

**FY 2011 Report on Monitoring of the
Golden-cheeked Warbler (*Setophaga chrysoparia*)
on Travis County's Balcones Canyonlands Preserve**



Photo: Melody Lytle 2011

Travis County
Department of Transportation and Natural Resources
Natural Resources and Environmental Quality Division



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INTRODUCTION

In the United States and Canada, 448 native bird species breed in terrestrial habitats (Rich et al. 2004). About 200 of those species, commonly known as neotropical migrants, breed in North America and winter in Mexico, Central America, South America, and the Caribbean (Sibley 2001). A majority of neotropical migratory bird species face population declines due to habitat loss, degradation, and fragmentation (Rich et al. 2004). Partners in Flight, the U.S. Fish and Wildlife Service (USFWS), and many other cooperating agencies are actively developing recovery and conservation plans, acquiring critical habitat, and educating the general public about bird conservation issues in order to slow or prevent further population declines.

In 1990, the USFWS listed the Golden-cheeked Warbler (*Setophaga chrysoparia*, hereafter GCWA), a neotropical migrant, as federally endangered as a result of habitat loss and fragmentation due to suburban development, reservoir construction, and agricultural use (USFWS 1990, Ladd and Gass 1999). The Golden-cheeked Warbler breeds exclusively in central Texas where suitable oak-juniper (*Quercus spp.-Juniperus ashei*) woodlands and forest are present (Ladd and Gass 1999, Pulich 1976). In Travis County, development has expanded rapidly westward from the city of Austin in recent decades, accelerating the loss and fragmentation of GCWA habitat. In 1996, the Balcones Canyonlands Conservation Plan (a Habitat Conservation Plan) was approved by the USFWS. This 10(a)1(b) permit is jointly held by the City of Austin and Travis County to mitigate for the incidental “take” of habitat due to development and to facilitate the local recovery of the warbler and seven other endangered species (USFWS 1996a). The permit requires a minimum of 30,428 acres of endangered species habitat in western Travis County be set aside as a preserve for these species. This preserve system, the Balcones Canyonlands Preserve (BCP), is managed by various entities, including Travis County. As of Fiscal Year 2011 (FY11), Travis County managed 7,339 acres within the BCP (Figure 1).

Travis County has been monitoring GCWAs on the BCP and other county-managed properties annually since 1996. (Travis County Natural Resources 1996; 1997; 1998; 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008; 2009; 2010). In FY11, Travis County Natural Resources staff monitored GCWAs on ten BCP tracts covering 1392 acres (351 hectares) (Figure 2; Table 1). Territory mapping of entire preserve tracts was conducted on the King, Attwood, Blake, Spezia, New Life, Crossings, Toops, Sam Hamilton Memorial Reserve East, Grandview Hills North, and Steiner Ranch 4 tracts as well as a tract on the

Cypress Creek Macrosite owned by the city of Cedar Park. On each tract, data were collected on male abundance, species distribution, territory density, and territory location.

In addition to these surveys, territory and productivity data were collected on six permanent prime habitat 100-acre (40.4 ha) study plots on the Buntan, Canyon Vista, Hamilton Pool Preserve, Lake Perspectives, Ribelin, and Vista Point tracts. On these plots, data were collected on territory density and location, pairing success, breeding success, and productivity.

Survey methods and data collection on the Canyon Vista, Lake Perspectives and Vista Point plots adhered to the protocol of the GCWA demography study being performed by the City of Austin BCP (see annual report Appendix G). The boundaries of the Canyon Vista and Lake Perspectives plots were modified and/or shifted to accommodate the requirements of this protocol, which calls for square or rectangular plots surrounded by a 100 meter 'buffer' of additional survey area. The Lake Perspectives and McGregor plots, which had been adjacent to each other, were fused into one plot which straddles tracts managed by both Travis County and the Lower Colorado River Authority. Color-banding and resighting of adult GCWA on these plots was performed according to study protocol. Furthermore, additional survey time was allowed on these plots, in order to collect the most complete record of productivity possible. Specifically, each of these sites was visited at least once per week in addition to the standard single six-hour weekly survey. The 'Vireo Ridge' site, situated within a designated Black-capped Vireo habitat area, is described as a 100 acre plot in Appendix G, but we do not include GCWA data from that plot in this report in order to retain continuity with prior reports (but see Appendix G for details).

METHODS

STUDY SITES

The Cypress Creek Unit (832 ac / 337 ha) is located within the Cypress Creek Macrosite (Balcones Canyonlands Preserve 2007) (Figure 1), and contains the King, Attwood, Blake, Spezia, New Life, Crossings, and Toops tracts (Figure 2). This management unit comprises the eastern edge of a ridge that extends northward between FM 2769 and Lime Creek Road in northwestern Travis County. The unit is bounded on the east by the Twin Creeks golf course and subdivision, on the west by the LCRA's Wheless tract, on the north by the Audubon Society's Baker Refuge, and on the south by FM 2769 which follows the course of Cypress Creek. Land use within the unit ranges between diverse oak-juniper woodlands on the mesic east and south facing slopes and draws, and upland areas that have undergone

varying levels of anthropogenic modification. These upland areas are dissected by numerous unimproved roadways and hunting lanes, and much of this area has experienced total or partial clearing in recent decades, resulting in open grassy areas, live-oak savannahs and secondary growth 'cedar brakes'. Geologically, the unit is similar to the neighboring Jollyville Unit, with Edwards Limestone overlying beds from the Walnut and Glen Rose formations. Overhanging rock layers on the rim of the upland areas have produced large shelter caves in several small canyons, some of which may contain archaeological artifacts. The New Life tract features a substantial spring which feeds into Cypress Creek and has been shown to contain Jollyville Plateau Salamanders (see JPS report Appendix K). There is evidence of extensive archaeological looting near the site of the spring, as well as in at least one shelter cave. Wild turkeys and coyotes are common on the unit and there have been several mountain lion sightings reported on the Crossings tract in recent years.

The Sam Hamilton Memorial Reserve East tract is located within the Bull Creek Macrosite (Figure 1 and 2). The tract contains a short section of Bull Creek, and the topography includes upland plateaus that give way to irregular, steep slopes and ravines. Primary soils on this tract are found in the Tarrant series (Soil Conservation Service 1974). Closed canopy oak-juniper woodlands cover the majority of the canyons and slopes. There are several ranch roads, a substantial power line corridor (which makes up the south boundary of the property line), man-made clearings, old dumps, and fences found throughout the tract.

Steiner Ranch Preserve (819 ac/332 ha) is located off RM 620 (Figures 1 and 2) in the North Lake Austin Macrosite (Balcones Canyonlands Preserve 2007) and contains the Steiner Ranch 4 tract. Bounded by FM 620 and Steiner Ranch Road, this tract is largely composed of xeric shrublands (some of which have been manipulated to create Black-capped Vireo habitat), but also contains areas of closed canopy woodlands suitable for GCWA.

The Jollyville Unit (1,909 ac/773 ha) is located in northwest Travis County in the Cypress Creek Macrosite (Balcones Canyonlands Preserve 2007) (Figure 1), and includes the Grandview Hills North tract. The eastern-most canyon of this irregularly shaped tract (referred to by staff as 'SAS canyon' in reference to neighboring SAS corporation) was surveyed for GCWA in 2011 in response to commercial development on a neighboring upland tract. Vegetation in the canyon is highly diverse and is considered high-quality GCWA breeding habitat. The intermittent stream at the base of the canyon is populated with Jollyville Plateau Salamanders.

TRACT TERRITORY MAPPING

Data Collection

Territory mapping of GCWAs was conducted from March 10 to June 1, 2011, on tracts of the Cypress Creek Unit, Sam Hamilton Memorial Reserve East, Steiner Ranch 4, and Grandview Hills North (SAS Canyon portion) tracts (Figure 2). Territory mapping was used to estimate territory density and male abundance, as well as species distribution and territory. All observations (both visual and auditory) of male, female, and juvenile warblers were plotted on hard-copy digital orthophoto maps. For each observation, sex, age, presence of a mate, and number of fledglings observed were recorded. Song type and counter singing were also noted. Avian locations and demographic data were later recorded in an ArcGIS 10 (ESRI, Inc., Redlands, California) geodatabase using the NAD 1983 Texas State Plane Coordinate System.

All potential warbler habitat at each site was surveyed repeatedly over the course of the breeding season. Total survey hours varied according to tract size, terrain, population density of warblers, and number of surveyors (Table 1). Due to limitations inherent to territory mapping methods (i.e. 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).

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

Observations of warblers that could not be differentiated from surrounding individuals with any confidence were designated as "unknown." All observations of brown-headed cowbirds (*Molothrus ater*) and any signs of nest parasitism were also noted.

Data analysis

Abundance was calculated as the sum of all individual male warblers detected at a given survey site, including those observed outside of tract boundaries. 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 were 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 type and 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) suggested counting each edge territory as half (0.5) of a territory (referred to as modified territories hereafter). In the results section, a “low” estimate (full territories only), “high” estimate (full and edge territories weighted the same, i.e. 1.00), and the modified estimate based on Verner’s (1985) method (number of full territories + 0.5 [number of edge territories]) are presented. For each of the surveyed tracts, territory density is calculated as the number of modified territories divided by the number hectares surveyed.

100-ACRE PLOT

Data collection

Establishment of 100-acre permanent plots allows standardized, long-term monitoring of GCWAs and statistical analyses of pair and breeding success and productivity, which is required by the USFWS Habitat Conservation Plan (1996b). In 2011, territory mapping was conducted on six 100-acre permanent plots on the following tracts: Bunten, Canyon Vista, Hamilton Pool, Lake Perspectives, Ribelin, and Vista Point. All of the aforementioned tracts are classified as “prime” sites, which means that more than 75% of each plot contains excellent warbler habitat (Balcones Canyonlands Preserve 2007).

The 100-acre plots were surveyed following the same procedure outlined in the Tract Territory Mapping section, with some exceptions. Territory mapping was conducted between March 22 and June 17, 2011. Surveys started one half hour after sunrise on days when the temperature was $> 55^{\circ}$ F, wind velocity was < 15 mph, and precipitation was light to none. Each of the 100-acre prime study plots were visited a total of 60 hours distributed evenly (i.e. ten 6-hour visits) throughout the season. Two different observers alternately

monitored each 100-acre plot during the survey period. For further information, a general study protocol for 100-acre plots is outlined in the BCP Land Management Plan (Balcones Canyonlands Preserve 2007).

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

Data analysis

Abundance, pair status, breeding status, and territory status for GCWAs on 100-acre plots were determined according to the same criteria as outlined in the previous section on territory mapping. Territory density is given in Table 2 and Table 4 as the number of modified territories (Verner 1985) per hectare. To calculate pair success, breeding success, and productivity, only full territory totals for each tract were used. Full territories were the territories that only fell within the plot boundaries. Pair success was calculated as the number of males (on full territories) determined to have paired with a female divided by the number of full territories (Anders 2000). To determine breeding success rate, full territories with at least one fledgling observed with either the male or female parent were tallied, and then divided by the total number of full territories for the plot (Koloszar and Becker 2000).

Productivity was measured two ways for the 100-acre study plots:

$$1) \text{ Productivity for paired full territories} = \frac{\text{\# of fledglings*}}{\text{\# of paired full territories}}$$

$$2) \text{ Productivity for all full territories} = \frac{\text{\# of fledglings*}}{\text{total \# of full territories}}$$

*Sum of the highest number of fledglings observed at any one time

RESULTS AND DISCUSSION

Golden-cheeked Warbler surveys were conducted between March 10 and June 17, 2011 on a total of 2204 acres. The total amount of time spent surveying was 1254 hours (Table 1).

Table 1. List of Travis County Balcones Canyonlands Preserve (BCP) tracts surveyed for Golden-cheeked Warblers (*Setophaga chrysoparia*) during the 2011 field season. Also included are tract acreages, survey dates and total survey hours for each tract. Plot acreages for Canyon Vista, Lake Perspectives/McGregor, and Vista Point plots include 100 m survey buffer (see Appendix G).

Tract	Acreage Surveyed	Survey Dates	Total Survey Hours
100-acre prime plots			
Bunten	100	3/22/2011-6/17/2011	60
Hamilton Pool	100	3/25/2011-6/08/2011	60
Ribelin	100	3/24/2011-6/10/2011	60
Canyon Vista	170.6	3/16/2011-6/6/2011	230.5
Lake Perspectives/McGregor	170.6	3/17/2011-6/14-2011	255
Vista Point	170.6	3/10/2011-6/7/2011	256.5
Total	811.8		922
Territory Mapping			
Cypress Creek Unit Sam Hamilton Memorial Reserve	867.1	3/10/2011-6/1/2011	208.5
East	335.5	3/18/2011-5/27/2011	92.25
Steiner Ranch #4	132	3/22/2011-4/20/2011	13.5
SAS Canyon	57.5	3/21/2011-5/25/2011	18
Total	1392.1		332.3
Overall Total	2203.9		1254

TRACT TERRITORY MAPPING

Excluding 100 acre prime plots, 1392 acres were surveyed for GCWA territories during the 2011 field season (Table 1). The total abundance of GCWA males on all tracts surveyed (not including 100-acre study plots) was 138. Figures 3 through 7 illustrate territory distribution and abundance for each of the tracts surveyed for GCWA in 2011. 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.

Table 2. Results of the Golden-cheeked Warbler (*Setophaga chrysoparia*) territory mapping on Travis County-managed Balcones Canyonlands Preserve tracts surveyed during the 2011 field season. Golden-cheeked Warblers were also mapped and tallied for the BCP tract owned by the city of Cedar Park which borders the Cypress Creek Unit on its northern edge (included in Cypress Creek Unit totals). Golden-cheeked Warbler male abundance, territory number (full, full and edge, and modified territory number^a), and territory density per acre and hectare are summarized. See methods section for definition of full and edge territory.

Preserve tract or survey area	Abundance	No. of full territories	Total territories (full +edge)	Modified number of territories (MT) ^a	Territory density (Total / ha)	Territory Density (MT / ha) ^b
Cypress Creek Unit	76	43	63	53	0.18	0.15
Sam Hamilton Memorial Reserve East	53	33	45	39	0.33	0.29
Steiner Ranch #4	4	1	2	1.5	0.04	0.03
SAS Canyon	5	0	4	2	0.17	0.09
Average					0.18	0.14

^a Number of full territories + 0.5 (number of edge territories) (Verner 1985)

^b Calculated using the modified number of territories

100-ACRE PRIME PLOTS

Territory Density

In the 2011 field season on the 100-acre prime plots, an average of 15.58 ‘modified’ territories (Verner 1985) were established per 100 acres or an average of 39 modified territories per 100 hectares (Table 3).

Based on Verner’s (1985) method for calculating territory number, territory density was highest at Bunten with 61 territories per 100 hectares (one male per 1.6 ha). Ribelin had the second highest territory density of 56 territories per 100 hectares or one male per 1.8 hectares. Hamilton Pool had the lowest territory density (17 territories per 100 ha or one male per 5.9 ha) (Table 3).

Exhibit A includes comprehensive territory density data for all 100-acre plots surveyed by Travis County since the inception of the BCP.

Table 3. Results of the 2011 Golden-cheeked Warbler (*Setophaga chrysoparia*) territory mapping on Bunten, Canyon Vista, Hamilton Pool, Lake Perspectives, Ribelin, and Vista Point prime habitat 100-acre study plots on Travis County-managed Balcones Canyonlands Preserve tracts.

100-acre Prime Study Plot	Abundance	No. of full territories	Total territories (full +edge)	Modified number of territories (MT)	Territory density (Total / ha)	Territory Density (MT / ha)
Bunten	30	19	30	24.5	0.74	0.61
Canyon Vista	27	10	22	16	0.54	0.40
Hamilton Pool	9	6	8	7	0.20	0.17
Lake Perspectives/McGregor	19	5	10	7.5	0.25	0.19
Ribelin	34	19	7	22.5	0.17	0.56
Vista Point	19	15	17	16	0.42	0.40
Average	23.00	12.33	15.67	15.58	0.39	0.39

Results include abundance, number of territories (full, full and edge, and modified), and territory density.

^a Number of full territories + 0.5 (number of edge territories) (Verner 1985)

^b Based on calculation of the modified territory number listed in column 4

Figures 8 through 13 illustrate territory distribution and abundance for each of the 100-acre prime study plots surveyed. Differences in territory density between prime plots may be attributed to site-specific characteristics, although other factors such as age structure of the local population, inter-specific competition, and conspecific attraction may also play a role. Although all prime study plots contain areas of excellent warbler habitat, there are differences between plots with regard to the proportion and spatial distribution of excellent and marginal habitat, as well as, the length of the perimeter along plot boundaries (see Campbell 1995 for descriptions of *excellent* and *marginal* warbler habitat).

Pairing Success, Breeding Success, and Productivity

Across all six 100-acre prime plots, the average pairing success (for full territories) was 86% (Table 4). The highest proportion of successfully paired full territories (100%) occurred at Lake Perspectives.

Breeding success on the 100-acre study plots ranged from 33-84% with an average of 63% of pairs successfully raising a brood. Plots averaged 2.42 fledglings per successfully paired territories (range: 1.2 to 2.63), and each full territory averaged 1.77 fledglings (range: 1 to 2.86) (Table 4).

Exhibit B includes comprehensive productivity data for all 100-acre study plots surveyed by Travis County since the inception of the BCP.

Table 4. Golden-cheeked Warbler pairing success rate, breeding success rate, and productivity per successful pair and full territory for the six Travis County prime habitat 100-acre prime plots.

100-acre Prime Study Plot	No. of full territories	No. of territories w/ female	No. of territories producing ≥ 1	Pairing Success	Breeding Success	Productivity per successful pair	Productivity per full territory
Bunten	19	14	12	0.74	0.63	2.5	1.84
Canyon Vista	10	7	6	0.7	0.6	2.5	1.5
Hamilton Pool	6	5	2	0.83	0.33	1.2	1
Lake Perspectives/McGregor	5	5	3	1	0.6	3	1.8
Ribelin	19	18	16	0.95	0.84	1.72	1.63
Vista Point	15	14	11	0.93	0.79	3.6	2.86
Average	12.33	10.50	8.33	0.86	0.63	2.42	1.77

Data collected during the 2011 field season on the Balcones Canyonlands Preserve in western Travis County, Texas. See methods section for a description of calculations.

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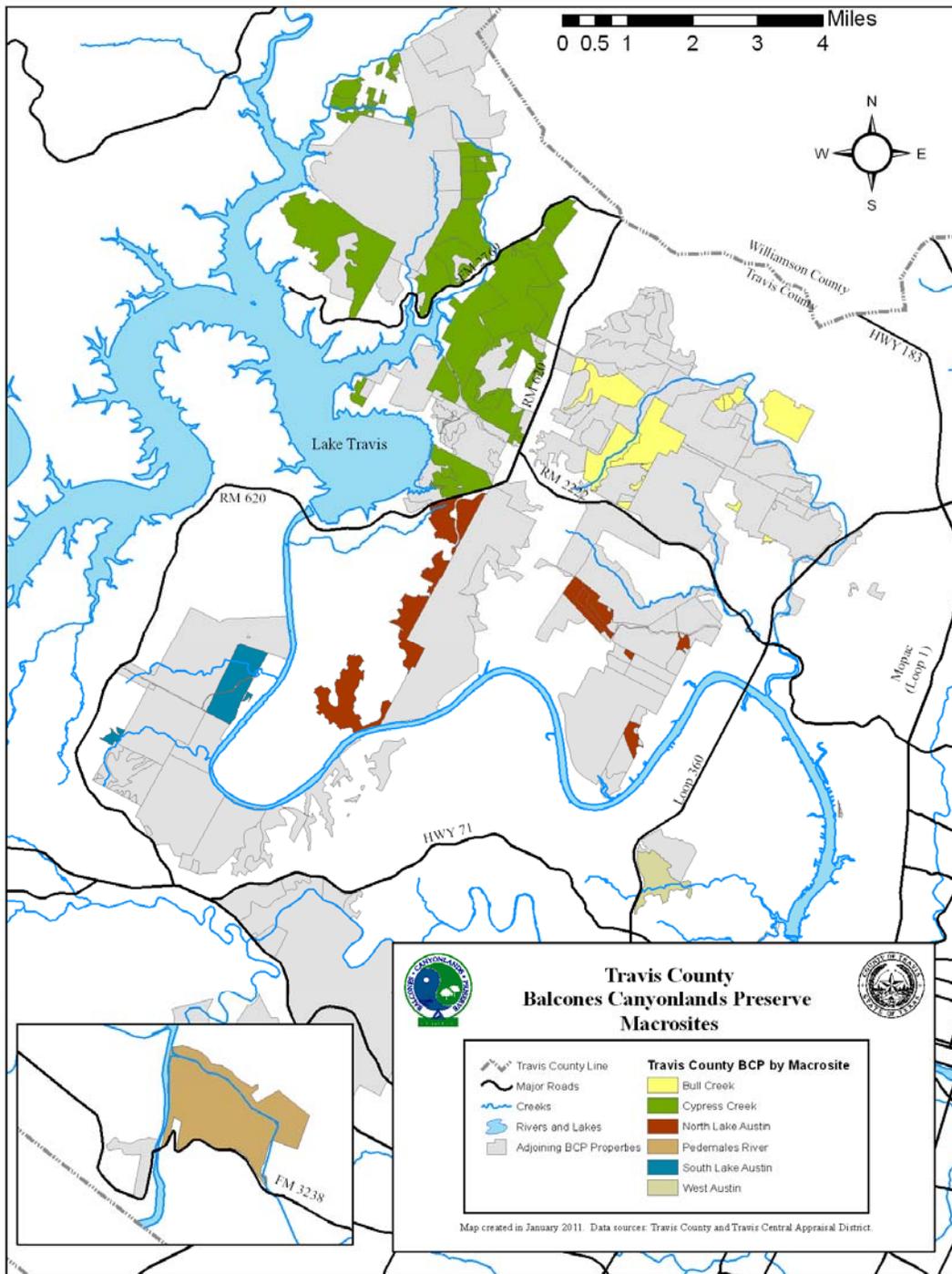


Figure 1. Location of Travis County Balcones Canyonlands Preserve tracts by macrosite.

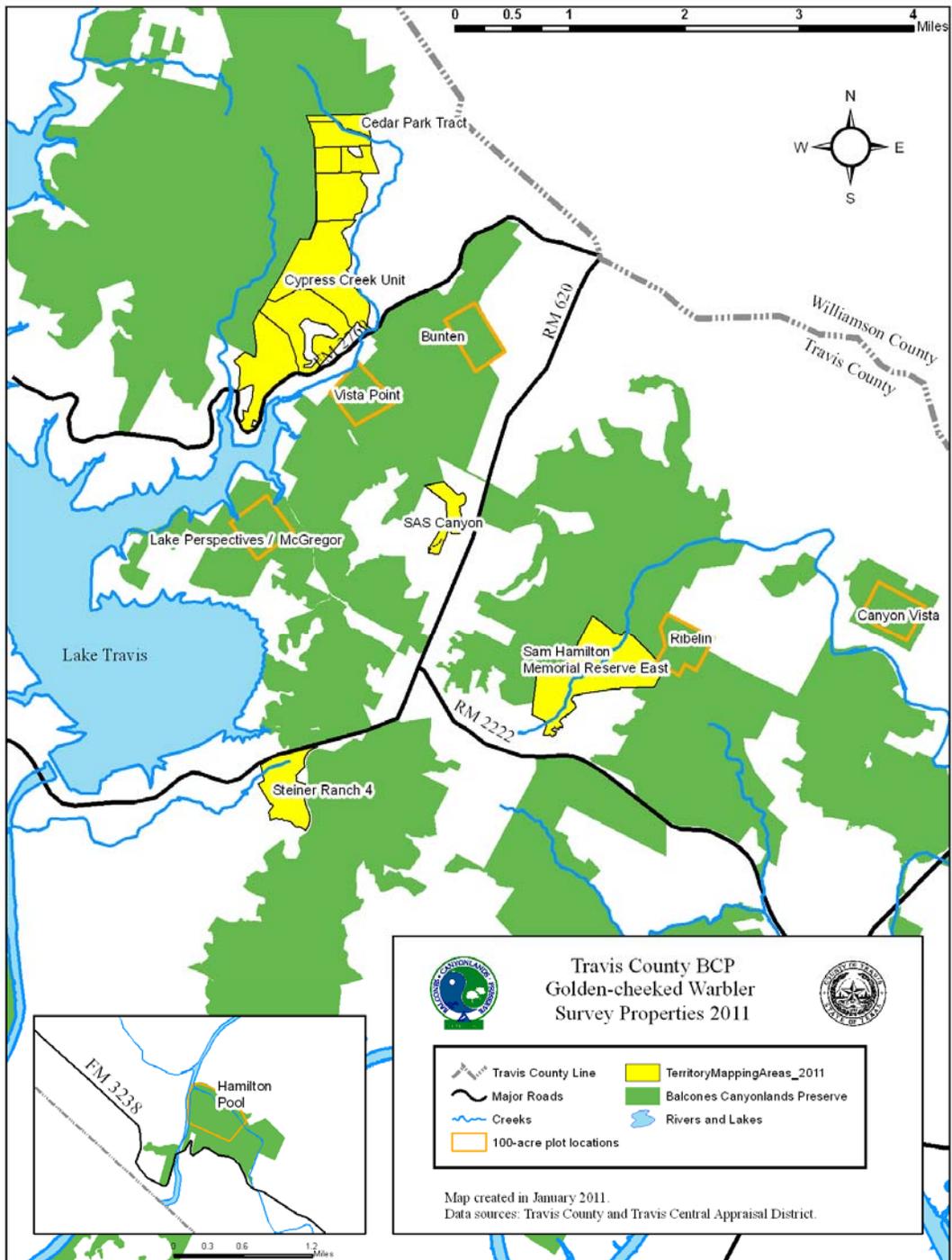


Figure 2. Locations of tracts surveyed for Golden-cheeked Warblers in 2011.

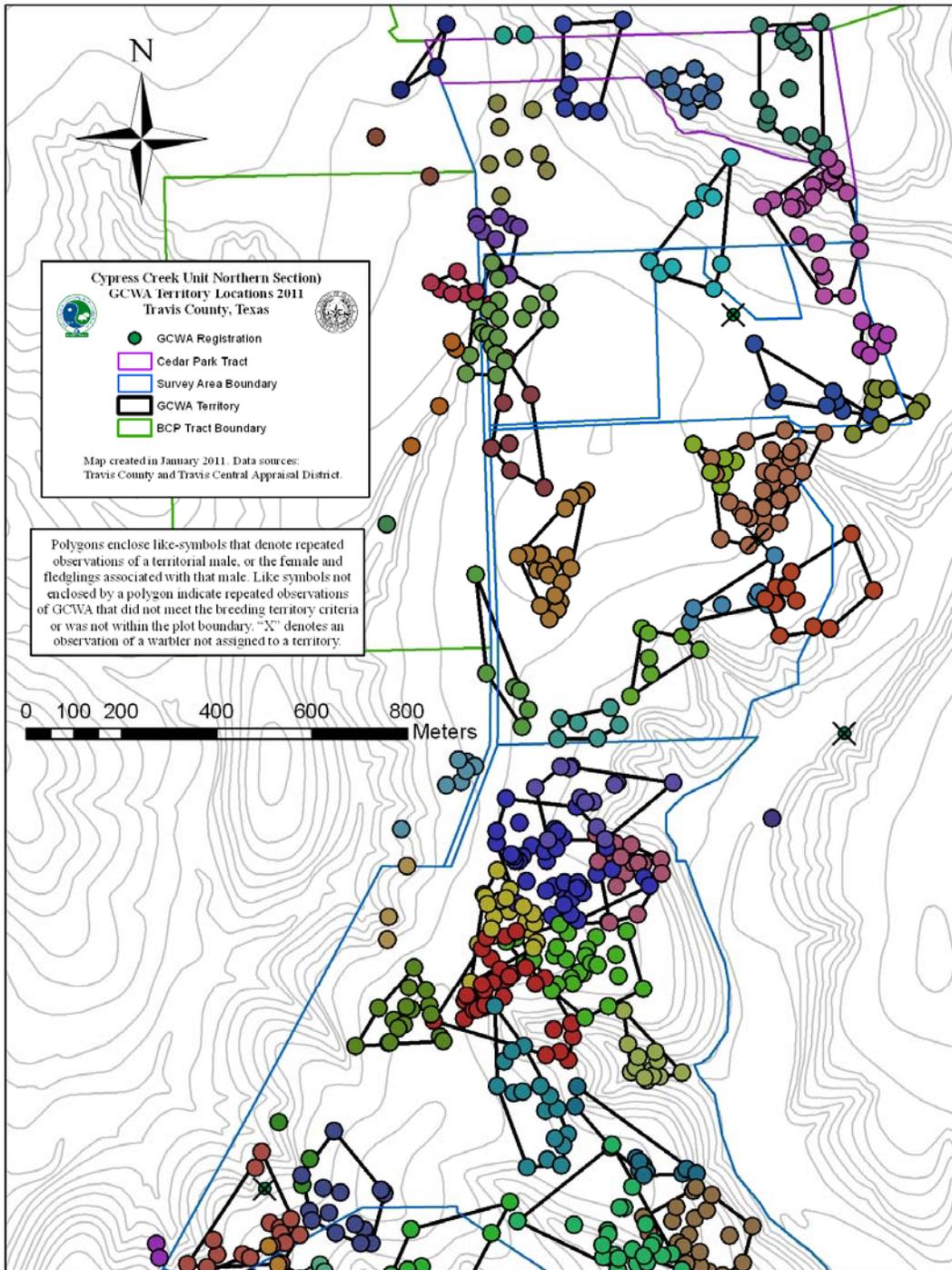


Figure 3. 2011 Golden-cheeked Warbler observations and territory locations on the northern section of the Cypress Creek Unit and Cedar Park tract (Cypress Creek Macrosite).

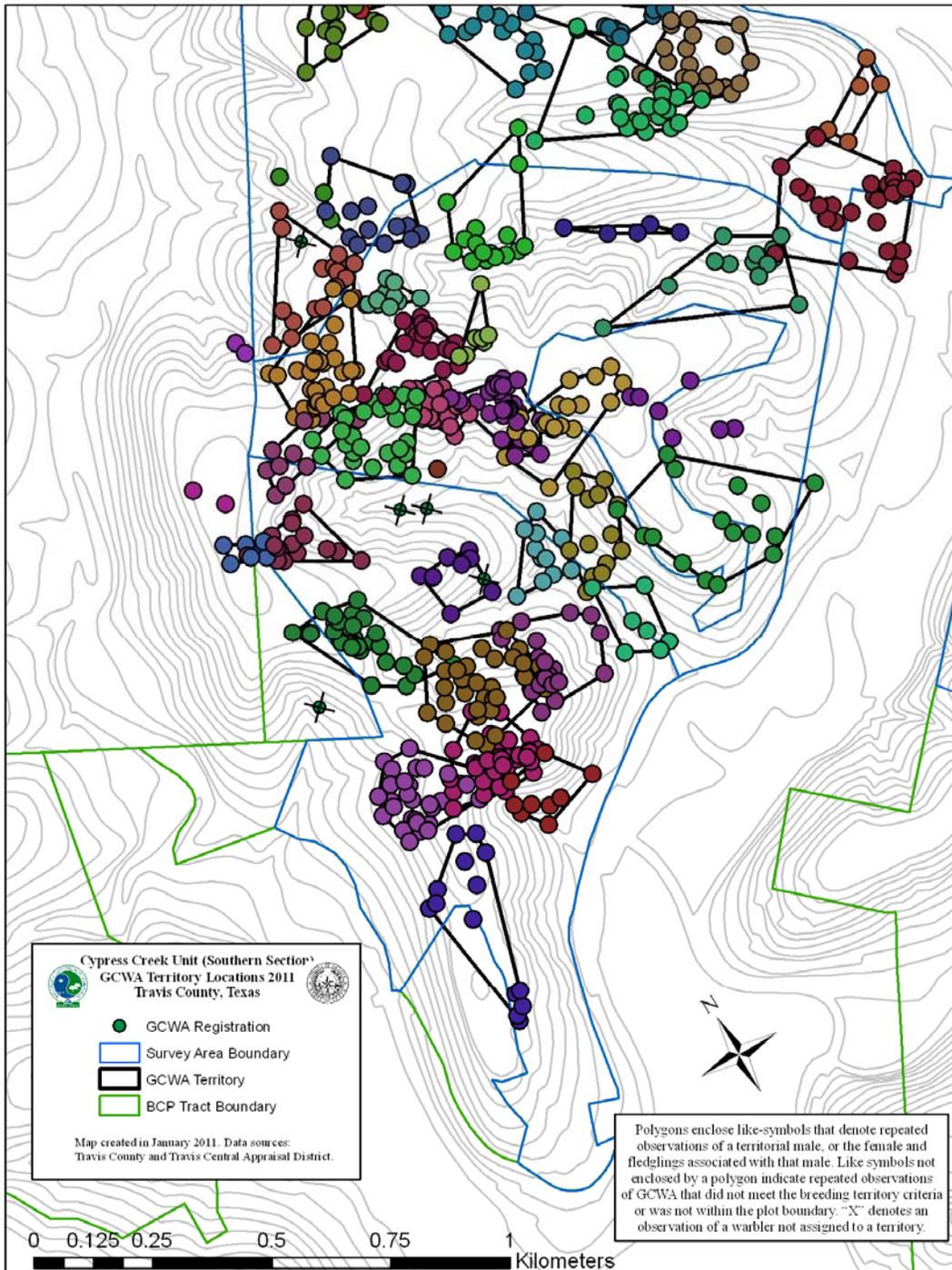


Figure 4. 2011 Golden-cheeked Warbler observations and territory locations on the southern section of the Cypress Creek Unit and Cedar Park tract (Cypress Creek Macrosite).

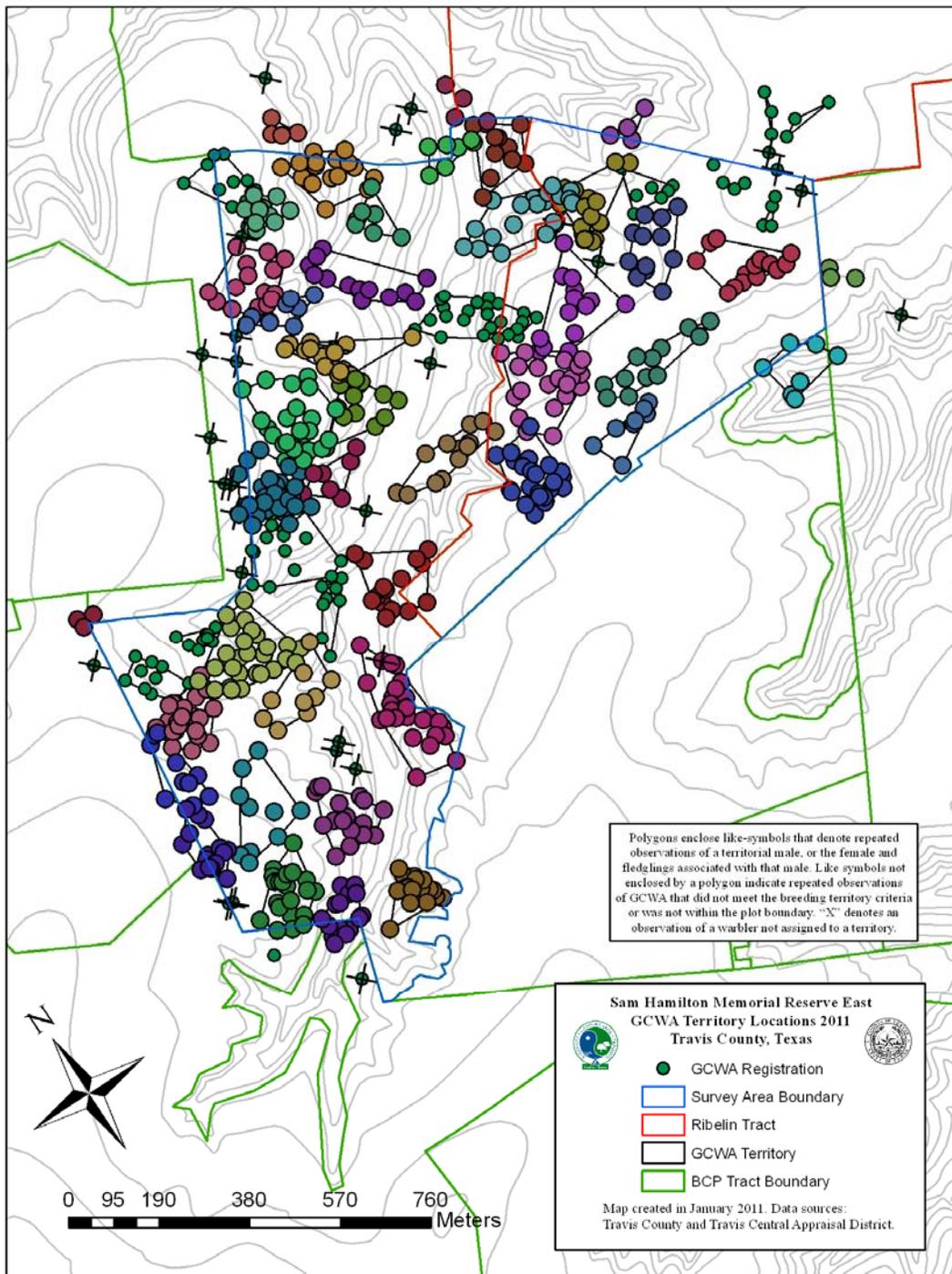


Figure 5. Golden-cheeked Warbler observations and territory locations on the Sam Hamilton Memorial Reserve East tract and adjacent Ribelin tract.

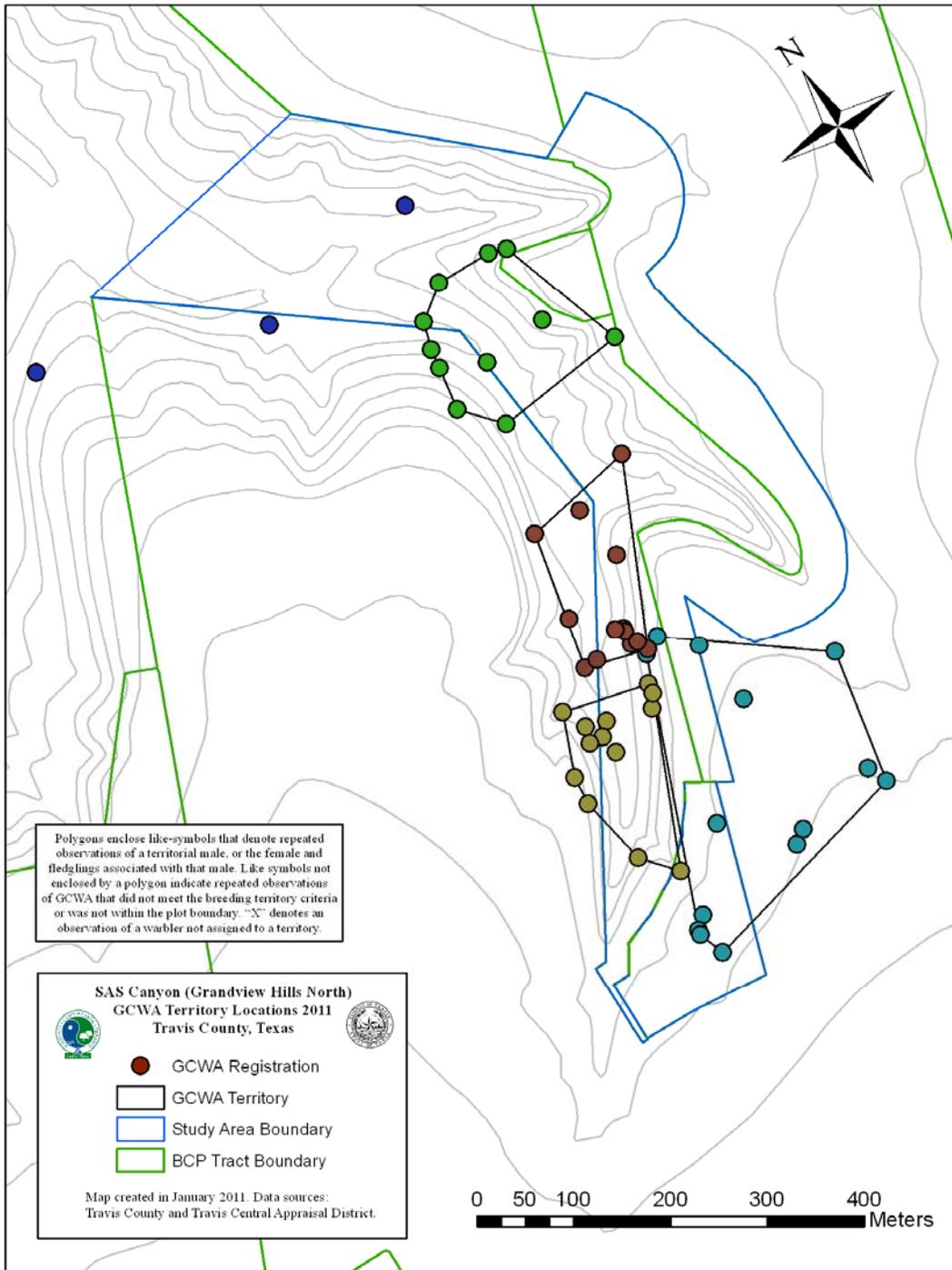


Figure 6. 2011 Golden-cheeked Warbler observations and territory locations on the SAS Canyon portion of the Grandview Hills North tract.

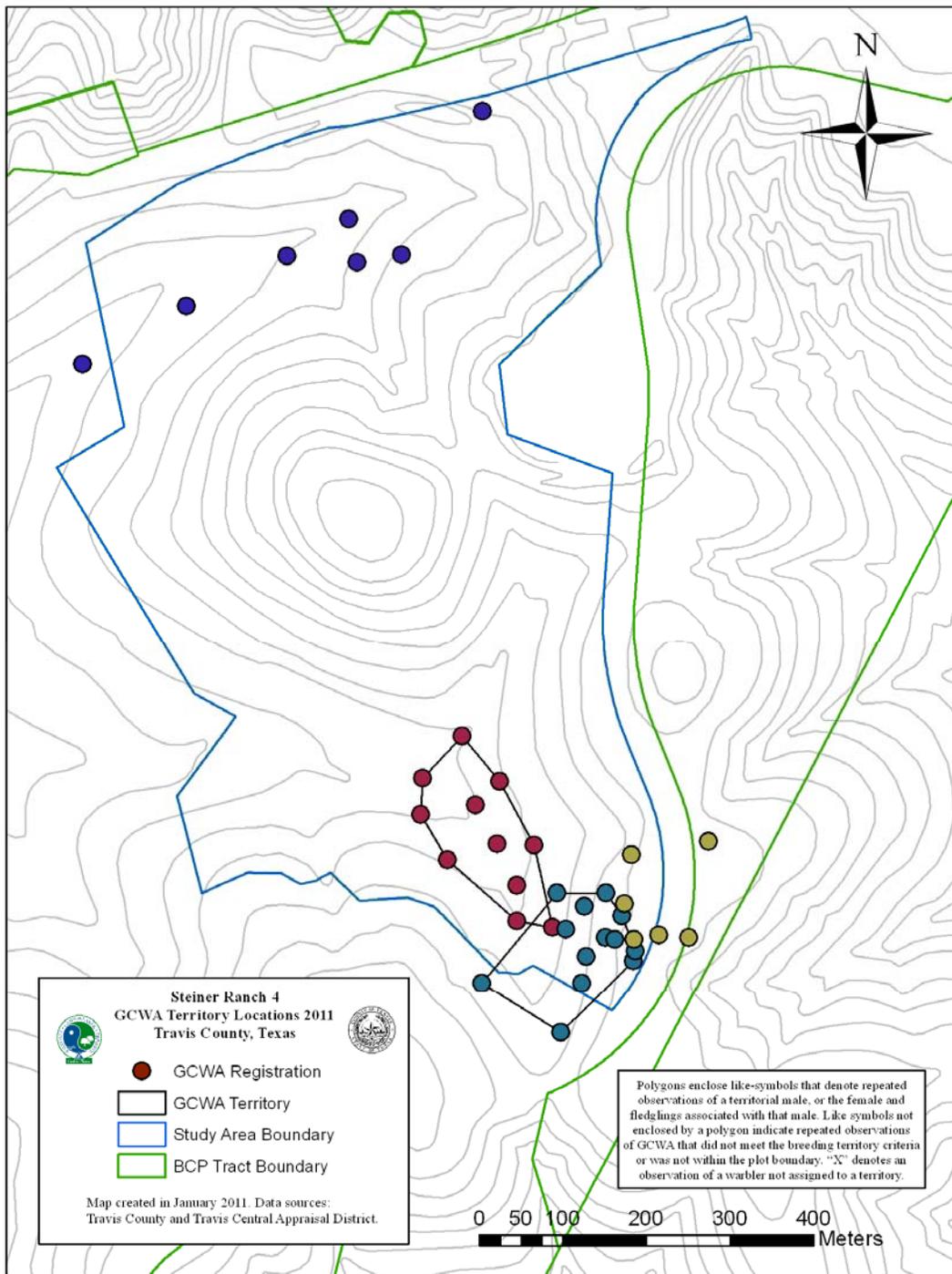


Figure 7. 2011 Golden-cheeked Warbler observations and territory locations on the Steiner Ranch 4 tract.

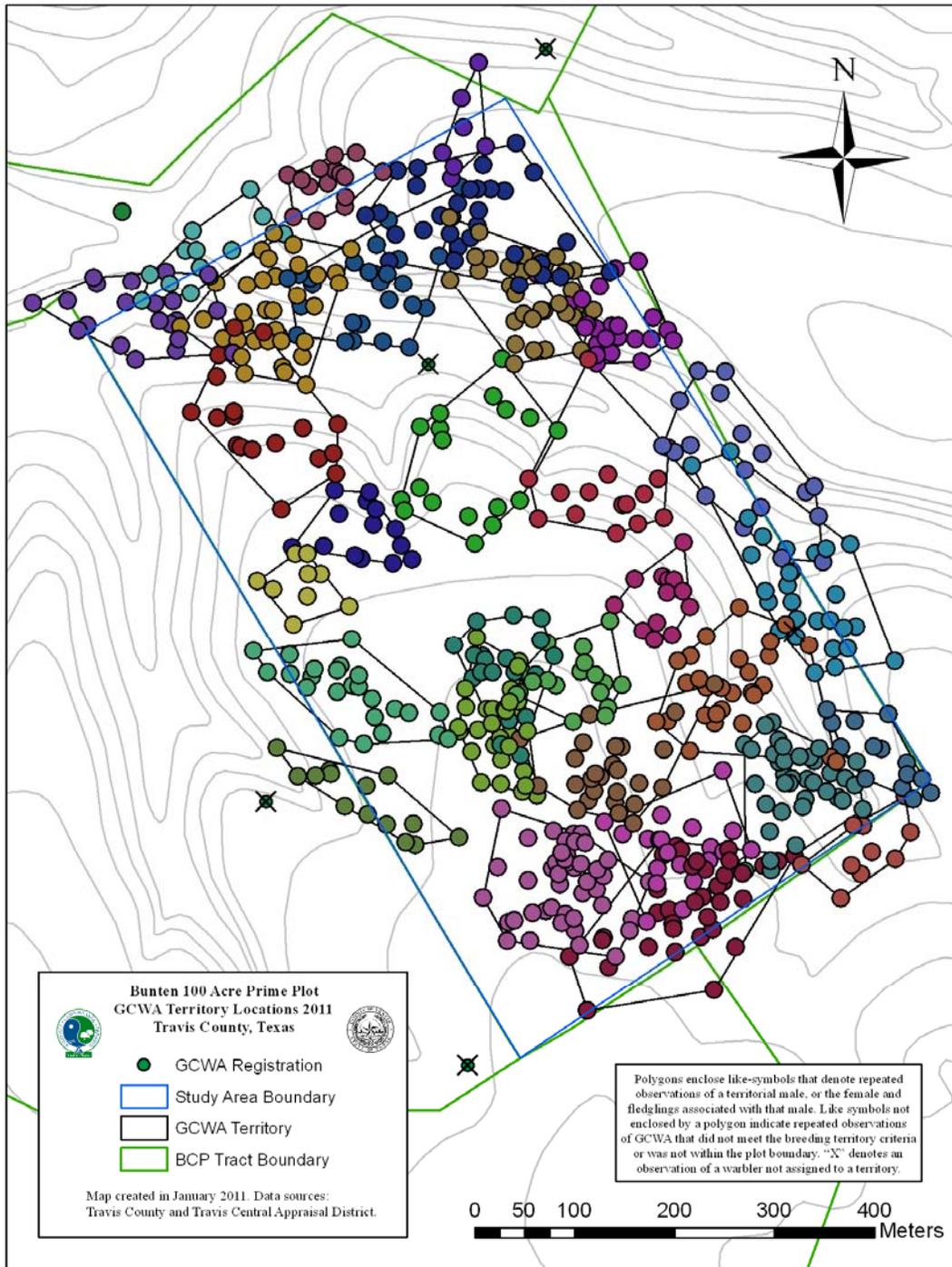


Figure 8. 2011 Golden-cheeked Warbler observations and territory locations on the Bunten prime 100-acre study plot.

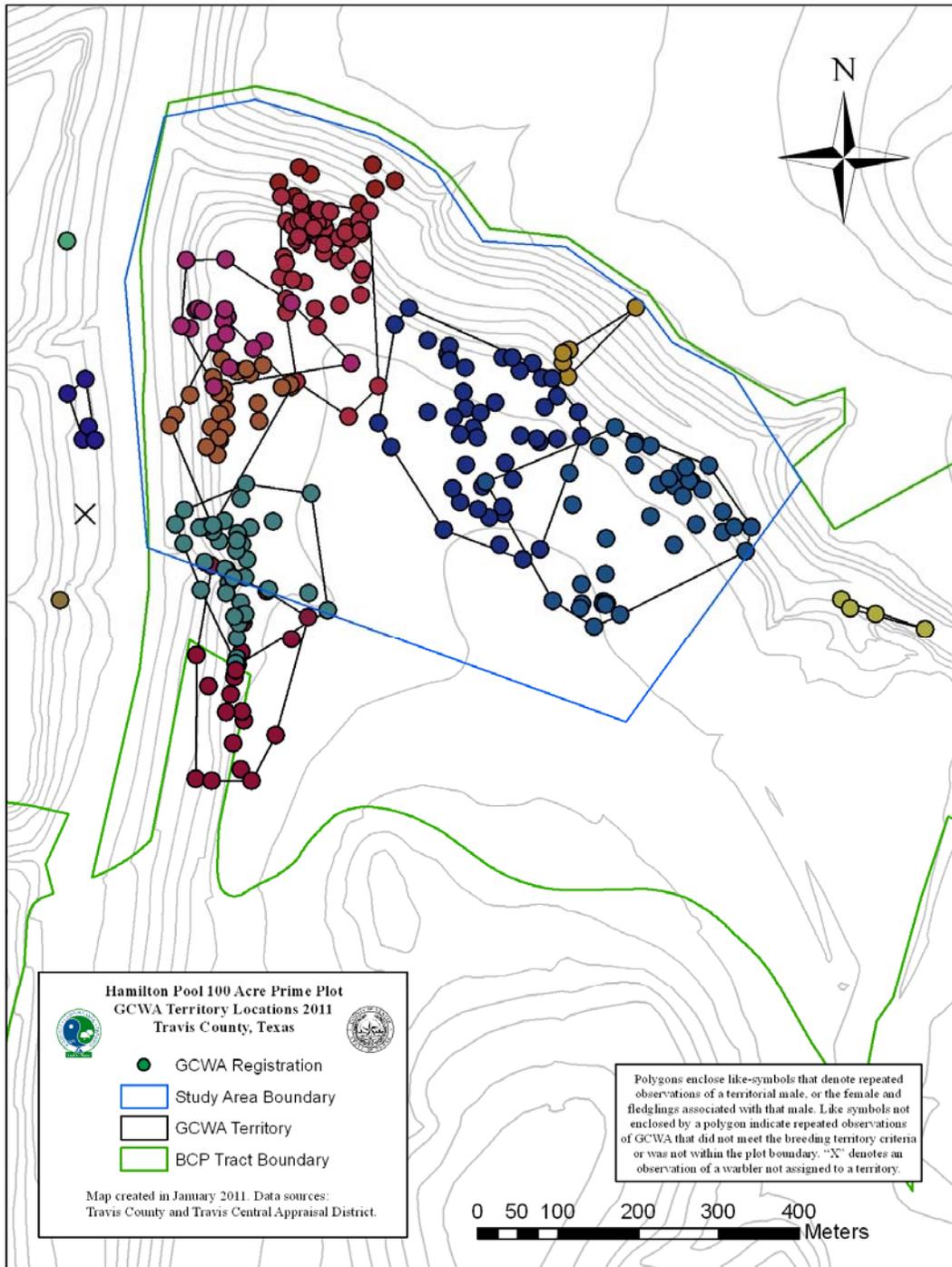


Figure 9. 2011 Golden-cheeked Warbler observations and territory locations on the Hamilton Pool Preserve prime 100-acre study plot.

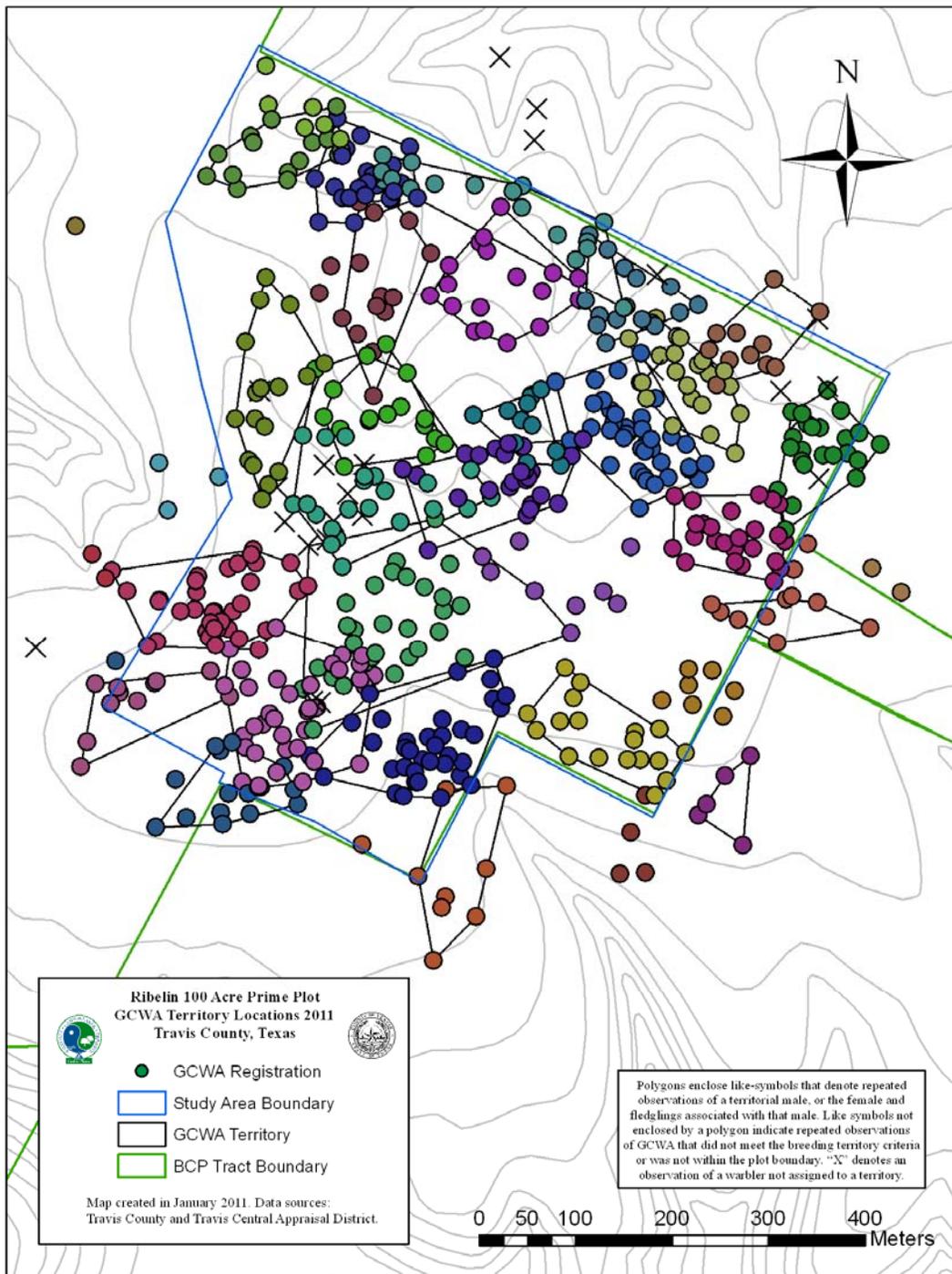


Figure 10. 2011 Golden-cheeked Warbler observations and territory locations on the Ribelin prime 100-acre study plot.

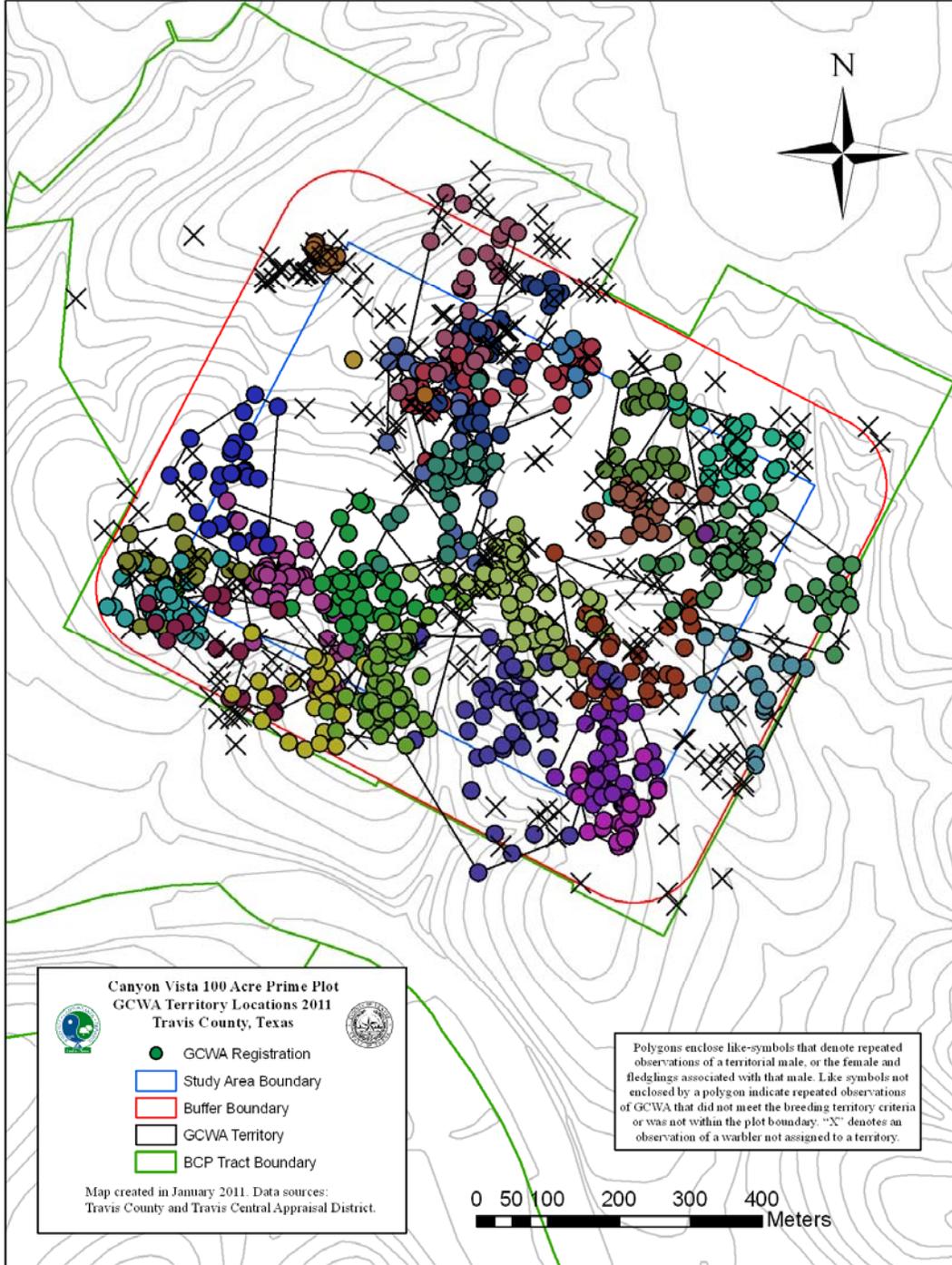


Figure 11. 2011 Golden-cheeked Warbler observations and territory locations on the Canyon Vista prime 100-acre study plot.

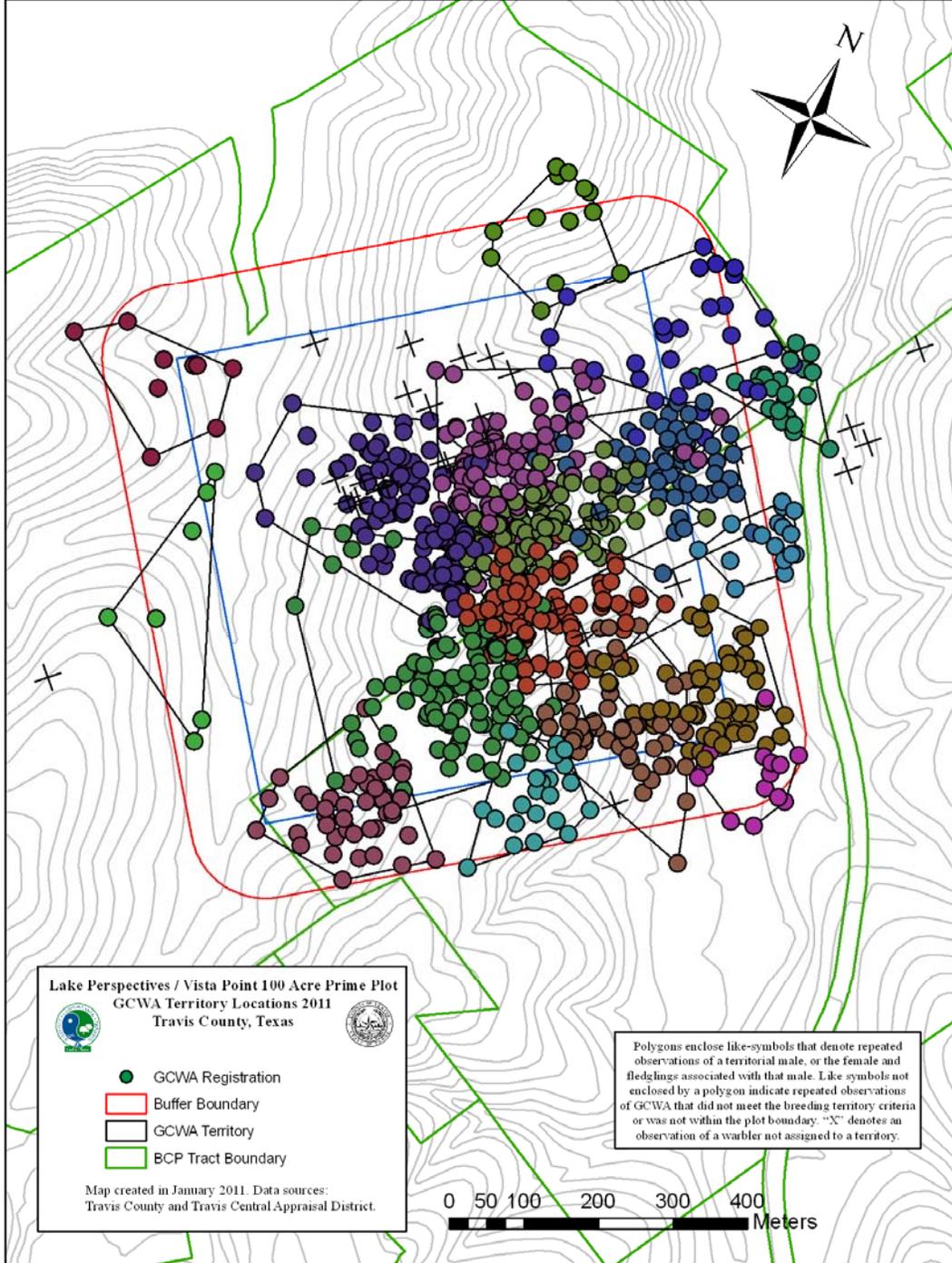


Figure 12. 2011 Golden-cheeked Warbler observations and territory locations on the Lake Perspectives / McGregor prime 100-acre study plot.

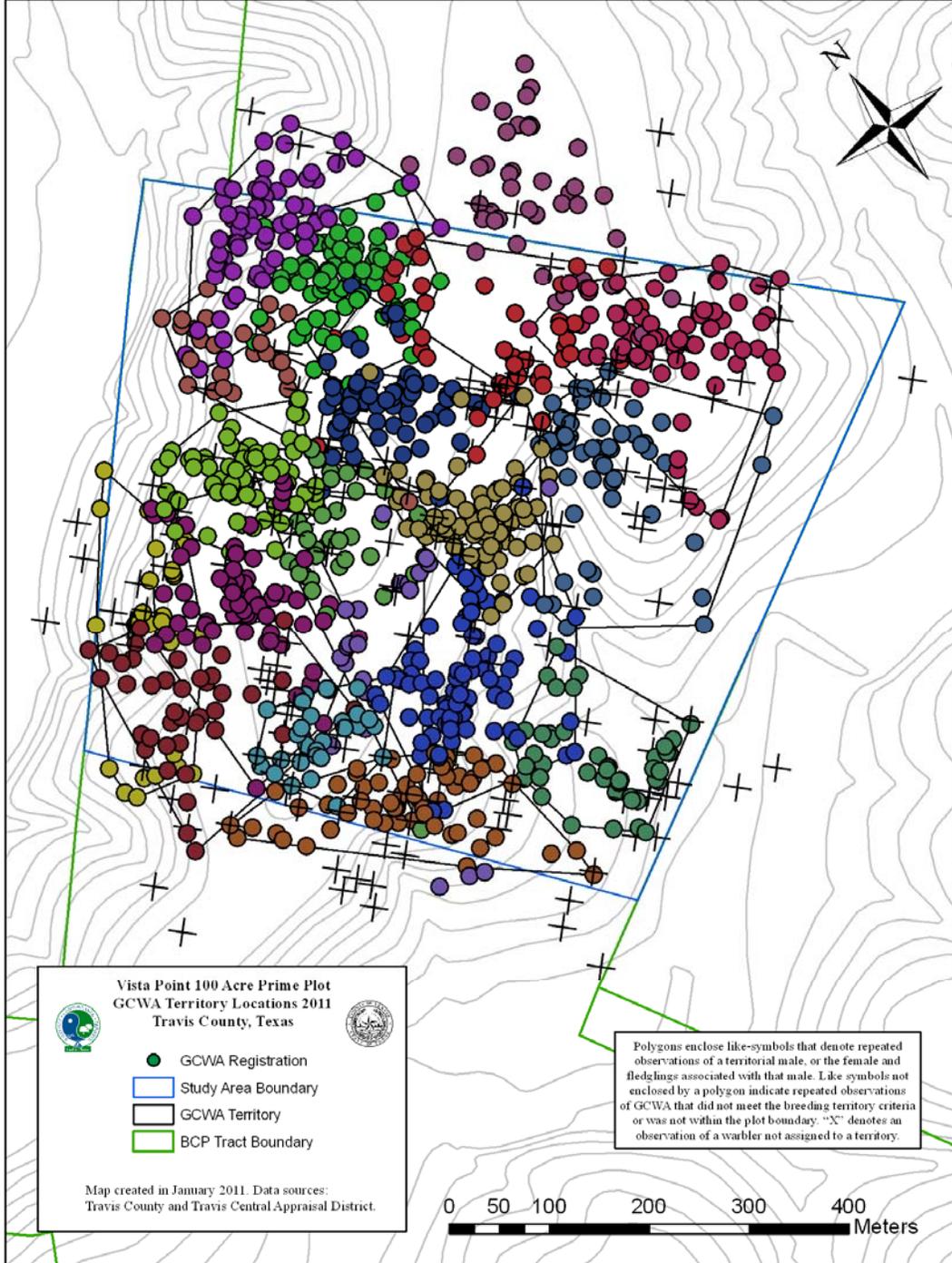


Figure 13. 2011 Golden-cheeked Warbler observations and territory locations on the Vista Point prime 100-acre study plot.

Exhibit A. Past territory density (modified territories, Verner 1985) per 100 hectares of Golden-cheeked Warblers on the six Travis County prime 100-acre plots

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Bunten		45	52	56	65	64	58	52	56	61	56.56
Canyon Vista							40	32	41	40	38.25
Hamilton Pool	16	19	20	17	22	21	20	28	21	17	20.10
Lake Perspectives	28	25	26	24	33	35	33	27	16	19	26.60
Ribelin					50	57	51	46	62	56	53.67
Vista Point								53	46	40	46.33
Average	22.00	29.67	32.67	32.33	42.50	44.25	40.40	39.67	40.33	38.83	40.25

Exhibit B. Past Productivity Data for Travis County prime habitat 100-acre golden-cheeked warbler study plots.

Hamilton Pool	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Pair Success	0.8	0.83	0.86	1	0.38	1	0.71	0.63	0.86	0.83	0.79
Breeding Success	0.4	0.67	0.43	1	0.25	0.57	0.57	0.5	0.29	0.33	0.50
Estimated Brood Size	1.5	2	1.66	1.8	1.5	1.86	1.6	1.8	0.67	1.2	1.56
Productivity	0.6	1.33	0.71	1.8	0.38	1.86	1.14	1.13	0.57	1	1.05

Lake Perspectives	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Pair Success	0.88	1	0.75	0.71	0.55	0.8	0.64	0.38	1	1	0.77
Breeding Success	0.75	0.86	0.5	0.71	0.18	0.7	0.36	0.13	0.75	0.6	0.55
Estimated Brood Size	1.83	2.16	2.25	2.2	0.33	1.88	1.43	0.66	1	3	1.67
Productivity	1.38	1.86	1.13	1.57	0.18	1.5	0.91	0.25	1	1.8	1.16

Bunten	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Pair Success	0.92	1	0.73	0.73	0.95	0.95	0.76	0.72	0.74	0.83
Breeding Success	0.75	0.8	0.67	0.68	0.89	0.58	0.24	0.39	0.63	0.63
Estimated Brood Size	1.89	2.5	2.8	1.75	1.55	1.33	0.85	1.31	2.5	1.83
Productivity	1.42	2	1.86	1.27	1.47	1.21	0.65	0.94	1.84	1.41

Ribelin	2006	2007	2008	2009	2010	2011	Average
Pair Success	1	0.86	0.66	1	0.82	0.95	0.88
Breeding Success	0.93	0.86	0.6	0.92	0.41	0.84	0.76
Estimated Brood Size	2.14	2.33	1.8	1.83	1.5	1.72	1.89
Productivity	2.14	2	1.2	1.83	1.24	1.63	1.67

Canyon Vista	2008	2009	2010	2011	Average
Pair Success	0.57	0.8	0.77	0.7	0.71
Breeding Success	0.36	0.5	0.38	0.6	0.46
Estimated Brood Size	1	1.25	0.9	2.5	1.41
Productivity	0.57	1	0.69	1.5	0.94

Vista Point	2009	2010	2011	Average
Pair Success	0.88	0.87	0.93	0.89
Breeding Success	0.41	0.73	0.79	0.64
Estimated Brood Size	0.87	2	3.6	2.16
Productivity	0.77	1.73	2.86	1.79