# Monitoring of the Black-capped Vireo (*Vireo atricapilla*) In Western Travis County, Texas: 2006 Field Season



**Photo: Jollyville Unit of the BCP, Travis County**


**Travis County**

**Department of Transportation and Natural Resources**

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## INTRODUCTION

In the United States and Canada, 448 native bird species breed in terrestrial habitats (Rich et al. 2004). About 200 of those terrestrial species, commonly known as neotropical migrants, breed in North America, and then migrate south to winter in Mexico, Central America, South America, and the Caribbean (Sibley 2001). A majority of neotropical migratory bird species face population declines due to a wide array of threats including, but not limited to, habitat loss, degradation, and fragmentation (Rich et al. 2004). Partners in Flight, the U.S. Fish and Wildlife Service (USFWS), and many other cooperating agencies are actively developing recovery and conservation plans, acquiring critical habitat, and educating the general public about bird conservation issues in order to slow or prevent further population declines.

The black-capped vireo (*Vireo atricapilla*, hereafter BCVI) was listed as a federally endangered species in 1987. Habitat loss and nest parasitism by brown-headed cowbirds (*Molothrus ater*) are the greatest threats to BCVI populations. The breeding range of this neotropical migrant has decreased markedly within the last few decades. Historically, BCVIs in the United States were found in Kansas, Oklahoma, and Texas during the breeding season (Grzybowski 1995). Presently, the BCVI breeds in a restricted range that includes portions of central and south-central Texas, three counties in Oklahoma, and south into central Coahuila, through Nuevo Leon and into southwestern Tamaulipas, Mexico (Farquhar, et al. 2005; U.S. Fish and Wildlife Service [USFWS] 1991; Grzybowski, et al.1994; Grzybowski 1995, Oklahoma Dept. of Wildlife Cons. 1999). Between 1996 and 2005, BCVI populations have been reported in only 38 south-central and central Texas counties (Wilkins et al. 2006).
Available BCVI habitat, and subsequently BCVI populations, in Travis County has been significantly reduced as natural disturbances, such as fire, are suppressed and urban/suburban development continues to expand. Additionally, browse pressure from white-tailed deer (*Odocoileus virginianus*) can negatively affect BCVI habitat structure (Grzybowski 1995). A USFWS review of the BCVI population status has recently been completed as required by the Endangered Species Act (Wilkins et al. 2006). Results of this review will be included in this report, and/or future annual reports as they are made available for the public.

In 1996, less than 100 individual BCVIs were estimated to occur in Travis County (USFWS 1996). More recent analyses of survey data indicate that since 2000, the Travis County BCVI population estimate is fewer than 50 individuals (Wilkins et. al 2006). The U.S. Fish and Wildlife Service issued the Balcones Canyonlands Conservation Plan (BCCP) section 10(a)1(B) permit to the City of Austin and Travis County in 1996. The plan calls for 30,428 acres of endangered species habitat in western Travis County to be set aside and managed

within the Balcones Canyonlands Preserve (BCP); a minimum of 2000 of these acres will be designated as BCVI habitat. Due to changes in land use and fire suppression, most BCVI habitat will have to be maintained and/or created through habitat restoration efforts (USFWS 1996). Currently, Travis County manages 4,789 acres of preserve land of which 3,970 acres is designated part of the BCP. Currently, less than 150 acres of Travis County managed BCP land could be classified as BCVI habitat.

BCCP Goals for BCVI recovery, outlined in the BCP Land Management Plan (1999), include maintaining and increasing the current population and protecting contiguous blocks of habitat. At present, most of the County-owned BCVI habitat occurs on the Jollyville Unit's Vireo Ridge tract (Figure 1). Additionally, isolated pockets of habitat can also be found on Travis County's Vista Point and Grandview Hills tracts of the Jollyville Unit and on the Steiner Ranch Unit. Most existing, unrestored BCVI habitat, whether occupied or not, is of poor to marginal quality. Optimal BCVI habitat, that was not a result of County habitat restoration efforts, is located along the southwestern boundary of the Vireo Ridge tract adjacent to the Grandview Hills subdivision.

Beginning in the winter of 2001-2002, and continuing every winter thereafter, Travis County has conducted BCVI habitat restoration activities on both the Jollyville Unit's Vireo Ridge and Steiner Ranch properties. Through a variety of techniques, poor quality BCVI habitat has been altered through the selective removal of undersirable woody species, such as Ashe juniper (*Juniperus ashei*) while stimulating the growth and shrubby structure of other woody species, such as shin oaks (*Quercus sinuata*), possomhaw (*Ilex decidua*) and sumacs (*Rhus* spp.), to create the patchy, mid-successional physiognomy or appearance associated with BCVI breeding habitat. Several sections, particularly those restored in 2002 and 2003, have become good to excellent quality habitat.

In January 2006, 10 acres on the Jollyville unit, adjacent to occupied habitat, were mechanically manipulated, bringing the accumulative total of restored habitat to approximately 100 acres (40.5 ha). A sixth phase of restoration is planned for January 2007, during which an additional 10-15 acres (4-6 ha) will be selectively cleared within the Jollyville Unit. It has been observed that BCVIs begin occupying these restored areas in three to five years of manipulation activity.

This report presents the results of the 2006 BCP surveys for BCVI conducted by Travis County Natural Resources personnel. Annual BCVI population data collected from the Jollyville Unit is analyzed in order to monitor changes in distribution, abundance and

productivity. Monitoring the population will help gauge the effectiveness of habitat restoration projects and prioritize sites for future restoration activities.

## STUDY SITES

The Jollyville Unit is comprised of 1,926 acres (779 ha) and includes the following tracts: Cuevas, Grandview Hills, Lake Perspectives, Vireo Ridge, Bunten, Vista Point and Nootsie (Figure 1). It is located approximately 13 miles (21 km) northwest of downtown Austin. Primary access points are on FM 2769, RM 620 and adjacent to the Grandview Hills subdivision located off Wilson Parke Road. Both golden-cheeked warbler (*Dendroica chrysoparia*) and BCVI inhabit this unit. Topography includes upland plateaus that give way to irregular, steep slopes and ravines. Ravines drain into an unnamed tributary of Lake Travis (Colorado River) or into Cypress Creek. Drainages tend to flow from the east to west. The Travis County soil survey shows riparian soils in these drainages are composed primarily of Volente complex; Brackett and Tarrant soils are found on steep slopes (USDA 1974). Tarrant soils also occur in level upland areas.

The Jollyville unit contains closed canopy oak-juniper (*Quercus sp.-Juniperus ashei*) woodlands, which cover the majority of the canyons and slopes. Historic harvest of mature Ashe juniper has allowed shrubby, second-growth junipers to dominate the uplands. Open grasslands are found in valleys, while riparian vegetation, dominated by black walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*) and elms (*Ulmus* spp.), occupies riparian areas along creeks and drainages.

The Steiner Ranch tract comprises five separate tracts totaling 819 acres (331 ha), and is located approximately nine miles (14 km) west of downtown Austin on RM 620 (Figure 2). The property is contiguous to the City of Austin's BCP Cortaña tract. Topography of the four northern tracts consists of upland hills incised by a number of draws or drainages. The southernmost section of Steiner Ranch encompasses three steep, wooded canyons. Here, preserve property interdigitates with residential development that is situated on canyon divides. Creeks in the canyons drain southward into Lake Austin, and many of their tributaries are intermittently spring-fed. The preserve is bordered to the south by Lake Austin with 2100 feet (640 m) of river frontage. Brackett series soils predominate on rolling uplands and gentle slopes while Tarrant series soils occur on steep slopes and in canyons (USDA 1974). Vegetation ranges from open juniper brakes on uplands and shallow slopes to closed canopy juniper-oak woodlands on steeper, mesic slopes. Existing BCVI habitat occurs in

limited quantity along areas adjacent to both RM 620 and the City of Austin's BCP Cortaña tract. Historically, both areas have had significant BCVI populations.

## METHODS

### Data Collection

All potential BCVI habitat on the Jollyville Unit was surveyed at least once a week throughout the breeding season. Additionally, tract five of the Steiner Ranch tract was also visited twice for the presence of BCVIs. BCVIs were surveyed for a total of 146 hours from 7 April to 31 August. Due to limitations inherent to territory mapping methods, results should be interpreted as indices rather than complete counts (Verner 1985).

Territory mapping was used to estimate BCVI abundance and number of individual territories present.. All observations (both visual and auditory) of male, female and juvenile BCVIs were plotted on hard-copy, digital ortho-photo maps with a scale of 1:3000 or less. The following data is recorded in the field for each observation: location (?GPS? and on map), date, behavior, sex, age, presence of a mate and number of fledglings. BCVI locations and corresponding data were later recorded into an ArcView 3.2 (ESRI, Inc., Redlands, CA) database script (Horne 2000) with the Texas State Plane (with NAD 1983 projection) coordinate system. All encountered males were assigned a unique number ("territory number") to signify them as individuals. Female locations were either recorded as independent locations or, if encountered with a territorial male, associated with that territory number.

Territory mapping methods generally followed International Bird Census Committee (IBCC) guidelines (1970). Bibby's (2000) "consecutive flush" was employed to increase accuracy in assigning observations of BCVIs to specific territories ("clusters"). However, Bibby's method was modified to be less intrusive in order to avoid harassment and/or human induced behaviors (Holiman 2000). No more than five locations for an individual bird were mapped at one time. Conspecific singing or counter-singing were relied upon in most cases to differentiate between individual males. BCVIs that could not be differentiated from surrounding individuals with any confidence were designated as "unknown." Playback tapes of BCVI vocalizations were used infrequently late in the season in accordance with USFWS protocol to elicit BCVI responses.

Pairing status of male BCVIs was determined by observing one or more of the following conditions: a male associating with a female; an active nest associated with a male; and/or a male tending at least one fledgling. These criteria were also used to determine if males had established a breeding territory. Additionally, if a male was observed in the same general location at least three different times with at least a week between observations, it was considered to have established a breeding territory as well.

Observations of fledglings tended by a male or female and the total number of fledglings observed at any one time provided data on breeding success and productivity. Cursory checks for nests were made for all breeding territories. Although nests were not systematically searched for, when found, they were checked every 4-5 days from the date of discovery until an outcome could be determined. Nest stage, contents, location and behavior of the attending adult were recorded during each nest check. In territories where no nest was found but fledglings were present, staff recorded the maximum number of fledglings observed and included this in productivity and breeding success estimates.

**Data Analysis**

BCVI abundance is defined as the sum of all individual male BCVIs detected at a given study site (regardless of territory status). Species distribution comprises all locations where BCVIs were observed. This includes males, females and fledglings and may include multiple sightings of the same individual. Due to the limited data collected per territory, territory locations are not meant to represent actual boundaries, but rather a portion of them. In calculating territory number, only territories that fell entirely within the county-managed boundaries were considered BCVI territories. Pairing success rate was calculated as the number of territories determined to have pairing success divided by the total number of territories (Anders 2001).

Productivity data is represented in two ways: the total number of fledglings per successful territories and the total number of fledglings per total number of territories. A territory is considered successful if at least one fledgling is observed with a territorial male or female. Thus, the success rate is the number of territories that successfully fledged young divided by the total number of territories (Koloszár and Becker 2000).

## RESULTS

Over all there were 676 observations of BCVIs recorded on the Jollyville Unit in 2006 (569 male, 13 female, 36 pairs and 58 hatch years [HY]) (Figure 3). These sightings include multiple observations of individuals. BCVI abundance totaled 12 males with nine establishing breeding territories (Figures 4 and 5). No territories were detected entirely off County-managed properties in 2006. However, one BCVI was detected on the Steiner Ranch Preserve but there was not enough data for it to be counted as a territory (Figure 6). No color-banded BCVIs were found during the 2006 season. Table 1 presents a summary of BCVI data collected during the 2006 breeding season in addition to recent data collected by various agencies on the Jollyville Unit as a whole.

**Table 1.** Summary of BCVI survey data collected by various agencies in the study area (Jollyville Unit, as of 2001), Travis County, Texas.

| Year Surveyed | Agency | No. Males | No. Territories |
|---|---|---|---|
| 1989 | DLS | 11 | 5 |
| 1990 | DLS | 11 | 5 |
| 1991 | DLS | 14 | 9 |
| 1992 | TXDOT | No Data[1] | Unknown |
| 1993 | TXDOT | 25 | 20 |
| 1994 | TXDOT | 27 | 27 |
| 1995 | TXDOT | 23 | 23 |
| 1996 | SWCA | 19-22 | 15 |
| 1997 | No Data[1] | Unknown | Unknown |
| 1998 | No Data | Unknown | Unknown |
| 1999 | No Data | Unknown | Unknown |
| 2000 | SWCA[2] | 3 | Unknown |
| 2001 | Travis County TNR | 19 | 13 |
| 2002 | Travis County TNR | 21 | 19 |
| 2003 | Travis County TNR | 21 | 20 |
| 2004 | Travis County TNR | 13 | 12 |
| 2005 | Travis County TNR | 12 | 11 |
| 2006 | Travis County TNR | 12 | 9 |

[1] Restricted access on the tract.

[2] Detected while on brief site visit.

In 2006, eight of the nine territories (88.9%) were considered successfully paired (Table 2). Additionally, eight territories successfully fledged young yielding a total of fifteen HY. Therefore, productivity among successful territories rose from 1.0 in 2005, to a value of 1.9

in 2006. Considering total number of territories, productivity data yields a value of 1.7 (Table 3), the highest rate since this data has been collected (2002).

**Table 2.** Abundance, territory number, pairing success and pairing success rate for BCVIs (*Vireo atricapilla*) on Jollyville Unit, Travis County, Texas, March-August 2001-2006.

| Year | Abundance | No. Territories | Successfully Paired | Pair Success Rate (%) |
|---|---|---|---|---|
| 2001 | 19 | 13 | -- | -- |
| 2002 | 21 | 19 | 18 | 94.7 |
| 2003 | 21 | 20 | 14 | 70.0 |
| 2004 | 13 | 12 | 9 | 75.0 |
| 2005 | 12 | 11 | 8 | 72.7 |
| 2006 | 12 | 9 | 8 | 88.9 |

-- data not collected

**Table 3.** Pair success and productivity for BCVI (*Vireo atricapilla*) territories on Jollyville Unit, Travis County, Texas, March-August 2001-2006.

| | | | | Productivity | |
|---|---|---|---|---|---|
| Year | No. of territories with breeding success* | Breeding success rate (%) | No. Fledglings | No. fledglings/ successful territory | No. fledglings/ total no. territories |
| 2001 | 4 | 44.0 | 12 | -- | 1.3 |
| 2002 | 14 | 73.7 | 27 | 1.9 | 1.4 |
| 2003 | 9 | 45.0 | 16 | 1.8 | 0.8 |
| 2004 | 6 | 50.0 | 13 | 2.2 | 1.1 |
| 2005 | 1 | 0.1 | 1 | 1.0 | 0.1 |
| 2006 | 8 | 88.9 | 15 | 1.9 | 1.7 |

-- data not collected
* Represents the number of all territories that fledged at least one young.

There were no BCVIs found utilizing entirely new areas on the Jollyville Unit and no territories were detected off County-managed property. The male detected on the Steiner Ranch tract is speculated to be a territorial male from the adjacent, City of Austin, Cortaña

tract. In 2006, as was the case in 2005, nine territories were established in areas in which habitat restoration had previously occurred (Figures 3 and 4).

A total of two BCVI nests were located post fledging in 2006. During data analysis both were determined successful, producing three young from the first nest and one from the second. The nest that produced three HYs also contained one failed egg. Interestingly, this nest was built in yaupon holly (*Ilex vomitoria*) adjacent to the remains of a BCVI nest built in 2005. The second nest was found in a Mexican buckeye (*Ungnadia speciosa*). Although no nests were found parasitized, 48 female brown-headed cowbirds were trapped and removed from the immediate area in 2006 (Travis County Natural Resources and Environmental Quality, 2006).

## DISCUSSION

BCVI territory numbers declined for the fourth consecutive year from a high of 20 territories in 2003 (see Table 2). However, BCVI abundance numbers in 2006 appear stable and did not show much deviation from totals in 2004 and 2005.Furthermore, BCVI breeding success (88.9%) and productivity (1.7, for all territories) were the highest recorded in the six years data has been collected (Table 3). 2006 Pairing success (88.9%) was the second highest rate recorded since 2001 as well (Table 2). Reasons for the pairing and breeding success remain . Survey effort was relatively unchanged and consistent compared to 2005 when breeding success and productivity reached their lowest values since 2001.

Territory establishment in 2006 occurred in the same general core areas, see Figure 3, on the Vireo Ridge tract as in previous years (Travis County Parks and Natural Resources 2001, 2002, 2003, 2004 and 2005). Although the same general areas are being utilized, the distribution of BCVI territories on the Vireo Ridge tract has changed each year. There are many factors that may influence territory distribution, including the intrinsic habitat characteristics of the site, the age structure of the population, the overall population density, and habitat restoration activities on the preserve (Grzybowski et al. 1994; Anderson and Gutzwiller 1996). Another factor influencing territory distribution is residential development, which has increased adjacent to the BCP Grandview Hills and Vireo Ridge tract boundaries. Excellent habitat, previously utilized on vacant property adjacent to the BCP Grandview Hills tract, has now been completely cleared and partially developed. Further residential development is planned in this area through 2007.

For the first time since the restoration activities began, all territories on the Vireo Ridge tract were established primarily in restored areas. This indicates that BCVIs continue to respond positively to habitat restoration efforts undertaken since 2001. Previous years surveys revealed that although many territories were using portions of restored areas, some territories were found adjacent to, but rarely utilizing them. It remains unclear whether these adjacent territories have now shifted into what has become or grown into better habitat. Because the BCVIs are not color-banded, there is no way of identifying individuals seasonally or from year to year. Additionally there is no data for age structure, recruitment or return rates for these birds to adequately analyze the existing BCVI population on Vireo Ridge and know if it is being replenished by the next generation or about to die out as the birds reach their expected life span. As more data is collected and more restoration activities planned knowing what is happing with the existing population will become vital to supporting further restoration activity and it's success. Further research is needed to better understand BCVI habitat dynamics and its relationship to reproductive success at the Jollyville Unit.

BCVIs tend to be "semi-colonial" and establish territories near other BCVIs (Ward and Schlossberg 2001). Isolated territories, either individual or small-clustered, located off the Vireo Ridge tract were recorded for the first three survey years (2001-2003). However, none of these territories were found from 2004 to 2006. Low BCVI abundance, especially in and around isolated territories, may bias detection rates, thus affecting estimates of abundance. Ward and Schlossberg (2001) found that in low-density populations of BCVIs, song rates and duration of song bouts were much lower than in high-density populations. Intensive golden-cheeked warbler (*Dendroica chrysoparia*) surveys planned on the Vireo Ridge tract for the 2007 season will increase survey time and possibly BCVI detections, as was the case in 2003.

Habitat degradation continues to be a primary concern and may also be affecting productivity. Grzybowski (1995) describes BCVI habitat as:

> "low scrubby growth, mostly deciduous and of irregular height and distribution, with small spaces between the thickets and clumps, with vegetation cover to ground level. This is an early successional progression, or one maintained in edaphic (due to soil or topography) settings such as occurs in rocky gullies, edges of ravines, and on eroded slopes; thus often quite localized."

Additionally BCVI habitat has been characterized as including:

- greater density of deciduous vegetation in height zones from 0 - 2 meters,

- average amounts of deciduous cover ranging from 30-45%, with total woody cover including Ashe juniper ranging from 36-55%
- greater within-territory heterogeneity of vegetation structure (with shrubs closely spaced but still separated, and allowing light to penetrate to ground levels),
- openness not exceeding about 65% in older adult vireo territories (i.e. at least 35% woody cover) (Grzybowski 1995).

Habitat descriptions provided here relate to BCVI in the Travis County area, and are not necessarily characteristic of the species throughout its entire range. Typical BCVI nesting habitat as described above is uncommon on the Jollyville Unit, although the first phases of BCVI restoration efforts are beginning to show characteristics of prime BCVI habitat. Habitat change through vegetational succession, primarily encroaching Ashe juniper, has reduced the openings in the deciduous cover generally associated with optimal BCVI habitat. Additionally, the vegetative growth pattern in occupied areas of this tract tends to be vertical rather than the horizontal, mid-successional stage preferred by BCVIs. Such growth may provide fewer preferred nesting sites. Although it is common for open nesting species, especially BCVIs, to have several re-nesting attempts (Martin 1992, Koloszar and Becker 2000), successful second nests were not observed during 2006. Suitable nest sites may not have been available, thus limiting renesting attempts/success (Martin 1992). Further research is needed to better understand BCVI habitat dynamics and its relationship to reproductive success at the Jollyville Unit.

Continued monitoring of BCVI on the Jollyville Unit is essential to determine whether the colony is a source population, adding to the general overall population or a sink population where numbers continue to decline and may become an extinct local population. Information regarding productivity and dispersal is very limited. Additional survey seasons will help gauge the effectiveness of habitat restoration projects and prioritize sites for future restoration activities. Without comprehensive productivity, banding information, and a complimentary data set for surrounding properties, we cannot make a definitive statement regarding the Jollyville Unit and its role within the central Texas metapopulation.

**RECOMMENDATIONS**

- An intensive BCVI monitoring program, including color-banding, should be established once long-term funding becomes available. Such research could answer many questions concerning the viability of the Jollyville Unit colony and its role in

the central Texas metapopulation. Long-term data sets would then be established to facilitate yearly comparisons. Data collected should include the following: abundance, age-classes, dispersal patterns, distribution, habitat associations during the breeding season, productivity, nest success, return rates and recruitment. Research should be focused upon answering questions of immediate relevance to setting management and recovery priorities.

- Facilitate opportunities for graduate students to collect and analyze quantitative habitat characterization data in order to build future habitat suitability and prediction models. Quantitative data are needed to compare the results of habitat restoration treatments over time.

- Maximize the amount of time spent on BCVI surveys through the hire and utilization of trained interns, seasonal staff and volunteers.

- Potential habitat should continue to be identified and mapped on all tracts owned and managed by Travis County. Historic BCVI locations on Travis County owned and managed properties should be visited during the field season to determine presence/absence of BCVIs.

- Travis County should consider the acquisition of additional historic BCVI breeding sites in order to increase the local population of BCVIs.

- Neighboring private landowners with historic or potential BCVI habitat seeking involvement in the Texas Parks and Wildlife Department's Landowner Incentive Program or a 1-d-1 wildlife valuation should be contacted, advised and encouraged to manage brown-headed cowbird populations and to appropriately manage BCVI habitat.

- Habitat restoration efforts will continue on tracts that support BCVI populations and on surrounding tracts that harbor potential habitat. Restoration methods will be evaluated to determine which technique best creates or restores suitable BCVI breeding habitat.

- Surveys for golden-cheeked warblers within and adjacent to BCVI habitat restoration sites should continue annually to ensure that these activities do not negatively effect them.

- Conspecific tape playback should continue to be utilized during the field season in accordance with USFWS protocols, especially in areas where few and/or isolated BCVIs have been and/or are detected, or to determine absence of target species (U. S. Fish and Wildlife Service 2003). Tape playback should increase detections of territorial males (Horne 2000).

- Cowbird trapping should continue on and adjacent to any Travis County managed properties occupied by endangered songbirds, with traps added or removed based on cowbird activity. Shooting female cowbirds in habitat is also recommended.

- Although currently not considered a major cause of BCVI nest depredations, red imported fire ants should possibly be managed within restored habitat areas.

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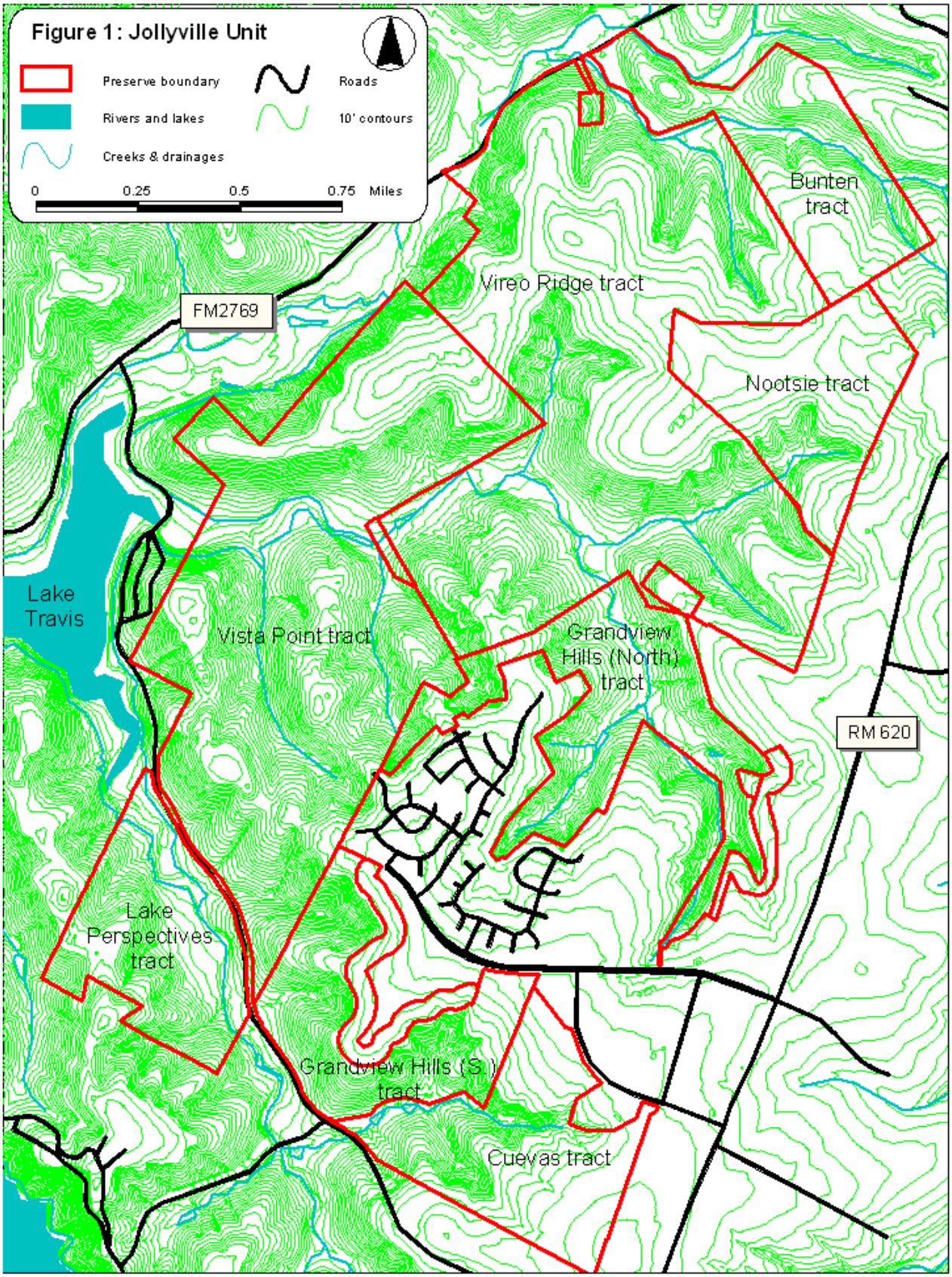


**Figure 1.** Jollyville Unit

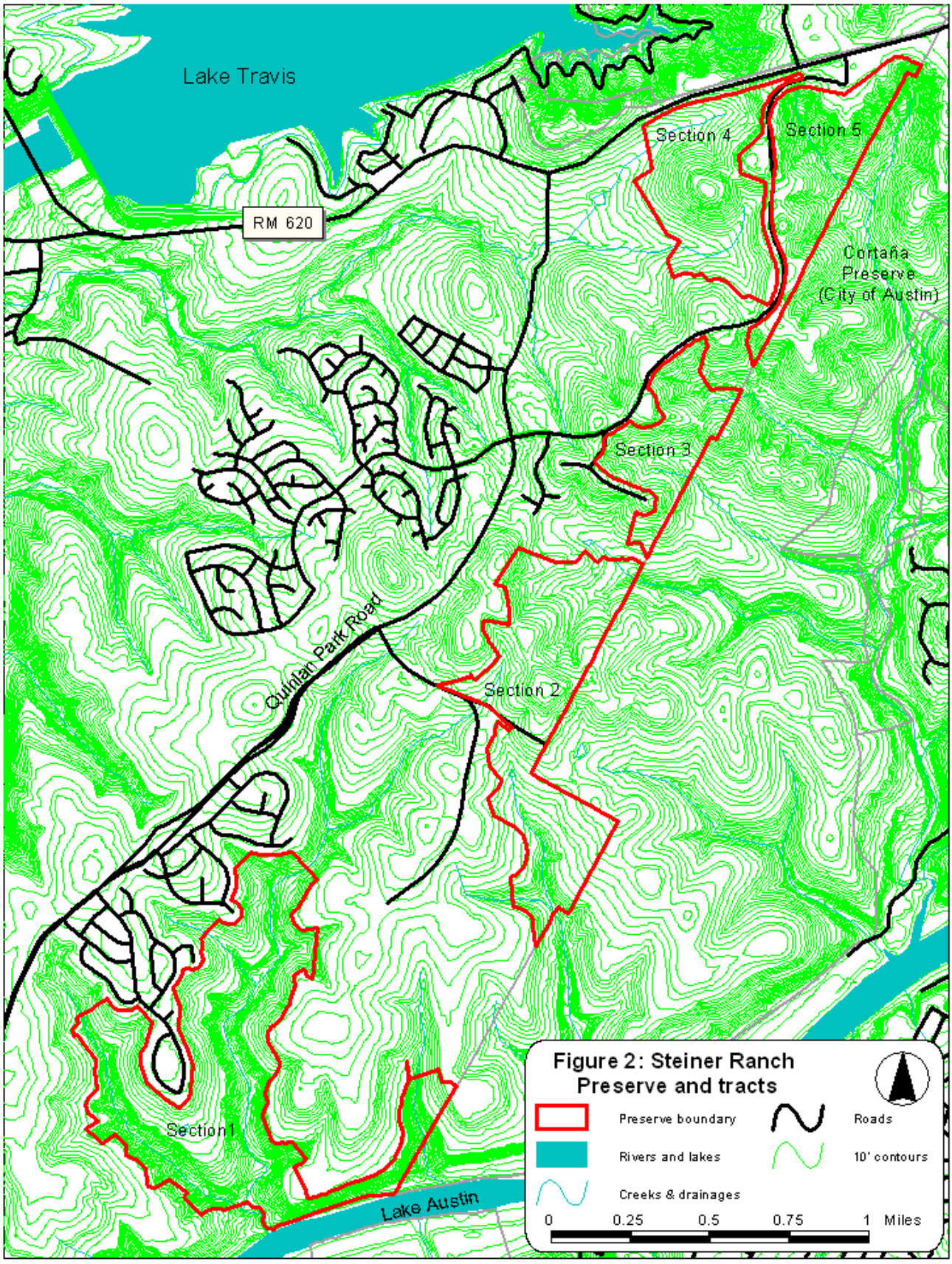


**Figure 2.** Steiner Ranch Preserve and tracts

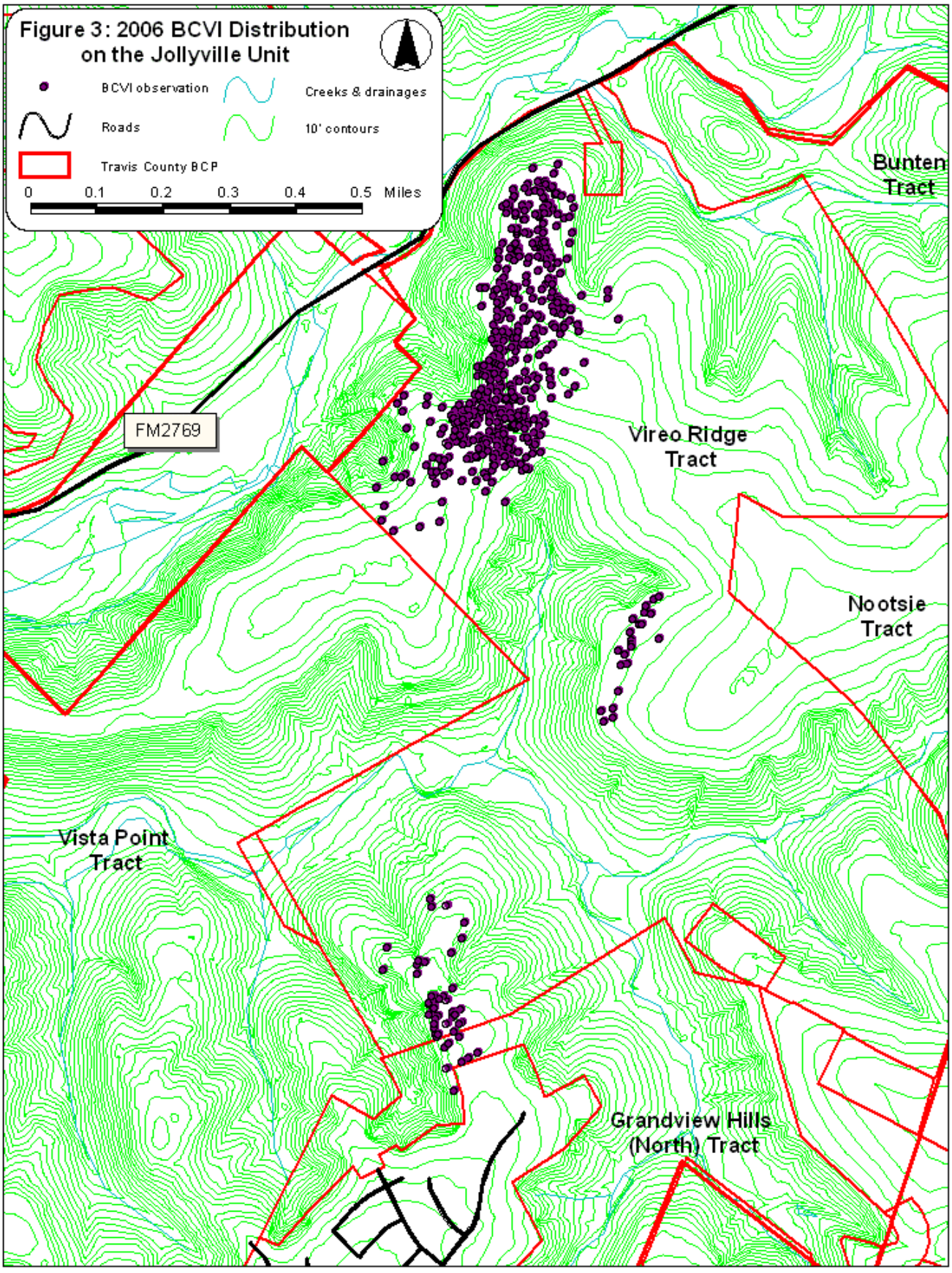


**Figure 3.** 2006 BCVI distribution on the Jollyville Unit

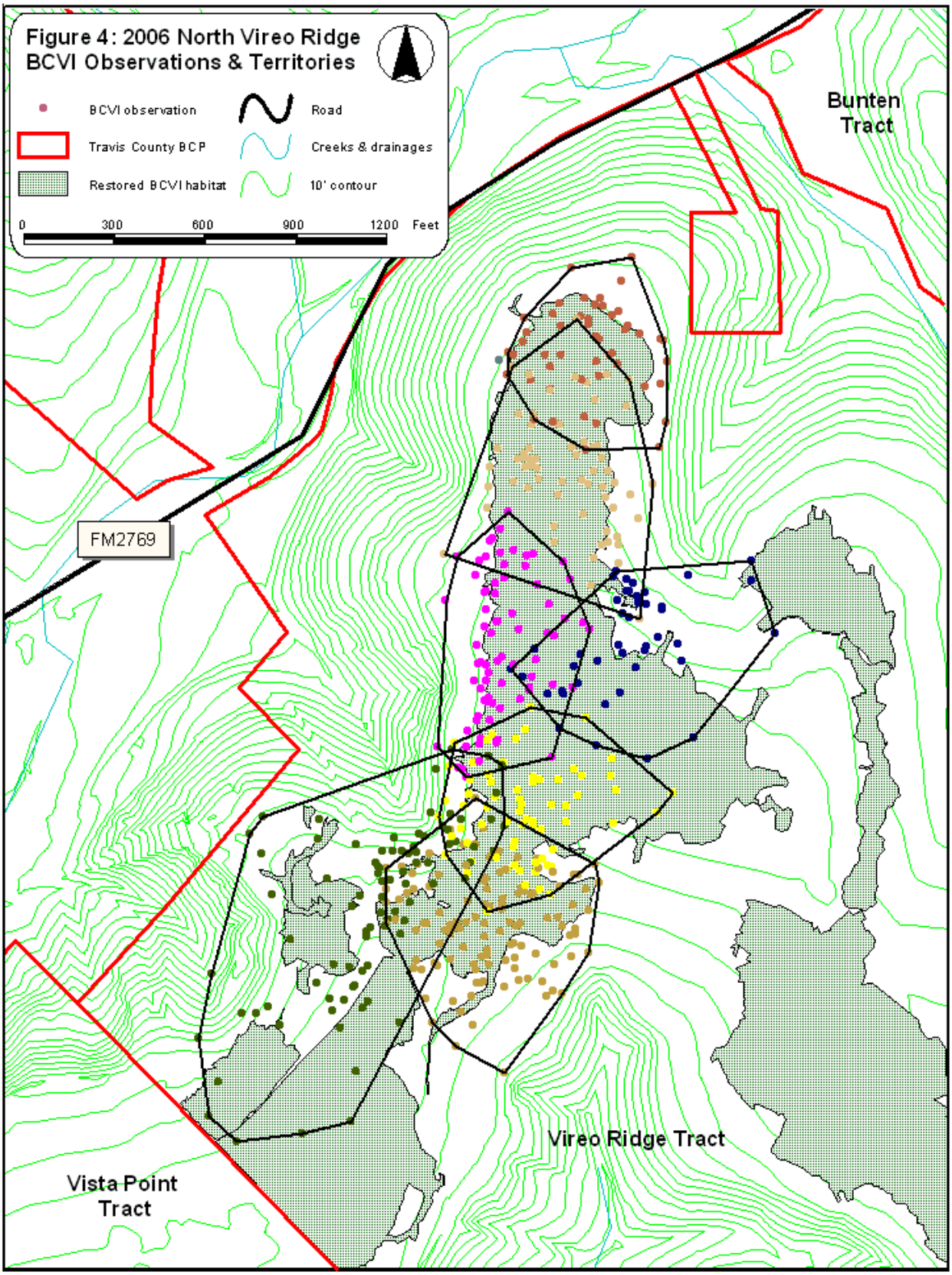


**Figure 4.** 2006 North Vireo Ridge BCVI observations and territories. Polygons enclose like symbols that denote repeated observations of a territorial male, or the female and fledglings associated with that male.

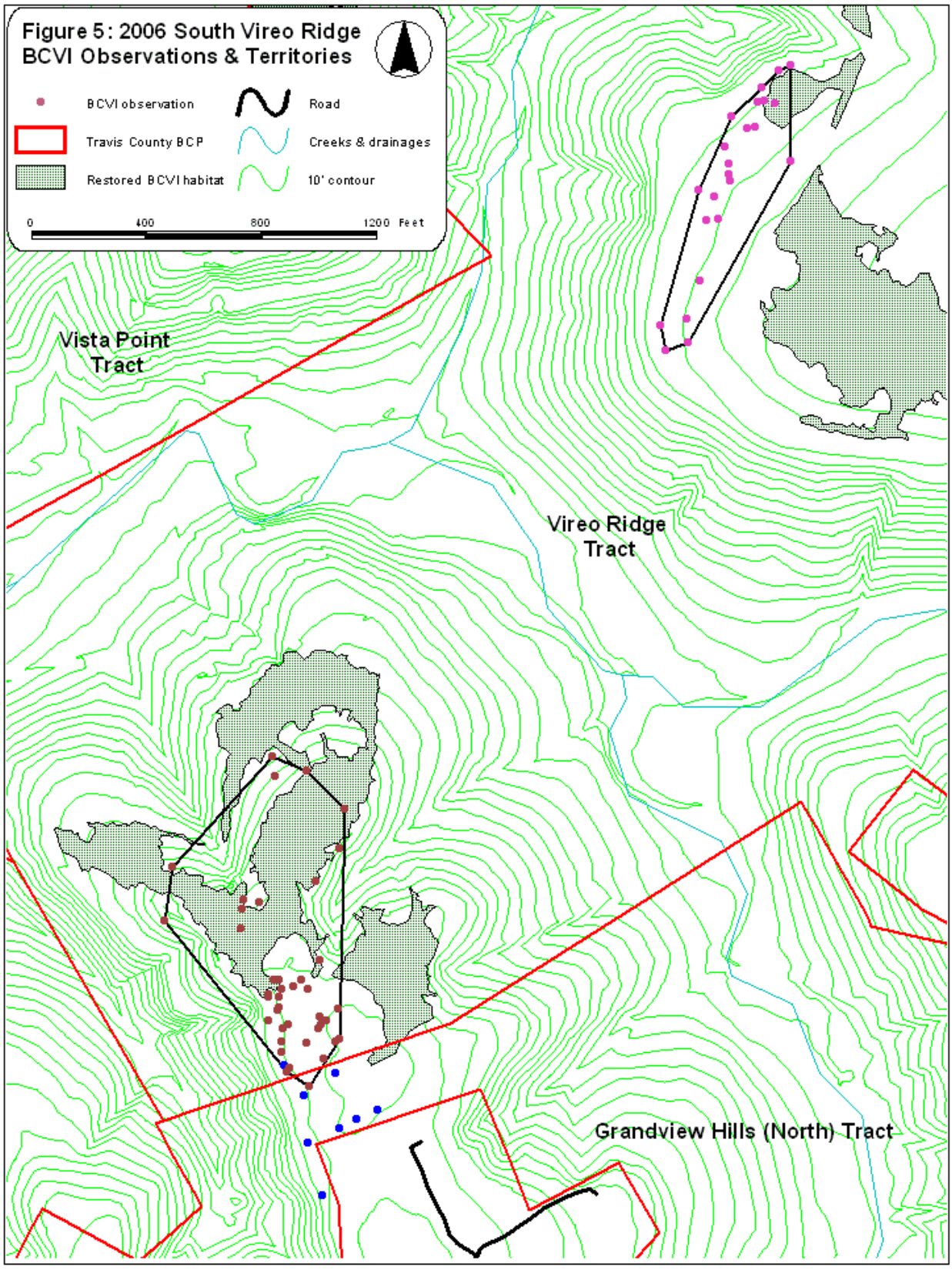


**Figure 5.** 2006 South Vireo Ridge BCVI observations and territories. Polygons enclose like symbols that denote repeated observations of a territorial male, or the female and fledglings associated with that male. Like symbols not enclosed by a polygon indicate repeated observations of a BCVI that did not meet the breeding territory criteria or was not within the plot boundary.

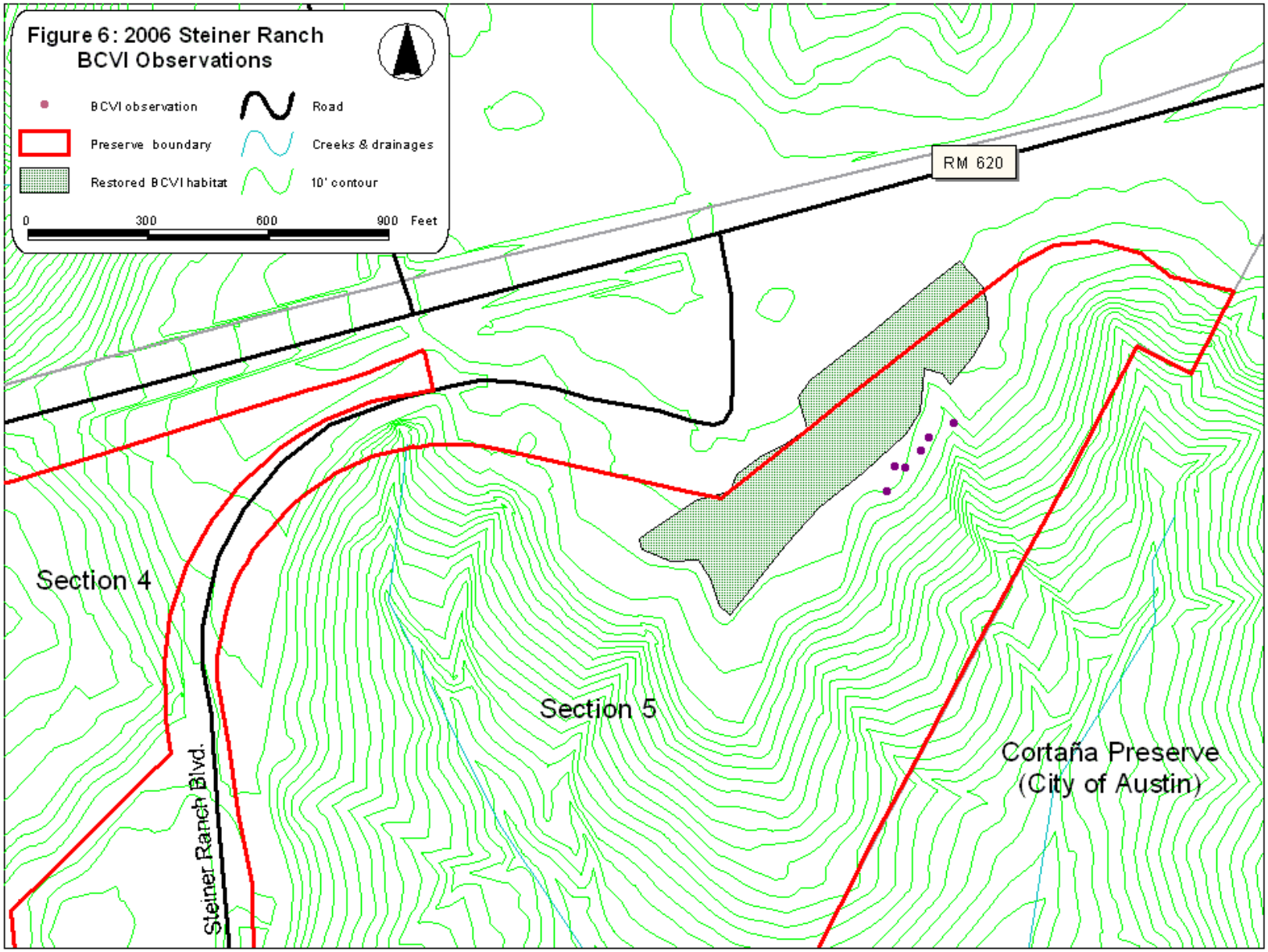


**Figure 6.** 2006 Steiner Ranch BCVI observations. Like symbols indicate repeated observations of a BCVI that did not meet the breeding territory criteria or was not within the plot boundary.