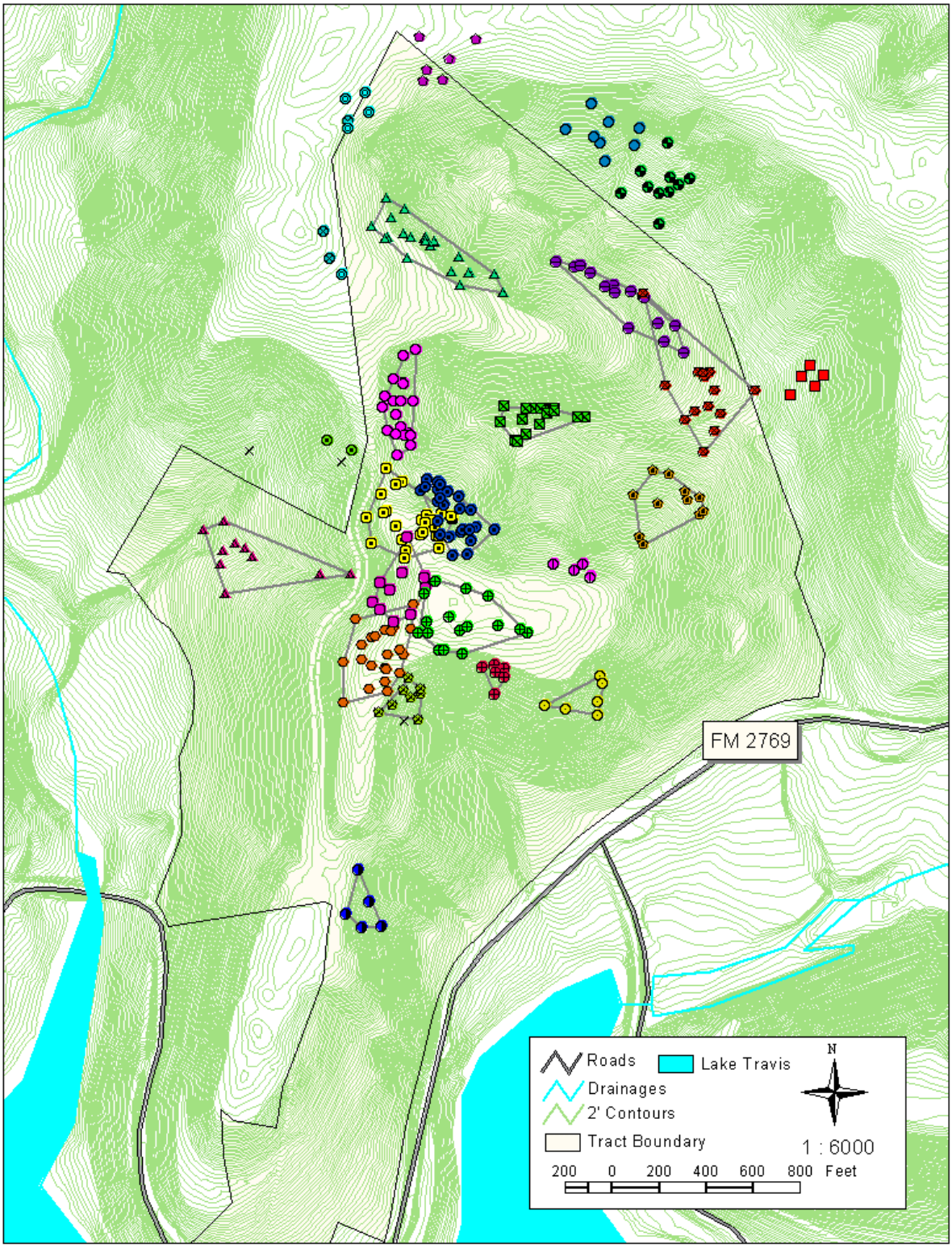

Figure 5. 2003 GCWA territory locations on the Toops Tract. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female or fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

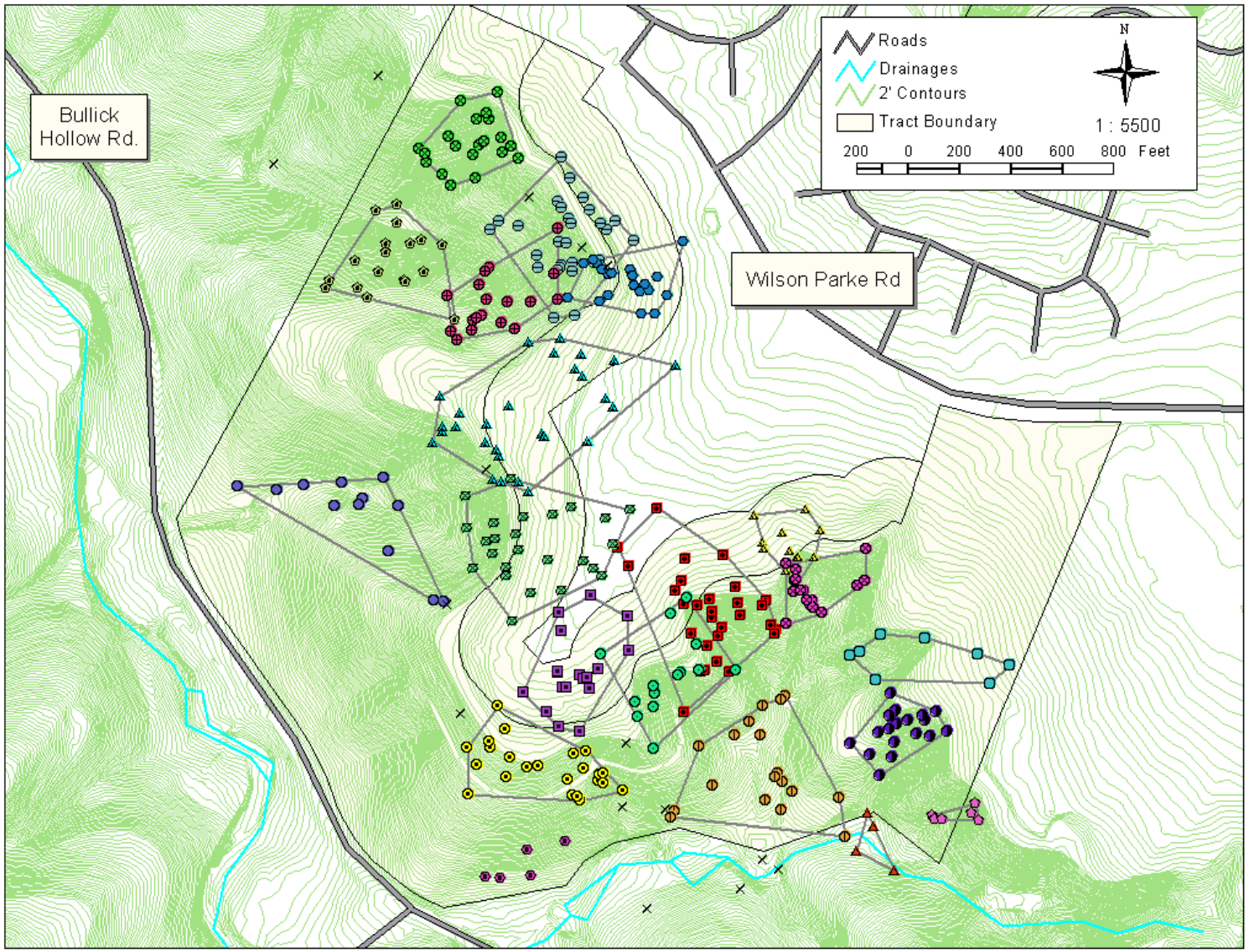

Figure 6. 2003 GCWA territory locations on the South Grandview Hills Tract. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female or fledglings associating with that male. Like-

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.

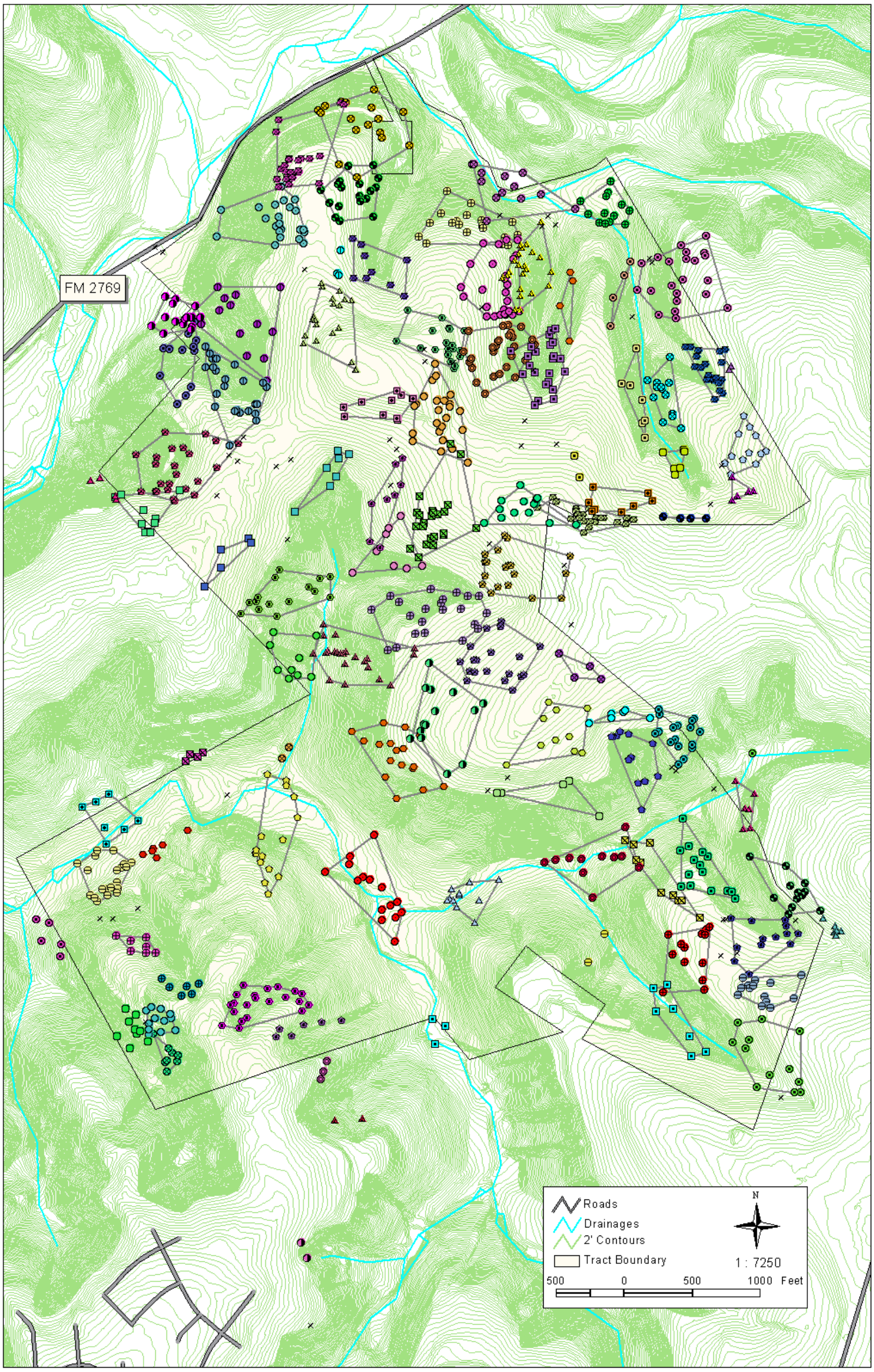

Figure 7. 2003 GCWA territory locations on the Vireo Ridge Tract. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female or fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

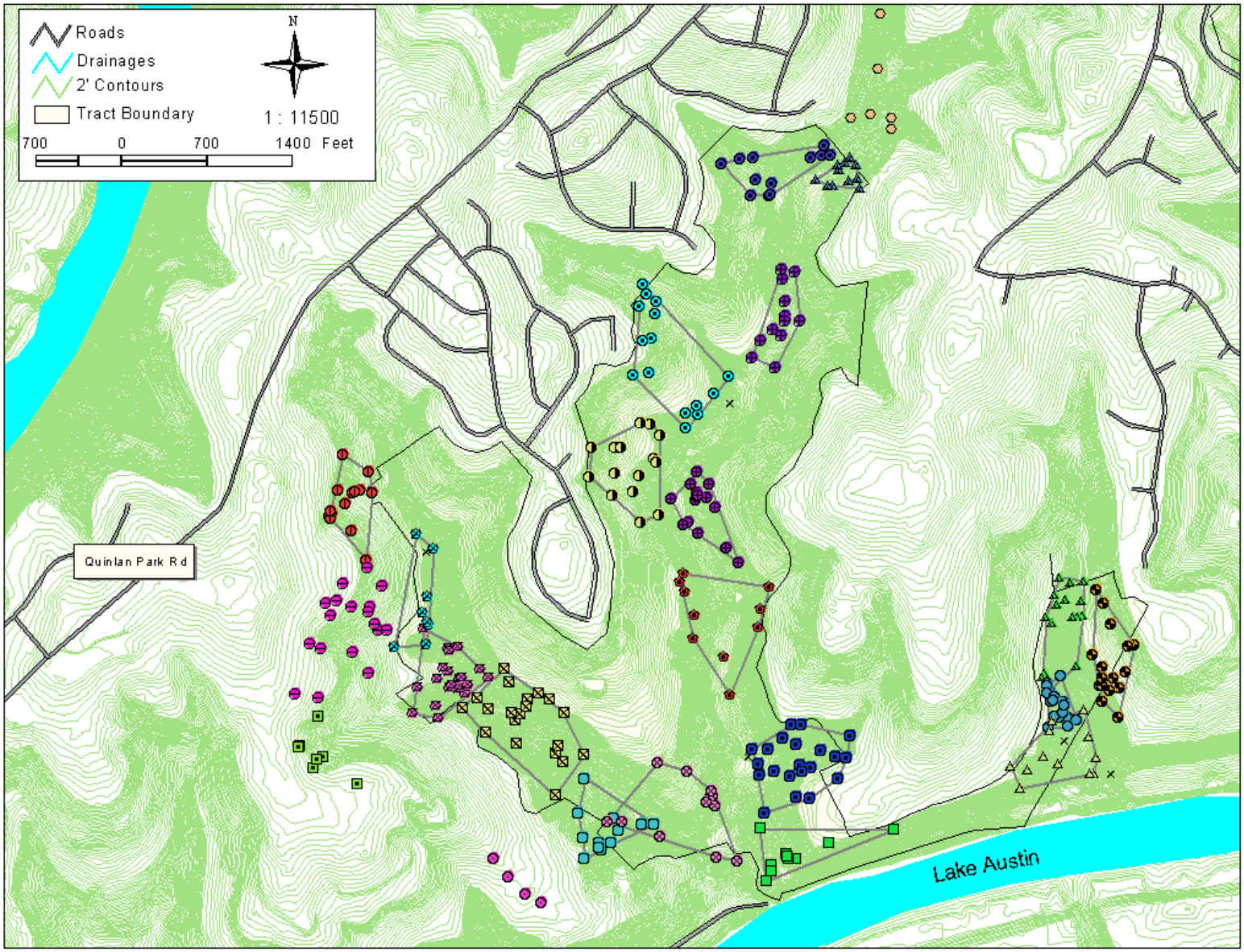

Figure 8. 2003 GCWA territory locations on Steiner Ranch, Tract 1. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female or fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

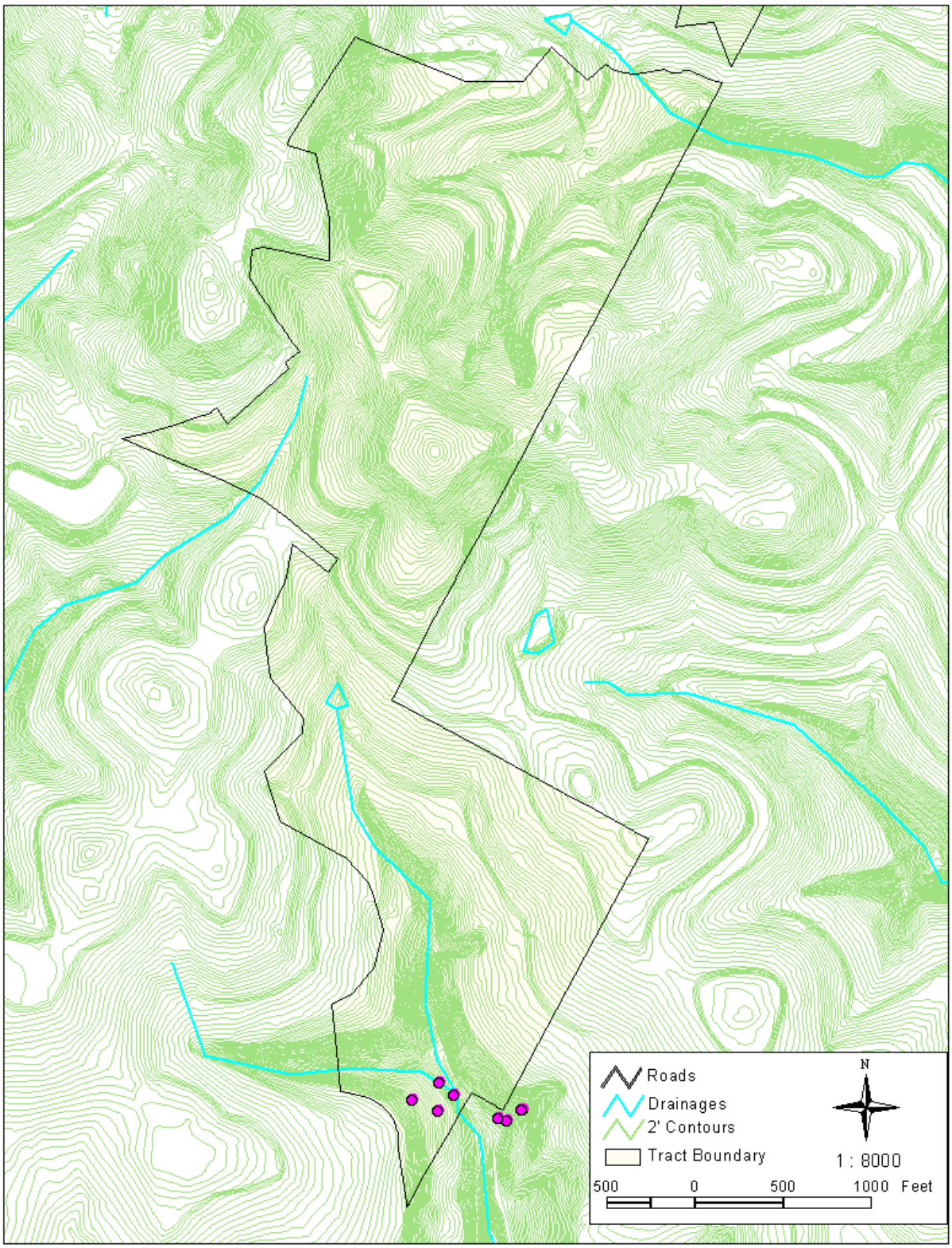

Figure 9. Locations of GCWA observations on Steiner Ranch, Tract 2. Symbols denote repeated observations of a non-territorial male.

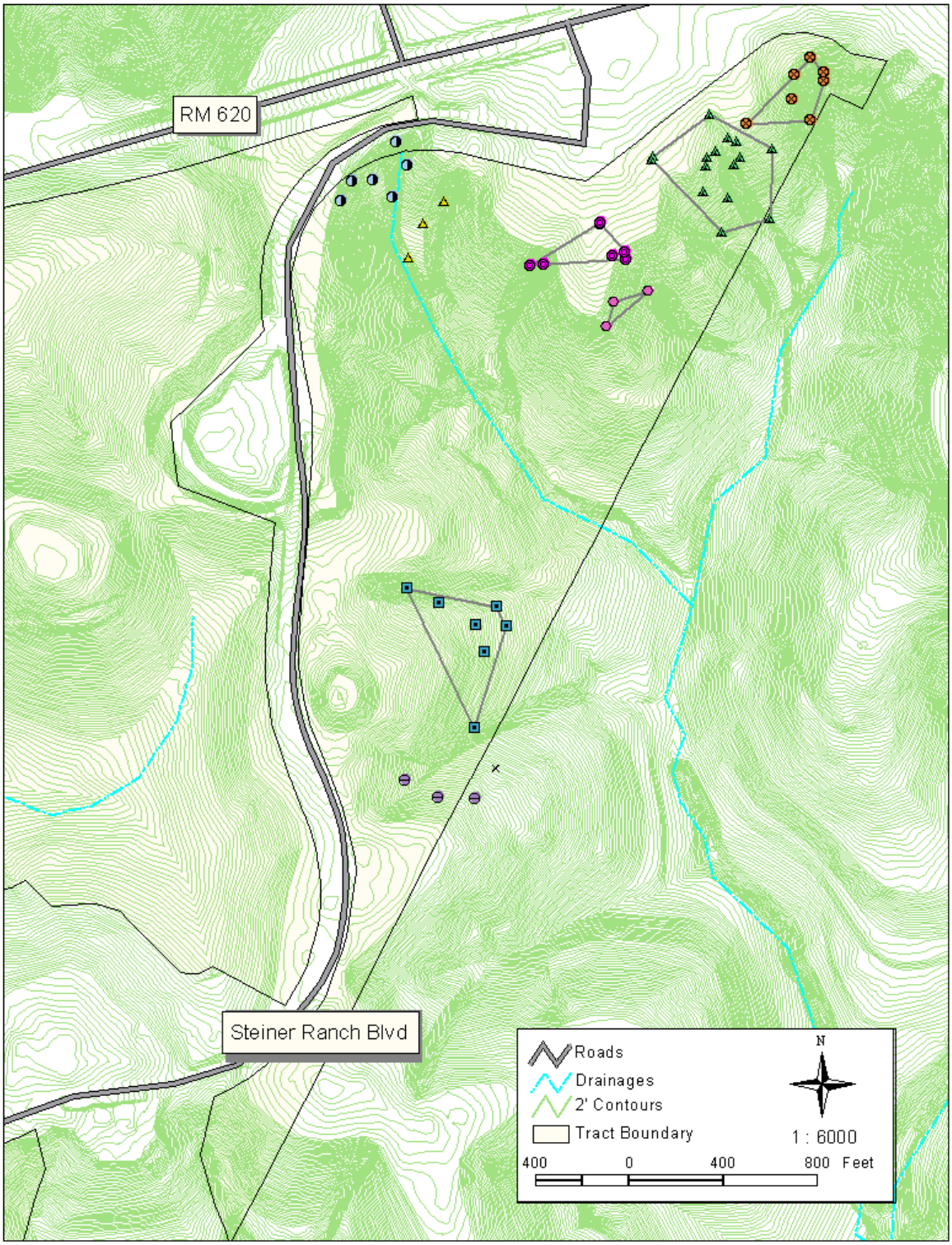

Figure 10. 2003 GCWA territory locations on Steiner Ranch, Tract 5. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female and fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observation of a warbler not assigned to a territory.

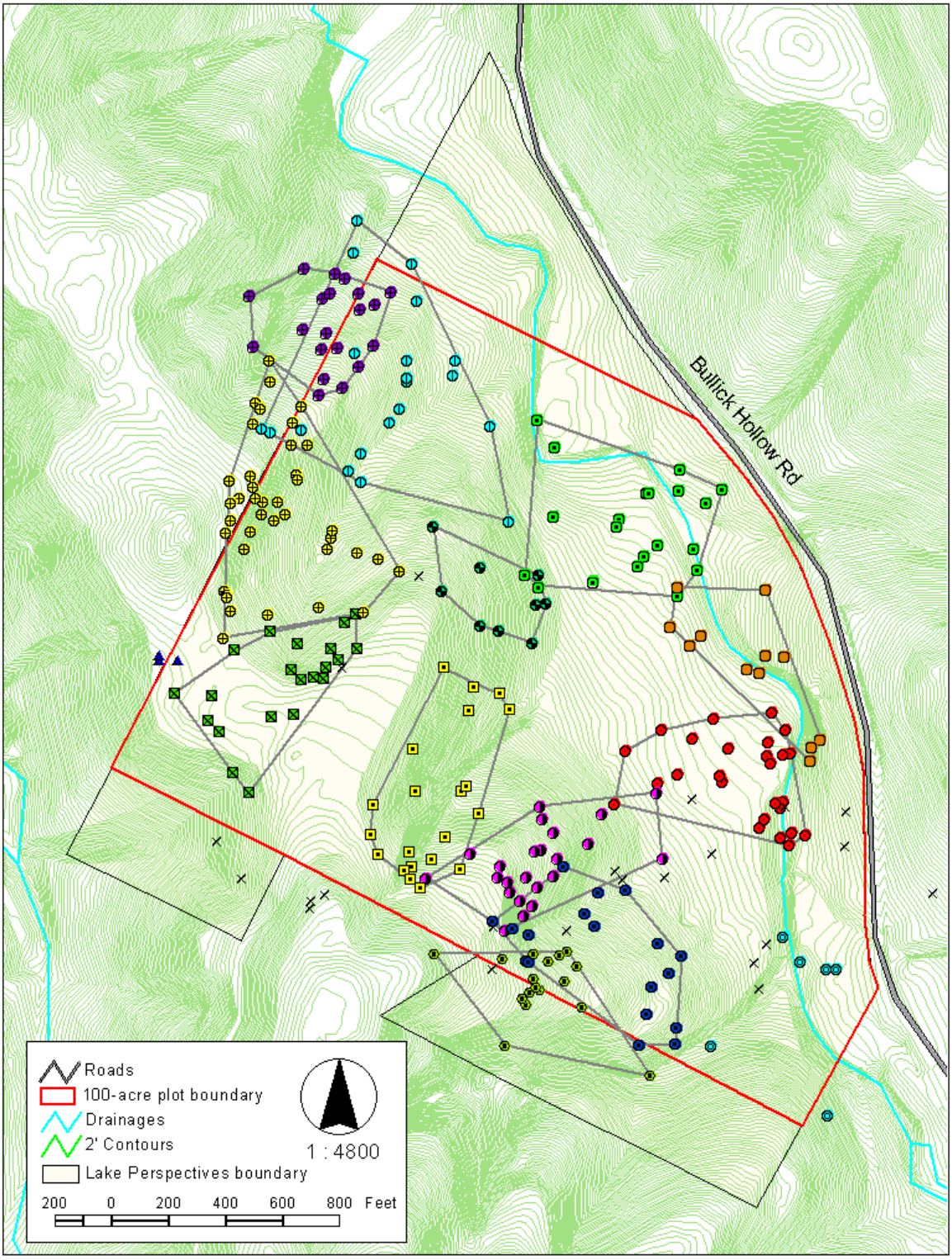

Figure 11. 2003 GCWA territory locations on the Lake Perspectives 100-acre study plot. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female and fledglings associating with that male. Like-symbols not

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

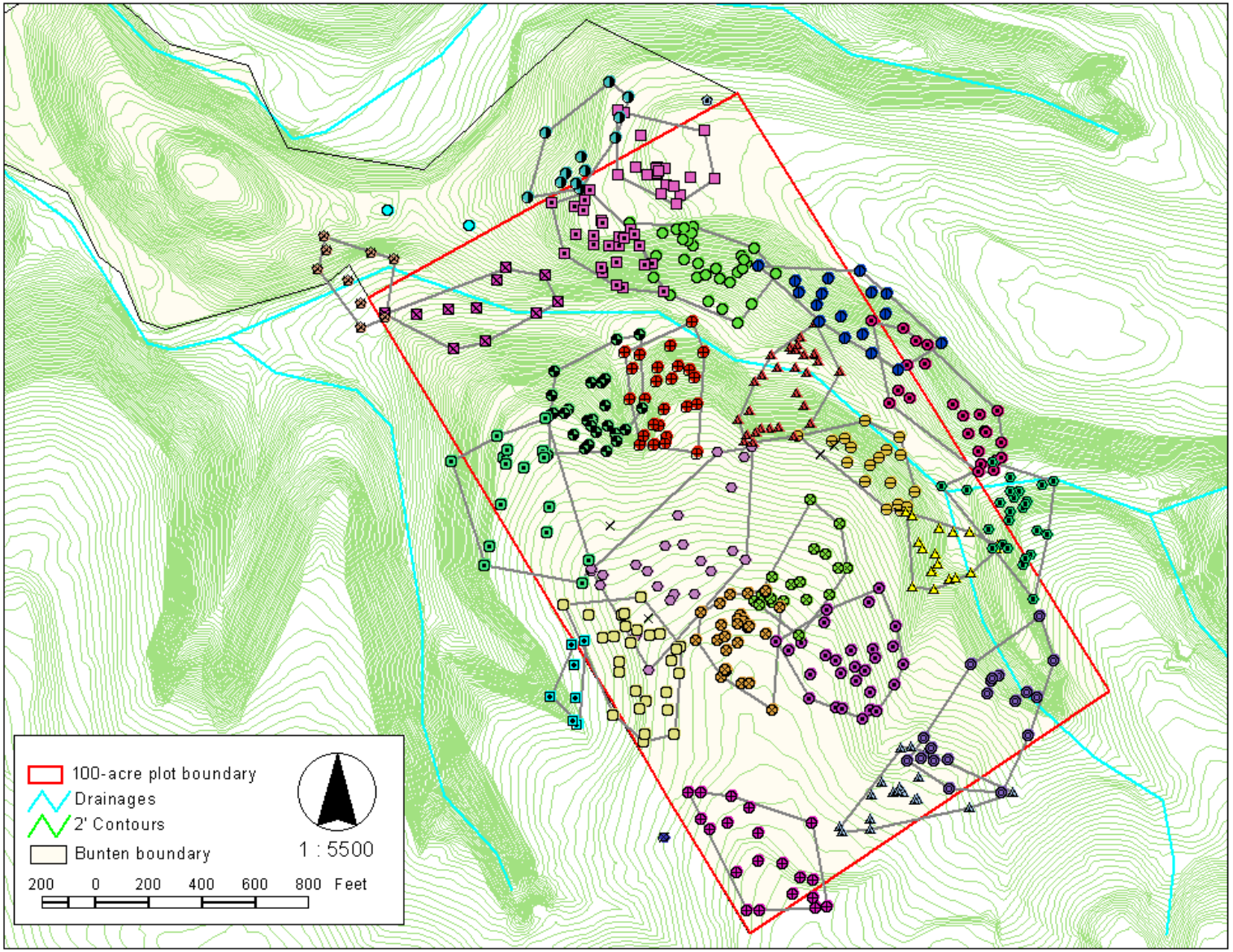

Figure 12. 2003 GCWA territory locations on the Bunten 100-acre study plot. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female and fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observations of a warbler not assigned to a territory.

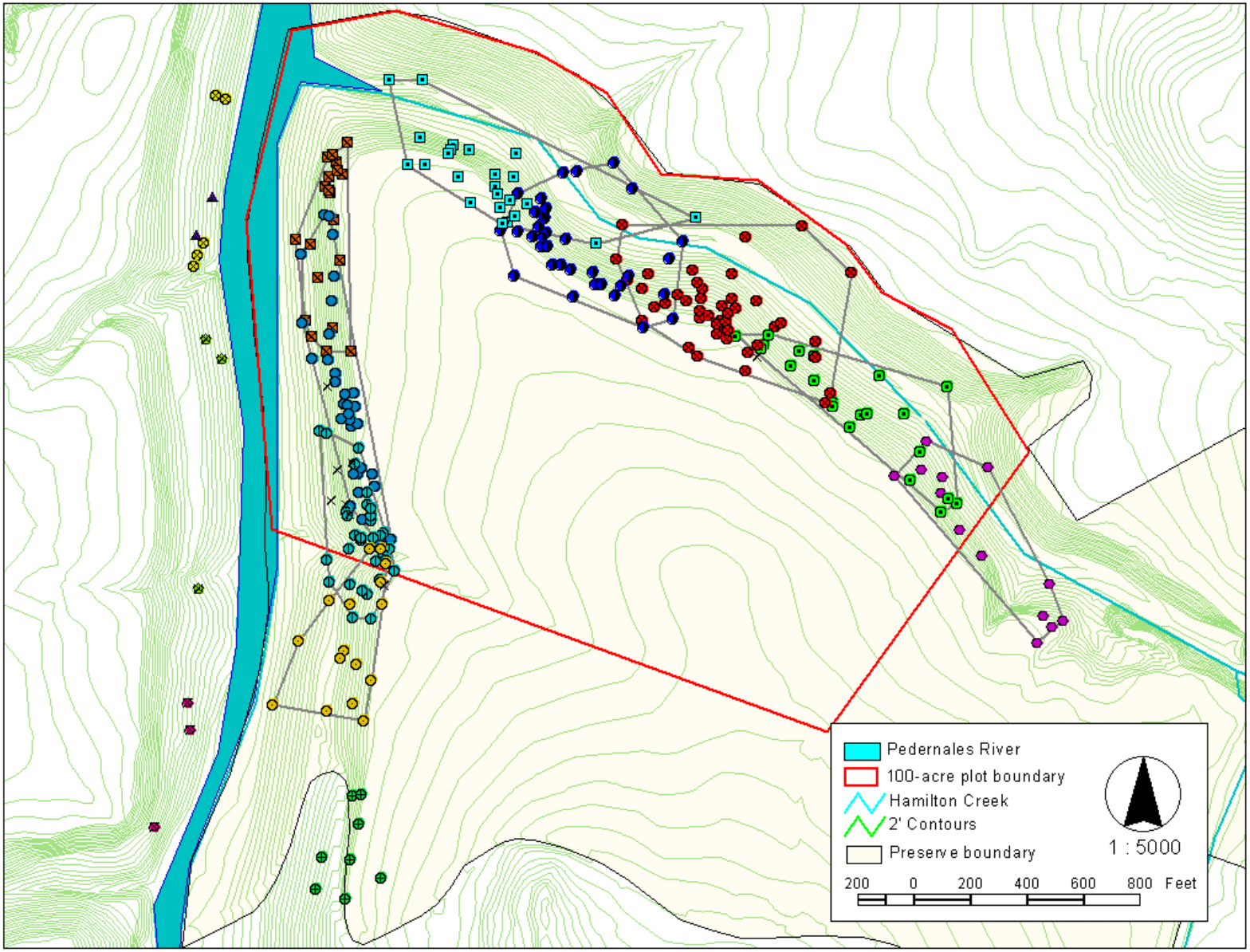

Figure 13. 2003 GCWA territory locations on the Hamilton Pool Preserve 100-acre study plot. Polygons enclose like-symbols that denote repeated observations of a territorial male, or the female and fledglings associating with that male. Like-symbols not enclosed by a polygon indicate repeated observations of a non-territorial male. “x” denotes an observations of a warbler not assigned to a territory.

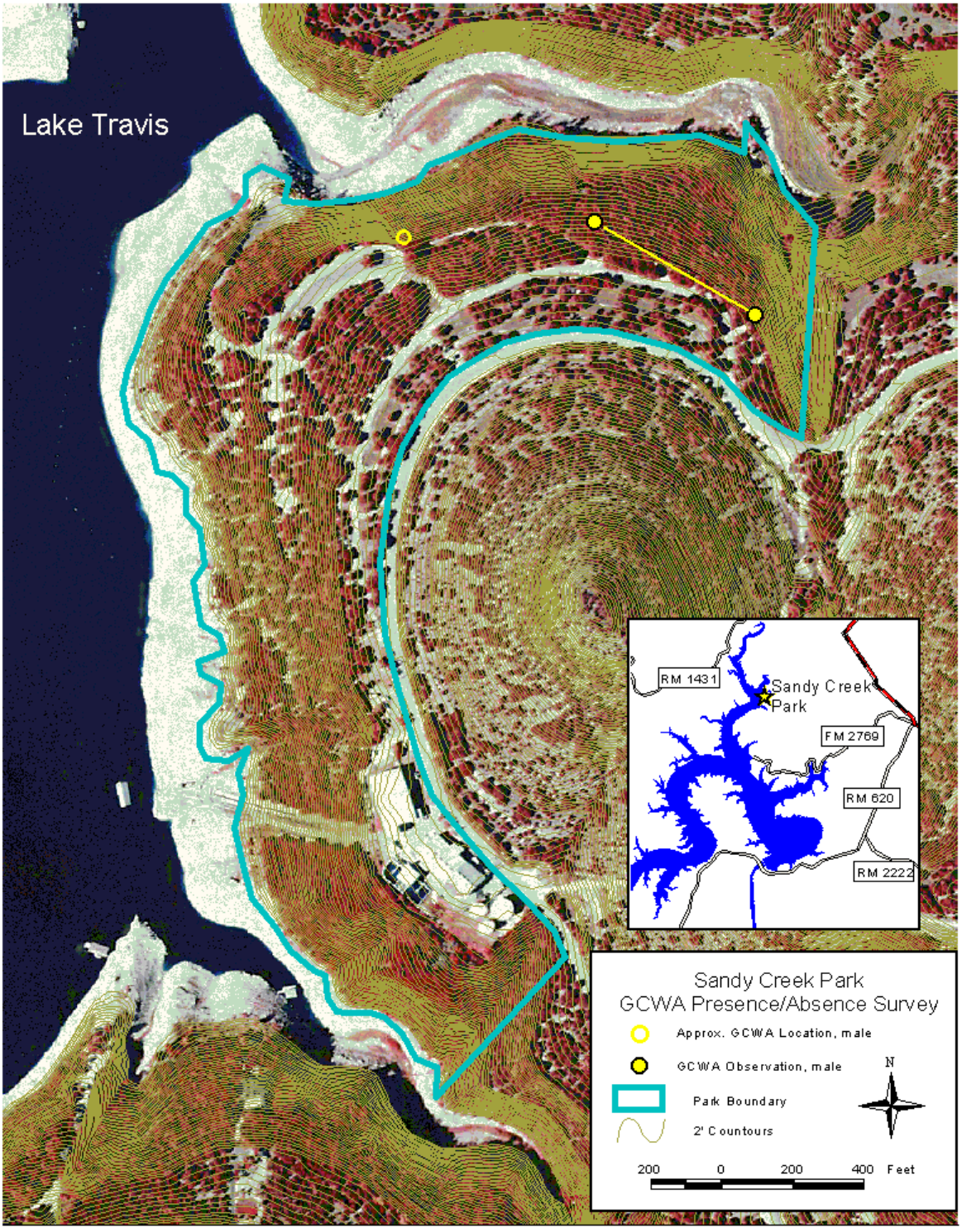
Lake Travis
RM 1431
Sandy Creek Park
FM 2769
RM 620
RM 2222
Sandy Creek Park
GCWA Presence/Absence Survey
Approx. GCWA Location, male
GCWA Observation, male
Park Boundary
2' Countours
N
200
0
200
400
Feet

Figure 14. Locations of GCWA male(s) at Sandy Creek Park, presence/absence survey, April 30, 2003.

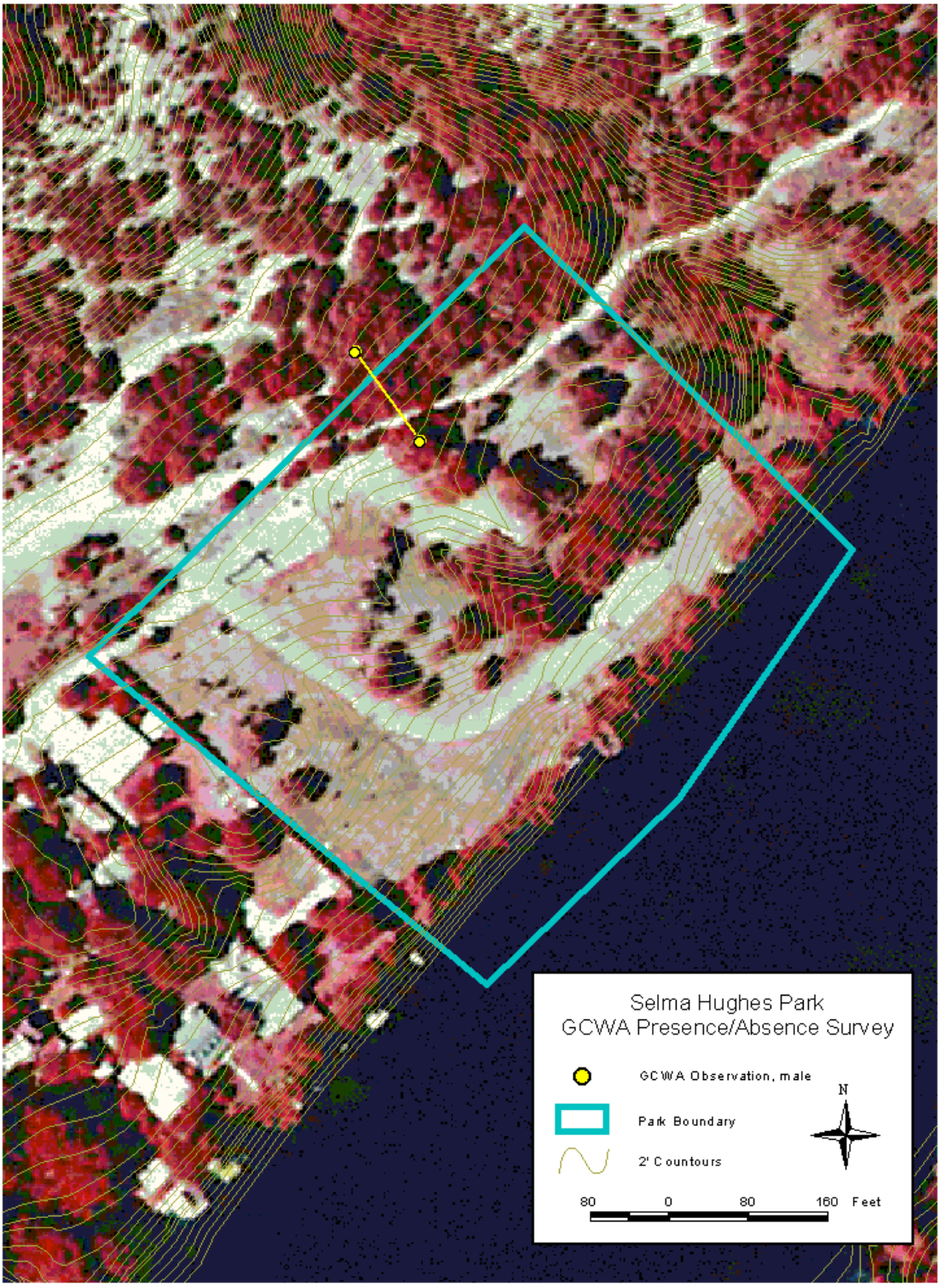
Selma Hughes Park
GCWA Presence/Absence Survey
GCWA Observation, male
Park Boundary
2' Countours
N
80 0 80 160 Feet

Figure 15. Locations of GCWA male at Sema Hughes Park, presence/absence survey, May 1, 2003.