City of Austin 2008
Golden-cheeked Warbler *(Dendroica chrysoparia)* and Black-capped Vireo *(Vireo atricapilla)* Monitoring Program

Balcones Canyonlands Preserve Annual Report
Fiscal Year 2007-08



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

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City of Austin

2008 Golden-cheeked Warbler and Black-capped Vireo Monitoring Program

Balcones Canyonlands Preserve Annual Report

FY 2007-08

This report summarizes the results of the City of Austin's 2008 golden-cheeked warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*) endangered species monitoring program. The 2008 field season was the eleventh 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 approximately 13,600 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 2008, warbler territories were mapped on five 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 five different BCP tracts: Emma Long Metropolitan Park, Barton Creek Wilderness Preserve, Ivanhoe, Forest Ridge, and 3M/St. Edwards (Appendix A). Staff biologists monitor these plots annually.

The warbler monitoring program was designed to have at least one prime study plot 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 75 percent excellent habitat. A portion of this plot was cleared during the winter of 2003-2004 and September 2005 to create black-capped vireo habitat. The plot shape also differs from all other prime plots. Thus, the Bohls plot is no longer considered to be a "prime" plot and is now treated as "transitional". Transitional plots comprise areas containing zero to a few warbler territories and may improve as warbler habitat within the next 30 years (BCP 1998). Two other transitional plots are located on the Canyon Creek and Double J&T tracts (Appendix A). These two plots have been monitored every other year and were monitored in 2007, so no data were collected in 2008.

In addition to the 100-acre plot surveys, enumeration surveys were conducted on portions of 23 City-managed BCP tracts and one Water Quality Protection Land (WQPL) tract comprising 5,704 acres. The purpose of the 2008 enumeration surveys was to document presence/absence in areas with few or no historic warbler sightings.

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 savannas. 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. Evidence of browse is visible on the majority of Preserve tracts. A paucity of certain deciduous woody species is also evident throughout the Preserve.

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

Region-wide Monitoring Program: 100-acre Study Plots

Territory mapping in 2008 was conducted on six permanent 100-acre study plots. Each of the five prime plots and the Bohls plot (now treated as a transitional plot) were monitored for a minimum of 60 hours over ten visits during the breeding season. Prime plots are surveyed each year.

The monitoring program and data collection protocol are described in detail in the Balcones Canyonlands Preserve Land Managers Handbook, Tier II-A, Chapter VII: Monitoring of the Golden-cheeked Warbler (BCP 2007); 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 100-Acre Plots. Territory size and configuration is based on observations prior to May 25 (BCP 2007). Observations after May 25 are recorded, but not used to delineate territory boundaries. Warbler observations were primarily recorded with a GPS datalogger (Garmin E-trex) which has an accuracy of 20–40 feet. Other sightings were recorded on topographic maps at a scale of 1:3,600, using a latitude/longitude grid of 0.001 degrees.

In 2008, the number of territories on 100-acre plots were calculated two ways: 1) full territories (territories contained entirely within the plot and 2) applying Verner's (1985) method (each full territory counted as 1.0 territory and each edge territory counted as 0.5 territories). Verner's counting method was recommended by Weckerly and Ott (2008) based on their analyses of the ten-year datasets and avoids the upward bias inherent in the IBCC (1970) methodology (both full territories and edge territories counted as 1.0 territories).

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 ten survey years for the 100-acre plots.

Analysis of Pairing and Productivity on Prime Plots. Productivity and mated status were estimated for full territories only. This methodology was used for data collected from 1998–2005 and 2007-2008. 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." Since results from 2006 may not be comparable to results from the other ten years of data, comparisons to this year 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 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.

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 a minimum of three visits per survey area during good weather conditions (USFWS 1994), which was increased to five visits during 2008 to confirm absence from a given area for that year. 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 all or portion of 23 BCP tracts comprising 5,647 acres. Staff also surveyed the 57-acre Stenis tract, which is a City of Austin WQPL tract adjacent to the BCP. The focus of the 2008 field season was to document presence/absence in areas with few or no historic warbler sightings. For each survey in 2008, observers were directed to allow roughly one hour for each 25 acres of habitat, with a minimum of three days in areas where warblers were detected and five days in areas where warblers were not found to verify non-detection. 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.

A complete list of properties on which enumerations were conducted, acres surveyed, surveyors, and survey effort for each tract are reported in Table 4. Acreages listed are for the areas that were surveyed within each tract (minus any 100-acre plot within the tract), not for the warbler habitat within the tract.

RESULTS AND DISCUSSION

100-acre Study Plots

Territory Densities and Locations. In field season 2008, average golden-cheeked warbler territory density (based on the full + 0.5 edge calculation) for the five prime plots was 13 territories /100 acres (range 6.5–21.5, Table 1), a slight overall increase as compared to 2007 average territory density (average 11.5 territories/100 acres, Appendix C). Barton Creek had a slight decrease in territory density, while the remaining prime plots increased by 1.5 to 3 territories (Appendix C). Territory density decreased slightly for the Bohls transitional plot with a loss of 1 territory/100 acres.

Consistent with 2007 surveys, Ivanhoe had the highest territory densities (21.5 territories/100 ac) of the five prime plots and Barton Creek had the lowest densities (6.5 territories/100 ac). Based on the 11 year datasets, overall long-term averages for all five prime plots is 13 territories/100 acres. The Barton Creek prime plot has the lowest long-term average (7 territories/100 ac), while Ivanhoe and Emma Long have the highest long-term average (17 and 16 territories/100 ac, respectively). Long-term averages for the Forest Ridge and 3M/St. Edwards plots are 13 and 11 territories/100 acres, respectively. Habitat patch size, differences in vegetation, and proximity to human activities are some of the variables that are likely to influence long-term averages and trends in warbler territory densities.

The Bohls 100-acre plot is now being treated as a transitional plot, so the averages for the prime plots and transitional plots have been recalculated based on this change (Appendix C). The Bohls plot is the only transitional plot that was surveyed during 2008 and had a decrease of 1 territory. Based on the long-term averages, the Canyon Creek and Bohls plots have similar territory densities (average 5 territories/100 ac), and Double J&T has the lowest (average 3 territories/100 ac).

Table 1. Golden-cheeked warbler territory number (per 100 acres) and estimated territory density (per 100 hectares) for each of the six 100-acre prime study plots on the City of Austin Balcones Canyonlands Preserve, Travis County, Texas, field season 2008. See Methods section for calculations.

Plot Name	No. of Full Territories	No. of Full Territories + (0.5 x Edge Territories)	Territory Density 100 ha[1]
Barton Creek	4	6.5	16
Emma Long	9	13.5	33
Ivanhoe	16	21.5	53
3M/St. Edwards	7	13	32
Forest Ridge	7	10.5	26
Average	9	13	32
Bohls	1	3	7

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

Figures 1–6 (Appendix D) depict warbler territory locations for the five prime plots and Bohls transitional plot in field season 2008. 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. The "X" symbol on the figures is also used to represent floater males. Floaters are typically young males observed later in the season only on one or two occasions.

Increases in territory density on prime plots through 2008 may reflect the continuing loss of warbler breeding habitat in western Travis County. As habitat becomes developed, warblers crowd into remaining habitat patches. The observed spatial and temporal changes in territory densities from one year to the next (Appendix C) 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 observers change from one year to the next. The 100-acre plot methodology used for warbler monitoring was not designed to assess cause and effect, so the 2009 field season will explore the feasibility of color-banding warblers, focus on obtaining additional productivity data, and using change detection analyses to estimate the amount of habitat loss in western Travis County.

Weckerly and Ott (2008) provide a statistical analysis of the 1998-2007 datasets for long-term trends and the potential for observer bias. The analytical results suggest that due to spatial variability, pooling of territory density data among plots is invalid, and thus trends in territory density should be analyzed separately for each plot. They further concluded that observer bias does not appear to be a major concern when analyzing the entire dataset. The recommended further study to assess whether pairing and reproductive success are biased low due to low detection probabilities of females, nests, and young.

Pairing Success, Breeding Success, and Productivity. In 2008, a total of 44 full territories were monitored for pairing and productivity data. Average pairing rate for full territories on the five prime plots was 87 percent (Table 2). Forest Ridge and Barton Creek had 100 percent pairing, and Emma Long and 3M/St. Edwards had 89 and 86 percent, respectively. The lower pairing rate (63 percent) and reproductive success reported for Ivanhoe may have been due to the high number of territories on this study plot and effects of crowding, and/or inadequate time to conduct a full survey of these parameters. The Bohls transition plot has 100 percent pairing success.

Average breeding success for full territories on the five prime plots was 69 percent (Table 2). The four full territories on the Barton Creek tract had 100 percent breeding success, followed by Emma Long (78 percent), 3M/St. Edwards (71 percent), and Forest Ridge (57 percent). Ivanhoe had the lowest reported breeding success (38 percent). No breeding was observed on Bohls.

A total of 62 fledglings were observed in the full territories on the five prime plots in 2008. For those territories that did produce offspring, the average productivity for all five plots was 2.4 fledglings. Average productivity for all full territories on the five prime plots was 1.67 fledglings.

In 2008, fecundity (number of male offspring per territorial male) in the prime plots averaged 0.72. Because nests and fledglings are difficult to locate, breeding success rates, productivity and fecundity rates represent minimum estimates only.

Table 2. Golden-cheeked warbler pairing rate, breeding success rate, and productivity on 100-acre study plots on the City of Austin's Balcones Canyonlands Preserve, Travis County, Texas, field season 2008. Data are based on observations of full territories only. See Methods section for calculations.

Plot Name	No. of Full Territories	No. of Full Territories w/ Female	Pairing Rate	No. of Full Territories Producing ≥ 1 Young	Breeding Success Rate	Total No. of Fledglings	Product. per Successful Territory	Product. per Full Territory
Prime Plots								
Barton Creek	4	4	1.00	4	1	11	2.75	2.75
Emma Long	9	8	0.89	7	0.78	17	2.43	1.89
Ivanhoe	16	10	0.63	6	0.38	14	2.33	0.88
3M/St. Edwards	7	6	0.86	5	0.71	10	2.00	1.43
Forest Ridge	7	7	1.00	4	0.57	10	2.50	1.43
Average			0.87		0.69		2.4	1.67
Transitional Plots								
Bohls	1	1	1.00	0	0	0	0	0

Enumerations

Total enumeration effort in 2008 equaled over 1,010 hours, covering 23 BCP tracts, 1 WQPL tract, and 5,704 acres (Table 4). 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. In addition, some of the warbler observations that were outside of the enumeration survey areas were approximate locations based on auditory rather than visual cues. For each hour spent conducting enumerations in 2008, an average of 5.65 acres were covered (range: 2.73–8.57 acres/hour for a tract). For each hour spent conducting territory mapping on 100-acre prime plots in 2008, 1.67 acres were covered.

Figures 7–27 (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. A single dot 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 100-acre plots are depicted on their tract's respective enumeration map; however the 100-acre plot data are not. See Figures 1–6 for 100-acre plot data.

Table 4. Summary of golden-cheeked warbler enumeration surveys on the City of Austin's Balcones Canyonlands Preserve, Travis County, Texas, field season 2008.

Tract Name	Acres Surveyed	Surveyor(s)	Survey Hours
Bohls	203	J. Beach S. Hargis	14
Bohls II	19	W. Reiner J. Chenoweth	6.5
Bowman	45	J. Reidy	6.25
Canyon Creek 1 (West)	112	M. Sanders	19
Canyon Creek 2 (East)	67	M. Sanders	16
Canyon Creek 3 (Stovepipe)	59	M. Sanders	10
Canyon Creek 4	30	J. Reidy	3.5
Cowfork	70	K. Nesvacil	15.4
Cortaña	1,200	C. Sperry W. Reiner	211
Double J&T	1,123	J. Chenoweth C. Sperry W. Reiner	179
Forest Ridge/Hilltop	247	J. Reidy J. Weber L. Weber	34.75
Ivanhoe/Beard Trust	470	J. Reidy	74.8

Jester	45	J. and L. Weber	14
Lime Creek	592	K. Nesvacil S. Rowin	51.2
Long Canyon	263	J. Chenoweth K. Nesvacil W. Reiner	39
Parke West	147	J. Mundy K. Nesvacil	38.5
Reicher Ranch	362	L. O'Donnell	72
Schramm Ranch	108	J. Chenoweth W. Reiner	27.4
Senna Hills	37	J. Chenoweth W. Reiner	6.25
Stenis *Not BCP Property, WQPL Property	57	J. Reidy	6.4
Vireo Preserve	210	L. O'Donnell J. O'Donnell	38
Former WTP4	238	L.O'Donnell R. Rochat J. Chenoweth	87.2
WARBLER Totals	5,704		1,010.15

Nest Data

City of Austin staff found a total of 39 warbler nests during the 2008 field season. All 39 nests were found in Ashe juniper trees. Forty-nine percent of the nests fledged one or more young, 41 percent failed, and 10 percent had an unknown fate.

No direct or indirect evidence of nest parasitism of warblers by brown-headed cowbirds (*Molothrus ater*) was reported on any survey in field season 2008. Appendix E contains a summary of brown-headed cowbird management for 2008.

Other Observations

William Reiner and Kelly Nesvacil videotaped two interesting warbler behaviors during the 2008 field season. William Reiner documented a female warbler on the ground collecting nesting material (feathers, grasses, downy plant material). This behavior is common during the nest-building phase and underscores the importance of ground habitat to this species in addition to the tree canopy and mid-story vegetation. Kelly Nesvacil documented a distraction display by a female warbler, which was feigning a wing-injury in the presence of this field biologist who was near a newly fledged juvenile. Both the female and the fledgling were in vegetation near the ground, again highlighting the importance of understory vegetation.

Table 5. Summary of data collected for golden-cheeked warbler nests found on the City of Austin's Balcones Canyonlands Preserve, Travis County, Texas, field season 2008.

COA Tract	Date Found	Fate	Tree Species
3M/St. Eds	4/28/2008	Fledged	Ashe juniper
3M/St. Eds	4/28/2008	Fledged	Ashe juniper
Beard Trust	5/9/2008	Fledged	Ashe juniper
Emma Long	4/1/2008	Failed	Ashe juniper
Emma Long	4/7/2008	Failed	Ashe juniper
Emma Long	4/25/2008	Fledged	Ashe juniper
Emma Long	4/28/2008	Fledged	Ashe juniper
Emma Long	4/28/2008	Fledged	Ashe juniper
Emma Long	5/10/2008	Failed	Ashe juniper
Forest Ridge	4/6/2008	Fledged	Ashe juniper
Forest Ridge	4/13/2008	Failed	Ashe juniper
Forest Ridge	4/16/2008	Failed	Ashe juniper
Forest Ridge	4/17/2008	Failed	Ashe juniper
Forest Ridge	4/17/2008	Fledged	Ashe juniper
Forest Ridge	4/17/2008	Fledged	Ashe juniper
Forest Ridge	4/18/2008	Fledged	Ashe juniper
Forest Ridge	4/19/2008	Fledged	Ashe juniper
Forest Ridge	5/9/2008	Fledged	Ashe juniper
Forest Ridge	4/20/2008	Failed	Ashe juniper
Hilltop	4/18/2008	Failed	Ashe juniper
Hilltop	5/9/2008	Fledged	Ashe juniper
Ivanhoe	4/20/2008	Unknown	Ashe juniper
Ivanhoe	4/20/2008	Fledged	Ashe juniper
Ivanhoe	4/28/2008	Unknown	Ashe juniper
Ivanhoe	4/29/2008	Failed	Ashe juniper
Ivanhoe	4/29/2008	Fledged	Ashe juniper
Ivanhoe	4/30/2008	Fledged	Ashe juniper
Ivanhoe	4/30/2008	Unknown	Ashe juniper
Jester	3/24/2008	Fledged	Ashe juniper
Jester	4/1/2008	Fledged	Ashe juniper
Jester	4/1/2008	Failed	Ashe juniper
Jester	4/3/2008	Failed	Ashe juniper
Jester	4/12/2008	Failed	Ashe juniper
Jester	4/22/2008	Failed	Ashe juniper
Jester	4/25/2008	Unknown	Ashe juniper
Jester	4/25/2008	Fledged	Ashe juniper
Jester	4/27/2008	Failed	Ashe juniper
Jester	5/11/2008	Failed	Ashe juniper
Double J&T	5/6/2008	Failed	Ashe juniper

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. That colony declined steadily from 32 territories in 1987 to just one territory in 1997 (Grzybowski 1989, Steed 1988, Abbruzzese 1998).

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. This year, for the first time since the BCP was established, biologists documented on the Ivanhoe tract a pair of vireos that successfully raised at least one young.

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.

BCP staff are committed to intensively managing cowbirds at all vireo colonies. BCP staff and volunteers have managed cowbirds at the Cortaña colony every year since vireos were first observed there in 2000; management data from 2008 can be found in Appendix E.

Because vireo habitat must continually be created and restored to remain viable, restoration projects are typically undertaken every year on various City of Austin tracts. While no restoration projects were undertaking during FY 2007-08, preparations were made for

restoration efforts planned for FY 2008-09 at the Vireo Preserve (Appendix F). Additional restoration work is also planned for the Cortaña tract.

METHODS

Sites and Survey Effort

In field season 2008, 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 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, City of Austin staff 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) methods to determine numbers and locations of territories, conducting surveys from 16 April to 28 June 2008 for a total of 44.5 hours. Staff returned to search the site later in the season (July 12, August 31) for evidence of breeding (nests and fledglings), for a total of 4 hours.

Data Collection and Analysis

Locations of vireos were primarily recorded with a GPS datalogger (Garmin E-trex) which has an accuracy of 20–40 feet. 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.

Natal Dispersal Study

2008 was the second year of a three-year Texas State University study spatially analyzing natal and breeding dispersal of vireos. The research will focus on known vireo colonies while also investigating unoccupied but appropriate habitat, at Balcones Canyonlands National Wildlife Refuge and the BCP (both Travis County and City of Austin tracts). Field work began in earnest this year as William Simper, the primary field biologist, and his team attempted to mistnet and band as many vireos as possible in the disparate colonies.

Staff coordinated our monitoring efforts with the TSU team, and shared information. The banders did use playback tapes of vireo song for short periods in order to draw vireos into a mistnet for banding.

RESULTS AND DISCUSSION

Territory Mapping

In 2008, staff found vireos on two City-owned BCP tracts: Cortaña and Ivanhoe.

Three male vireos defended territories on the restored portions of Cortaña and the adjacent River Place mitigation tract, a decrease of one territory from 2007. However, the southeastern portion of the site, which had been improved during the winter of 2006-2007, was the center of a successful vireo territory for the first time since the habitat was restored in 1995. Figure 27 depicts territory locations for the Cortaña tract during 2008.

Two of the territories were held by second-year males, based upon plumage characteristics described in Pyle (1997). Only one of the males, whose territory was situated in the northwest part of the shinnery, was an after-second-year (ASY) male. The River Place mitigation property was apparently lightly used by vireos this year. The highest ground (often called "the knoll"), in the north-central portion of the site, was also lightly used. This area is dominated by mature oaks, junipers, and other trees; it is less suitable for vireos, but has been occupied in past years. Male vireos did, however, wander into closed-canopy woodland on the southern and western edges of the site.

Pairing, Breeding Success, and Productivity

Pairing success was 100 percent. All of the territorial males were observed associating with a female, or tending a nest or fledglings.

Two pairs produced at least one offspring, yielding a breeding success of at least 67 percent. TSU researchers spotted 2 fledglings with the male in the eastern territory on June 21. They also found a nest of 3 young in the central territory on July 8. A June 16 inspection of the nest found it empty except for shed pinfeather sheathing (a fine, whitish powder that is typical in nests in which the young have successfully fledged). There were, however, no fledglings actually documented, so the fate of this nest is unknown. Productivity, therefore, was 2 fledglings for the one successful territory, and 0.67 for all territories. Productivity results represent minimum numbers. As with golden-cheeked warblers, vireo fledglings can be difficult to detect, so actual productivity may have been higher than observed.

Natal Dispersal Study

TSU researchers successfully mistnetted and banded male vireos from all three Cortaña territories, and also banded the three nestlings from the central territory. The male from the central territory was banded on April 25, with a combination of Blue/Silver:Yellow/Black. The other two males were banded on May 22. The ASY male in the northwestern territory was banded Red/White:Black/Silver. The eastern male was given Dark Blue/Silver:Dark

Blue/Dark Green. The nestlings were all assigned No Band/Silver:Pink/Dark Green on July 8.

Parasitism

Brown-headed cowbirds were seen on the Cortaña site only in the immediate vicinity of the cowbird trap, though they were occasionally observed flying overhead. No vireos were observed tending cowbird fledglings; however, a blue-gray gnatcatcher (*Polioptila caerulea*) was feeding a young cowbird on July 12 on the west side of the knoll. A total of 23 cowbirds were caught in the hybrid metal trap located in the study area; six of these were female brown-headed cowbirds and two were female bronzed cowbirds (Appendix E).

In 2004, common grackles (*Quiscalus quiscula*), western scrub-jays (*Aphelocoma coerulescens*) and northern mockingbirds (*Mimus polyglottos*) were observed harassing vireos in the Cortaña study area on several occasions, but no harassment by other avian species has been observed since then. Although depredation of nests was not observed in 2008, 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 red imported fire ants (*Solenopsis invicta*).

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 (Figure 13). Male warblers were usually detected singing 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, O'Donnell et. al. 2007), golden-cheeked warblers were also observed in the interior of the study site, on April 2 and 17, and on May 29.

Vireos on the Ivanhoe Tract

On May 9, a staff biologist noted a male vireo on the northern portion of the Ivanhoe tract. A volunteer found a pair of vireos in the same general area on May 23, and a staff biologist later noted a male giving agitated "shrad" calls. Staff visited the site again on June 11, and found a male, a female, and at least one fledgling vireo. Staff returning to the site on July 3 heard a male vireo near the previous location but were unable to observe it.

Though vireos have been seen on the Ivanhoe tract in the past, this is the first recorded successful breeding since the Preserve was established. The habitat is mixed brushy cover in two wide corridors beneath electric transmission lines. The corridors are flanked and separated by closed-canopy woodland occupied by golden-cheeked warblers.

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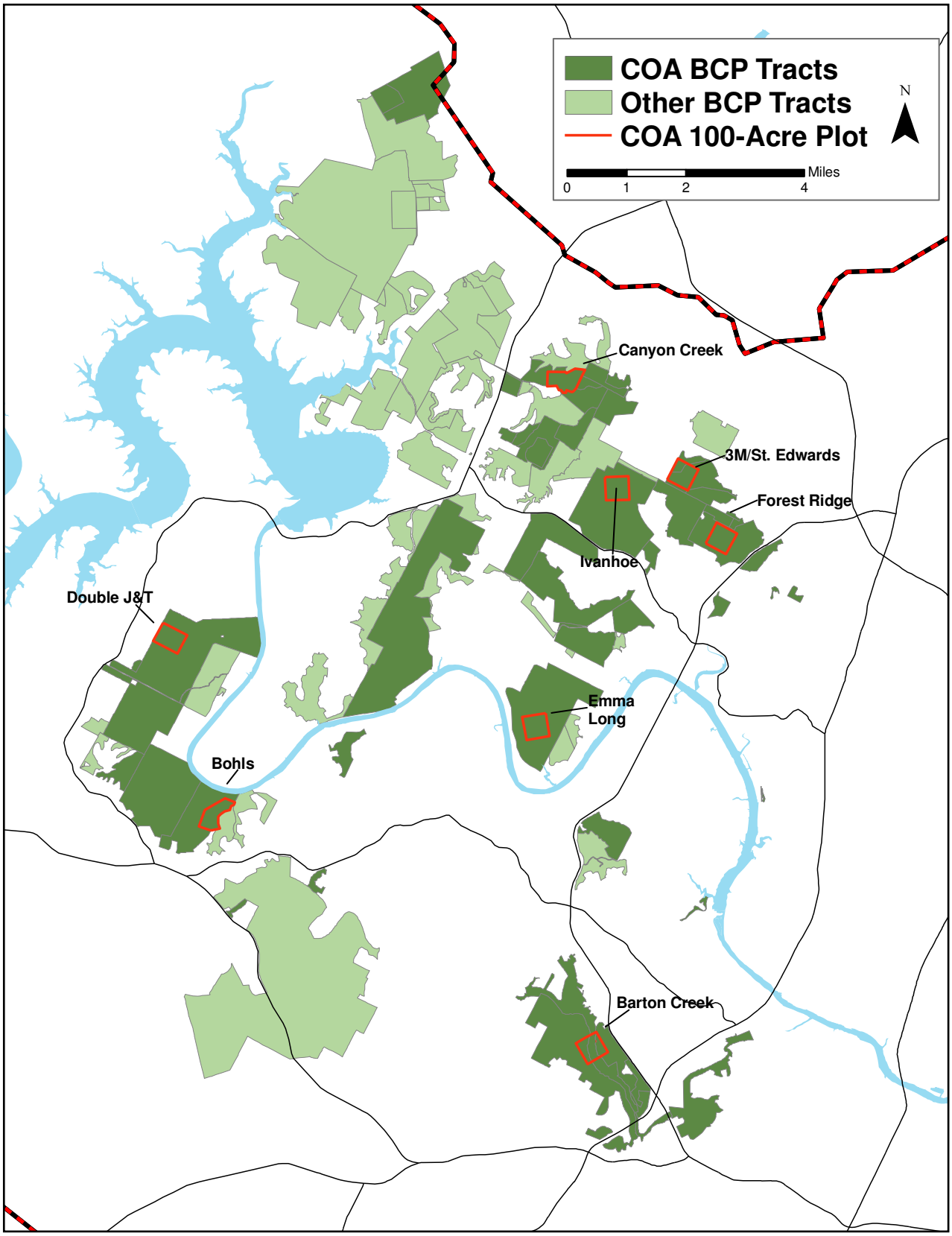
IV. APPENDICES

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



APPENDIX B: 100-ACRE STUDY PLOT PROTOCOL

Golden-cheeked Warbler Monitoring
Balcones Canyonlands Preserve, City of Austin
100-Acre Plot Protocol, 2008

Monitoring in these plots is more intensive than for enumerations. The primary goal is to map the location and extent of territories as accurately as possible in order to estimate density trends within the BCP. Another goal is to determine the breeding success of the Golden-cheeked Warblers (warbler) in these areas, so observations of females, nests, and fledglings are important. An accurate count of fledglings gives us valuable information about productivity. Prime Study Plots are located in excellent warbler habitat. Transitional Study Plots are situated in areas that are less than ideal warbler habitat, but are improving.

Survey Dates: [These are general and may vary from year to year, ± 5 days, depending on arrival of warblers, initial fledging dates, dates when fledglings begin to move beyond territory boundaries]

a) March 15 - April 30 – Focus primarily on mapping the number and configuration of territories and determining mating status: for the prime plots, a minimum of 6 visits; for the transitional plots, a minimum of 3 visits.
b) May 1 – May 25 – Shift focus to obtaining productivity data (number of warbler young fledged) for all territories within and along the edges of the 100-acre plots. Continue to verify the number and extent of territories: for the prime plots, a minimum of 4 visits; for the transitional plots, a minimum of 2 visits.
c) May 25 – June 15 – Focus entirely on obtaining productivity data: a minimum of 1 additional visit. It is important to record dependent young during this time. Independent hatch-year birds may associate with other warbler families or stray far from natal territories.

Training: Continue to provide annual training prior to the onset of the survey season. Have each new staff accompany a BCP biologist for at least one survey before working independently.

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 within 30 minutes of sunrise.

1) At start and end of each site visit, record on the field map the time, date, and weather conditions – temperature, wind speed, cloud cover, and any precipitation. 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 warbler on a field map, using the symbols on the attached sheet. Standardized notation will help when we compile data from multiple observers.
3) For each observation, use a different number or letter, unless you are certain the bird is the same as an earlier one. For a female warbler, use the female symbol: "♀". (Do not use the male symbol "♂" for a male warbler, because it could be confused for a singing bird that has moved to the upper right.) For a fledgling warbler, use a lowercase "f".
4) 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.
5) Record other information requested on the survey form. You may either use a copy of the form or record the data on the back of the field map.
6) No two visits should be less than 5 days apart.
7) Do not census warblers in steady rain or thunderstorms (light drizzle is okay).
8) Do not conduct a warbler 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, unobtrusively. Locations of warbler nests are important information, but do not warrant disturbance of 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 warblers feeding fledgling cowbirds are especially important.

12) If you are surveying in an area where warblers 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 per 100 acres and per 100 hectares for five 100-acre prime study plots and three 100-acre transitional study plots on the City of Austin's BCP, Travis County, Texas, field seasons 1998-2008. See Methods section for calculations.

Plot Name	Survey Year	No. of Full Territories	No. of Full Territories + 50% of Edge Territories	No. of Territories per 100 ha
Prime Plots				
Barton Creek	1998	2	5.0	12
	1999	6	9.0	22
	2000	5	7.0	17
	2001	3	5.0	12
	2002	2	5.0	12
	2003	2	5.5	14
	2004	3	6.5	16
	2005	4	7.5	19
	2006	6	9.0	22
	2007	6	7.5	19
	2008	4	6.5	16
	Average	4	7.0	17
Emma Long	1998	6	8.5	21
	1999	7	9.5	24
	2000	12	16.5	41
	2001	15	18.5	46
	2002	18	20.0	50
	2003	14	16.5	41
	2004	11	16.5	41
	2005	14	18.5	46
	2006	19	24.5	61
	2007	5	10.5	26
	2008	9	13.5	33
	Average	12	16.0	39
Ivanhoe	1998	7	10.0	25
	1999	8	12.5	31
	2000	7	13.0	32
	2001	2	8.0	20
	2002	9	15.5	38
	2003	13	21.5	53
	2004	12	21.0	52
	2005	15	20.5	51
	2006	20	24.0	59
	2007	16	20.0	49
	2008	16	21.5	53
	Average	11	17.0	42
3M/St. Edwards	1998	6	9.0	22
	1999	7	11.0	27
	2000	7	12.0	30
	2001	3	6.0	15
	2002	9	12.5	31
	2003	8	12.5	31
	2004	6	11.5	28
	2005	7	13.5	33
	2006	8	11.5	28
	2007	6	11.5	28
	2008	7	13.0	32
	Average	7	11.0	28

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

Plot Name	Survey Year	No. of Full Territories	No. of Full Territories + 50% of Edge Territories	No. of Territories per 100 ha
Forest Ridge	1998	7	10.5	26
	1999	11	14.0	35
	2000	7	10.5	26
	2001	8	11.0	27
	2002	11	13.0	32
	2003	9	12.5	31
	2004	13	17.5	43
	2005	11	15.0	37
	2006	16	21.0	52
	2007	4	9.0	22
	2008	7	10.5	26
	Average	9	13.0	32
Average, All Prime Plots	1998	6	9	21
	1999	8	11	28
	2000	8	12	29
	2001	6	9.5	24
	2002	10	13	33
	2003	9	13.5	34
	2004	9	14.5	36
	2005	10	15.0	37
	2006	14	18.0	45
	2007	7	11.5	29
	2008	9	13.0	32
	Average	9	13.0	32

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

Plot Name	Survey Year	No. of Full Territories	No. of Full Territories + 50% of Edge Territories	No. of Territories per 100 ha
Transitional Plots				
Bohls	1998	3	4.0	10
	1999	1	4.0	10
	2000	1	3.0	7
	2001	4	6.0	15
	2002	4	5.5	14
	2003	4	6.5	16
	2004	5	8.0	20
	2005	6	8.0	20
	2006	9	6.5	16
	2007	1	4.0	10
	2008	1	3	7
	Average	4	5.0	13
Canyon Creek	1998	0	4.0	10
	1999	2	4.5	11
	2000	0	4.0	10
	2001	3	7.5	19
	2003	0	3.5	9
	2005	3	8.0	20
	2007	3	6.5	16
	Average	2	5.0	13
Double J&T	1998	0	0.5	1
	1999	0	0.5	1
	2000	0	0.5	1
	2001	2	3.0	7
	2003	3	3.5	9
	2005	6	6.5	16
	2007	3	3.5	9
	Average	2	3.0	6
Average, All Transitional Plots	1998	1	3.0	7
	1999	1	3.0	7
	2000	0	2.5	6
	2001	3	5.5	14
	2003	2	4.5	11
	2005	5	7.5	19
	2007	2	4.5	12
	Average	2	4.0	11

APPENDIX D: SURVEY MAPS (FIGURES 1–27)

100-acre Study Plots

Figures 1–6 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

Enumerations

Figures 7-27 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. A single dot 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 1–6 for 100-acre plot data.

Figure 7: Bohls

Figure 8: Bohls II

Figure 9: Bowman/Canyon Creek 4/Former WTP4

Figure 10: Canyon Creek 1/Canyon Creek 3

Figure 11: Canyon Creek 2

APPENDIX D: SURVEY MAPS, CONTINUED

Figure 12: Cowfork

Figure 13: North and Middle Cortaña

Figure 14: South Cortaña

Figure 15: North Double J&T

Figure 16: South Double J&T

Figure 17: Forest Ridge/Stenis

Figure 18: Ivanhoe South/Beard Trust

Figure 19: Ivanhoe North

Figure 20: Jester

Figure 21: Lime Creek

Figure 22: Long Canyon

Figure 23: Parke West

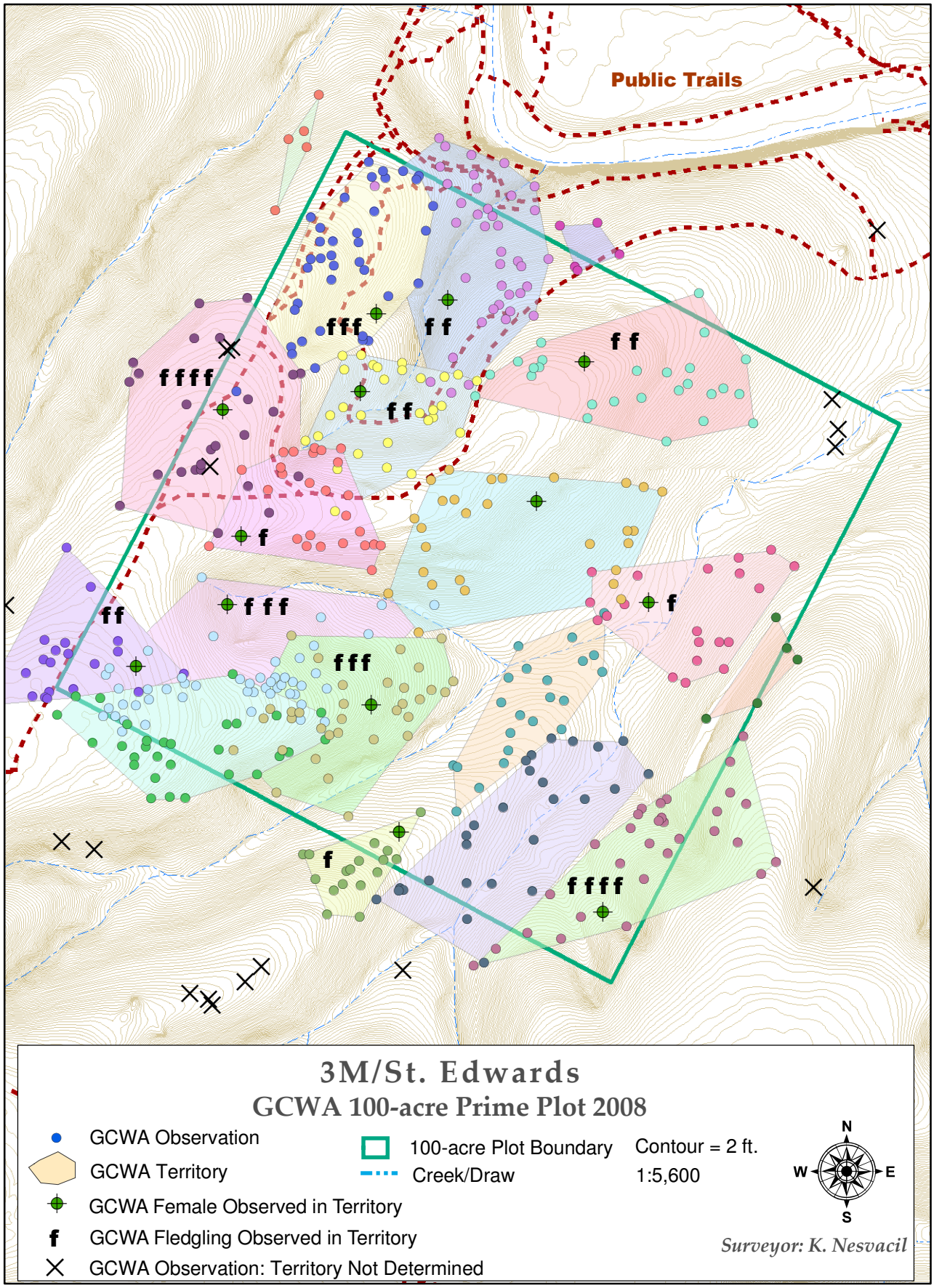
Figure 24: Reicher Ranch/Schramm Ranch

Figure 25: Senna Hills

Figure 26: Vireo Preserve

Black-capped Vireo Survey

Figure 27: Cortaña


Public Trails
3M/St. Edwards
GCWA 100-acre Prime Plot 2008
GCWA Observation
GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
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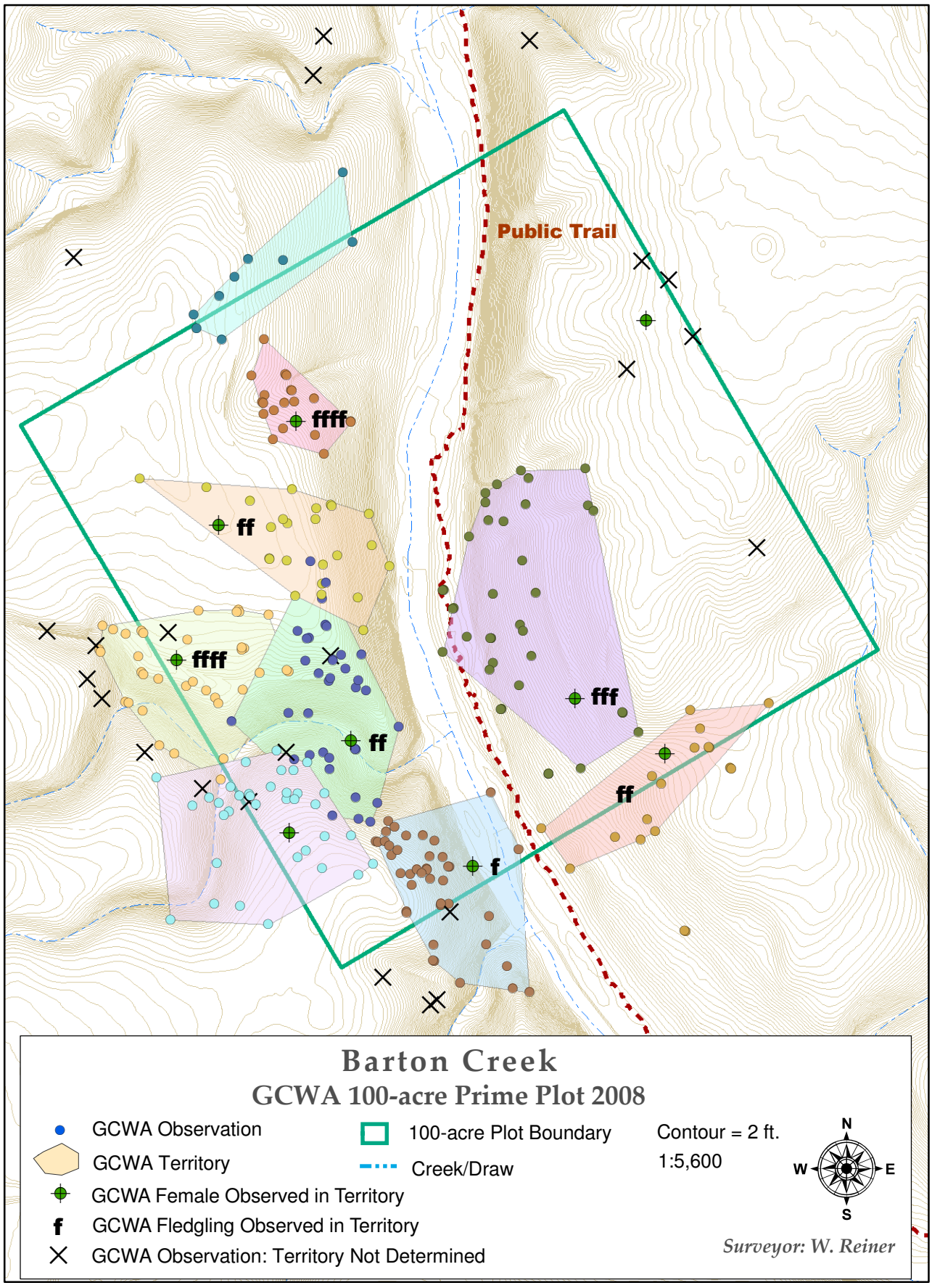
N
W
E
S
Surveyor: K. Nesvacil

Figure 1


Public Trail
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Barton Creek
GCWA 100-acre Prime Plot 2008
GCWA Observation
GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
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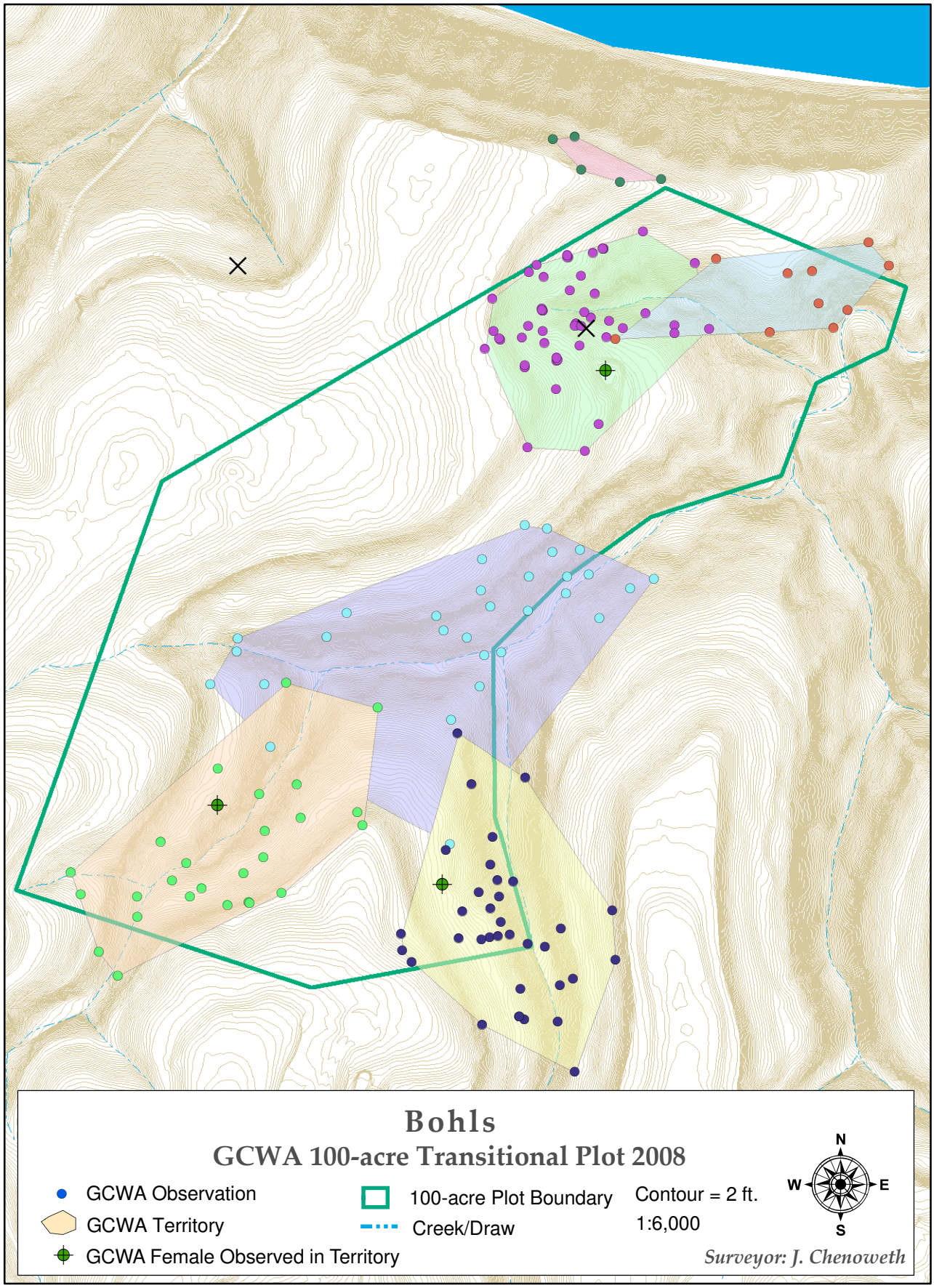
N
W
E
S
Surveyor: W. Reiner

Figure 2


Bohls
GCWA 100-acre Transitional Plot 2008
GCWA Observation
GCWA Territory
GCWA Female Observed in Territory
100-acre Plot Boundary
Creek/Draw
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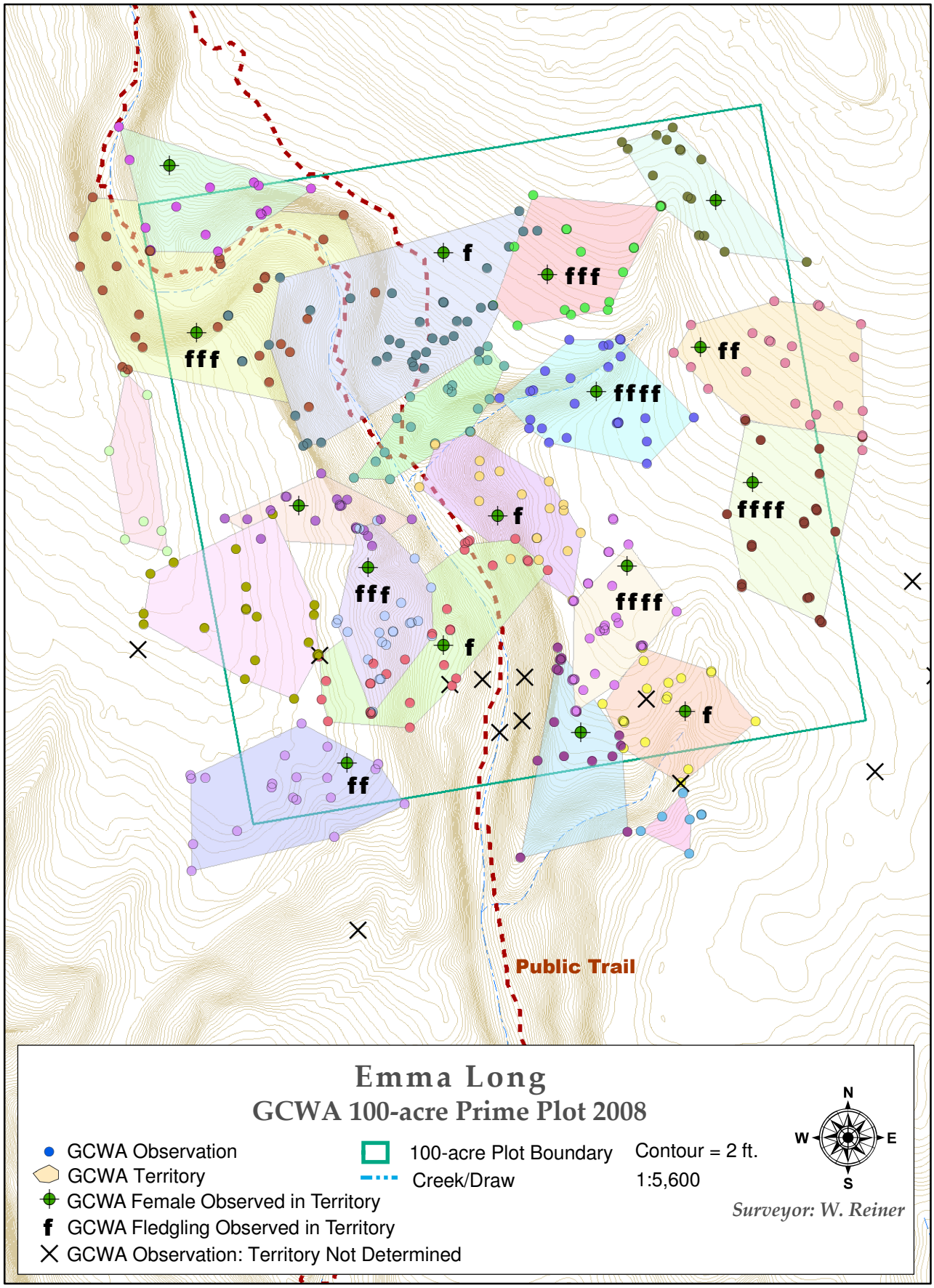
1:6,000
N
W
E
S
Surveyor: J. Chenoweth

Figure 3


Emma Long
GCWA 100-acre Prime Plot 2008
GCWA Observation
GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:5,600
Surveyor: W. Reiner
N
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Public Trail
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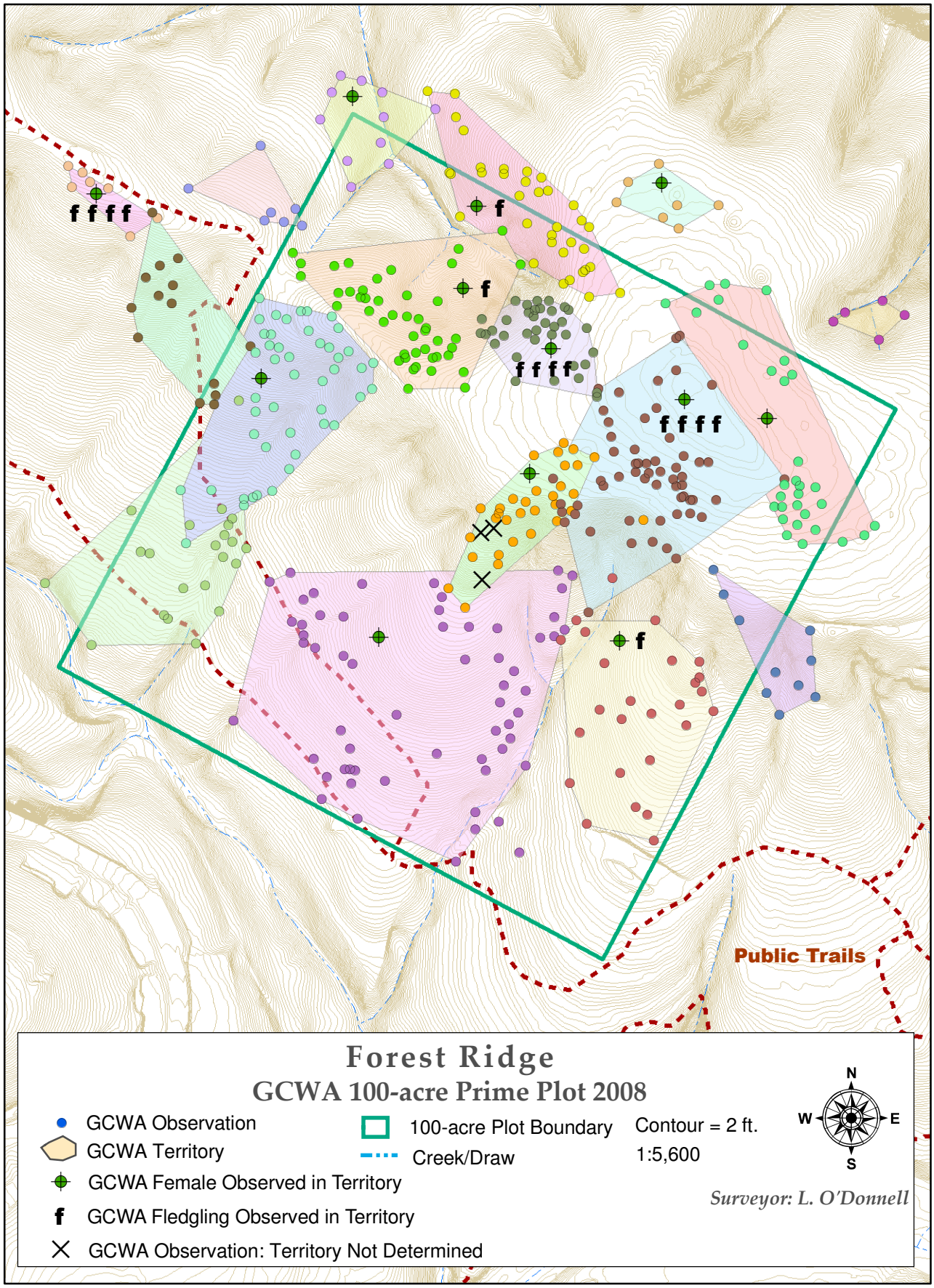
Figure 4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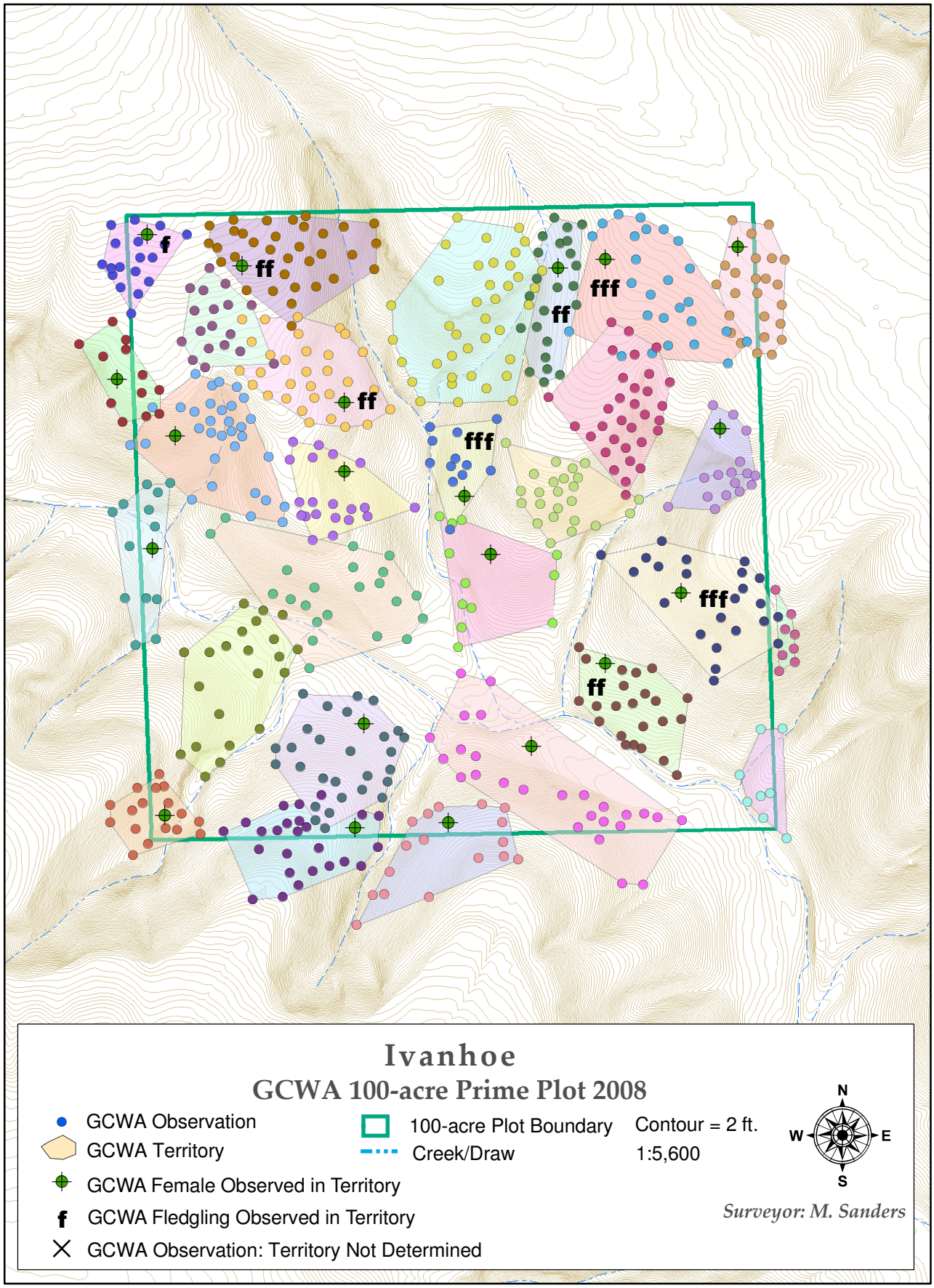
Public Trails
Forest Ridge
GCWA 100-acre Prime Plot 2008
GCWA Observation
GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
1:5,600
N
W
E
S
Surveyor: L. O'Donnell

Figure 5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Ivanhoe
GCWA 100-acre Prime Plot 2008
GCWA Observation
GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation: Territory Not Determined
100-acre Plot Boundary
Creek/Draw
Contour = 2 ft.
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N
W
E
S
Surveyor: M. Sanders

Figure 6

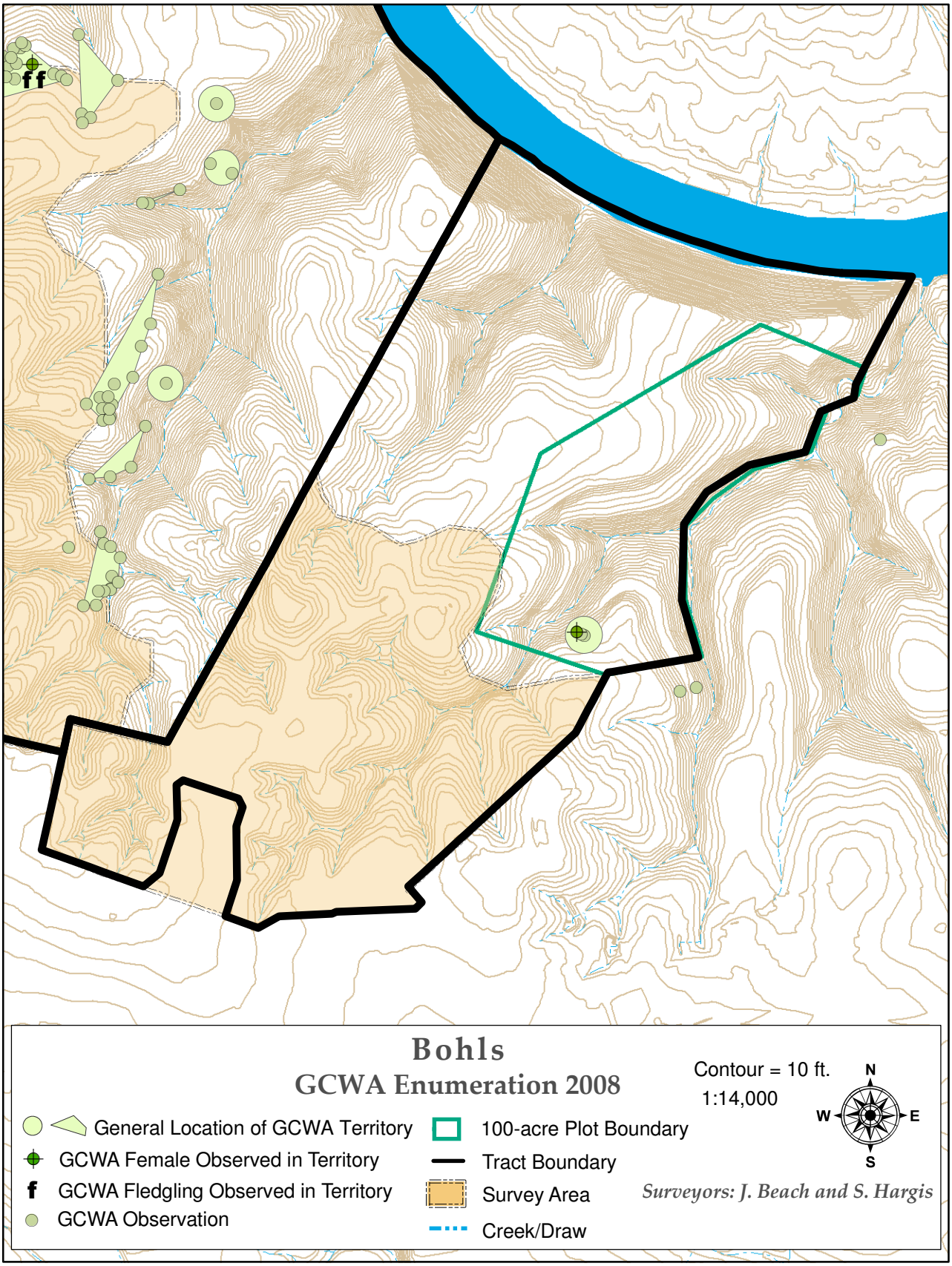

Bohls
GCWA Enumeration 2008
Contour = 10 ft.
1:14,000
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
GCWA Fledgling Observed in Territory
GCWA Observation
100-acre Plot Boundary
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Beach and S. Hargis

Figure 7

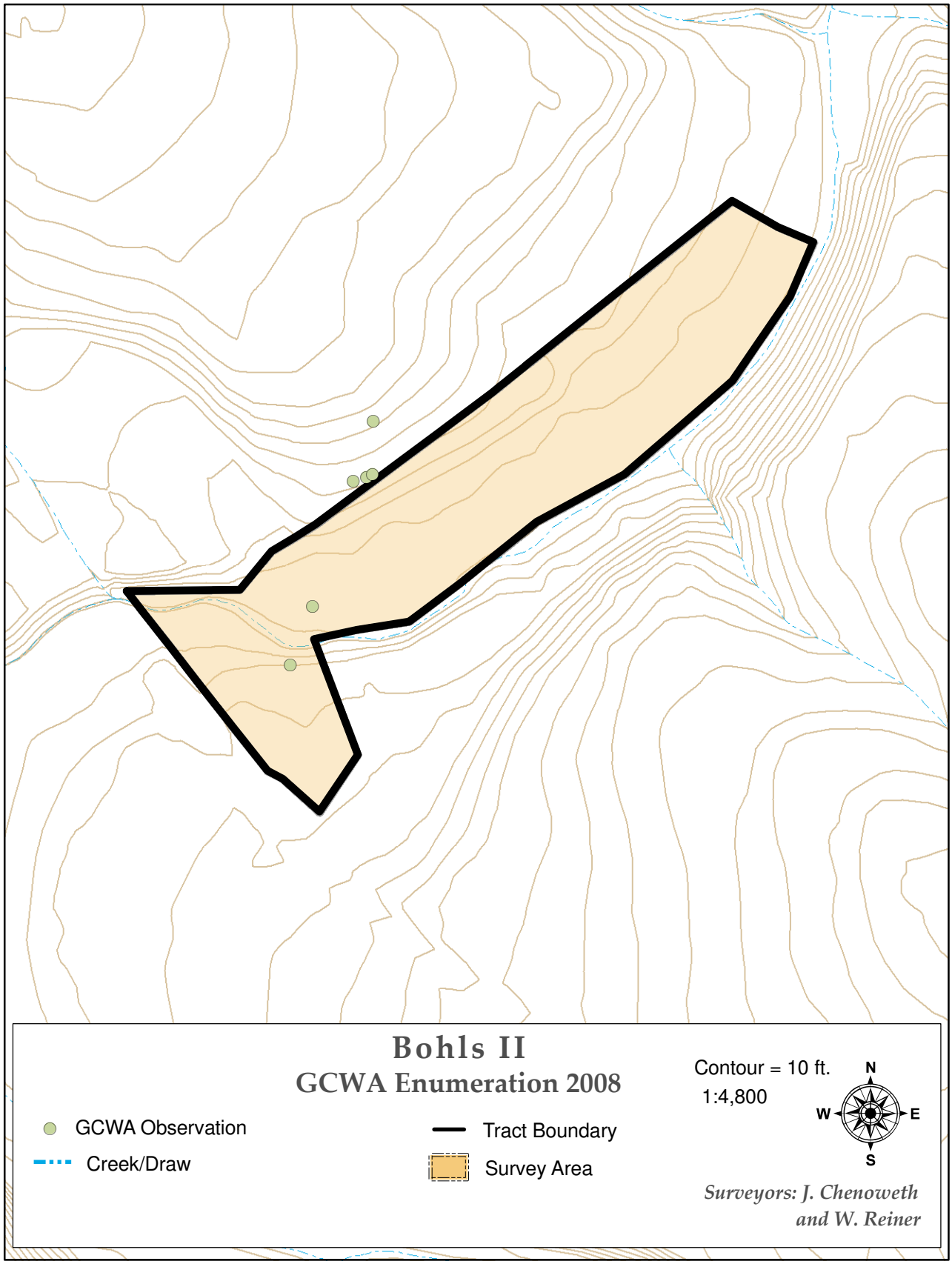
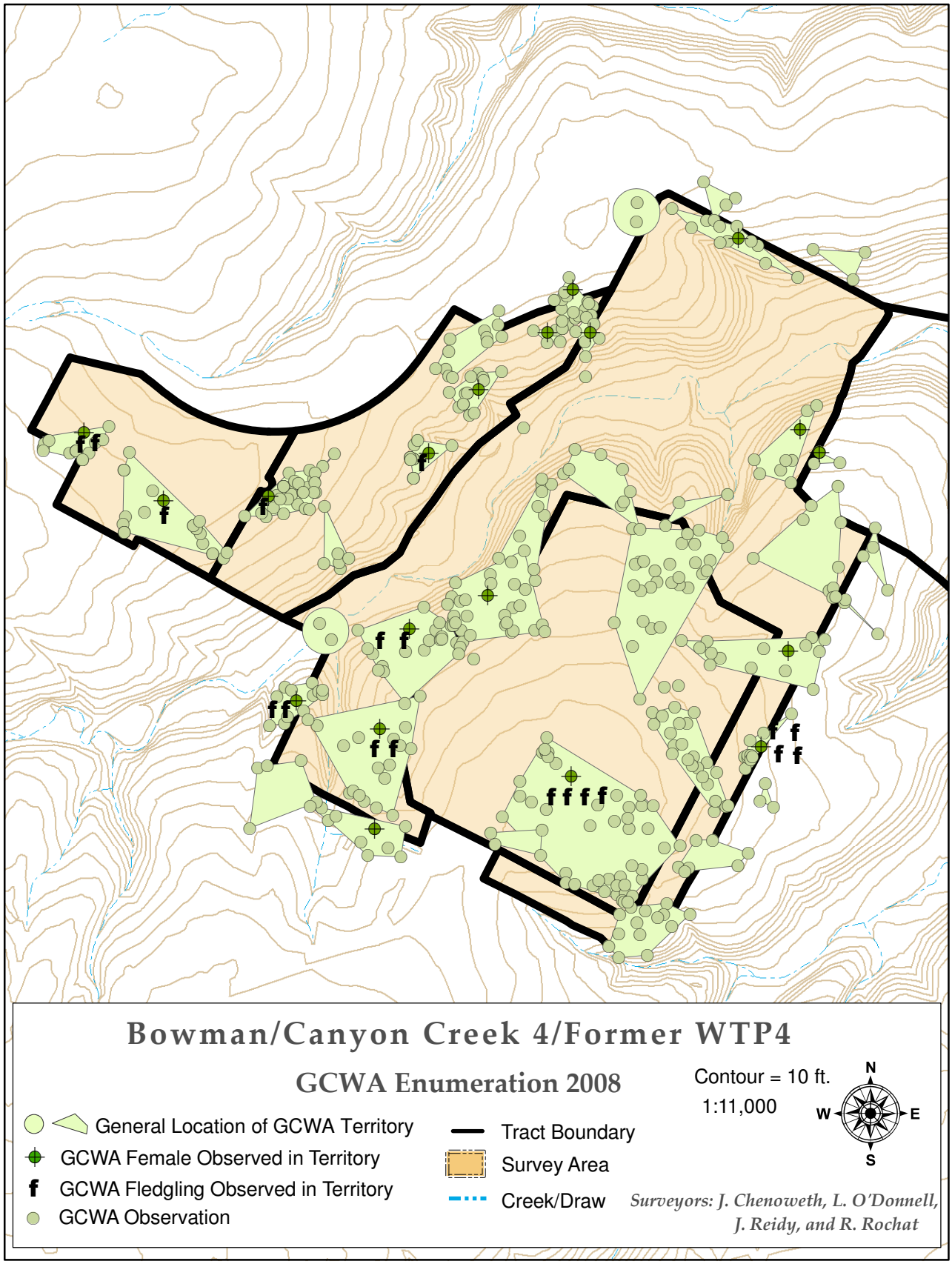

Bohls II
GCWA Enumeration 2008
GCWA Observation
Creek/Draw
Tract Boundary
Survey Area
Contour = 10 ft.
1:4,800
N
W
E
S
Surveyors: J. Chenoweth
and W. Reiner

Figure 8


Bowman/Canyon Creek 4/Former WTP4
GCWA Enumeration 2008
Contour = 10 ft.
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N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Chenoweth, L. O'Donnell, J. Reidy, and R. Rochat

Figure 9

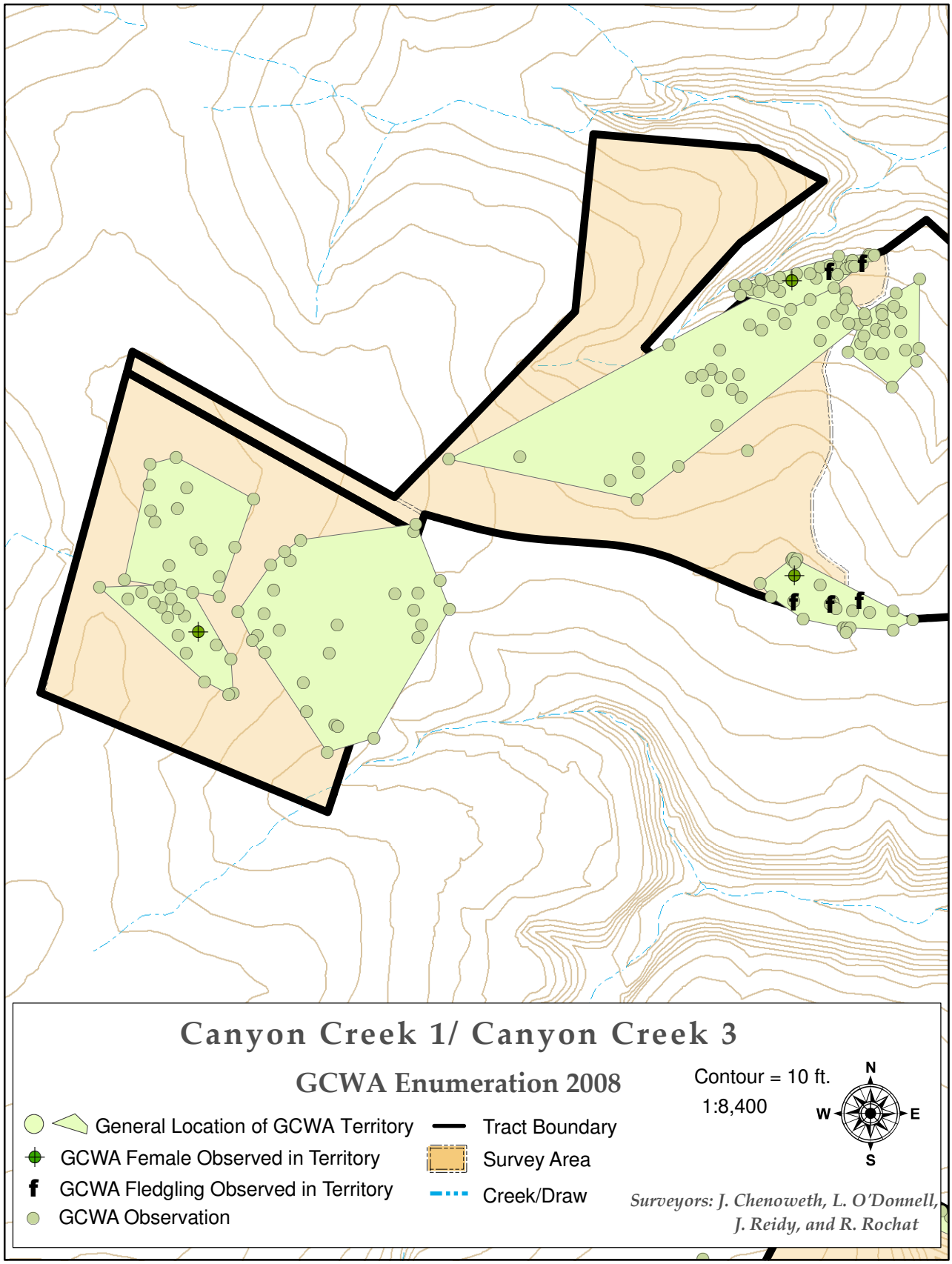
Canyon Creek 1/ Canyon Creek 3
GCWA Enumeration 2008
Contour = 10 ft.
1:8,400
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Chenoweth, L. O'Donnell, J. Reidy, and R. Rochat

Figure 10

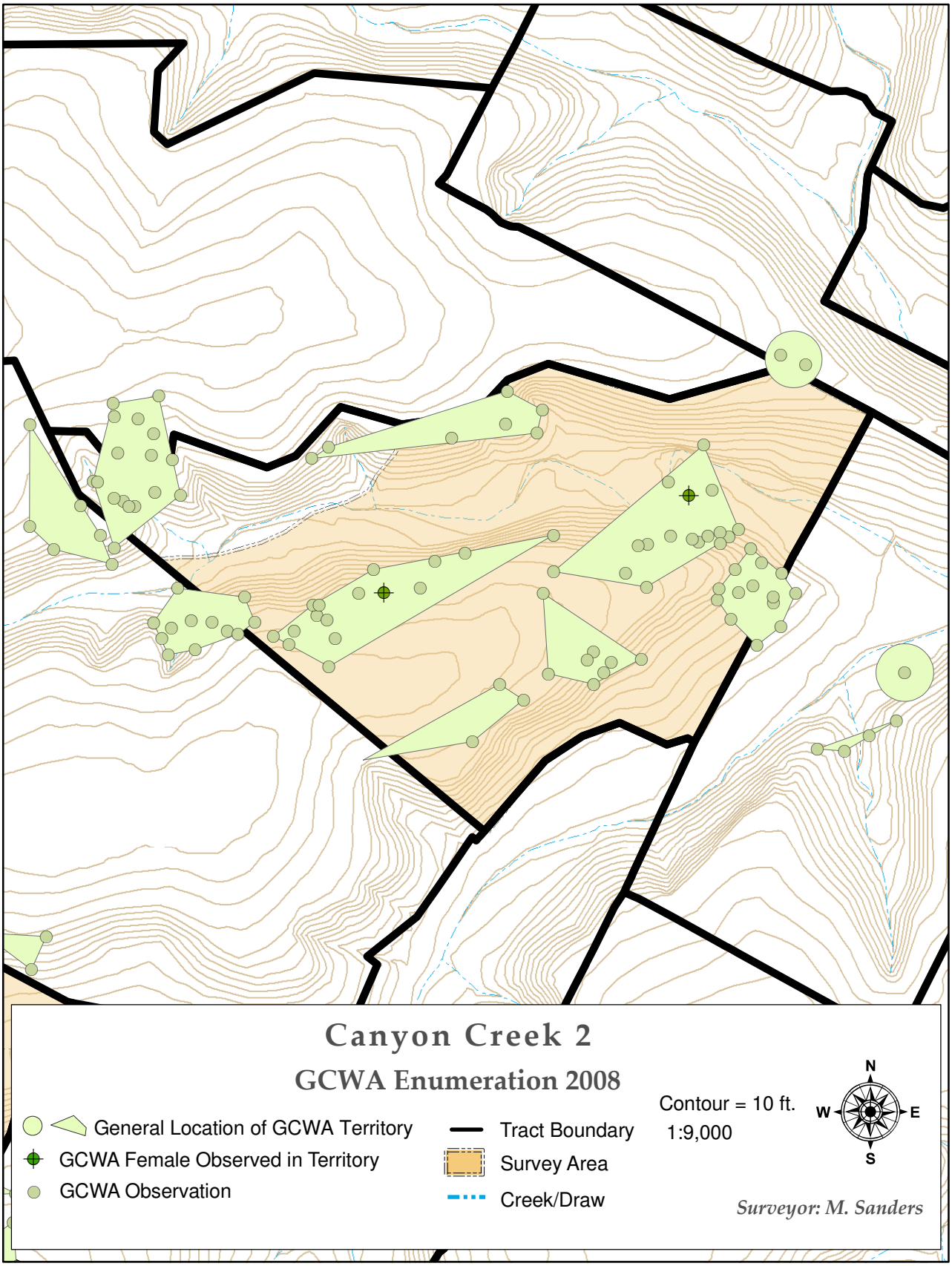
Canyon Creek 2
GCWA Enumeration 2008
General Location of GCWA Territory
GCWA Female Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Contour = 10 ft.
1:9,000
N
W
E
S
Surveyor: M. Sanders

Figure 11

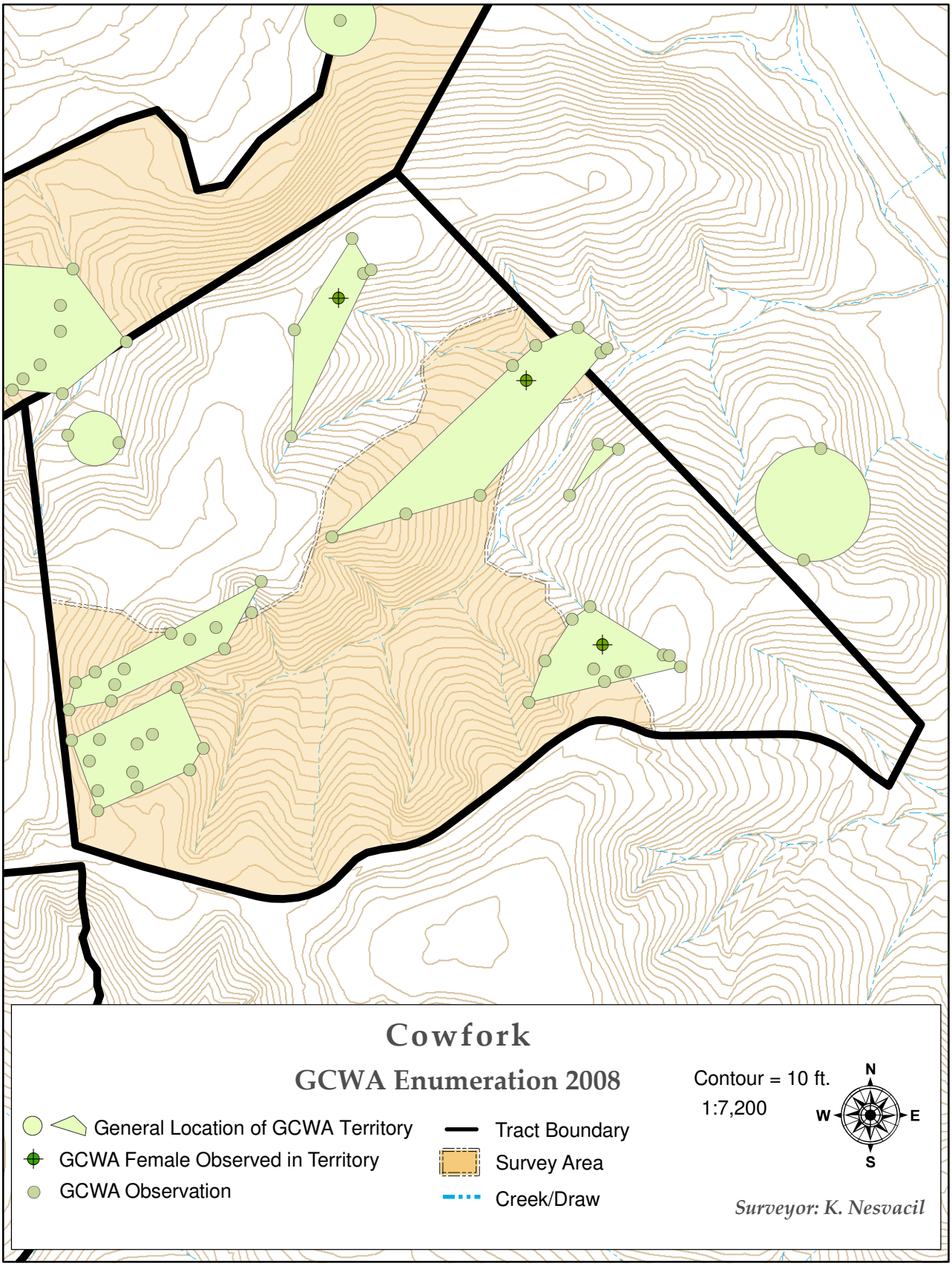
Cowfork
GCWA Enumeration 2008
General Location of GCWA Territory
GCWA Female Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Contour = 10 ft.
1:7,200
N
W
E
S
Surveyor: K. Nesvacil

Figure 12

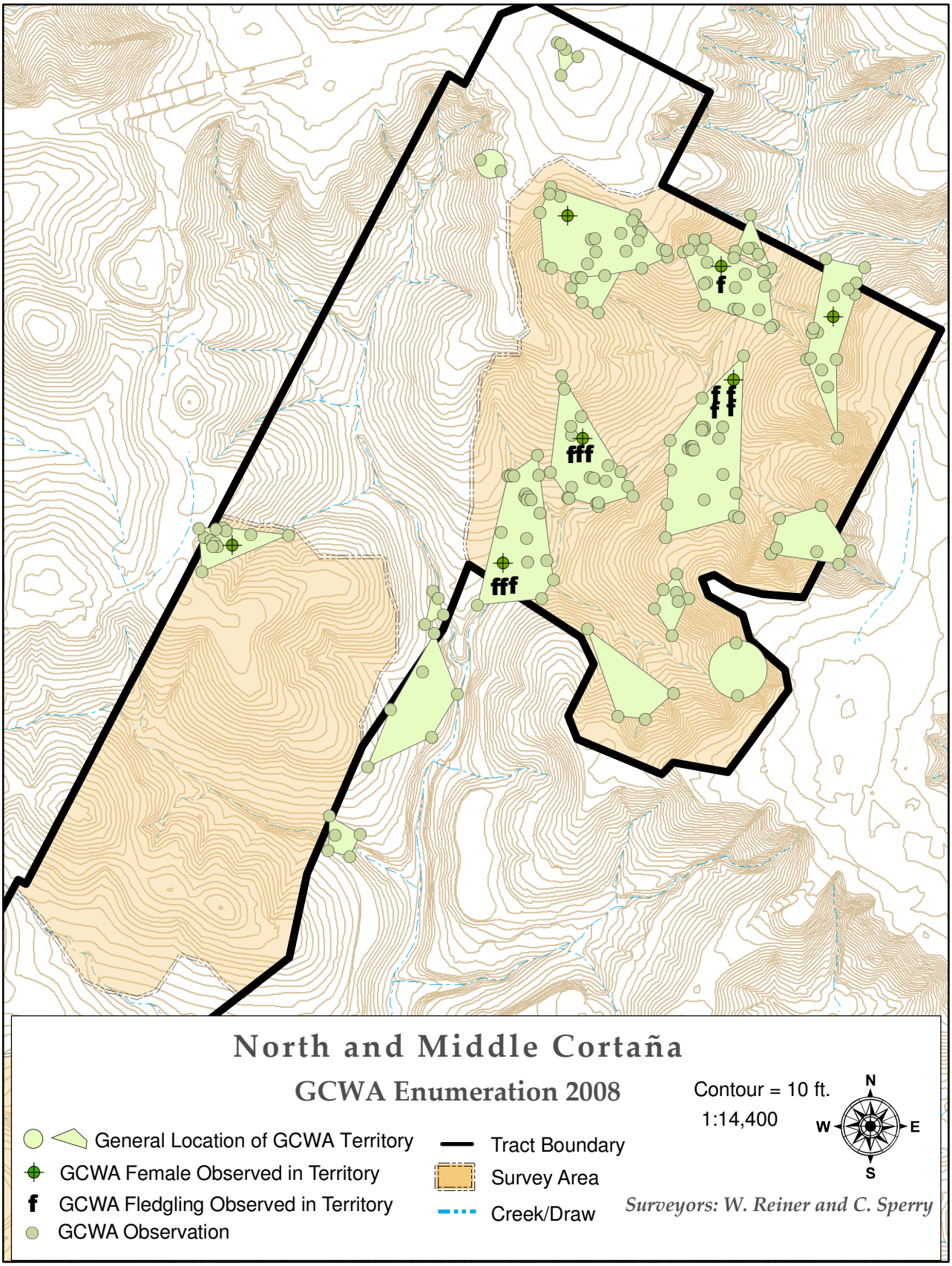
North and Middle Cortaña
GCWA Enumeration 2008
Contour = 10 ft.
1:14,400
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: W. Reiner and C. Sperry
f
ff
fff
fff

Figure 13

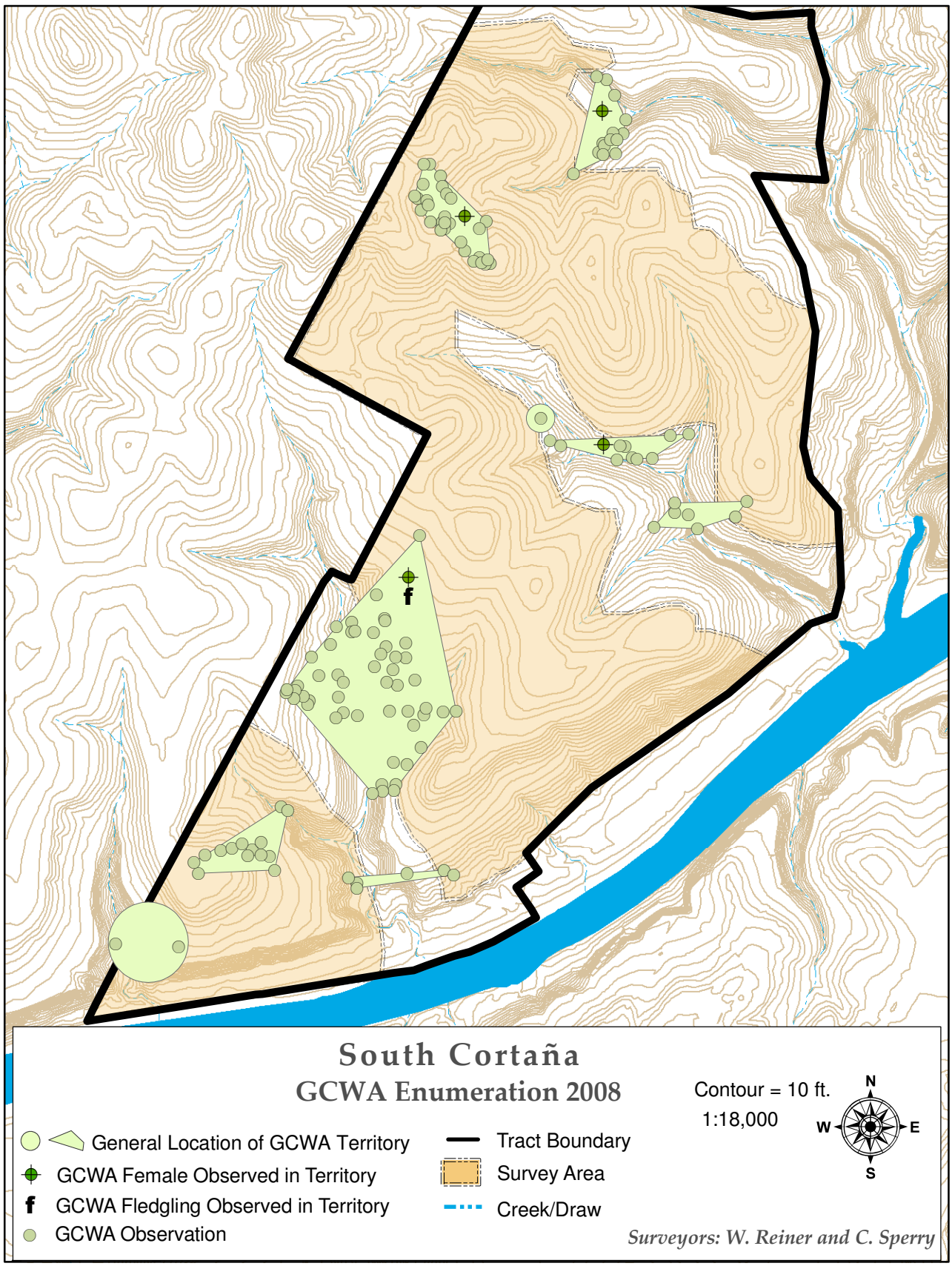
South Cortaña
GCWA Enumeration 2008
Contour = 10 ft.
1:18,000
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f
GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: W. Reiner and C. Sperry

Figure 14

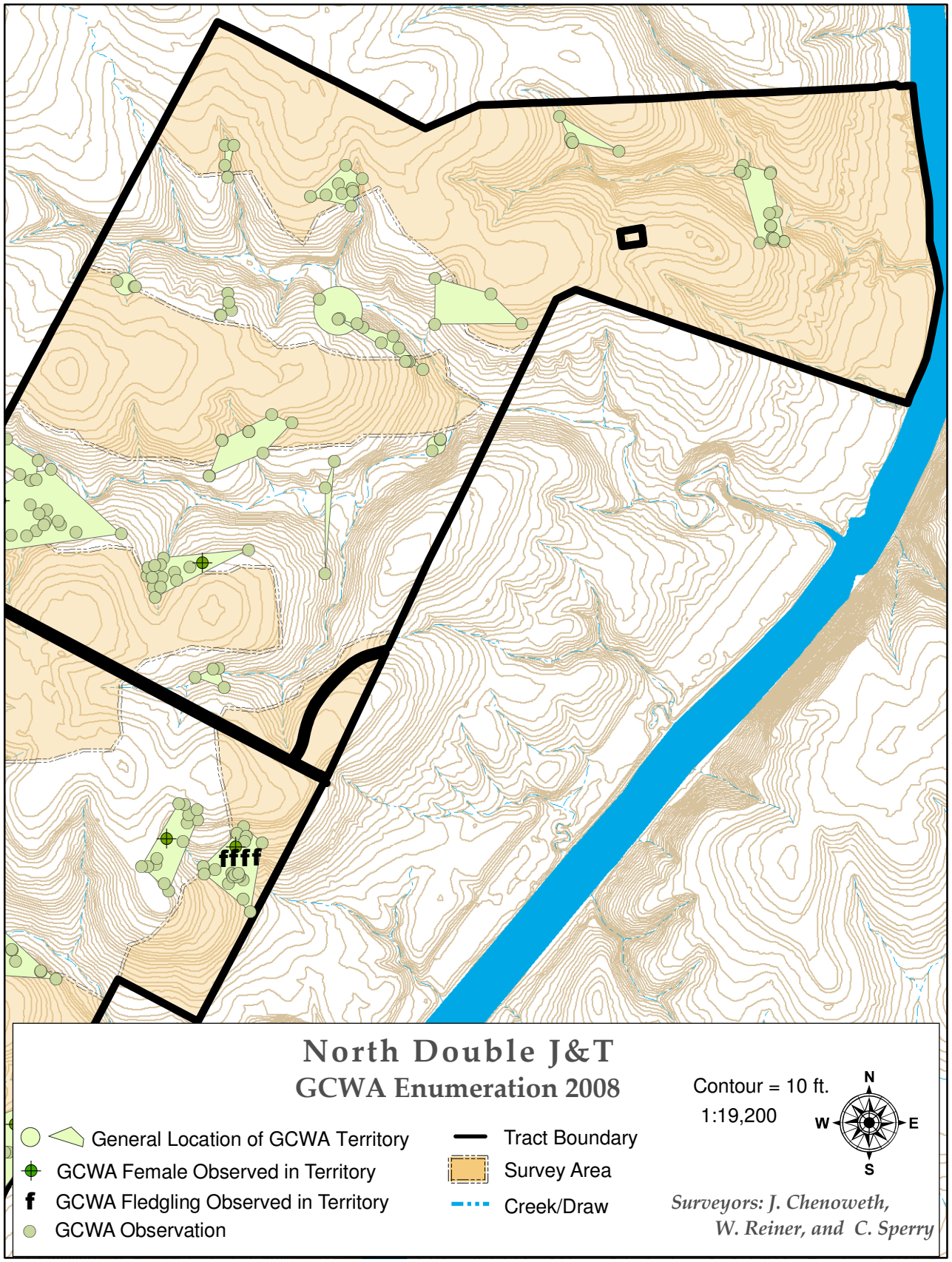
ffff
North Double J&T
GCWA Enumeration 2008
Contour = 10 ft.
1:19,200
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Chenoweth,
W. Reiner, and C. Sperry

Figure 15

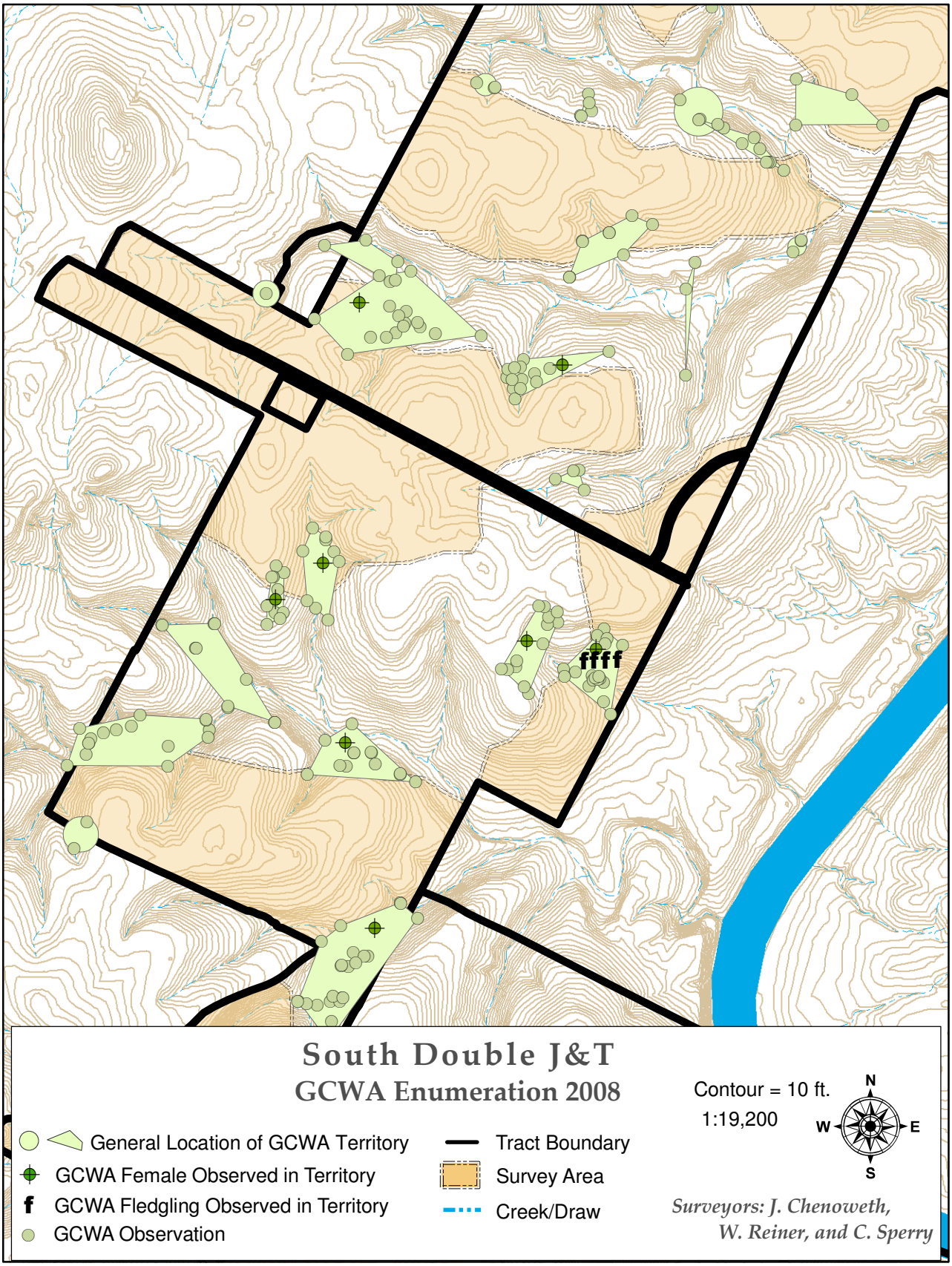
ffff
South Double J&T
GCWA Enumeration 2008
Contour = 10 ft.
1:19,200
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Chenoweth,
W. Reiner, and C. Sperry

Figure 16

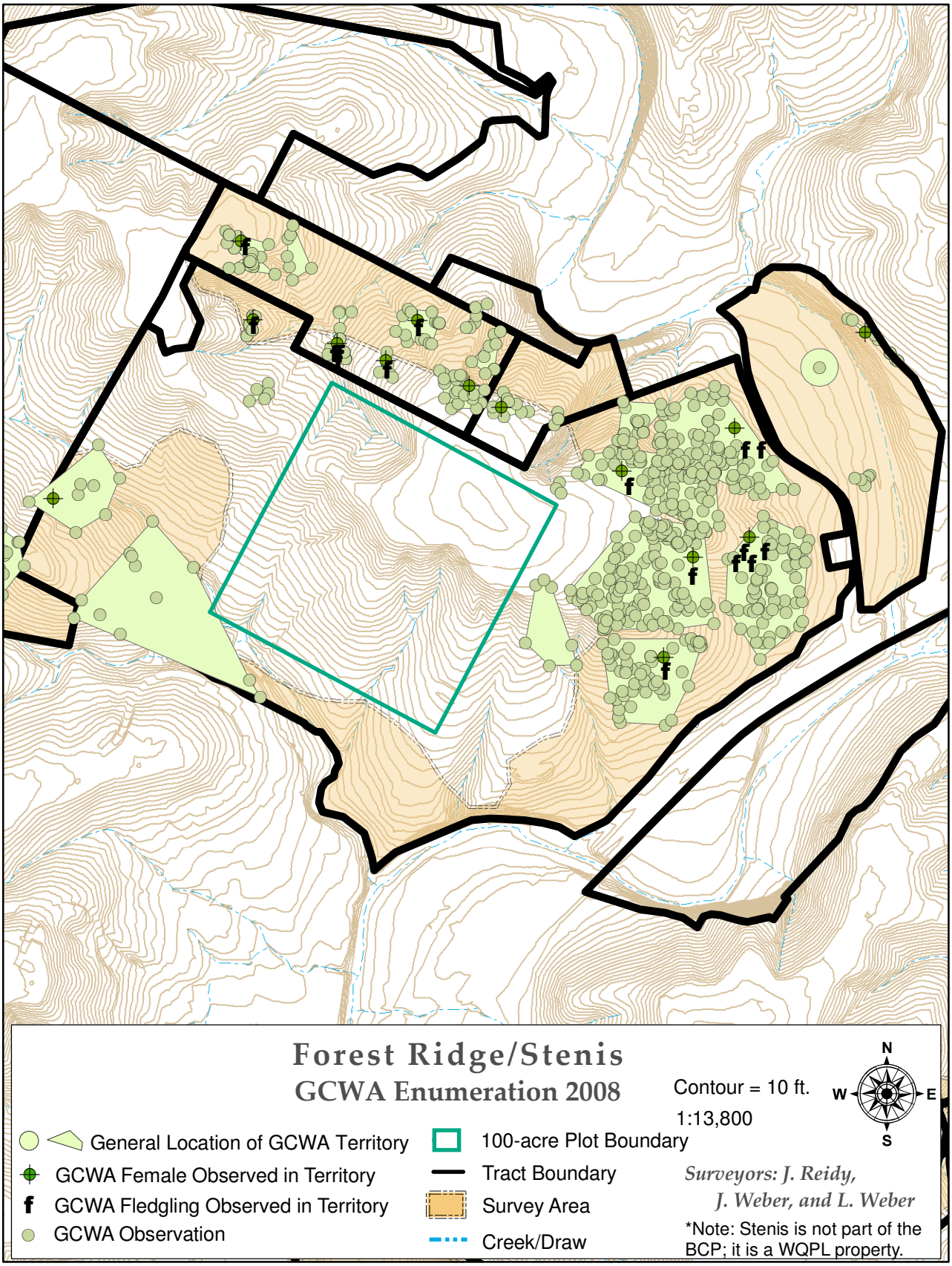
Forest Ridge/Stenis
GCWA Enumeration 2008
Contour = 10 ft.
1:13,800
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
100-acre Plot Boundary
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Reidy, J. Weber, and L. Weber
*Note: Stenis is not part of the BCP; it is a WQPL property.

Figure 17

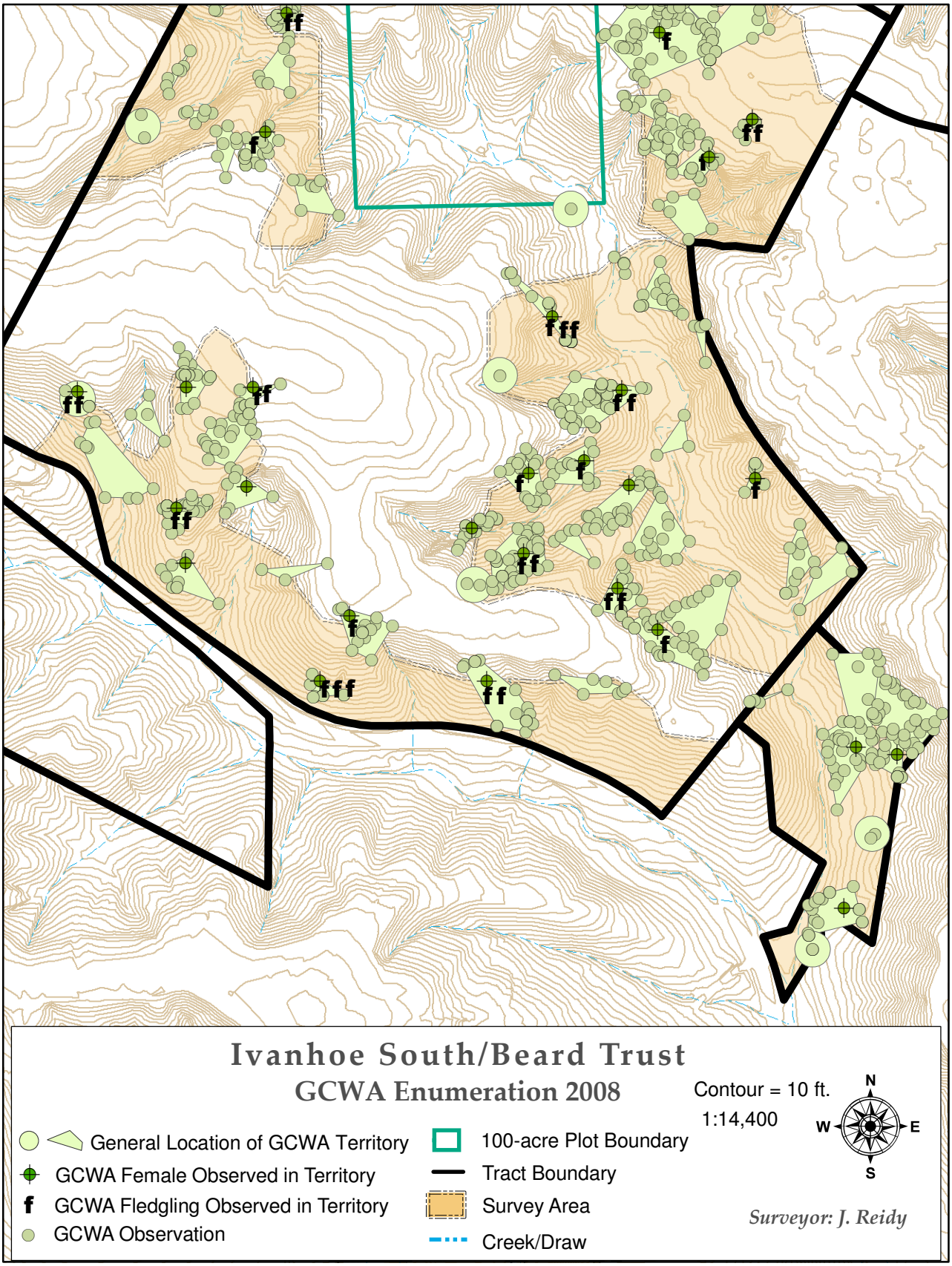
Ivanhoe South/Beard Trust
GCWA Enumeration 2008
Contour = 10 ft.
1:14,400
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
100-acre Plot Boundary
Tract Boundary
Survey Area
Creek/Draw
Surveyor: J. Reidy

Figure 18

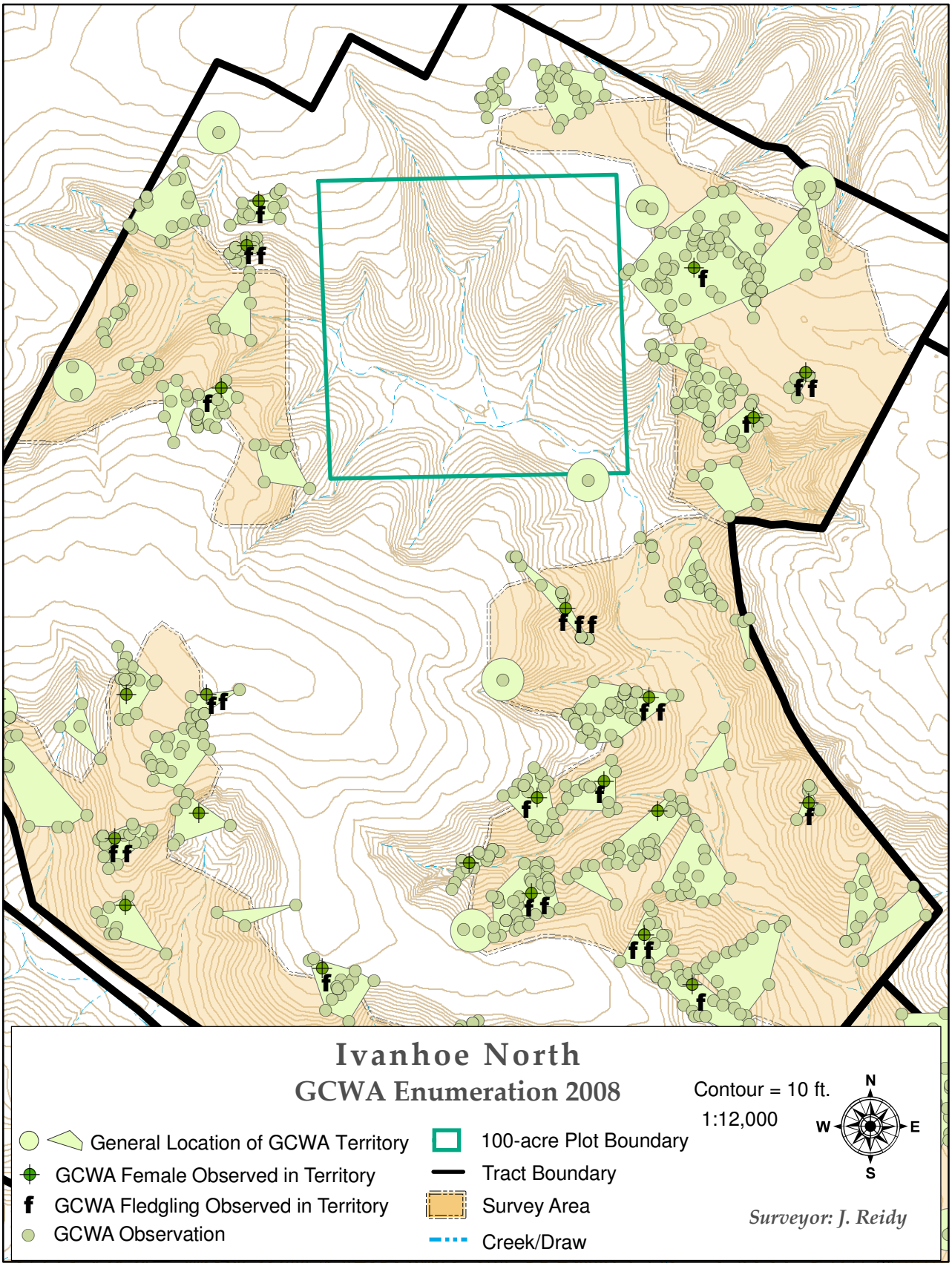
Ivanhoe North
GCWA Enumeration 2008
Contour = 10 ft.
1:12,000
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
100-acre Plot Boundary
Tract Boundary
Survey Area
Creek/Draw
Surveyor: J. Reidy

Figure 19

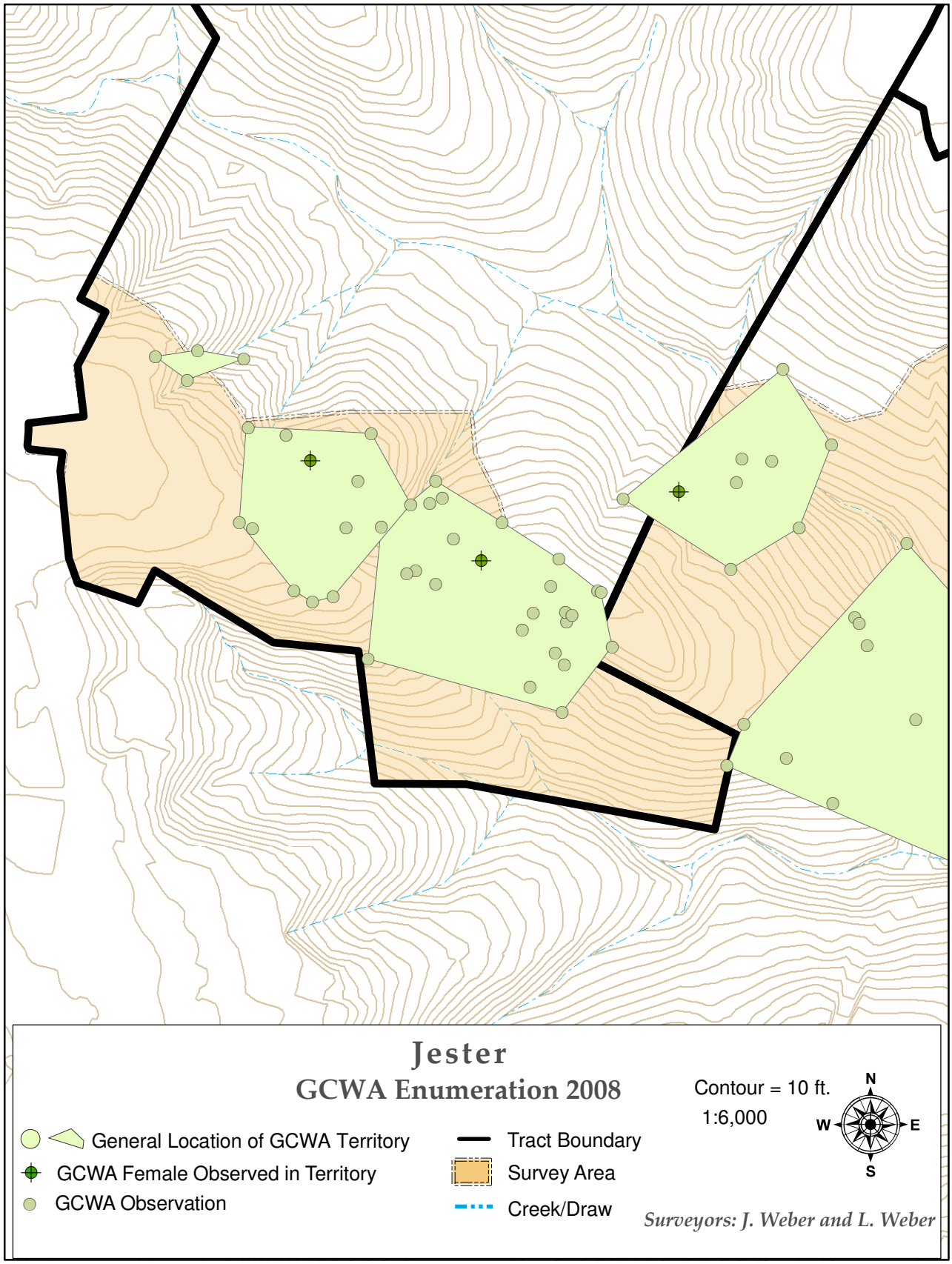
Jester
GCWA Enumeration 2008
Contour = 10 ft.
1:6,000
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Weber and L. Weber

Figure 20

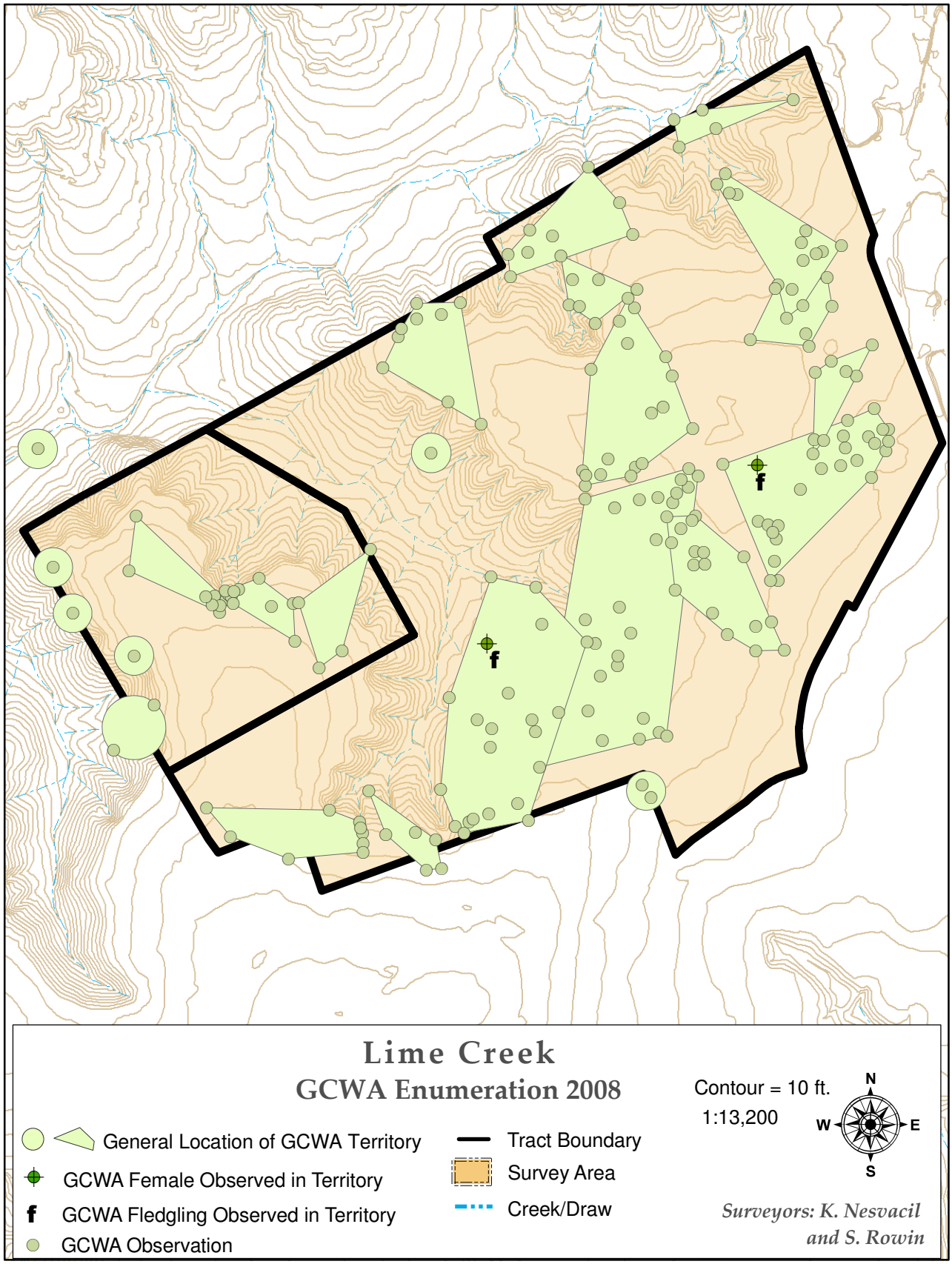
Lime Creek
GCWA Enumeration 2008
Contour = 10 ft.
1:13,200
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: K. Nesvacil and S. Rowin

Figure 21

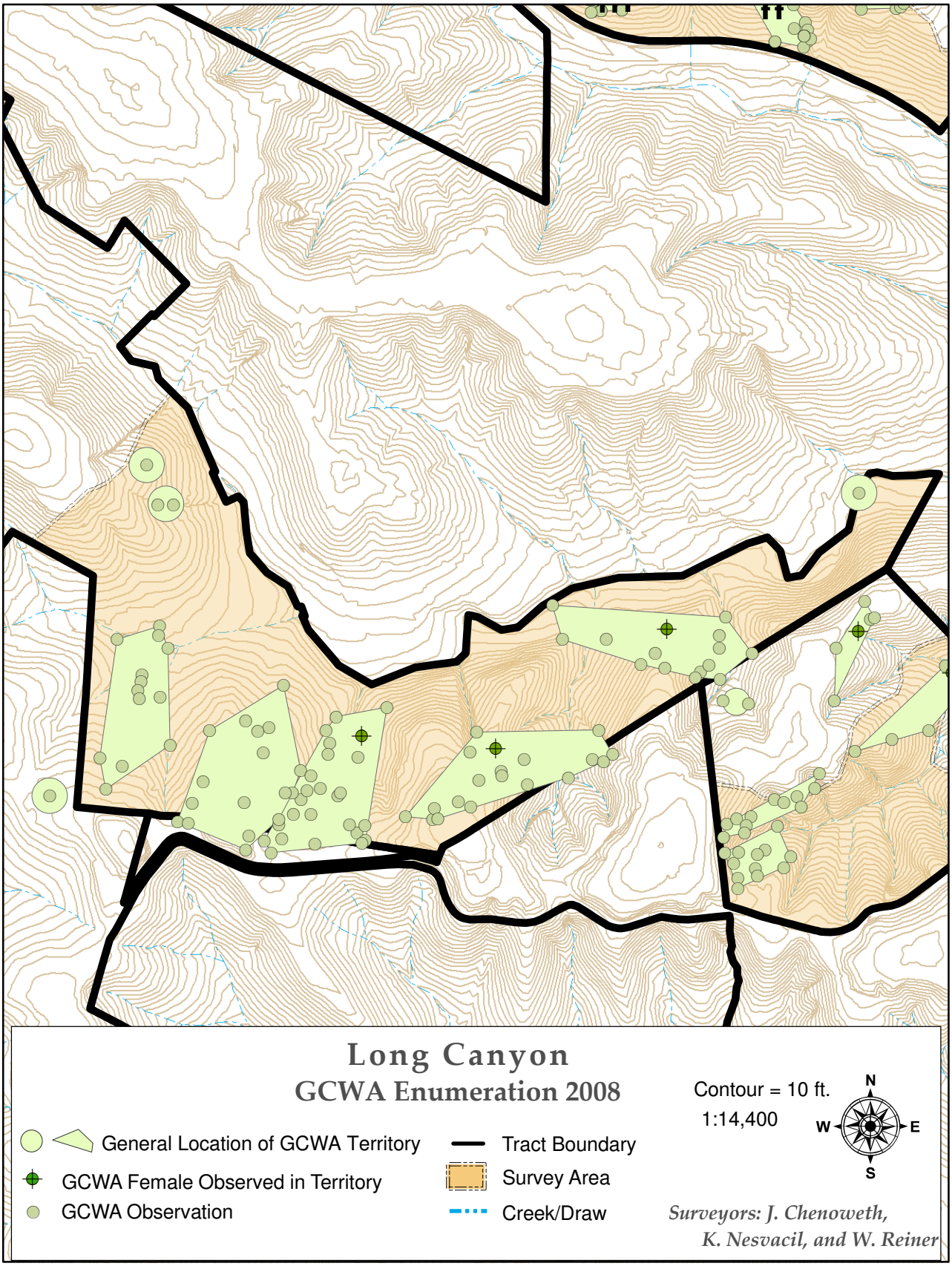
Long Canyon
GCWA Enumeration 2008
Contour = 10 ft.
1:14,400
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Chenoweth,
K. Nesvacil, and W. Reiner

Figure 22

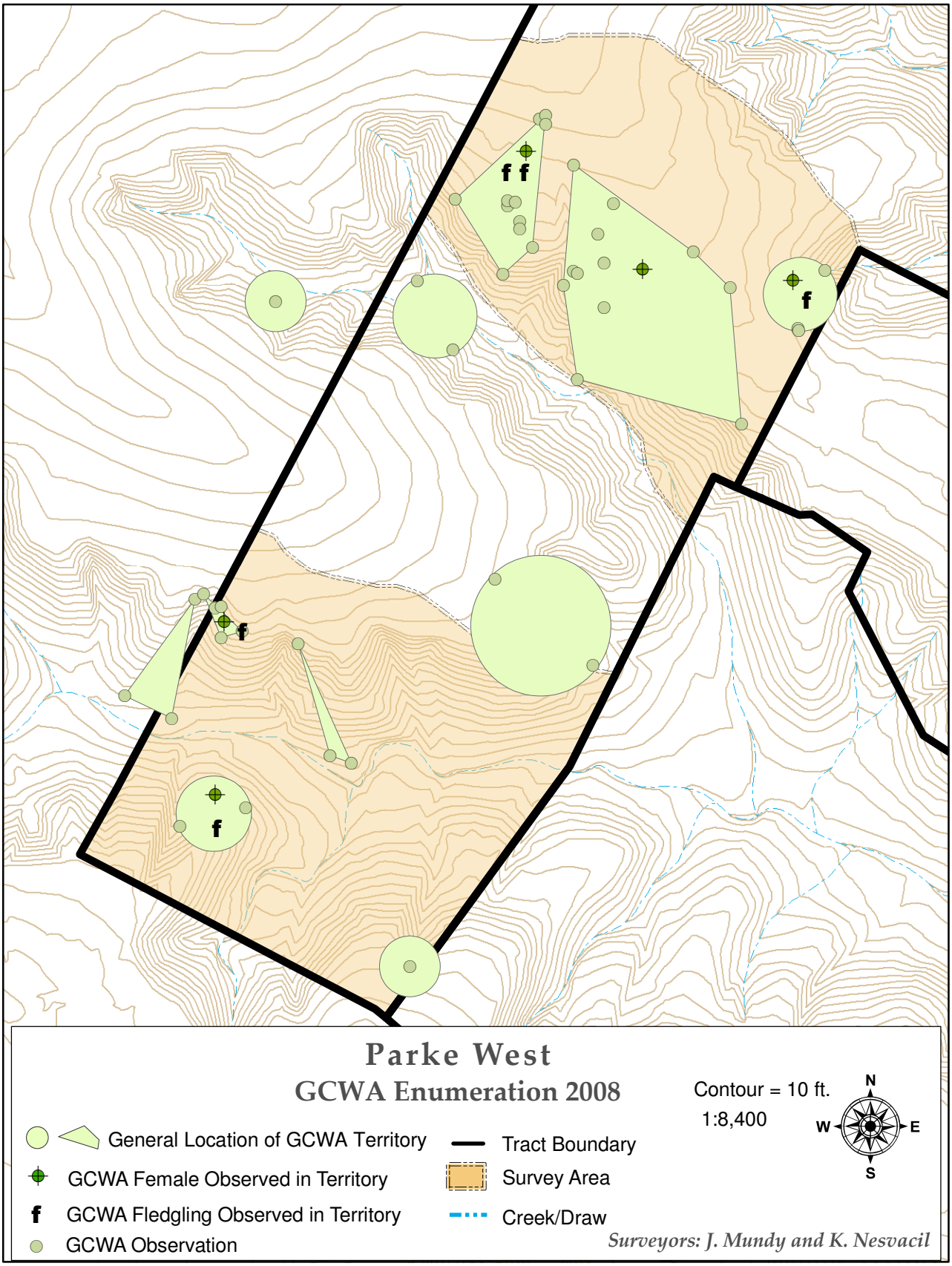
Parke West
GCWA Enumeration 2008
Contour = 10 ft.
1:8,400
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Mundy and K. Nesvacil

Figure 23

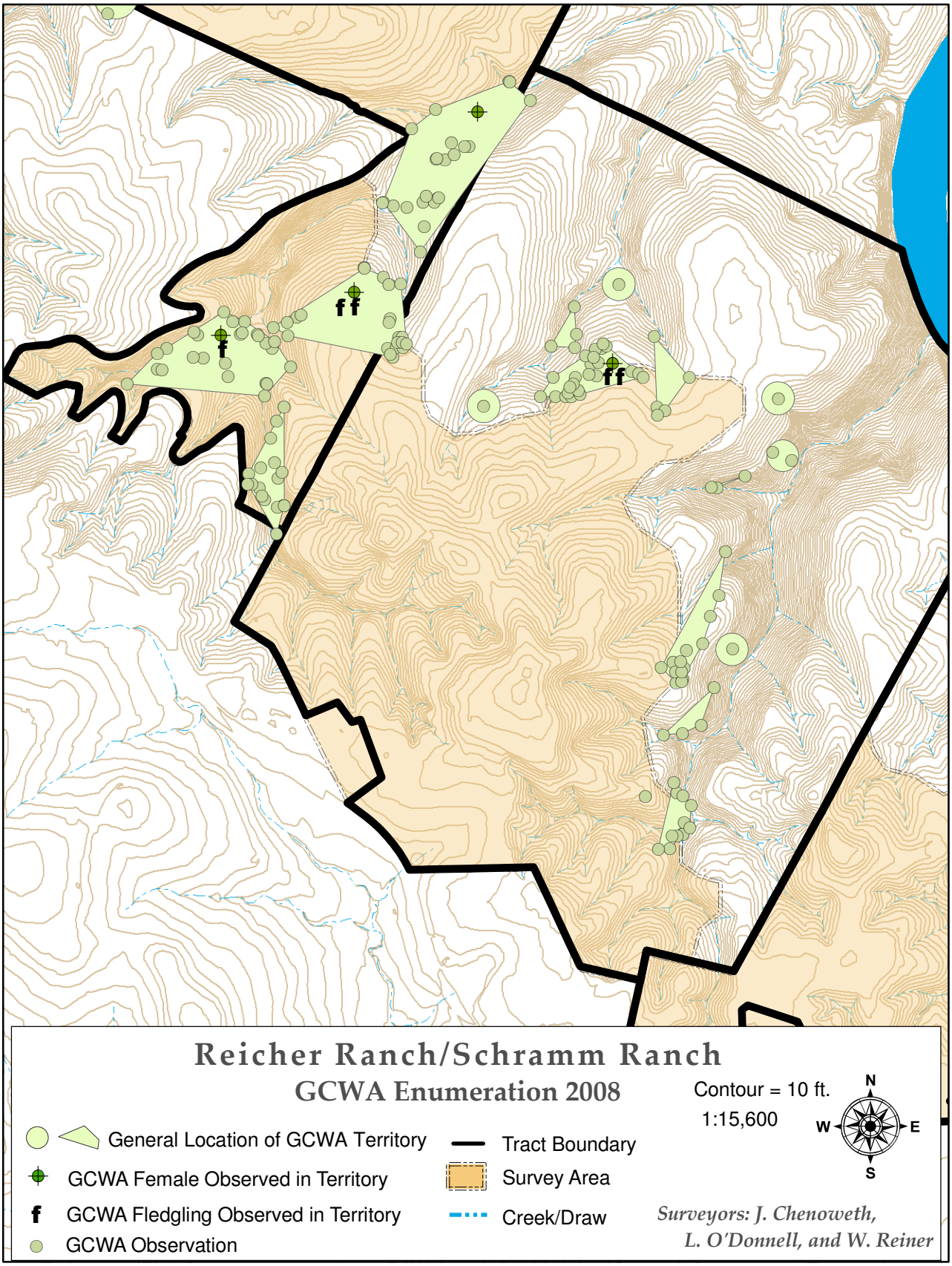
Reicher Ranch/Schramm Ranch
GCWA Enumeration 2008
Contour = 10 ft.
1:15,600
N
W
E
S
General Location of GCWA Territory
GCWA Female Observed in Territory
f GCWA Fledgling Observed in Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Surveyors: J. Chenoweth,
L. O'Donnell, and W. Reiner

Figure 24

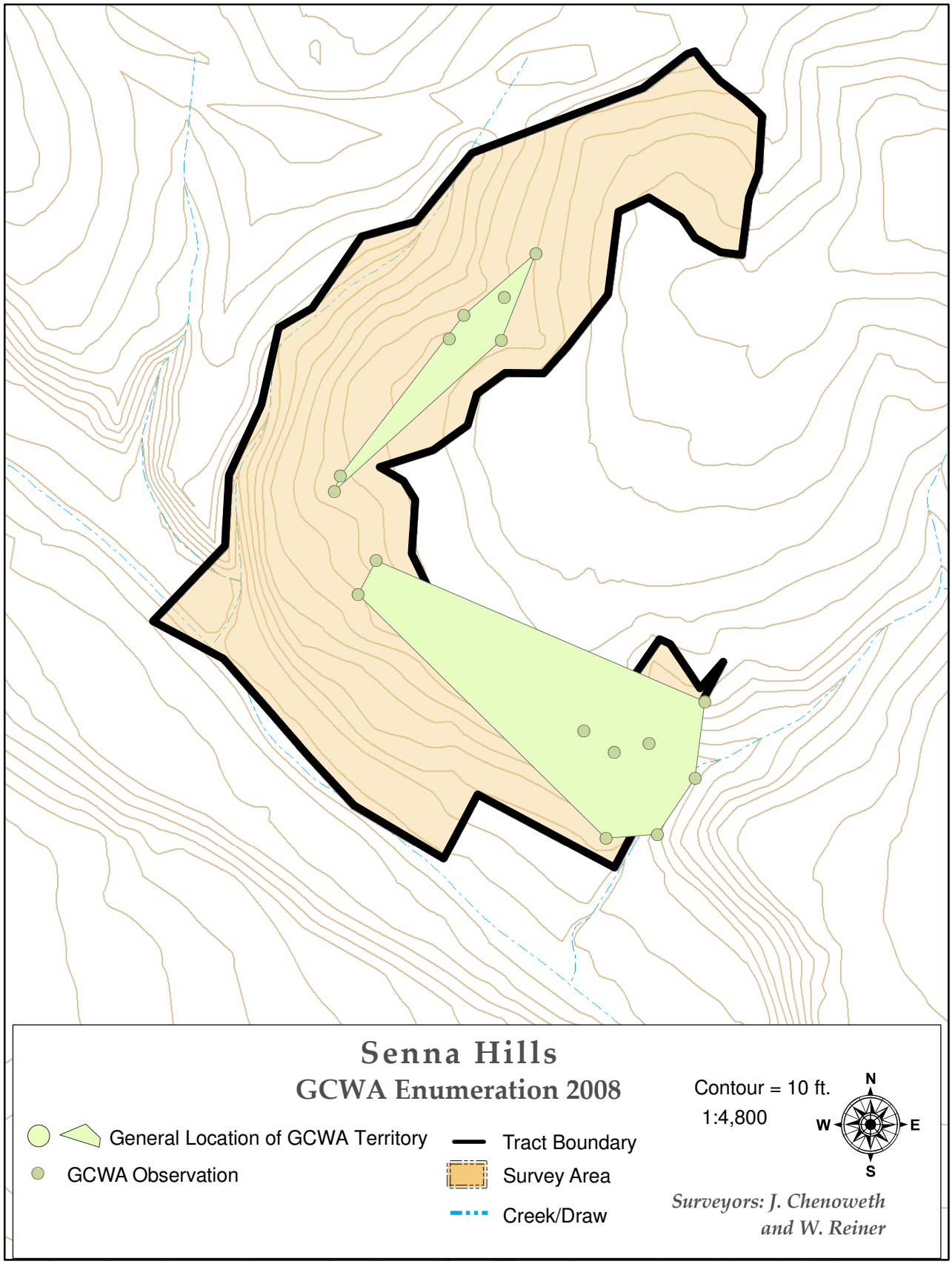
Senna Hills
GCWA Enumeration 2008
General Location of GCWA Territory
GCWA Observation
Tract Boundary
Survey Area
Creek/Draw
Contour = 10 ft.
1:4,800
N
W
E
S
Surveyors: J. Chenoweth
and W. Reiner

Figure 25

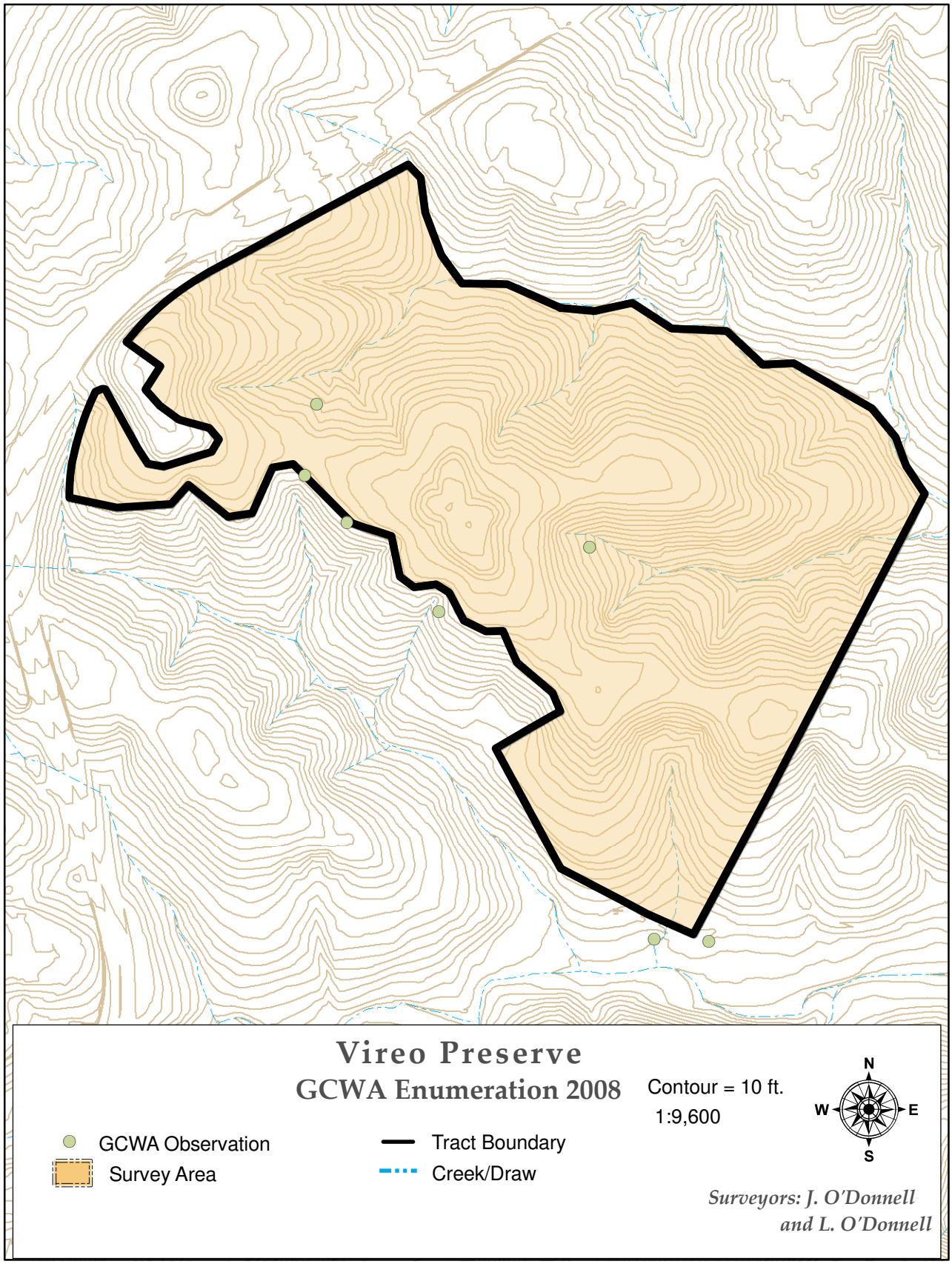
Vireo Preserve
GCWA Enumeration 2008
Contour = 10 ft.
1:9,600
N
W
E
S
GCWA Observation
Survey Area
Tract Boundary
Creek/Draw
Surveyors: J. O'Donnell
and L. O'Donnell

Figure 26

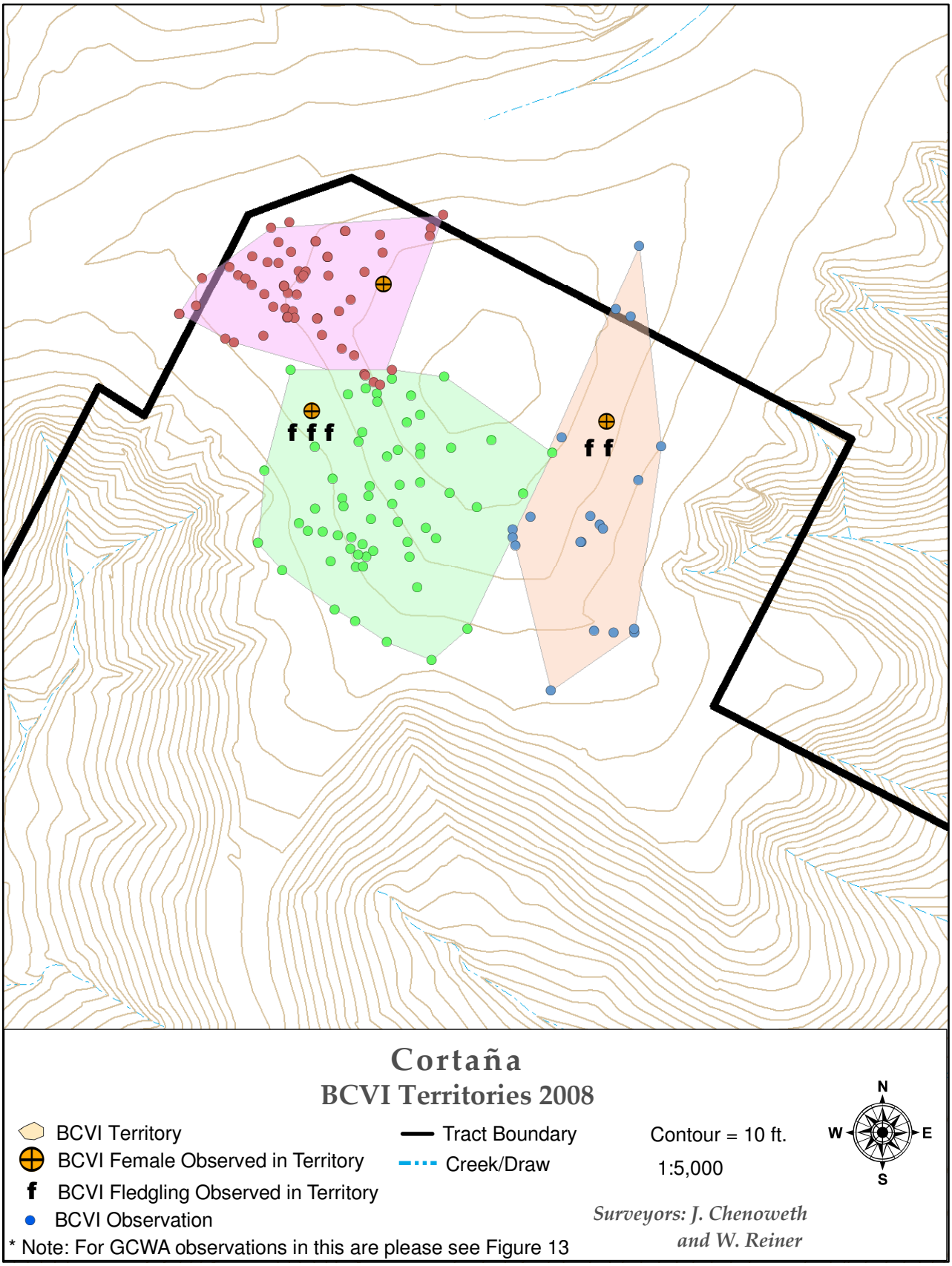
f f f
f f
Cortaña
BCVI Territories 2008
BCVI Territory
BCVI Female Observed in Territory
f BCVI Fledgling Observed in Territory
BCVI Observation
Tract Boundary
Creek/Draw
Contour = 10 ft.
1:5,000
N
W
E
S
Surveyors: J. Chenoweth and W. Reiner
* Note: For GCWA observations in this are please see Figure 13

Figure 27

2008 Brown-headed Cowbird Management

Nest parasitism of black-capped vireos (vireo) by brown-headed cowbirds (cowbird) has been well documented and is considered a major threat to this species' survival. Parasitism of golden-cheeked warblers 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 five traps this year, as compared to seven in 2007. For 2008, operation of the west Ivanhoe trap and the Long Canyon trap were suspended due to several years of low productivity. Of the five traps in operation, two were operated in vireo habitat and the other three traps were situated adjacent to golden-cheeked warbler breeding habitat.

Two of the traps in operation in 2008 were wooden mega traps. These were situated on Canyon Creek and the east side of Ivanhoe. The other three traps were hybrids 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*), unidentified species of mouse, northern cardinal (*Cardinalis cardinalis*), mockingbird (*Mimus polyglottos*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), and Bewick's wren (*Thryomanes bewickii*). Very few mortalities of non-target species occurred; the majority were released unharmed. In addition, two female bronzed cowbirds (*Molothrus aeneus*) were caught in the Cortaña trap.

Trap results for field season 2008 are given below. Results will be used to gauge the success of future trap locations.

APPENDIX E: COWBIRD MANAGEMENT, CONTINUED

Trap Location	Habitat	Trap Opening and Closing Dates	Total Cowbird Trapped	Cowbird Females Trapped	Fledglings Trapped	Trap Rate (=Females Caught per Trap Day)
Bohls	Vireo	3/08/08-5/28/08	11	3	0	0.04
Canyon Creek*	Warbler	3/16/08-6/04/08	70	32	0	0.40
Cortaña	Vireo	3/08/08-6/22/08	21	6	0	0.06
Ivanhoe*	Warbler	3/19/08-6/05/08	10	1	0	0.01
Double J&T	Warbler	3/07/08-5/28/08	54	14	0	0.17

*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. This site was once part of a larger ranch that burned in April 1961 and has not been burned since. City of Austin staff hand-cleared Ashe juniper from portions of the Vireo Preserve during the mid-1990s. However, much of the deciduous component of the habitat, which has grown out of suitability as nesting substrate, was not manipulated. In particular, the predominant nesting shrub for the black-capped vireo on the Vireo Preserve, the evergreen sumac (*Rhus virens*), appears to be too tall, with thick trunks and stems and sparse foliage, to be suitable for concealing vireo nests from potential predators.

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 restoration efforts FY2007-08. During the fall of 2008, City of Austin staff and American Youth Works prepared staging areas and 12 to 15-foot firelines along existing 2-tracks to accommodate a pilot prescribed burn project on the Vireo Preserve. The prescribed burn is planned for a seven-acre area as a pilot project scheduled for February 2009. Mechanical manipulation along the perimeter of the proposed burn area is also planned.

Habitat monitoring FY2007-08. During the fall of 2008, photo-point monitoring of vegetation and vegetation transect (point-intercept and line-transect methods) data were collected on established transects to monitor restoration efforts. In addition, five vegetation transects (point-intercept and line-transect methods) were established in the pilot habitat restoration area on the Vireo Preserve.