City of Austin 2007
Golden-cheeked Warbler *(Dendroica chrysoparia)* and Black-capped Vireo *(Vireo atricapilla)* Monitoring Program

Balcones Canyonlands Preserve Annual Report
Fiscal Year 2006-07



John Ingram



John Ingram

City of Austin Water Utility
Wildland Conservation Division
Balcones Canyonlands Preserve Program

Lisa O'Donnell, Senior Biologist
Kelly Nesvacil and William Reiner, Staff Biologists
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City of Austin

2007 Golden-cheeked Warbler and Black-capped Vireo Monitoring Program

Balcones Canyonlands Preserve Annual Report

FY 2006-07

This report summarizes the results of the City of Austin's 2007 golden-cheeked warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*) endangered species monitoring program. The 2007 field season was the tenth year of endangered species monitoring on the City of Austin's Balcones Canyonlands Preserve tracts.

I. GOLDEN-CHEEKED WARBLER MONITORING

INTRODUCTION

Background

The golden-cheeked warbler (hereafter, warbler) is a neotropical migrant passerine that breeds only in central Texas where mature oak-juniper (*Quercus* spp.-*Juniperus ashei*) habitat occurs (Ladd and Gass 1999). Due to accelerating loss of breeding habitat over the past several decades, this species was listed as federally endangered by the U.S. Fish and Wildlife Service in 1990 (USFWS 1990). The Balcones Canyonlands Preserve (BCP) was established in 1996 in part to mitigate for continuing loss of warbler breeding habitat in western Travis County and to aid in the species' local recovery (BCP 1998). The Balcones Canyonlands Preserve is managed by a number of private and public entities, including the City of Austin. The City of Austin manages 13,367 acres of the BCP.

Objectives

The HCP/EIS of the BCP (USFWS 1996) states that "baseline monitoring studies should concentrate on determining basic population levels on preserve lands, key population parameters, and other ecological parameters that may affect the target species." The primary objectives of the City of Austin's warbler monitoring program to date has been to estimate population size, territory density and trends, productivity, and distribution. The warbler population on the BCP and on the Balcones Canyonlands National Wildlife Refuge (BCNWR) is monitored using a standardized, region-wide program. Population and productivity trends are tracked on a series of 100-acre plots located on the BCP and BCNWR. The City of Austin collects data on territory density, territory location, pairing success, breeding success, and productivity. The City of Austin also conducts territory enumerations over a large area of the BCP to ascertain warbler distribution and to attempt to get a rough estimate of overall territory density.

METHODS

Study Sites

In field season 2007, warbler territories were mapped on six 100-acre "prime" study plots on the BCP. Prime plots are defined as those with >75 percent excellent warbler habitat, i.e. habitat with >70 percent canopy cover (BCP 1998). Prime plots are located on six different BCP tracts: Emma Long Metropolitan Park, Barton Creek Wilderness Preserve, Ivanhoe, Forest Ridge, 3M/St. Edwards, and Bohls (Appendix A). Staff biologists monitor these plots annually.

At least one study plot is located in each Macrosite where the City of Austin owns significant BCP acreage: South Lake Austin (3,127 ac), North Lake Austin (4,047 ac), Bull Creek (3,123 ac) and Barton Creek (1,907 ac). Limited prime habitat in the South Lake Austin Macrosite required establishing the Bohls study plot in an area that does not fully meet the definition of prime plot because it contains less than, but close to, 75 percent excellent habitat. The plot shape also differs from all other prime plots.

Warbler territories were also mapped on two "transitional" plots in 2007: one on the Canyon Creek tract, and one on Double J&T (Appendix A). Transitional plots comprise areas containing zero to a few warbler territories and may improve as warbler habitat within the next 30 years (BCP 1998). Additionally, enumeration surveys were conducted on 22 City-managed BCP tracts comprising 11,018 acres.

Site Description

The topography and vegetation of the surveyed tracts are typical of the eastern edge of the Edwards Plateau. Steep, wooded canyons and riparian corridors dissect drier upland savannahs. Most streams are intermittent, though a few have a permanent water source, such as a perennial spring. The predominant vegetation association is oak-juniper.

It is thought that woodlands in western Travis County were logged in the late 1800s and early 1900s and are currently in various stages of recovery (Keddy-Hector 1996). After clearing, much of the topsoil was lost due to chaining and subsequent goat and cattle overgrazing. On some steep slopes, this soil loss has greatly reduced the revegetation potential. Current and past overbrowsing by white-tailed deer (*Odocoileus virginianus*) has reduced understory floral diversity and species abundance. A distinct browse line is visible on the majority of Preserve tracts. A paucity of certain deciduous woody species is evident throughout the Preserve.

In woodlands and forests, the canopy is dominated by Texas red oak (*Q. buckleyi*), Ashe juniper, plateau live oak (*Q. fusiformis*), shin oak (*Q. sinuata* var. *breviloba*), escarpment black cherry (*Prunus serotina* var. *exsimia*), Texas ash (*Fraxinus texensis*), and cedar elm

(*Ulmus crassifolia*). Common understory species include young Ashe juniper, Carolina buckthorn (*Frangula caroliniana*), yaupon holly (*Ilex vomitoria*), red buckeye (*Aesculus pavia* var. *pavia*), Mexican buckeye (*Ungnadia speciosa*), Lindheimer silk-tassel (*Garrya lindheimeri*) and elbow bush (*Forestiera pubescens*). Descriptions of individual prime plots can be found in Abbruzzese and Koehler (2003), as well as in Tier III Land Management Plans for each property (BCP 1998).

Region-wide Monitoring Program: 100-acre Study Plots

Territory mapping was conducted on eight permanent 100-acre study plots. Each prime plot was monitored for a minimum of 60 hours over ten visits during the breeding season. Prime plots are surveyed each year. The previous minimum level of effort for transitional plots was at least every other year and at least three visits and 18 hours of survey time in the years they are surveyed (BCP 1998). In 2007, survey time for the 100-acre transitional plots was increased to five visits (30 hours).

The monitoring program and data collection protocol are described in detail in the Balcones Canyonlands Preserve Land Managers Handbook, Chapter VIII: Monitoring of the Golden-cheeked Warbler (BCP 1998); the City of Austin Golden-cheeked Warbler and Black-capped Vireo Monitoring Program (Abbruzzese and Koehler 2003); and Appendix B of this document. As with previous years, no playback tapes of warbler songs or calls were used during this season's monitoring.

Analysis of Territory Density on Prime and Transitional Plots. Number of territories on 100-acre plots were calculated in three ways: 1) as a low estimate [only full territories (territories contained entirely within the plot) were counted]; 2) as a high estimate [both full territories and edge territories (territories that straddles the boundary of the plot) were counted as 1.0 territories]; and 3) applying Verner's (1985) method (each full territory counted as 1.0 territory and each edge territory is counted as 0.5 territories). Verner's counting method avoids the upward bias inherent in the IBCC (1970) methodology. Finally, territory density is given as number of territories (using Verner's counting method) per 100 hectares. These calculations were also applied during the previous nine survey years for the 100-acre plots.

Analysis of Pairing and Productivity on Prime Plots. In 2007, productivity and mated status were estimated for full territories only. This methodology was used for data collected from 1998–2005. However, in 2006 all full territories plus randomly selected edge territories were included in pairing and productivity analyses. These territories were collectively called "monitored territories." Results from 2006 may not be simply comparable to results from 2007; as a result, comparisons are not made. It is also important to note that because females and juveniles are often difficult to detect, estimates of their numbers are assumed to be biased low.

A male was determined to be paired if he was observed associating with a female, observed tending young, or a nest was located for that male. The pairing success rate is the number of males determined to have paired divided by the number of full territories.

A territory was considered to have had breeding success if the male or female was observed tending one or more nestlings or fledglings. The breeding success rate is the number of territories determined to have produced at least one nestling or fledgling divided by the number of full territories. Productivity is the sum of all fledglings observed for all full territories. Average productivity is presented in two ways: 1) as the sum of all fledglings divided by the number of pairs that successfully bred (as defined above), and 2) as the sum of all fledglings divided by the total number of full territories.

Fecundity was derived by multiplying the total number of offspring (nestlings or fledglings) produced for all full territories by 0.5 [based on studies indicating a 1:1 ratio of male and female offspring for this species (Anders 2000)] and then dividing by the number of full territories. This gives an estimate of the number of male offspring per territorial male.

Pairing and productivity data were collected only incidentally for transitional plots.

Enumerations

An enumeration is a survey of all male warblers in a given area. This methodology provides information on distribution of the species over a large area. Enumerations require three visits per survey area during good weather conditions (USFWS 1994). Incidental sightings of females and fledglings are also recorded, as are observations of parasitism and potential predators. Surveys were carried out by staff biologists and trained volunteers.

Enumeration surveys were conducted this year on 22 BCP tracts comprising 11,018 acres. For each survey in 2007, observers were directed to allow roughly one hour for each 30 acres of habitat. This survey effort allows staff to cover a large portion of the preserve, but the results are less accurate than those obtained on the 100-acre plots. Surveyors attempted to sort out individual warblers to increase the accuracy of the count. However, significantly less time was spent on enumeration surveys per acre than on 100-acre prime plots. Therefore, enumerations provide only rough estimates of territory number and size due to a limited number of sightings.

Because enumeration survey effort varies among tracts and among years, results are not comparable. In 2007, all or portions of five tracts did not receive a full three visits or the required number of hours: Double J&T, Lanier, Lime Creek, southern Jester, and southern Ivanhoe. However, data collected for the warblers that were observed are still reported for these tracts. The portion of Emma Long Metropolitan Park bounded by Lake Austin, Turkey Creek Trail, City Park Road, and the northern Park boundary had an intensified survey effort

this year. This area was visited five times during the breeding season, an effort comparable to that put forth for the transitional 100-acre plots this year. All of the Water Treatment Plant 4 (WTP4) tract and proposed construction area (240 ac total) was surveyed using the 100-acre prime plot protocol.

A complete list of properties on which enumerations were conducted, acres surveyed, surveyors, and survey effort for each tract are reported. Acreages listed are for the entire tract (minus any 100-acre plot within the tract), not for the warbler habitat within the tract.

RESULTS AND DISCUSSION

100-acre Study Plots

Prime Plot Territory Densities and Locations. In field season 2007, average golden-cheeked warbler territory density for six prime plots was 18.3 territories/100 hectares (range 9.9–49.5, Table 1), a 54 percent decrease as compared to 2006 average territory density (39.7 territories/100 ha, Appendix C). The largest decreases in territory densities occurred at Emma Long and Forest Ridge, losing 34.5 and 29.6 territories/100 ha, respectively. These numbers reflect a 57 percent decrease in territories in both the Emma Long and Forest Ridge plots from 2006 (Appendix C). Territory density also decreased for the Bohls plot with a loss of 6.2 territories/100 ha. This loss equates to a 39 percent decrease for Bohls in 2007 as compared to 2006. Territory density decreased by 16 percent and 17 percent when compared to 2006 data at Barton Creek and Ivanhoe, respectively. The Barton Creek plot lost 3.6 territories/100 ha and Ivanhoe lost 9.8 territories/100 ha. Territory density remained the same in 2007 when compared to 2006 for the 3M/St. Edwards 100-acre plot.

Consistent with 2006 surveys, Ivanhoe had the highest territory densities of all six plots and Bohls had the lowest densities. Variability in plot vegetation may explain in part the low territory density on the Bohls plot. Less than, but close to, 75 percent of habitat on Bohls is prime warbler habitat, whereas on the remaining five plots, prime habitat is >75 percent.

Figures 1–6 (Appendix D) depict warbler territory locations for the six prime plots in field season 2007. 100-acre plot maps depict territories relative to topographic features and to other warbler territories. Polygons represent our best estimate of territory boundaries. Circles have an approximately 45 m radius and represent individual male warblers when enough information was not available to form a polygon. An "X" symbol on the figures represents an observation of a male warbler that does not have enough sightings or other information, such as contemporaneous vocalizations, to assign it to an existing territory or to estimate territory boundaries. A diamond symbol on the figures represents a floater male. Floaters are typically young males observed later in the season only on one or two occasions.

Table 1. Golden-cheeked warbler territory number and territory density (per 100 ha) for six 100-acre prime study plots on the City of Austin Balcones Canyonlands Preserve, Travis County, Texas, field season 2007. See Methods section for calculations.

Prime Plot Name	Survey Hours	No. of Full Territories	No. of Full and Edge Territories	No. of Full Territories + (0.5 x Edge Territories)	Territory Density 100 ha[1]
Barton Creek	61.38	6	9	7.5	18.6
Emma Long	62.25	5	16	10.5	26.0
Ivanhoe	60	16	24	20.0	49.5
3M/St. Edwards	61.98	6	17	11.5	28.4
Forest Ridge	61	4	14	9.0	22.3
Bohls	60.25	1	7	4.0	9.9
Average				10.4	18.3

Increases in territory density on prime plots through 2006 may reflect the continuing loss of warbler breeding habitat in western Travis County. As habitat becomes developed, warblers crowd into remaining habitat patches. In 2007, there was slight to marked decline in territory densities throughout all the plots as compared to more recent years' data (Appendix C). This decline may be explained by natural year-to-year variability inherent in biological populations, a potential negative effect due to crowding of breeding habitat, or possible observer bias as several plots switched observers this year. The 100-acre plot methodology used for warbler monitoring was not designed to assess cause and effect, so testing of the above hypotheses may require a separate methodology and protocol.

The City currently has ten years of monitoring data, and staff is working with researchers at Texas State University to statistically analyze the datasets for long-term trends and the potential for observer bias. The results of these analyses will be included in next year's report. Preliminary data suggest that due to spatial variability among plots, averaging of territory densities among all plots may be invalid and observer bias does not appear to be a major concern when analyzing the entire dataset. For future reports, staff plans to include statistical analyses and interpretation of the monitoring data to assist in ensuring that monitoring and management goals for the BCP are being met.

[1] Calculation based on Verner's counting method.

Prime Plot Pairing Success, Breeding Success, and Productivity. Comparisons among pairing success, breeding success, and productivity data for 2006 and 2007 are not made due to the differing analyses used (Region-wide Monitoring Program: 100-acre Study Plots, Analysis of Pairing and Productivity on Prime Plots, page 3)

In 2007, a total of 38 breeding territories were monitored for pairing and productivity data. Average pairing rate for full territories on six prime plots was 0.70 in 2007 (Table 2). In 2007, Forest Ridge had 100 percent pairing and Barton Creek and 3M/St. Edwards had 83 percent. The pairing rate on Emma Long and Ivanhoe in 2007 was 0.80 and 0.75, respectively. Out of all six plots, Bohls had the lowest pairing rate with no pairing observed.

Average breeding success for full territories on the six plots was 68 percent (Table 2). Full territories on the Forest Ridge tract had 100 percent breeding success, followed by full territories on 3M/St. Edwards and Barton Creek (both 83 percent), Emma Long (80 percent), and Ivanhoe (63 percent). No breeding was observed on Bohls.

Table 2. Golden-cheeked warbler pairing rate, breeding success rate, and productivity on six prime study plots on the City of Austin's Balcones Canyonlands Preserve, Travis County, Texas, field season 2007. Data are based on observations of full territories only. See Methods section for calculations.

Prime Plot Name	No. of Full Territories	No. of Territories w/ Female	Pairing Rate	No. of Territories Producing ≥ 1 Young	Breeding Success Rate	Total No. of Fledglings	Product. per Successful Territory	Product. per Full Territory
Barton Creek	6	5	0.83	5	0.83	13	2.60	2.17
Emma Long	5	4	0.80	4	0.80	9	2.25	1.80
Ivanhoe	16	12	0.75	10	0.63	24	2.40	1.50
3M/St. Edwards	6	5	0.83	5	0.83	16	3.20	2.67
Forest Ridge	4	4	1.00	4	1.00	8	2.00	2.00
Bohls	1	0	0.00	0	0.00	0	0.00	0.00
Average			0.70		0.68		2.08	1.69

A total of 70 fledglings were observed in the full territories in 2007. In 2007, for those territories that did produce offspring, the average productivity for all six plots was 2.08 fledglings. Average productivity for all full territories on all six prime plots was 1.69 fledglings.

In 2007, fecundity (number of male offspring per territorial male) in the prime plots averaged 0.92. Because nests and fledglings are difficult to locate, breeding success rates, productivity and fecundity rates represent minimum estimates only.

Transitional 100-acre Study Plots. Average territory density for the two transitional study plots was 16.1 territories/100 hectares (Table 3). Densities for the Canyon Creek plot decreased slightly in 2007 (16.1 territories/100 ha) as compared to 2006, (19.8 territories/100 ha) and decreased by almost half for the Double J&T plot (2007, 8.7 territories/100 ha; 2006, 16.1 territories/100 ha). Based on incidental observations, only one male was mated on each of the transitional plots and no fledglings were observed in the field.

Figures 7–8 (Appendix D) depict warbler territory locations for the two transitional plots in field season 2007. 100-acre plot maps depict territories relative to topographic features and to other warbler territories. Polygons represent our best estimate of territory boundaries. Circles have an approximately 45 m radius and represent individual male warblers when enough information was not available to form a polygon. An "X" symbol on the figures represents an observation of a male warbler that does not have enough sightings or other information, such as contemporaneous vocalizations, to assign it to an existing territory or to estimate territory boundaries.

Table 3. Golden-cheeked warbler territory number and territory density (per 100 ha) for two 100-acre transitional study plots on the City of Austin Balcones Canyonlands Preserve, Travis County, Texas, field season 2007. See Methods section for calculations.

Prime Plot Name	Survey Hours	No. of Full Territories	No. of Full and Edge Territories	No. of Full Territories + (0.5 x Edge Territories)	Territory Density per 100 ha[1]
Canyon Creek	30.25	3	10	6.5	16.1
Double J&T	30.75	3	4	3.5	8.7
Average				5	12.4

[1] Calculation based on Verner's counting method.

Enumerations

Total enumeration effort in 2007 equaled 839 hours, covering 22 BCP tracts and 11,018 acres (Table 4). An estimated total of 379 territorial warbler males were recorded during enumeration surveys. Total incidental observations from enumerations included 94 females and 122 fledglings. The total estimated number of territorial warblers is a rough estimate only. Enumerations primarily provide information on general distribution of warblers in areas surveyed. It is expected that some territories are missed and some territories are represented as smaller than what they actually are due to being based on a limited number of sightings. For each hour spent conducting enumerations in 2007, an average of 13.1 acres were covered (range: 6.3–45.3 acres/hour for a tract). For each hour spent conducting territory mapping on 100-acre prime plots in 2007, 1.9 acres were covered.

Figures 9–27 (Appendix D) display the distribution of estimated territories and incidentally sighted females and fledglings, given the limitations described above. Circles/polygons displayed on the maps represent best approximations of individual bird territories; polygons were used to represent best approximation of individual bird territories when enough information was available. Circles have an approximately 45 m radius and represent individual male warblers when enough information was not available to form a polygon. An "X" symbol on the figures represents an observation of a male warbler that does not have enough sightings or other information, such as contemporaneous vocalizations, to assign it to an existing territory or to estimate territory boundaries. Female and fledgling observations are summarized and depicted by estimated numbers for a territory. Boundaries for the eight 100-acre plots are depicted on their tract's respective enumeration map; however the 100-acre plot data are not. See Figures 1–8 for 100-acre plot data. Given that the WTP4 tract and proposed construction area were surveyed using 100-acre plot protocols, these areas were mapped using the same methods as other 100-acre plots (Figure 27).

Nest Parasitism

No direct or indirect evidence of nest parasitism of warblers by brown-headed cowbirds (*Molothrus ater*) was reported on any survey in field season 2007. Appendix E contains a summary of brown-headed cowbird management for 2007.

Table 4. Summary of golden-cheeked warbler enumeration surveys on the City of Austin's Balcones Canyonlands Preserve, Travis County, Texas, field season 2007.

Tract Name	Acres Surveyed	Surveyor(s)	Survey Hours
3M/Krueger	235	C. Sperry	27
Barton Creek Wilderness Park and Greenbelt	1,017	S. Haywood	92.5
Bohls	450	J. Beach	43.75
Coldwater/Cowfork	427	K. Nesvacil P. Ramirez	38
Cortaña	1,752	C. Davis W. Reiner	64.5
Double J&T	1,629	J. Beach C. Davis E. Z. Fair	36
Emma Long Park	850	J. Beach	109.3
Forest Ridge	310	D. Lakey K. Nesvacil	18
Franklin	151	M. Sanders	15.5
Hanks	88	M. Sanders	14
Ivanhoe/Beard Trust	896	C. Sperry	62.75
Jester	294	J. Weber L. Weber	20.5
Lanier	133	L. O'Donnell	9.5
Lime Creek	594	M. Cetaruk	18
Long Canyon	450	P. Ramirez	19
Parke West	468	K. Nesvacil	56.7
Reicher Ranch/ Schramm Ranch	820	J. Beach	89.75
Vireo Preserve	214	D. Lakey K. Nesvacil	22
WTP4 (plus proposed construction site)	240	J. Chenoweth	82.5
GCWA Totals	11,018		839.2

II. BLACK-CAPPED VIREO MONITORING

INTRODUCTION

Background

The black-capped vireo (hereafter, vireo) is an endangered, neotropical migrant that breeds in portions of Oklahoma, Texas, and Mexico (Grzybowski 1995). This species was listed by the U.S. Fish and Wildlife Service in 1987. Major threats to the species' survival are habitat loss, habitat fragmentation, and parasitism by brown-headed cowbirds.

The Balcones Canyonlands Preserve was established in 1996 to mitigate for loss of vireo habitat in western Travis County due to exurban sprawl, and to aid vireo recovery. The vireo has been documented on several BCP tracts managed by the City of Austin. The best-studied colony existed at the Black-capped Vireo Research Area. The colony declined steadily from 32 territories in 1987 to just one territory in 1997 (Grzybowski 1989, Steed 1988, Abbruzzese 1998). In 2004, a second-year male vireo was observed briefly at the Vireo Research Area (Becker and Koehler 2004).

A small breeding colony of vireos (three to five territories) has occupied habitat on the Cortaña tract every year since 2000. A part of this colony spills onto the adjacent River Place mitigation tract to the east. Other records for vireos on the City of Austin's BCP tracts for the past decade include sightings of males on Forest Ridge, Ivanhoe, Parke West, and WTP4.

Objectives

The City of Austin's vireo monitoring program focuses on estimating population size, trends, and productivity. To monitor population trends, surveys for vireos are conducted every year using territory mapping methods (IBCC 1970, Bibbey 1992). Data are collected on abundance, pairing, nesting, and productivity. Survey effort is roughly equivalent to golden-cheeked warbler 100-acre prime plots. In addition, because of the threat posed by the brown-headed cowbird, monitoring for direct and indirect signs of cowbird parasitism during field surveys is a high priority.

The BCP is committed to intensively managing cowbirds at all vireo colonies. The BCP has managed cowbirds at the Cortaña colony every year since vireos were first observed there in 2000; management data from 2007 can be found in Appendix E.

Because vireo habitat must continually be created and restored to remain viable, restoration projects are undertaken every year on various City of Austin tracts. Descriptions of projects undertaken in FY 2006-07 can be found in Appendix F. Restoration projects prior to this are described in previous annual reports.

METHODS

Sites and Survey Effort

In field season 2007, vireos were censused on a 39-acre section of the Cortaña tract (total acreage: 1,752). Combined with an 18-acre section of the adjacent River Place Mitigation tract, this parcel makes up the original 57-acre vireo habitat study area that was originally restored in 1996. Vireos detected during other endangered species surveys were also recorded and mapped, and attempts were made to determine their breeding status.

From the Cortaña colony, biologists collected the following data: number of territories, territory location, pairing success, breeding success, parasitism, and productivity. Staff biologists used territory mapping (IBBC 1970, Bibbey 1992) to determine territory numbers and locations. Biologists did not actively search for nests this year. Staff biologists conducted surveys from 3 May to 8 August 2007 for a total of 37.5 hours. A 2.5-hour inspection on October 3 found no vireos remaining on site.

Data Collection and Analysis

Locations of males, females, and fledglings were primarily recorded using a GPS unit with an accuracy of 20–40 feet (Garmin E-trex). Other sightings were recorded on topographic maps at a scale of 1:3,600, using a latitude/longitude grid of 0.001 degrees. Pairing status, breeding success, and number of fledglings produced per pair were determined for each territory. (For methodology and calculations, see Data Collection and Analysis in Part I: Golden-cheeked Warbler) No playback tapes of vireo songs or calls were used during this season's monitoring.

RESULTS AND DISCUSSION

Territory Mapping

In 2007, only two vireos were found on tracts other than Cortaña. The first was a singing male that was observed within the Forest Ridge 100-acre warbler study plot on 2 May 2007. The bird appeared to be a second-year male with a gray nape. It was not seen on four subsequent visits to the site. On 4 June 2007, a singing male was heard on the WTP4 property but was not observed. It was not seen or heard during any of the 10 enumeration surveys.

Four male vireos defended territories on the restored portions of Cortaña and River Place, a decrease of one territory from 2006. Figure 28 depicts territory locations for 2007. The male holding the southern territory did not appear until mid-June, and may have re-located there after failing to attract a mate elsewhere.

Three of the territorial males were after second-year and one (north-central) appeared to be second-year, based upon plumage characteristics described in Pyle (1997). The territories

were situated in the same general areas as four of the territories of the previous year. Unlike last year, there was no territory centered on the top of the knoll in the north-central part of the site, though the male from the territory north of the knoll included part of this area in his territory.

For the first time in four years, male vireos were observed in the southern half of the study area. Over the past two years, there has been intensive restoration of this portion of the site (Figure 28 and Appendix F). The southern territory expanded southward from the previous year, into an area in which junipers had been thinned the previous year. This male was also twice observed ranging into the 16-acre parcel from which all juniper had been removed the previous fall and winter. The eastern male included a portion of the 16-acre parcel in his territory; on one occasion, he also wandered into the southern half of the tract.

Three of the territorial males were observed associating with a female, carrying food, or tending one or more fledglings. Thus, pairing success was 75 percent.

Two pairs produced at least one offspring, yielding a breeding success of at least 67 percent. An adult vireo in the third (eastern) territory was observed carrying food across the tract boundary onto the River Place property, but no fledglings were found.

Breeding success was based upon observations of fledglings only because only one nest was located this year after the young had fledged. The two successful territories produced six fledglings. The western territory produced at least two broods: the first brood was comprised of three fledglings first observed on May 3, and one fledgling observed on July 6. The north-central territory produced at least two fledglings in one brood first seen June 4. Productivity, therefore, averaged at least 3.0 fledglings per successful territory, and 1.5 fledglings for all territories. Productivity results represent minimum numbers. As with golden-cheeked warblers, vireo fledglings can be difficult to detect. Thus, it is highly likely that actual productivity was higher than observed.

Brown-headed Cowbirds

Though they were occasionally observed flying over, cowbirds were seen on the Cortaña site only in the immediate vicinity of the cowbird trap. No vireos or other avian species were observed tending cowbird fledglings. A total of 14 cowbirds were trapped in the hybrid trap located in the study area; five of these were females (Appendix E).

As in 2005 and 2006, no incidences of harassment of vireos by corvids or other avian species were observed in 2007. In 2004, common grackles (*Quiscalus quiscula*), western scrub-jays (*Aphelocoma coerulescens*) and northern mockingbirds (*Mimus polyglottos*) were seen on several occasions harassing vireos in the Cortaña study area. Although depredation of nests was not observed in 2007, potential predators include several snake species, ringtails

(*Bassariscus astutus*), raccoons (*Procyon lotor*), foxes, squirrels, western scrub-jays, American crows (*Corvus brachyrhynchos*), various raptor species, and imported red fire ants (*Solenopsis invicta*).

Future Work

Preliminary work began on a Texas State University study spatially analyzing vireo natal and breeding dispersal. The three years of research will target known vireo colonies as well as unoccupied but appropriate habitat, on Balcones Canyonlands National Wildlife Refuge and the BCP (both Travis County and City of Austin tracts). Work so far has been limited to identifying and gaining familiarity with potential study sites. The primary tasks of 2008 will be banding vireos – especially nestlings and fledglings, but also adults – and mapping nest and banding locations.

Golden-cheeked Warblers in Black-capped Vireo Habitat

Golden-cheeked warblers were incidentally mapped during vireo surveys on and around the 39-acre vireo habitat area on the Cortaña tract (Figures 13 and 28). Males were usually detected near the perimeter of the vireo habitat area; the canyons surrounding the upland study site are excellent golden-cheeked warbler habitat. However, as in previous years (see Becker and Koehler 2004, Becker and Koehler 2005), golden-cheeked warbler families were also observed in the interior of the study site. On May 29, a male golden-cheeked warbler tended three fledgling warblers at the western edge of the site, where a vireo family was observed a week later (Figure 13). On June 15, two warbler families collided in the oak woodland atop the knoll (Figure 28). One family, a male tending three dependent young, moved to the head of the eastern canyon. The other family, a male and a female with two dependent young, moved north onto the River Place mitigation property. Independent hatch-year golden-cheeked warblers were also present in the knoll-top woodland on June 15 and June 22.

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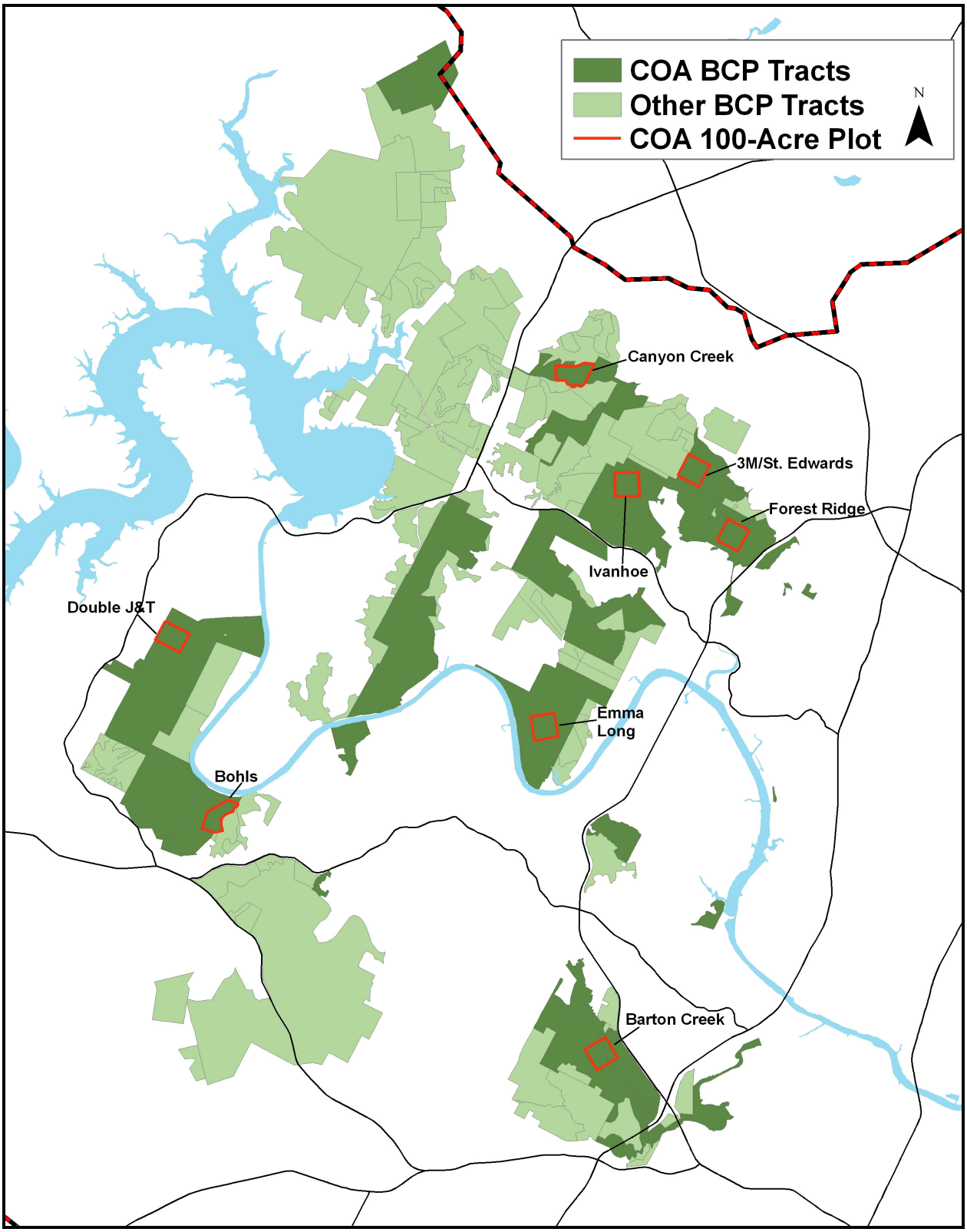
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IV. APPENDICES

APPENDIX A: DISTRIBUTION OF CITY OF AUSTIN 100-ACRE STUDY PLOTS



APPENDIX B: 100-ACRE STUDY PLOT PROTOCAL

Golden-cheeked Warbler Monitoring
Balcones Canyonlands Preserve, City of Austin
2007 100-acre Study Plot Protocol

Monitoring in these plots is more intensive than for enumerations, with the goal of accurately mapping the location and extent of territories. Another goal is to determine the breeding success of the golden-cheeked warblers (GCWA) in these areas, so observations of females, nests, and fledglings are particularly important. An accurate count of fledglings gives us valuable information about productivity.

Prime Study Plots are located in excellent GCWA habitat. Each prime study plot must be visited 10 times during the season, for 6 hours on each visit. Transitional Study Plots are situated in areas that are less than ideal GCWA habitat, but are improving. Each transitional study plot must be visited 5 times during the season, also for 6 hours per visit.

The observer should try to cover all parts of the plot on each visit. No two visits should be less than 5 days apart. Surveys should begin approximately 30 minutes after sunrise.

1) Complete the survey form (attached) for each visit to your site. Starting and ending times are important so we can report how many hours we devoted to each site this year.
2) Record each observation (a sighting or a singing male heard) of a GCWA on a field map, using the symbols on the attached sheet. Standardized notation will help when we compile data from multiple observers.
3) Write any details of the observation (plumage characteristics of the bird, song type, behavior, etc.) on the reverse side of the field map or on the survey form. These details can help distinguish individual birds, especially females.
4) For each observation, use a different number or letter, unless you are certain the bird is the same as an earlier one.
5) For a female GCWA, use the female symbol: "♀". (You can also use the male symbol "♂" for a male GCWA, but it could be confused for a singing bird that has moved to the upper right.) For a fledgling GCWA, use a lowercase "f".
6) The monitoring season this year will run from March 19 through May 25.
7) Do not census GCWAs in steady rain or thunderstorms (light drizzle is okay), or if the temperature is below 50°F.
8) Do not conduct a GCWA census if sustained wind is stronger than 12 miles/hour (> Beaufort 3).
9) Do not use playback of songs or calls to elicit a response.
10) If you see a warbler carrying nesting material or food, try to follow it. Locations of GCWA nests are important information, but do not disturb the nesting pair. If the parents appear agitated, move away to watch from a respectful distance.
11) Record numbers of potential predators observed, such as Blue Jays, Western Scrub-Jays, American Crows, Common Ravens, grackles, hawks, owls, Texas Rat Snakes, and Eastern Fox Squirrels. Numbers of Brown-headed Cowbirds, and sightings of GCWAs feeding fledgling cowbirds are especially important.
12) If you are surveying in an area where GCWAs encounter the public, please note any interactions and the warblers' response.
13) Materials to bring with you for monitoring visits:
    Field maps
    Survey form
    Pens/pencils
    Binoculars
    Compass and/or GPS
    Thermometer

APPENDIX C: GOLDEN-CHEEKED WARBLER 100-ACRE STUDY PLOT TERRITORY DATA

A summary of golden-cheeked warbler territory number and territory density (per 100 ha) for six 100-acre prime study plots and two 100-acre transitional study plots on the City of Austin's BCP, Travis County, Texas, field seasons 1998-2007. See Methods section for calculations.

Prime Plot Name	Survey Year	No. of Full Territories	No. of Full and Edge Territories	No. of Full Territories + 50% of Edge Territories	No. of Territories per 100 ha
Barton Creek	1998	2	8	5.0	12.5
	1999	6	12	9.0	22.5
	2000	5	9	7.0	17.5
	2001	3	7	5.0	12.5
	2002	2	8	5.0	12.5
	2003	2	9	5.5	13.8
	2004	3	10	6.5	16.1
	2005	4	10	7.5	17.3
	2006	6	12	9.0	22.2
	2007	6	9	7.5	18.6
Emma Long	1998	6	11	8.5	21.3
	1999	7	12	9.5	23.8
	2000	12	21	16.5	41.3
	2001	15	23	18.5	46.3
	2002	18	22	20.0	50.0
	2003	14	19	16.5	41.3
	2004	11	22	16.5	40.8
	2005	14	22	18.5	44.5
	2006	19	30	24.5	60.5
	2007	5	16	10.5	26.0
Ivanhoe	1998	7	13	10.0	25.0
	1999	8	17	12.5	31.3
	2000	7	19	13.0	32.5
	2001	2	14	8.0	20.0
	2002	9	22	15.5	38.8
	2003	13	30	21.5	53.8
	2004	12	30	21.0	51.9
	2005	15	26	20.5	50.6
	2006	20	28	24.0	59.3
	2007	16	24	20.0	49.5
3M/St. Edwards	1998	6	12	9.0	22.5
	1999	7	15	11.0	27.5
	2000	7	17	12.0	30.0
	2001	3	8	6.0	15.0
	2002	9	16	12.5	31.3
	2003	8	16	12.5	31.3
	2004	6	17	11.5	28.4
	2005	7	19	13.5	32.1
	2006	8	15	11.5	28.4
	2007	6	17	11.5	28.4
Forest Ridge	1998	7	14	10.5	26.3
	1999	11	17	14.0	35.0
	2000	7	14	10.5	26.3
	2001	8	14	11.0	27.5
	2002	11	15	13.0	32.5
	2003	9	16	12.5	31.3
	2004	13	22	17.5	43.2
	2005	11	19	15.0	37.1
	2006	16	26	21.0	51.9
	2007	4	14	9.0	22.3

APPENDIX C: GOLDEN-CHEEKED WARBLER 100-ACRE STUDY PLOT TERRITORY DATA, CONTINUED

Prime Plot Name	Survey Year	No. of Full Territories	No. of Full and Edge Territories	No. of Full Territories + 50% of Edge Territories	No. of Territories per 100 ha
Bohls	1998	3	6	4.0	10.0
	1999	1	4	4.0	10.0
	2000	1	5	3.0	7.5
	2001	4	8	6.0	15.0
	2002	4	7	5.5	13.8
	2003	4	9	6.5	16.3
	2004	5	11	8.0	19.8
	2005	6	10	8.0	19.8
	2006	9	10	6.5	16.1
	2007	1	7	4.0	9.9

		TOTALS			AVERAGE
All Prime Plots	1998	31	64	47.0	19.6
	1999	40	77	60.0	25.0
	2000	39	85	62.0	25.9
	2001	35	74	54.5	22.7
	2002	53	88	70.5	29.4
	2003	50	99	74.0	34.1
	2004	50	112	81.0	33.4
	2005	57	106	81.5	33.6
	2006	72	121	96.5	39.7
	2007	38	87	62.5	18.3

Transitional Plot Name	Survey Year	No. of Full Territories	No. of Full and Edge Territories	No. of Full Territories + 50% of Edge Territories	No. of Territories per 100 ha
Canyon Creek	1998	0	8	4.0	10.0
	1999	2	7	4.5	11.3
	2000	0	8	4.0	10.0
	2001	3	12	7.5	18.8
	2003	0	7	3.5	8.8
	2005	3	13	8.0	19.8
	2007	3	10	6.5	16.1
Double J&T	1998	0	1	0.5	1.3
	1999	0	1	0.5	1.3
	2000	0	1	0.5	1.3
	2001	2	4	3.0	7.5
	2003	3	4	3.5	8.8
	2005	6	7	6.5	16.1
	2007	3	4	3.5	8.7
		TOTAL			AVERAGE
All Transitional Plots	1998	0	9	4.5	5.7
	1999	2	8	5.0	6.3
	2000	0	9	4.5	5.7
	2001	5	16	10.5	13.2
	2003	3	11	7.0	8.8
	2005	9	20	14.5	18.0
	2007	6	14	10	12.4

APPENDIX D: SURVEY MAPS (FIGURES 1–28)

100-acre Study Plots

Figures 1–8 depict estimated territories from 100-acre plot surveys. Polygons represent our best estimate of territory boundaries. Circles have an approximately 45 m radius and represent individual male warblers when enough information was not available to form a polygon. An "X" symbol on the figures represents an observation of a male warbler that does not have enough sightings or other information, such as contemporaneous vocalizations, to assign it to an existing territory or to estimate territory boundaries. A diamond symbol on the figures represents a floater male. Floaters are typically young males observed later in the season only on one or two occasions.

Figure 1: 3M/St. Edwards

Figure 2: Barton Creek

Figure 3: Bohls

Figure 4: Emma Long

Figure 5: Forest Ridge

Figure 6: Ivanhoe

Figure 7: Canyon Creek

Figure 8: Double J&T

Enumerations

Figures 9–27 display the distribution of estimated territories and incidentally sighted females and fledglings. Circles/polygons displayed on the maps represent best approximations of individual bird territories; polygons were used to represent best approximation of individual bird territories when enough information was available. Circles have an approximately 45 m radius and represent individual male warblers when enough information was not available to form a polygon. An "X" symbol on the figures represents an observation of a male warbler that does not have enough sightings or other information, such as contemporaneous vocalizations, to assign it to an existing territory or to estimate territory boundaries. Female and fledgling observations are summarized and depicted by estimated numbers for a territory. Boundaries for the eight 100-acre plots are depicted on their tract's respective enumeration map; however the 100-acre plot data are not. See Figures 1–8 for 100-acre plot data. Given that the WTP4 tract and proposed construction area were surveyed using 100-acre plot protocols, these areas were mapped using the same methods as other 100-acre plots (Figure 27).

Figure 9: 3M/Krueger

Figure 10: Barton Creek Wilderness Park and Greenbelt

Figure 11: Bohls

APPENDIX D: SURVEY MAPS, CONTINUED

Figure 12: Coldwater

Figure 13: Cortaña

Figure 14: Cowfork

Figure 15: Double J&T

Figure 16: Emma Long Park

Figure 17: Forest Ridge

Figure 18: Hanks/Franklin

Figure 19: Ivanhoe/Beard Trust

Figure 20: Jester

Figure 21: Lanier

Figure 22: Lime Creek

Figure 23: Long Canyon

Figure 24: Parke West

Figure 25: Reicher Ranch/Schramm Ranch

Figure 26: Vireo Preserve

Figure 27: WTP4 (plus proposed construction site)

Black-capped Vireo Survey

Figure 28: Cortaña

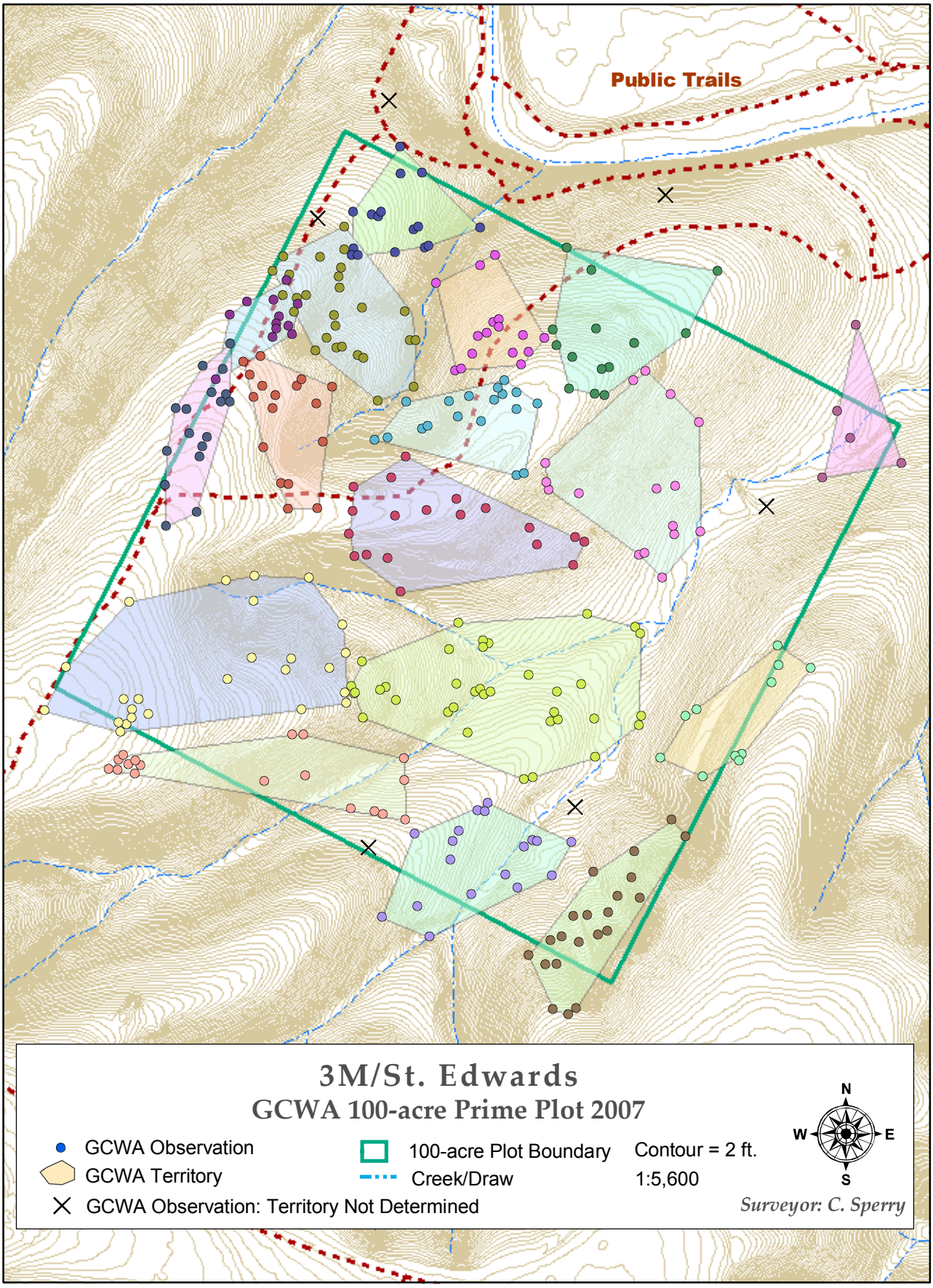

Public Trails
3M/St. Edwards
GCWA 100-acre Prime Plot 2007
GCWA Observation
GCWA Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:5,600
N
W
E
S
Surveyor: C. Sperry

Figure 1

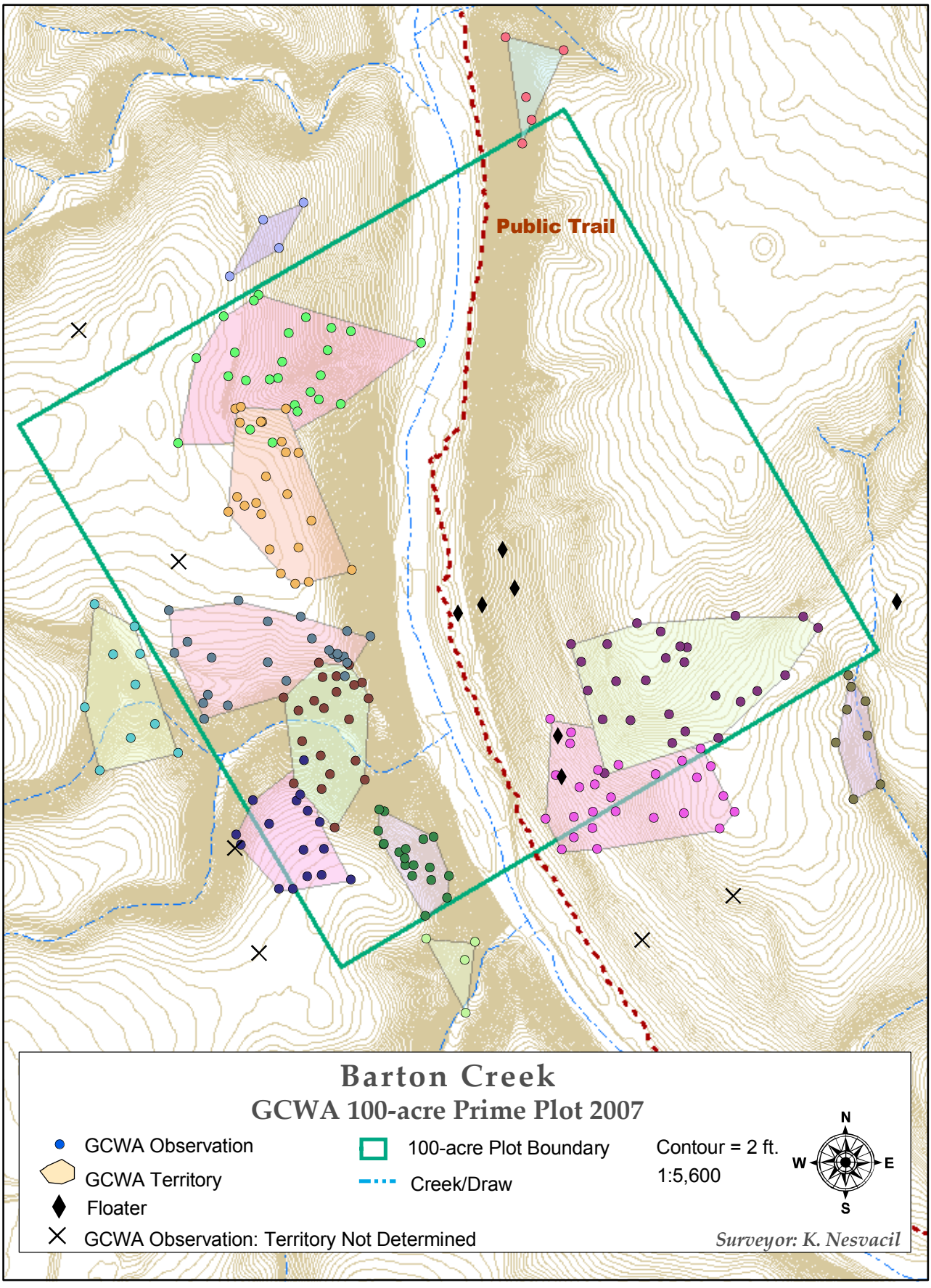

Public Trail
Barton Creek
GCWA 100-acre Prime Plot 2007
GCWA Observation
GCWA Territory
Floater
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:5,600
N
W
E
S
Surveyor: K. Nesvacil

Figure 2

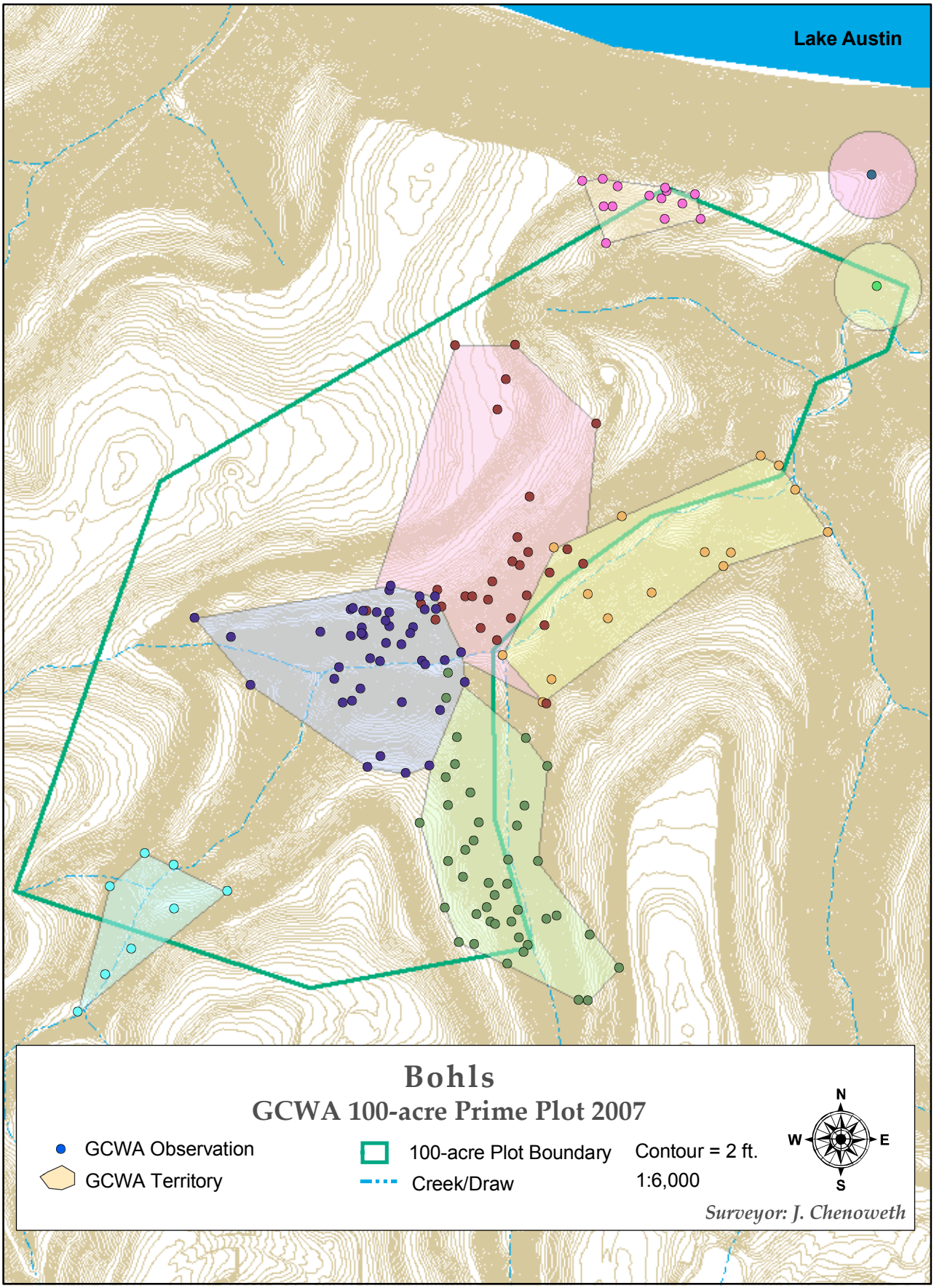

Lake Austin
Bohls
GCWA 100-acre Prime Plot 2007
GCWA Observation
GCWA Territory
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:6,000
N
W
E
S
Surveyor: J. Chenoweth

Figure 3

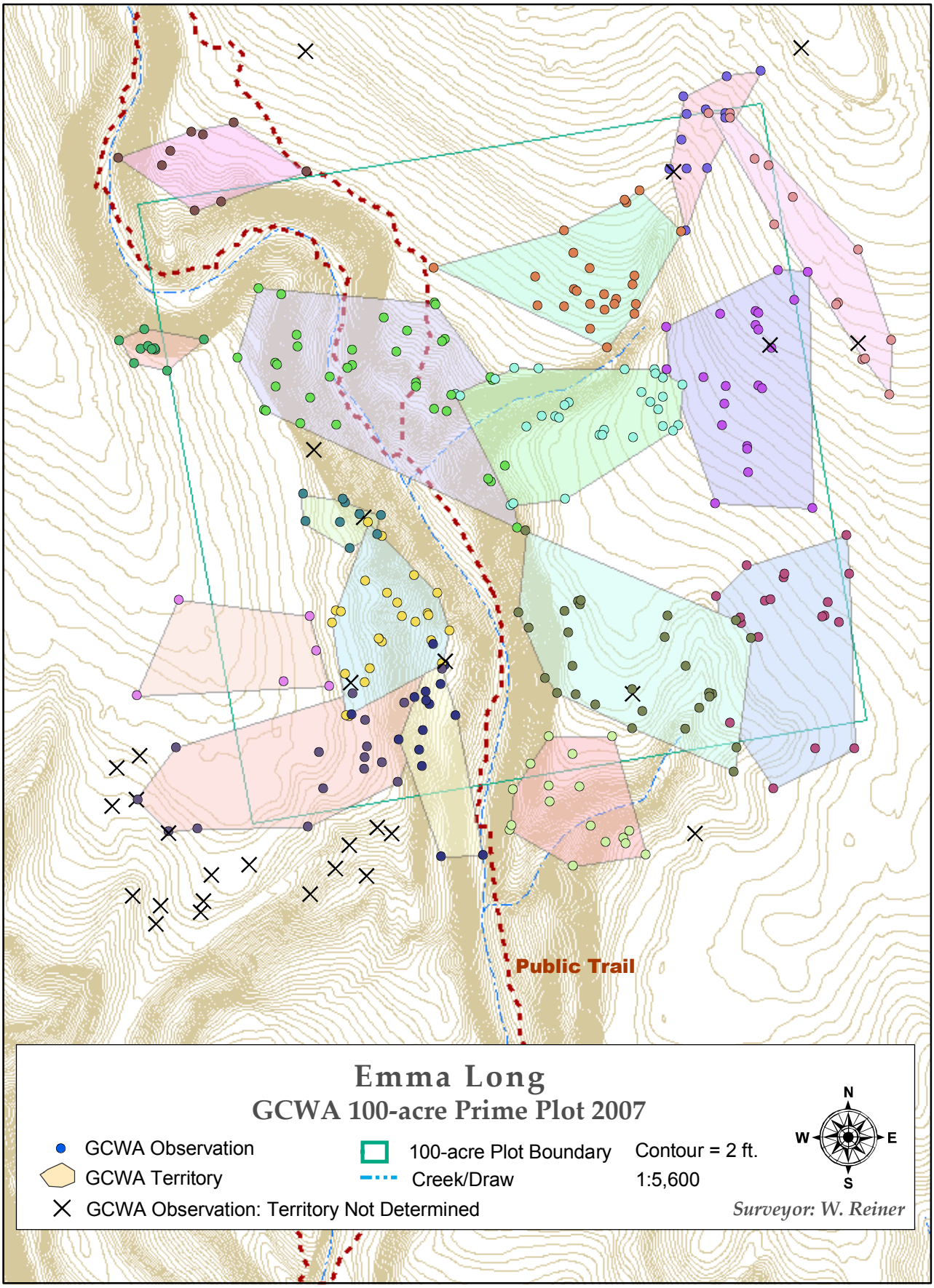

Public Trail
Emma Long
GCWA 100-acre Prime Plot 2007
GCWA Observation
GCWA Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:5,600
N
W
E
S
Surveyor: W. Reiner

Figure 4

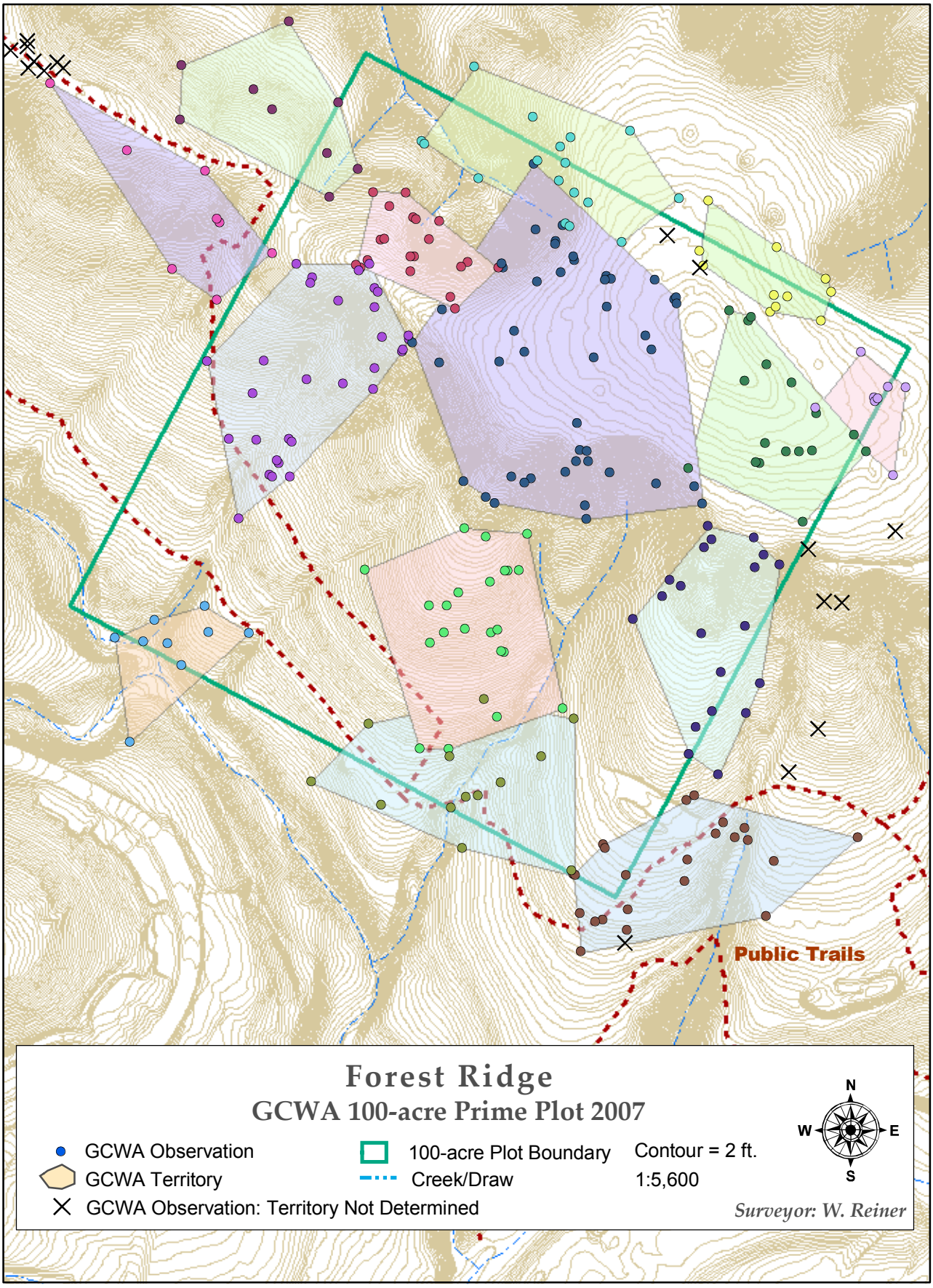

Public Trails
Forest Ridge
GCWA 100-acre Prime Plot 2007
GCWA Observation
GCWA Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:5,600
N
W
E
S
Surveyor: W. Reiner

Figure 5

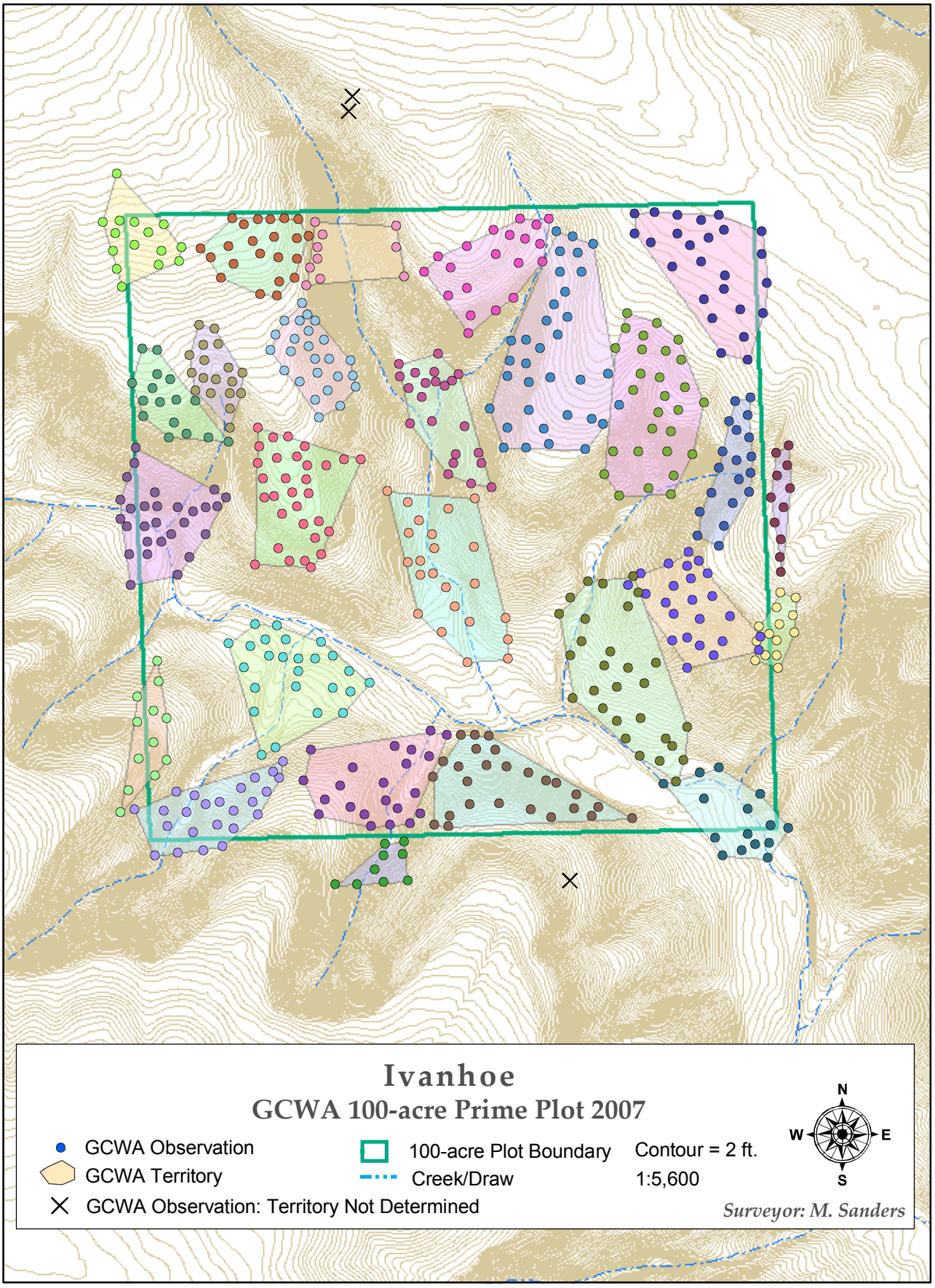

Ivanhoe
GCWA 100-acre Prime Plot 2007
GCWA Observation
GCWA Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:5,600
N
W
E
S
Surveyor: M. Sanders

Figure 6

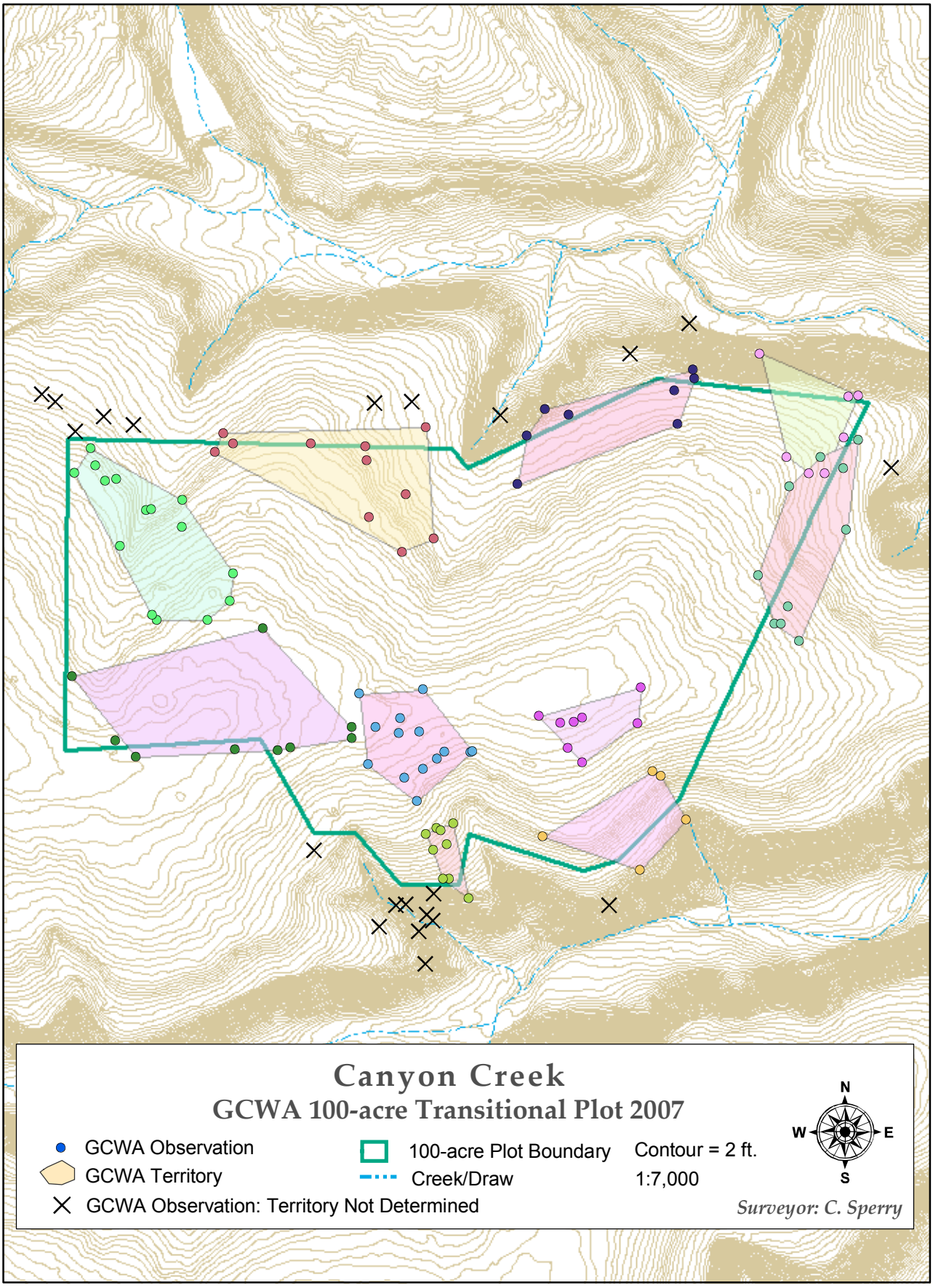

Canyon Creek
GCWA 100-acre Transitional Plot 2007
GCWA Observation
GCWA Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:7,000
N
W
E
S
Surveyor: C. Sperry

Figure 7

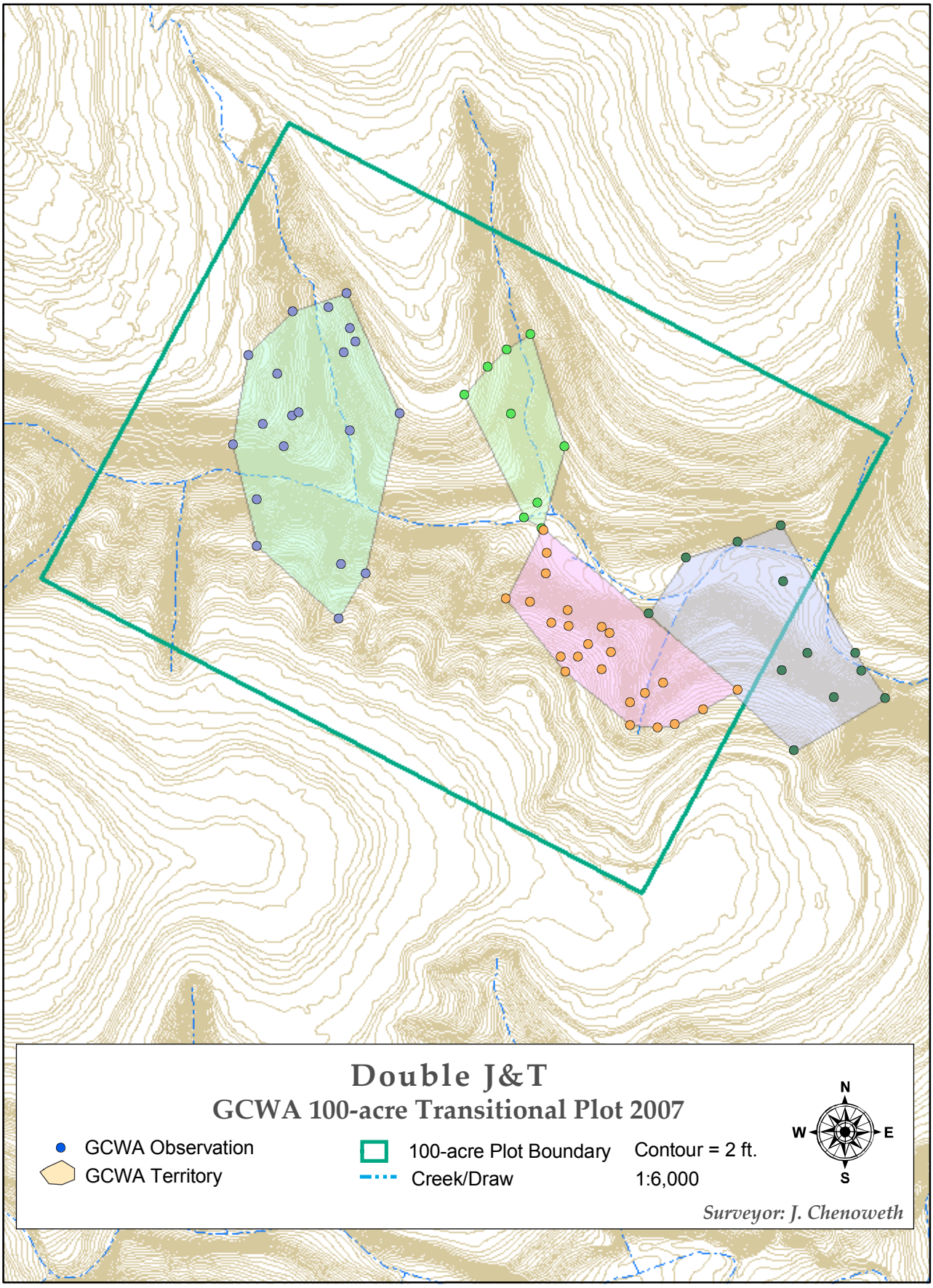

Double J&T
GCWA 100-acre Transitional Plot 2007
GCWA Observation
GCWA Territory
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:6,000
N
W
E
S
Surveyor: J. Chenoweth

Figure 8

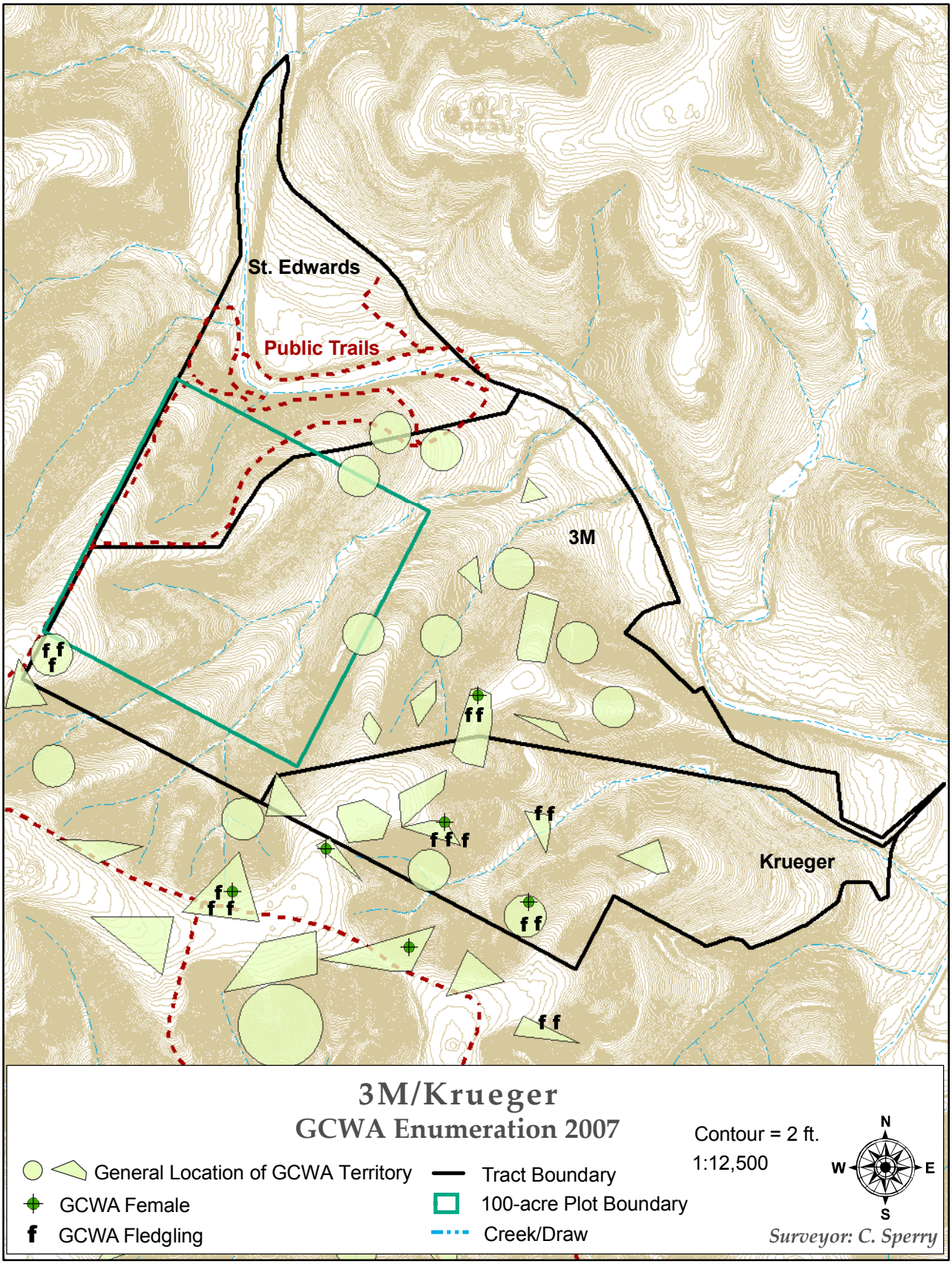

St. Edwards
Public Trails
3M
Krueger
3M/Krueger
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
GCWA Fledgling
Tract Boundary
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:12,500
N
W
E
S
Surveyor: C. Sperry

Figure 9

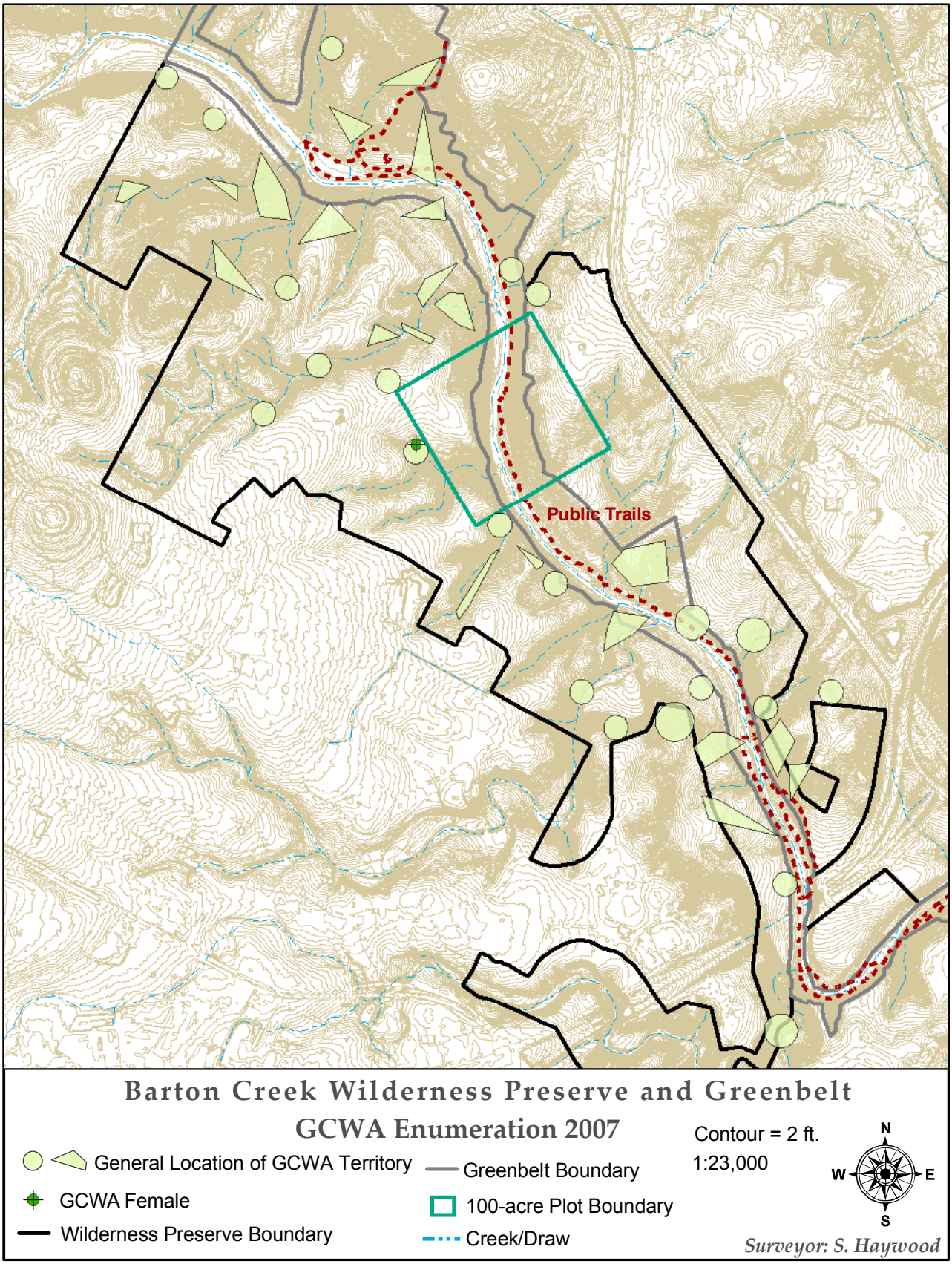

Public Trails
Barton Creek Wilderness Preserve and Greenbelt
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
Wilderness Preserve Boundary
Greenbelt Boundary
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:23,000
N
W
E
S
Surveyor: S. Haywood

Figure 10

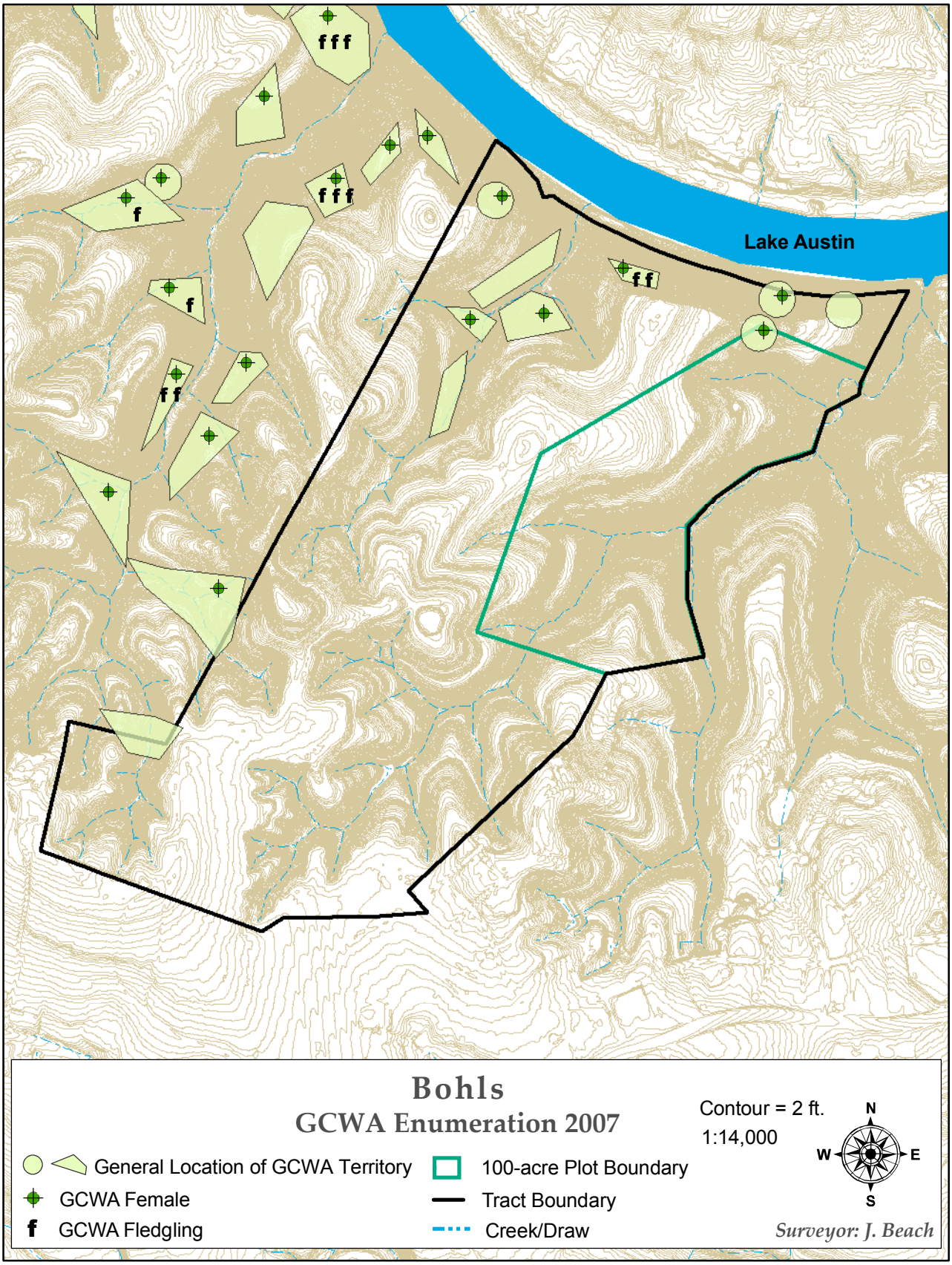

Lake Austin
f f f
f f f
f
f
f f
f f
Bohls
GCWA Enumeration 2007
Contour = 2 ft.
1:14,000
N
W
E
S
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
100-acre Plot Boundary
Tract Boundary
Creek/Draw
Surveyor: J. Beach

Figure 11

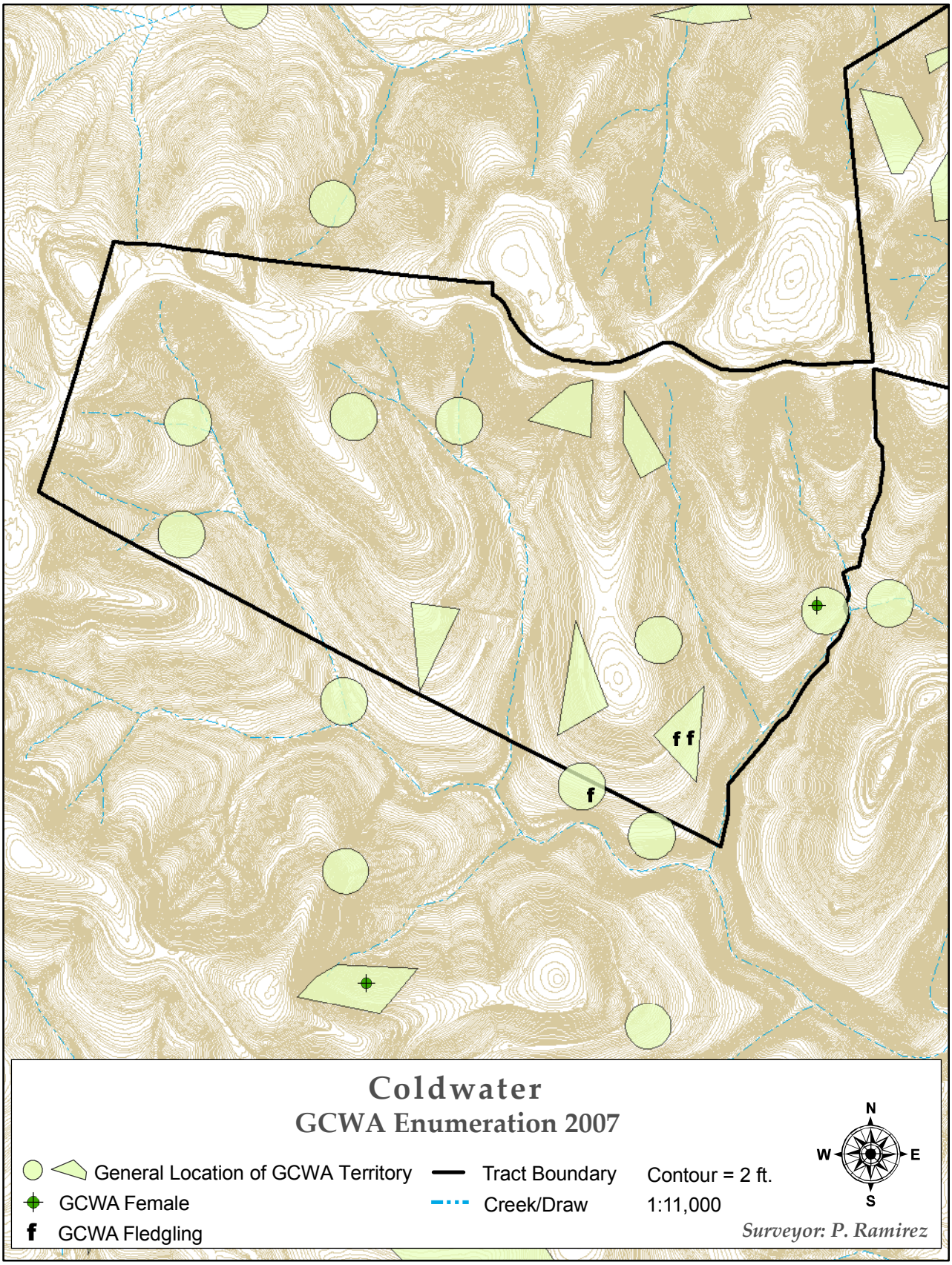

f f
f
Coldwater
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
GCWA Fledgling
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:11,000
N
W
E
S
Surveyor: P. Ramirez

Figure 12

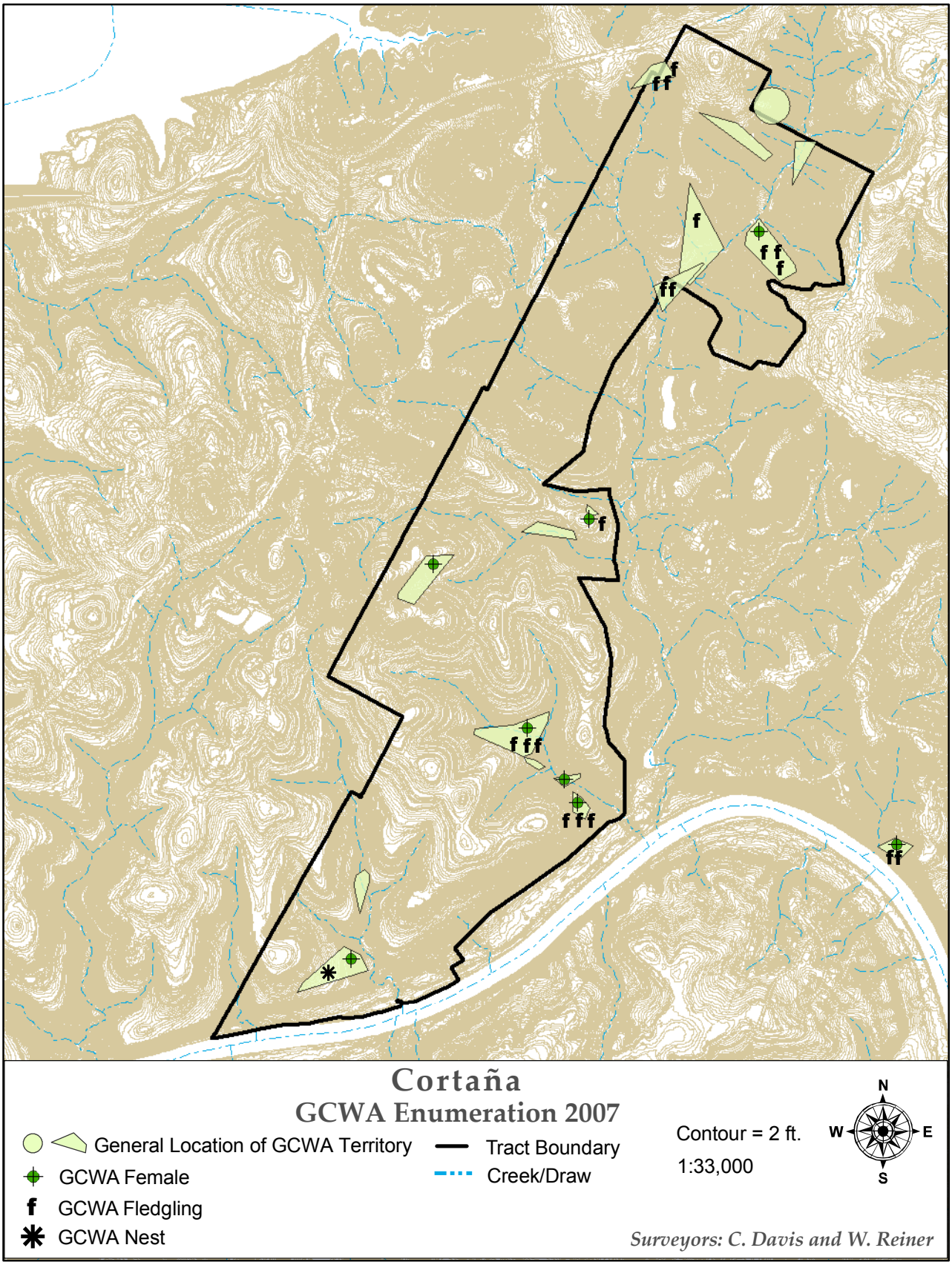

Cortaña
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
GCWA Nest
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:33,000
N
W
E
S
Surveyors: C. Davis and W. Reiner

Figure 13

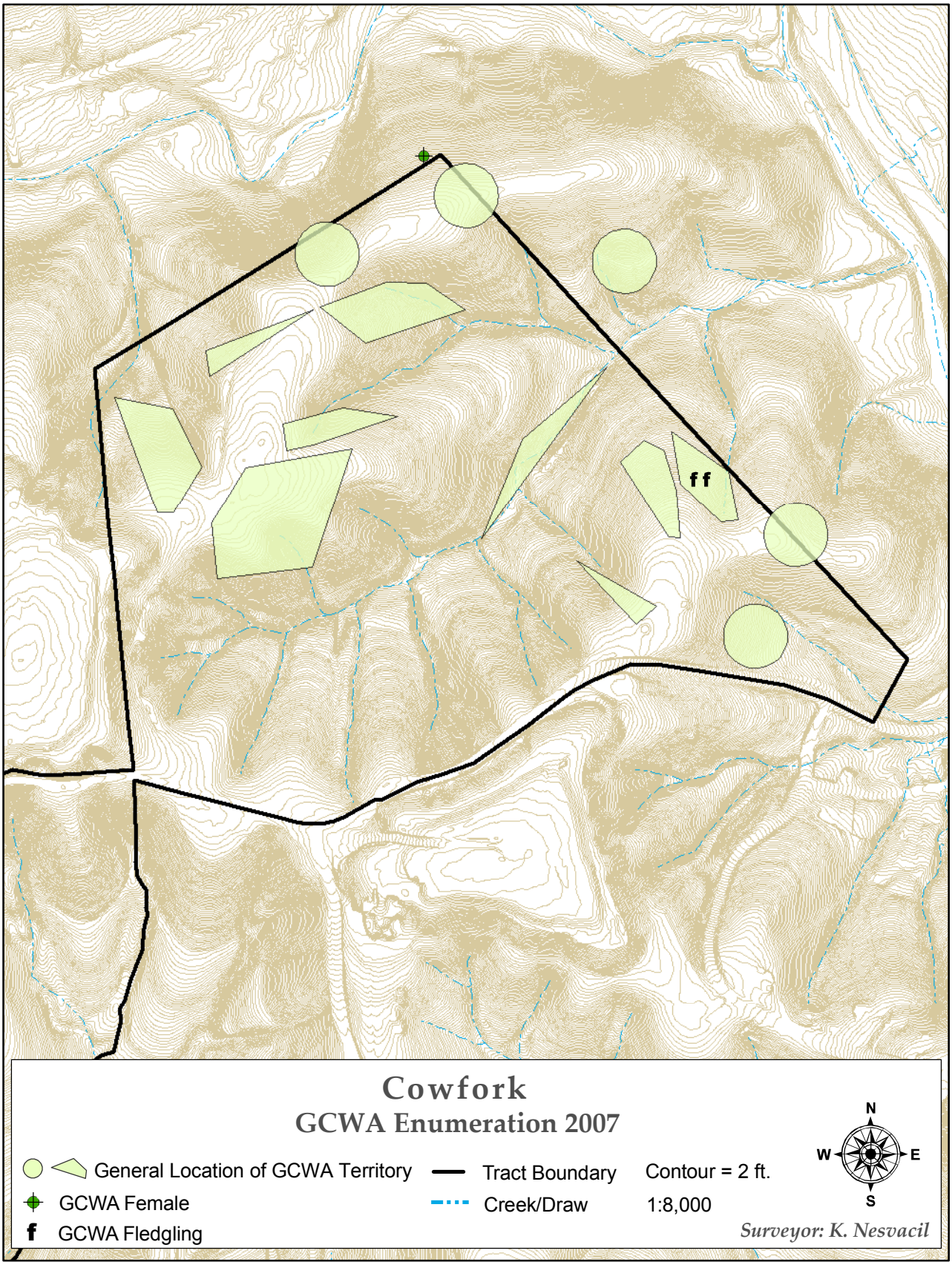

f f
Cowfork
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:8,000
N
W
E
S
Surveyor: K. Nesvacil

Figure 14

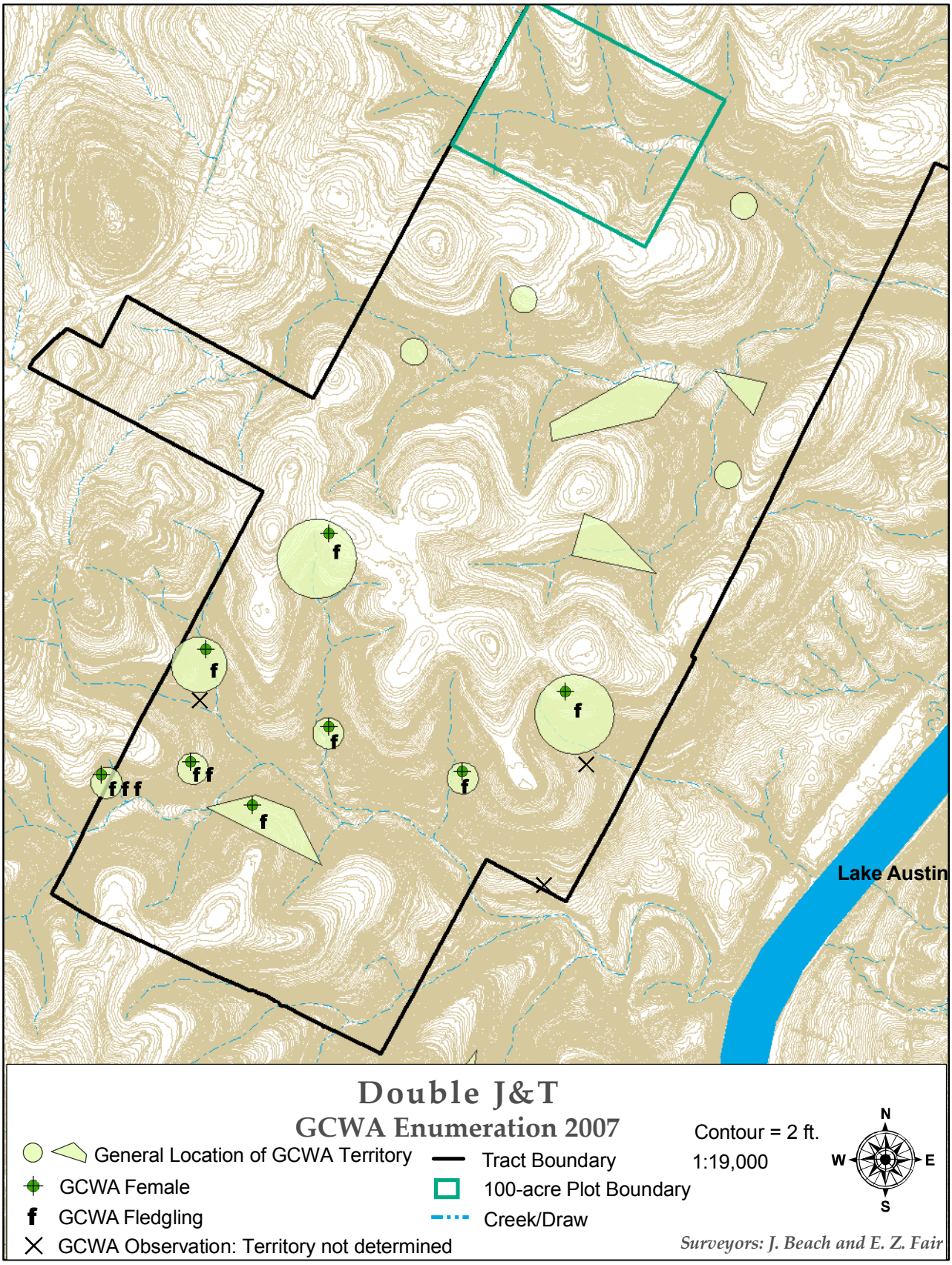

Lake Austin
Double J&T
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
GCWA Fledgling
GCWA Observation: Territory not determined
Tract Boundary
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:19,000
N
W
E
S
Surveyors: J. Beach and E. Z. Fair

Figure 15

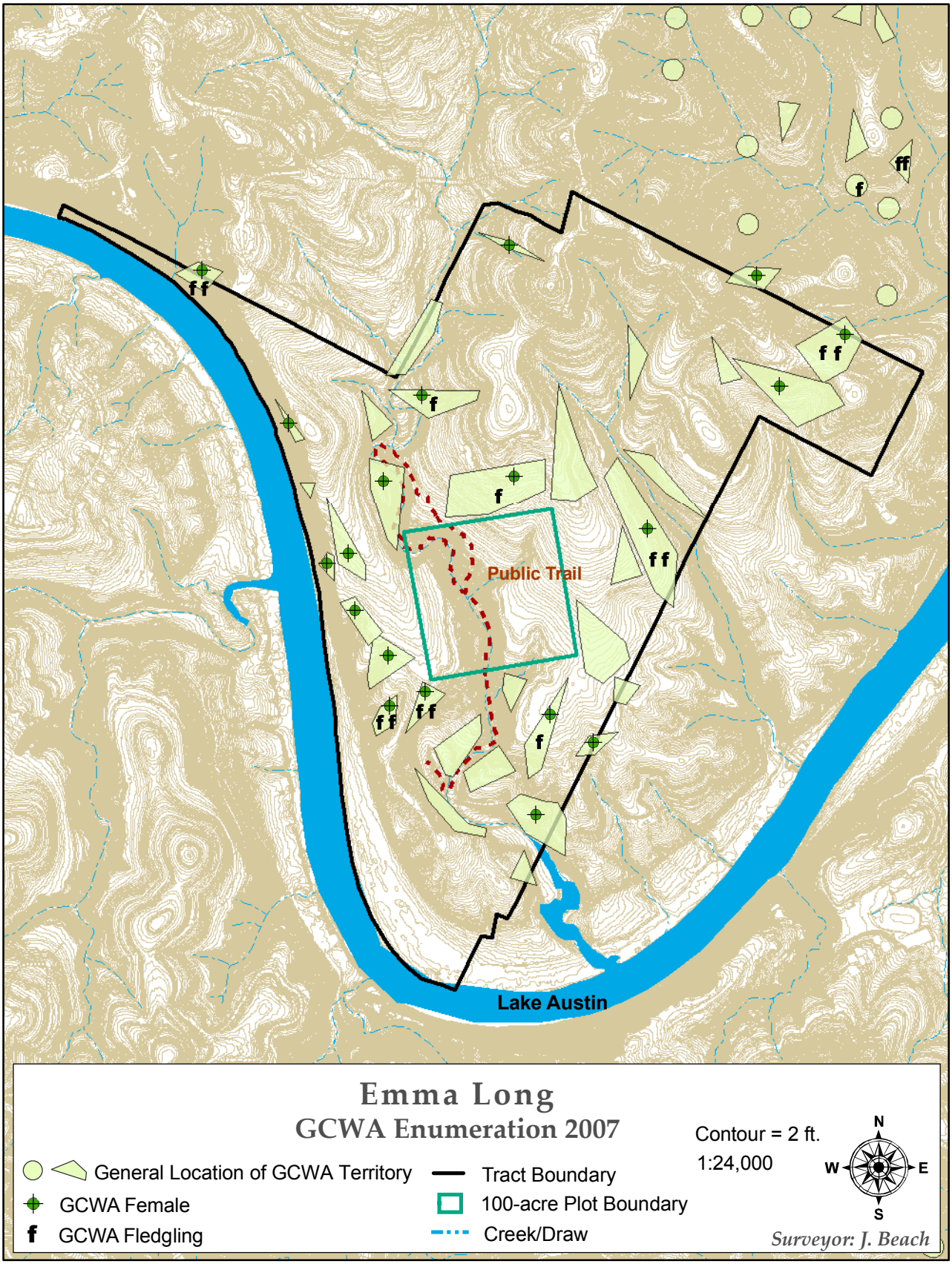

Public Trail
Lake Austin
Emma Long
GCWA Enumeration 2007
Contour = 2 ft.
1:24,000
N
W
E
S
General Location of GCWA Territory
GCWA Female
GCWA Fledgling
Tract Boundary
100-acre Plot Boundary
Creek/Draw
Surveyor: J. Beach

Figure 16

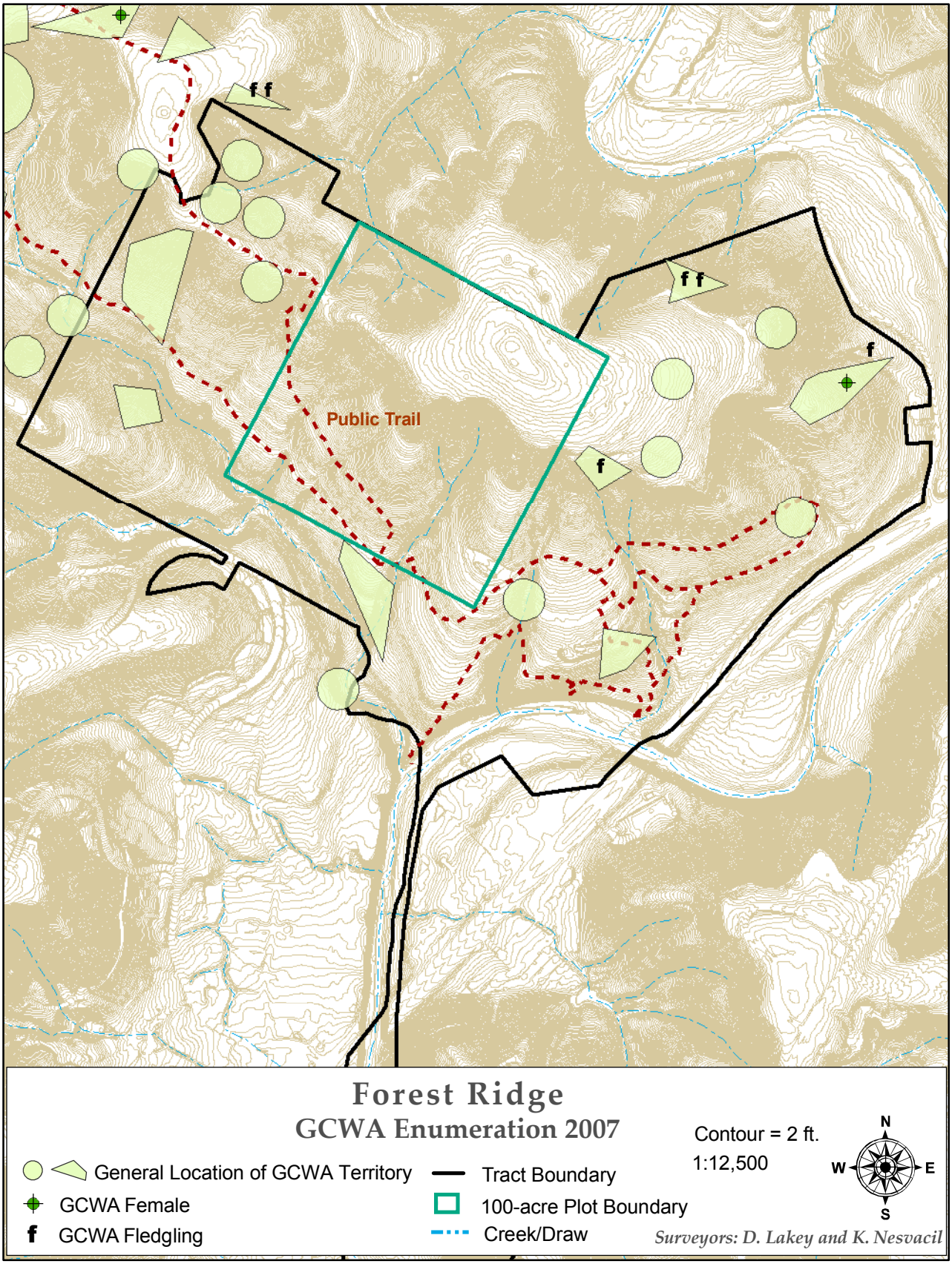

f f
f f
f
f
Public Trail
Forest Ridge
GCWA Enumeration 2007
Contour = 2 ft.
1:12,500
N
W
E
S
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
Tract Boundary
100-acre Plot Boundary
Creek/Draw
Surveyors: D. Lakey and K. Nesvacil

Figure 17

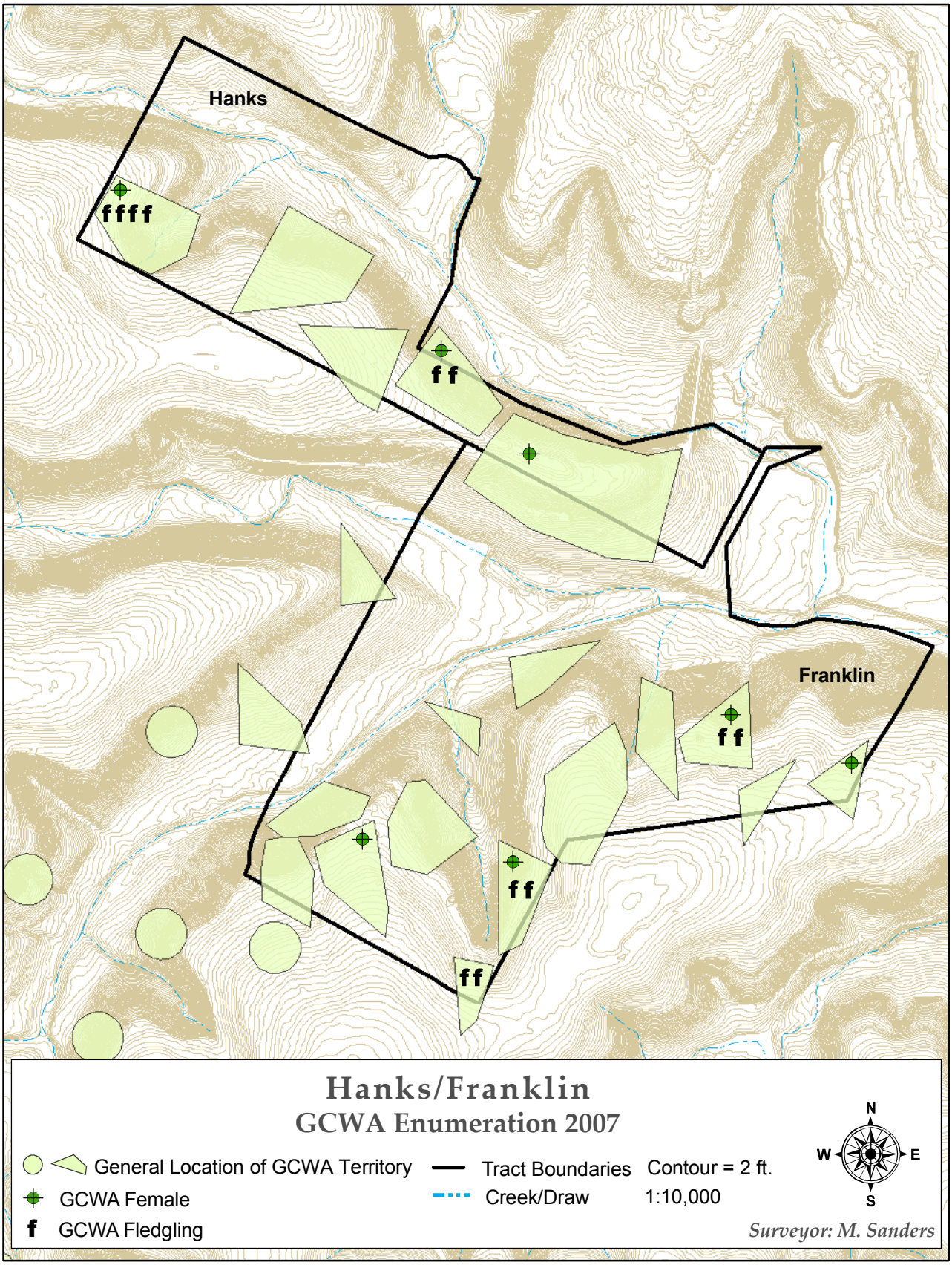

Hanks
ffff
ff
Franklin
ff
ff
ff
Hanks/Franklin
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
Tract Boundaries
Creek/Draw
Contour = 2 ft.
1:10,000
N
W
E
S
Surveyor: M. Sanders

Figure 18

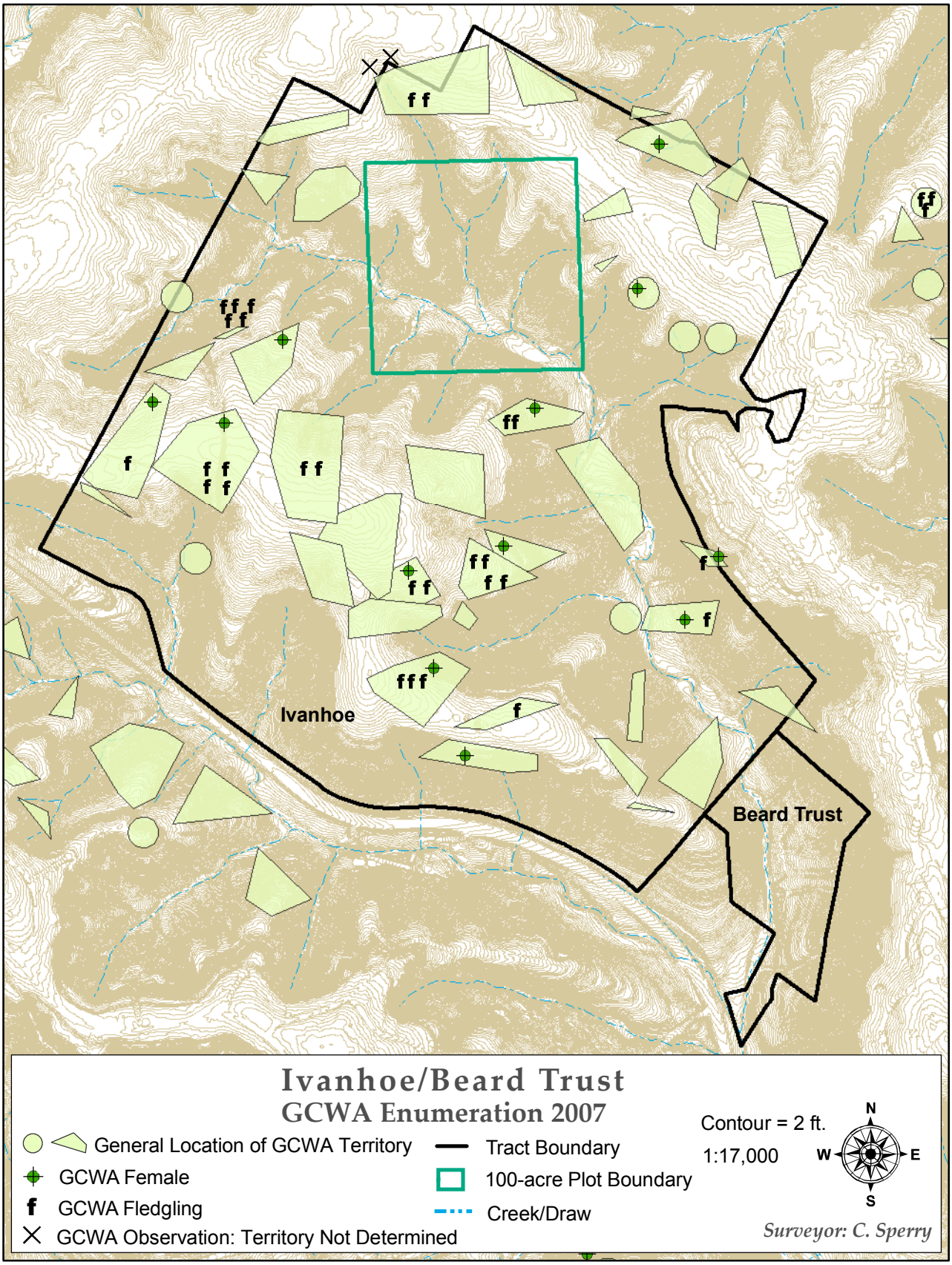

Ivanhoe/Beard Trust
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
GCWA Observation: Territory Not Determined
Tract Boundary
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:17,000
N
W
E
S
Surveyor: C. Sperry
Ivanhoe
Beard Trust

Figure 19

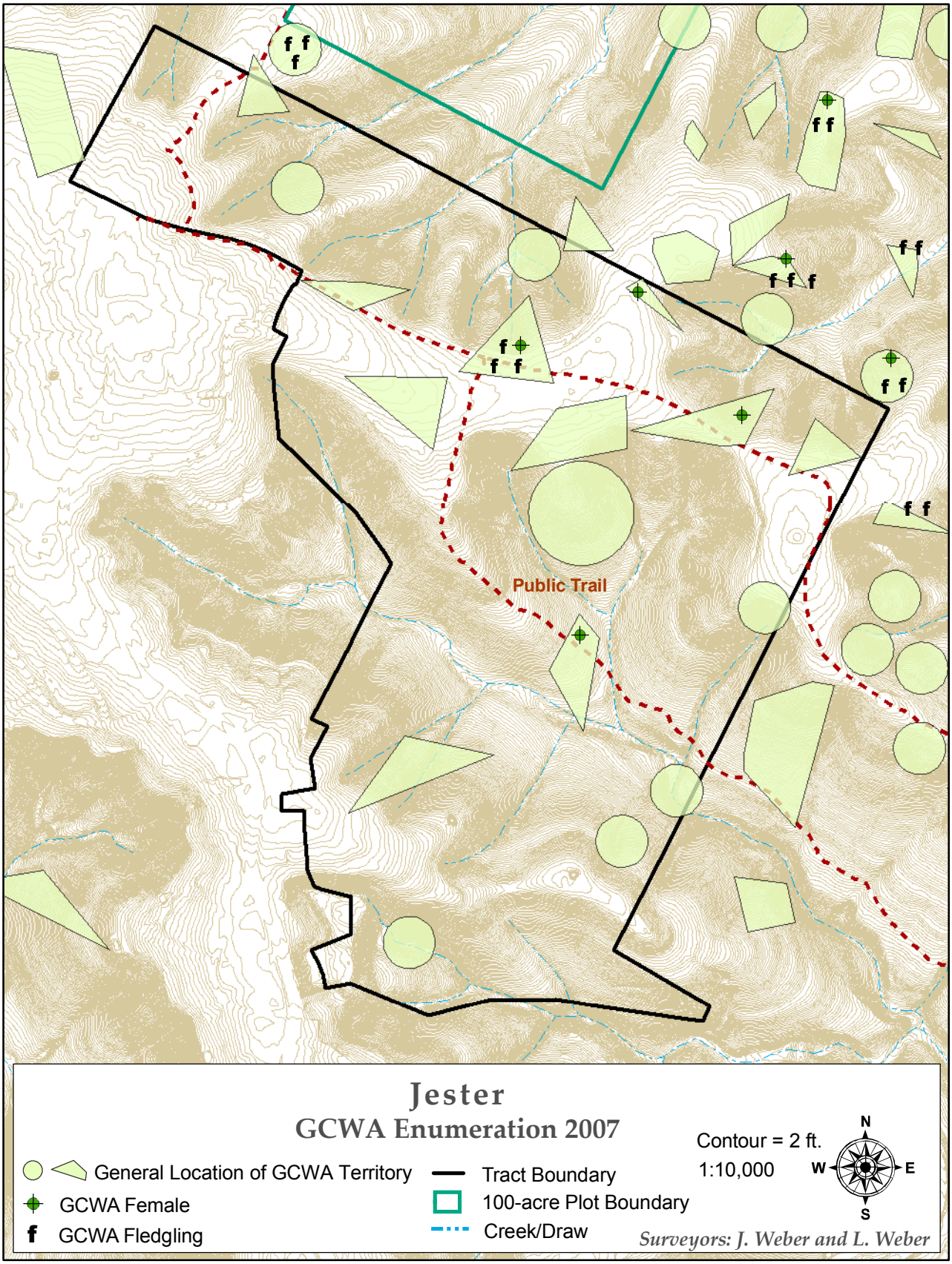

Public Trail
Jester
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
GCWA Fledgling
Tract Boundary
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:10,000
N
W
E
S
Surveyors: J. Weber and L. Weber

Figure 20

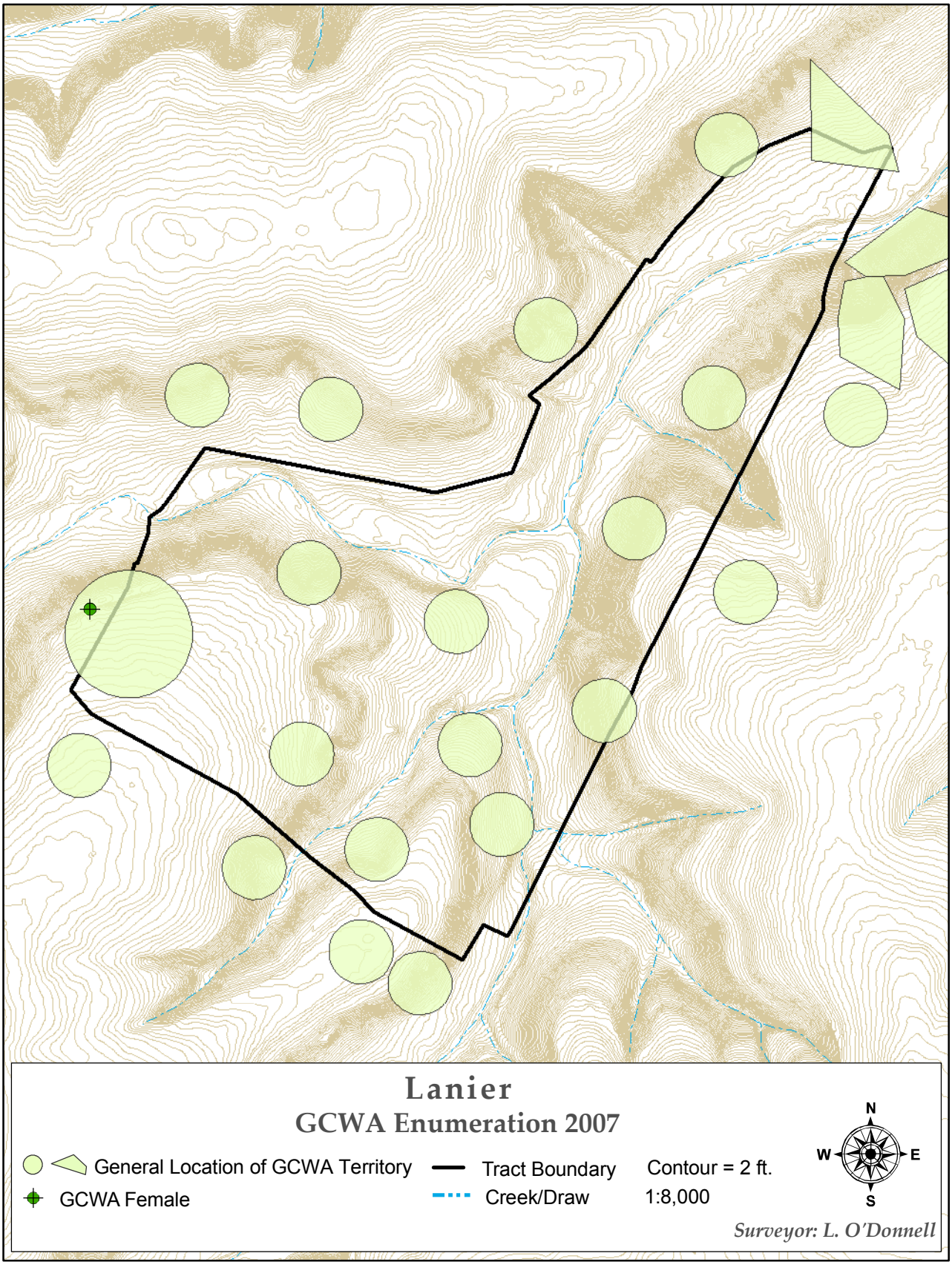

Lanier
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:8,000
N
W
E
S
Surveyor: L. O'Donnell

Figure 21

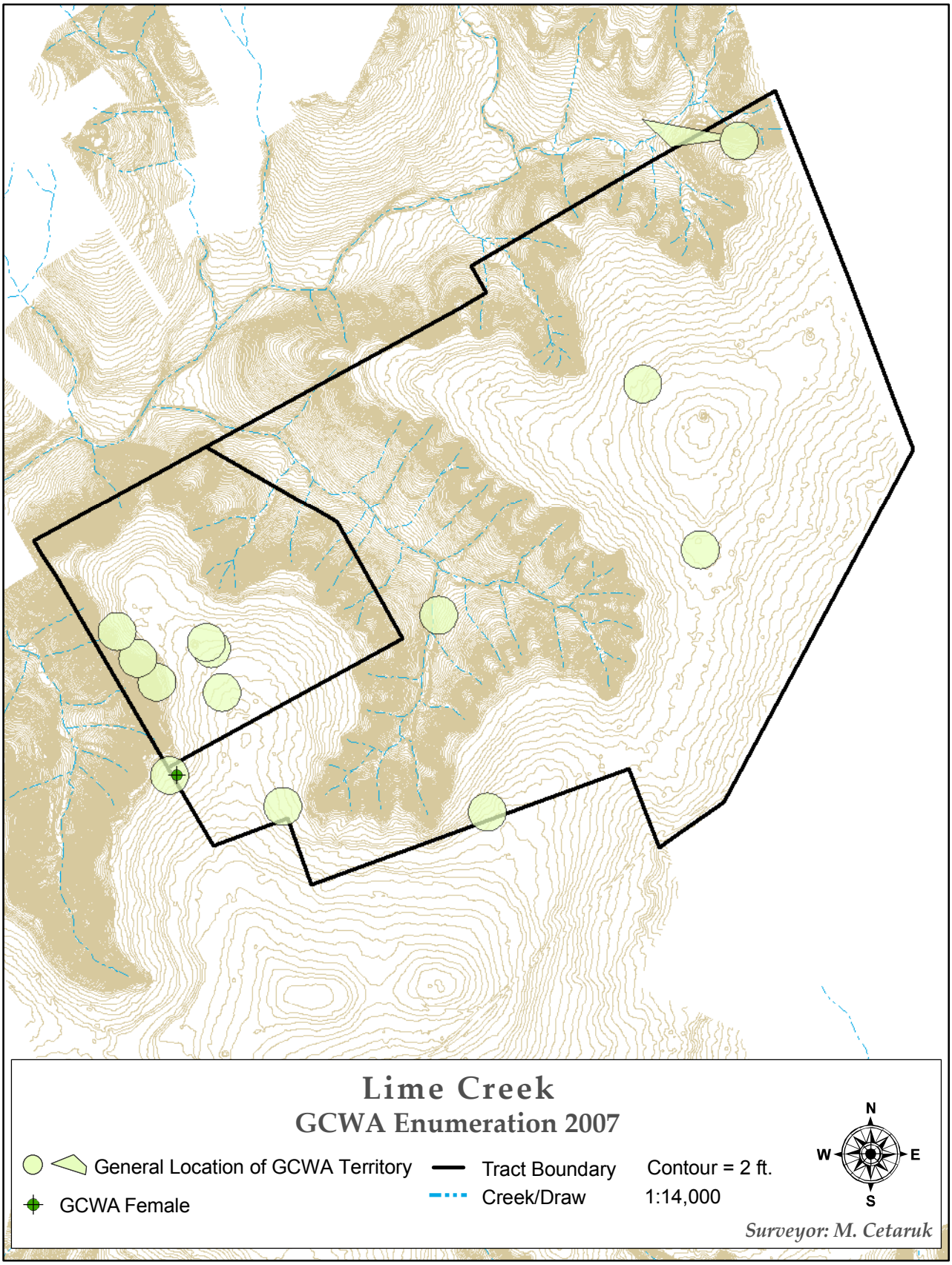

Lime Creek
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:14,000
N
W
E
S
Surveyor: M. Cetaruk

Figure 22

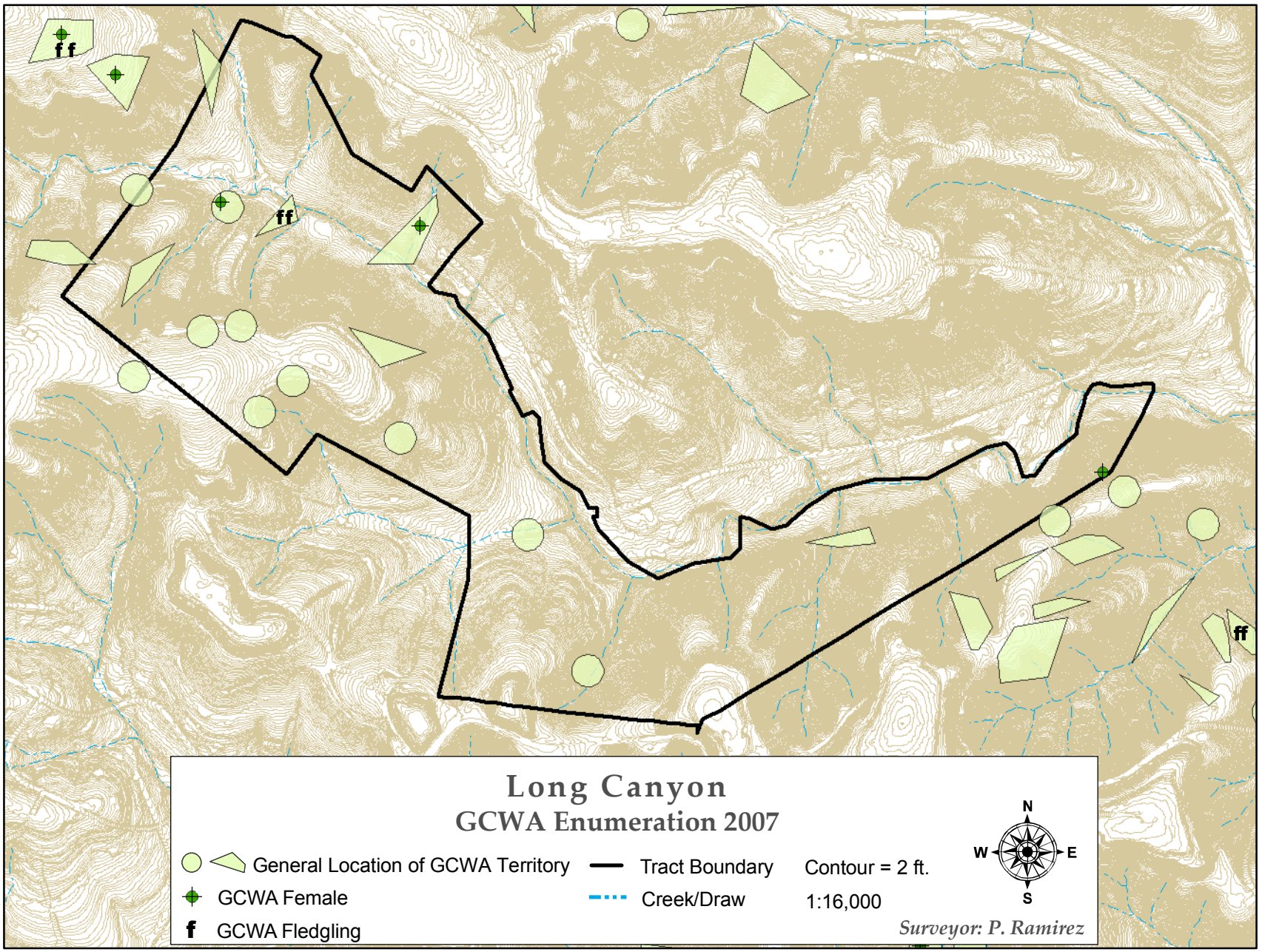

f f
ff
ff
Long Canyon
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:16,000
N
W
E
S
Surveyor: P. Ramirez

Figure 23

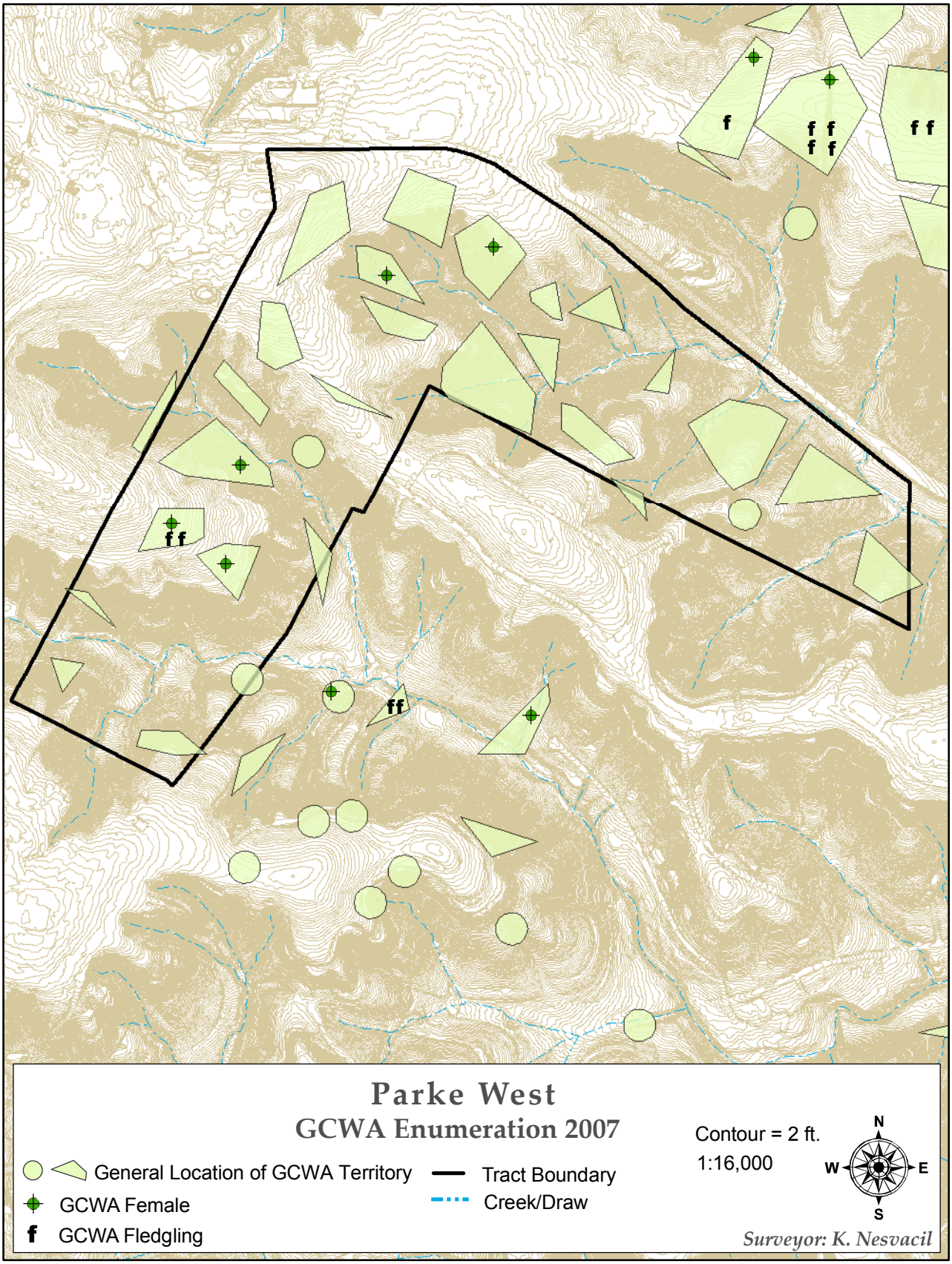

f
f f
f f
f f
f f
ff
ff
Parke West
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:16,000
N
W
E
S
Surveyor: K. Nesvacil

Figure 24

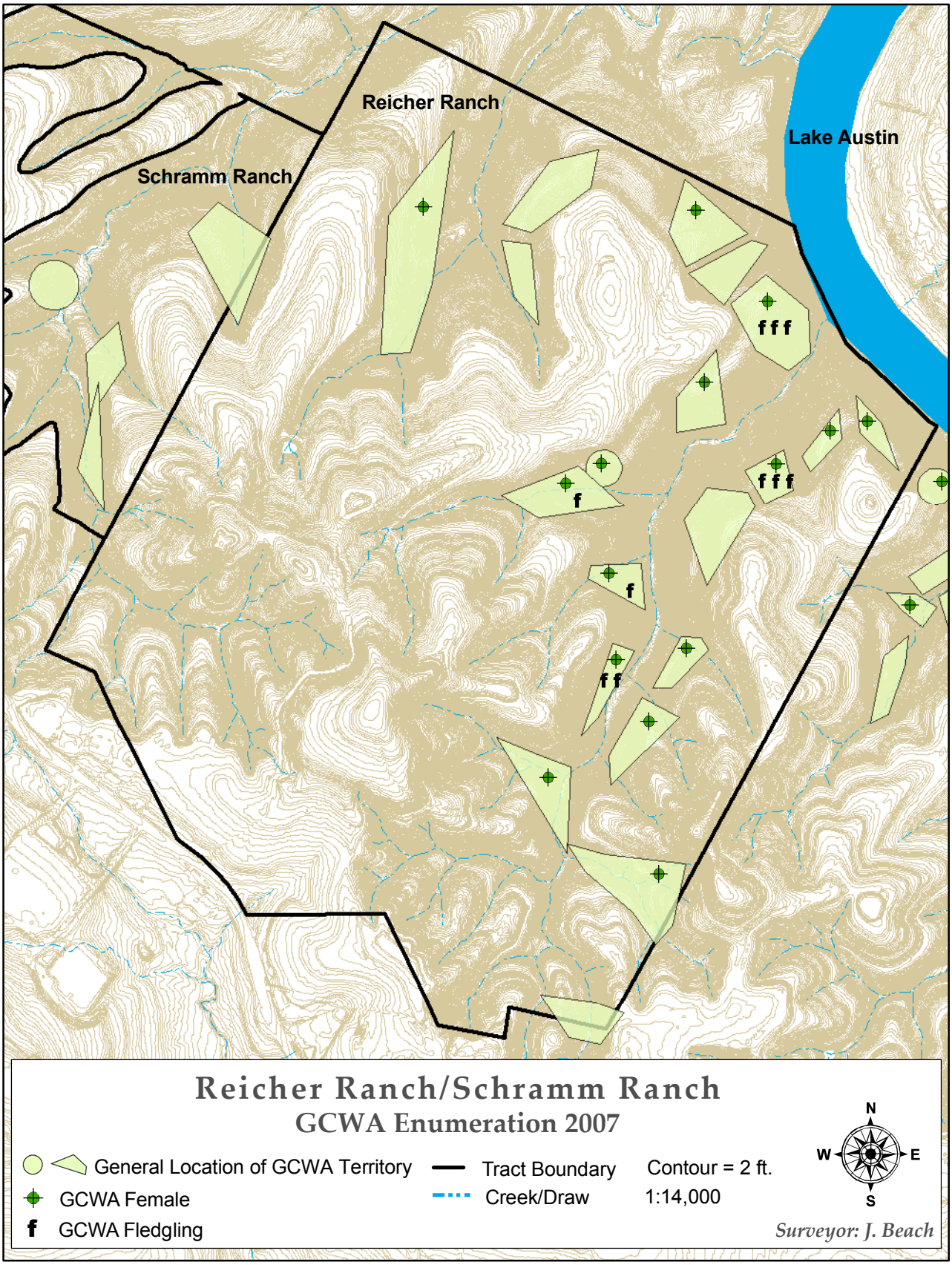

Reicher Ranch
Schramm Ranch
Lake Austin
f f f
f
f f f
f
f f
Reicher Ranch/Schramm Ranch
GCWA Enumeration 2007
General Location of GCWA Territory
GCWA Female
f GCWA Fledgling
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:14,000
N
W
E
S
Surveyor: J. Beach

Figure 25

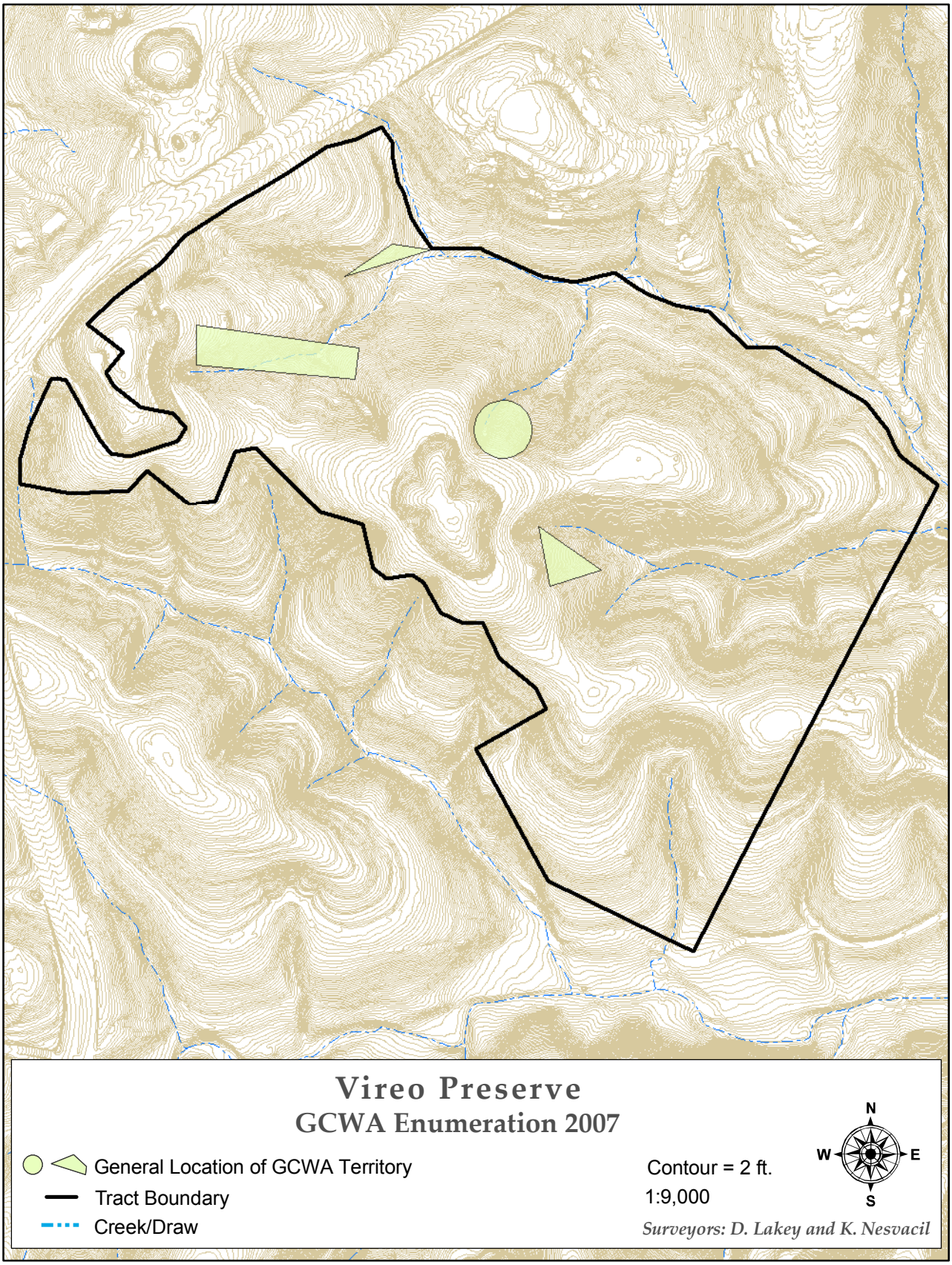

Vireo Preserve
GCWA Enumeration 2007
General Location of GCWA Territory
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:9,000
N
W
E
S
Surveyors: D. Lakey and K. Nesvacil

Figure 26

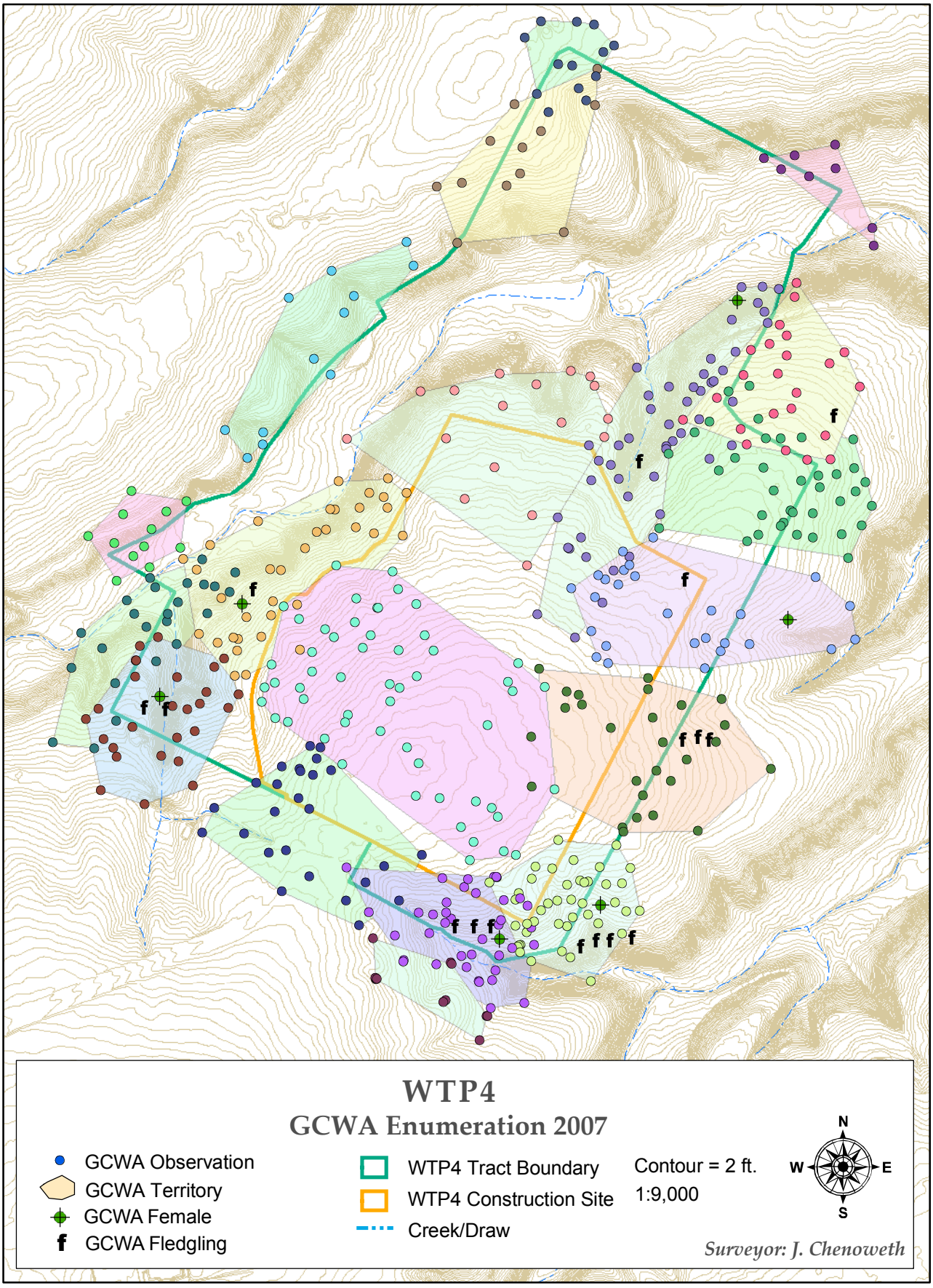

WTP4
GCWA Enumeration 2007
GCWA Observation
GCWA Territory
GCWA Female
f GCWA Fledgling
WTP4 Tract Boundary
WTP4 Construction Site
Creek/Draw
Contour = 2 ft.
1:9,000
N
W
E
S
Surveyor: J. Chenoweth

Figure 27

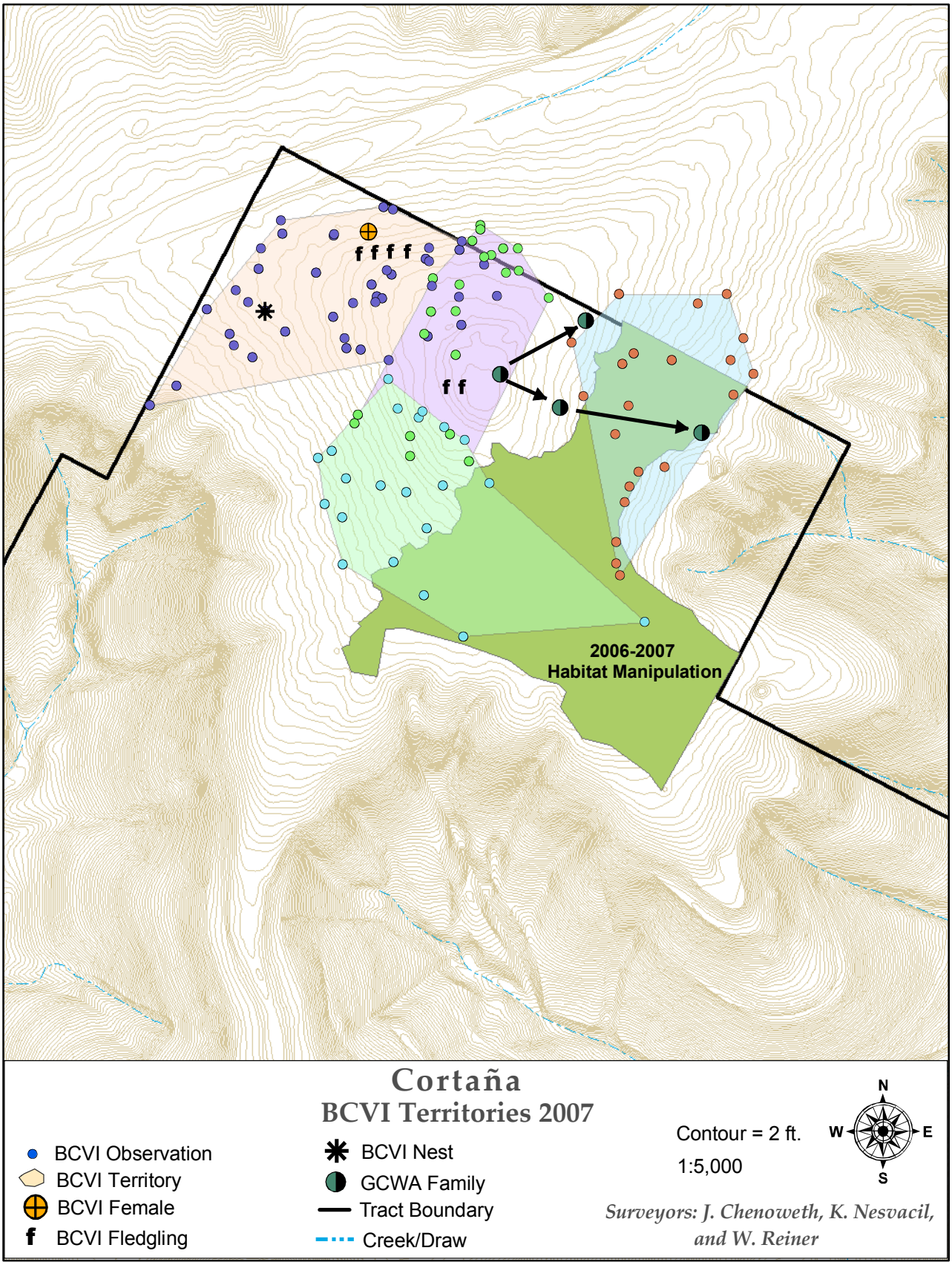

f f f f
f f
2006-2007
Habitat Manipulation
Cortaña
BCVI Territories 2007
BCVI Observation
BCVI Territory
BCVI Female
f BCVI Fledgling
BCVI Nest
GCWA Family
Tract Boundary
Creek/Draw
Contour = 2 ft.
1:5,000
N
W
E
S
Surveyors: J. Chenoweth, K. Nesvacil, and W. Reiner

Figure 28

APPENDIX E: COWBIRD MANAGEMENT

2007 Brown-headed Cowbird Management

Nest parasitism of black-capped vireos (vireo or BCVI) by brown-headed cowbirds (cowbird or BHCO) has been well documented and is considered a major threat to species' survival. Parasitism of golden-cheeked warblers (GCWA) on the BCP has also been documented by both City of Austin and Travis County biologists and reported in annual reports.

The cowbird management program operated seven traps this year, as compared to nine in 2006. For 2007, operation of the 3M and south Cortaña traps were suspended due to several years of low productivity and the Reicher Ranch trap was not in operation due to vandalism. A new trap location at Bohls was started due to the potential vireo habitat created on that tract. Of the seven traps in operation, two were operated in vireo habitat and the other five traps were situated adjacent to golden-cheeked warbler breeding habitat.

Two of the traps in operation in 2007 were wooden mega traps. These were situated on Canyon Creek and the east side of Ivanhoe. All other traps were hybrids (two metal and three wooden) and built according to specifications recommended by the Texas Parks and Wildlife Department (TWPD). Please see the following URL for specifications: http://www.tpwd.state.tx.us/conserve/pdf/cowbirds.pdf . The maintenance of traps this year was supported by the volunteer program. All volunteers took part in a 2-hour training program and were supervised by staff biologists throughout the field season.

Euthanasia of cowbirds and care of cowbirds and non-target species followed TPWD guidelines (see previously referenced URL). Non-target species encountered this year included the Texas rat snake (*Elaphe guttata emoryi*), northern cardinal (*Cardinalis cardinalis*), mockingbird (*Mimus polyglottos*), and an unknown species of wren (Family Troglodytidae).

Trap results for field season 2007 are given below. Results will be used to gauge the success of current trap locations.

APPENDIX E: COWBIRD MANAGEMENT, CONTINUED

Trap Location	Habitat	Trap Opening and Closing Dates	Total BHCO Trapped	Females Trapped	Fledglings Trapped	Trap Rate (=Females Caught per Trap Day)
Bohls	BCVI	3/07/07-6/04/07	17	7	0	0.08
Canyon Creek[1]	GCWA	3/23/07-6/04/07	21	13	0	0.18
Cortaña n.	BCVI	3/17/07-6/27/07	14	5	0	0.05
Ivanhoe e.[1]	GCWA	3/16/07-6/04/07	3	2	0	0.02
Ivanhoe w.	GCWA	3/16/07-6/04/07	5	1	1	0.01
Double J&T	GCWA	3/08/07-6/04/07	39	15	0	0.17
Long Canyon	GCWA	3/20/07-6/31/07	1	0	0	0.00

[1] Mega-trap

APPENDIX F: HABITAT RESTORATION

Black-capped Vireo Habitat Restoration

Background. The BCCP Land Management Plan (BCP 1998) requires maintaining or creating 2000 acres of black-capped vireo (vireo) habitat within the BCP. The plan originally identified specific acreages as potential vireo habitat. Much of this acreage is currently mature oak-juniper woodland that is prime habitat for the warbler. Additionally, a number of properties containing potential or occupied vireo habitat that were originally included within the proposed BCP boundaries have been lost to development since 1996.

Current occupied habitat. The Cortaña tract (1,752 acres) in the North Lake Austin Macrosite is the only CoA BCP property currently occupied by vireos. In 1996, about 57 acres of oak-juniper habitat were manipulated on upper Cortaña and the adjacent, privately managed, River Place Mitigation tract. Approximately 39 acres were manipulated on Cortaña and 18 acres on River Place. Both hand-clearing and hydro-axing methods were applied. In each year since 2000, three to five males have established territories in this area.

The Black-capped Vireo Preserve, although once home to 32 vireo territories, is no longer occupied habitat. The last territory was detected there in 1997.

Identifying sites. Identification in the field of possible sites for restoration or habitat creation is ongoing from year to year. During wildlife monitoring and land management activities, biologists search for occupied or potential vireo habitat. GIS is used to assess site characteristics and to locate additional possible sites. Specific site characteristics (e.g., soils, topography, geology), the distribution of warblers, and the history of occupation by vireos are all considered in identifying restoration sites. Size of potential restoration area, proximity to nearest vireo colony, and proximity to exurban development are also critical variables.

Habitat creation and restoration FY2006-07. The following projects were completed or initiated in winter 2006-2007.

- Continued work in the existing vireo habitat on the northern portion of the Cortaña tract. American Youth Works removed invading Ashe juniper from 16 acres, and lopped off, at waist-height, the larger trunks of shin oaks and live oaks, to promote the shrubby growth favored by the vireos. BCP volunteers removed juniper seedlings from another 2 to 3 acres in this area.

- Creation of potential vireo habitat continued on the Bohls tract in winter 2006-2007. With the assistance of American Youth Works, shin oaks and live oaks were topped and juniper was hand cleared in the newer 18 acres of the restoration site. A 25 acre prescribed burn was conducted in the habitat restoration area on 21 February 2007. Three days later, gale force winds from a strong cold front caused some smoldering mulch piles to flare up, resulting in a minor wildfire incident. An additional 1.7 acres

were burned outside of the management unit. It is now estimated that approximately 25 acres of the restoration area has the potential to be good quality vireo habitat, with an additional 11 acres having the potential to be low to medium quality habitat. Breeding Bird Surveys points, photo-point monitoring of vegetation, and vegetation transects (point-intercept and line-transect methods) were completed in the habitat restoration area to monitor restoration efforts.

- Out of the planned 60 acres selected for mechanical habitat manipulation on the Lime Creek tract, six acres were manipulated before the beginning of the warbler season. During 2007 warbler monitoring, several males and fledglings were found adjacent to the cleared area and within the area proposed for further clearing. As such, all plans for future clearing were halted. American Youth Works and BCP staff performed wildland fire mitigation work for the six acres of cleared potential vireo habitat.