Monitoring of the Black-capped Vireo (*Vireo atricapilla*)

2003 Field Season

Travis County Natural Resources

PROJECT NUMBER 0905-0312, 0905-0325, 0905-0327

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INTRODUCTION

This report presents the results of the 2003 black-capped vireo surveys conducted by Travis County Natural Resources personnel. The black-capped vireo (*Vireo atricapilla*, hereafter vireo) is a migratory passerine whose breeding range in the United States has decreased markedly within the last few decades. In recognition of these significant population declines, the U.S. Fish and Wildlife Service listed the black-capped vireo as endangered in 1987 (U. S. Department of the Interior, Fish and Wildlife Service 1991b). Though not known to have been widespread in the United States, vireos were once found in Kansas, Oklahoma, and Texas (Grzybowski 1995). Today, however, the vireo breeds in a restricted range that includes portions of central and south-central Texas, three areas in Oklahoma, and central Coahuila, Mexico. (U. S. Department of the Interior, Fish and Wildlife Service, 1991a; Grzybowski, et al.1994; Grzybowski 1995, Oklahoma Dept. of Wildlife Cons. 1999). Vireo populations have been reported in 34 south-central and central Texas counties (U. S. Department of the Interior, Fish and Wildlife Service 1996).

Habitat loss and nest parasitism by Brown-headed cowbirds (*Molothrus ater*) are the greatest threats to Black-capped vireo populations. Vireo populations in Travis County have been significantly reduced due to habitat loss. In 1996, less than 100 individual vireos were estimated to occur in Travis County. Historic colonies no longer exist as urban sprawl further fragments vireo habitat. In 1996, an incidental "take" permit known as the Balcones Canyonlands Conservation Plan (BCCP) was issued to the City of Austin and Travis County under section 10(a)1(b) of the Endangered Species Act (U. S. Department of the Interior, Fish and Wildlife Service 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); including at least 2000 acres of vireo habitat. In the Travis County portion of this species range, breeding habitat is composed of mid-successional deciduous shrub matrices, maintained historically by fire and other naturally occurring disturbance regimes.

Goals for vireo recovery outlined in the BCP Land Management Plan (1999) include maintaining and increasing the current population and protecting contiguous blocks of habitat. As a BCCP permit holder, Travis County acquired several tracts now referred to as the Jollyville Unit (**Figure 1**). At present, most of the County-owned vireo habitat occurs on the Jollyville Unit's Vireo Ridge tract and is of poor to marginal quality (Campell 1995) due natural succession and encroachment of secondary growth Ashe juniper. Additional isolated

pockets of poor to marginal 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. Excellent black-capped vireo habitat (Campbell 1995) is located along the southwestern boundary of the Vireo Ridge tract adjacent to the Grandview Hills subdivision.

In order to reduce the amount of Ashe juniper (*Juniperus ashei*) and stimulate the growth and shrubby structure of other woody species needed for optimum vireo habitat, such as oaks (*Quercus* sp.) and sumacs (*Rhus* sp.), Travis County contracted to have approximately 55 acres of primarily poor vireo habitat selectively manipulated for restoration during the winters of 2002 and 2003 (Travis County Parks and Natural Resources 2003). The majority of this manipulation occurred adjacent to occupied habitat. However, approximately 23,000 feet (7010 m) of lanes were cut through occupied, marginal habitat, in order to create the patchy physiognomy associated with vireo habitat. A third phase of restoration is planned for January 2004, during which an additional 10-15 acres (4-6 ha) will be selectively cleared adjacent to areas utilized by vireos.

Annual vireo population data collected from the Jollyville Unit will be analyzed in order to monitor changes in distribution, abundance and productivity. Monitoring the population will help gauge the effectiveness of habitat restoration projects and to prioritize sites for future restoration activities.

STUDY SITES

The Jollyville Unit is comprised of 1658 acres (671 ha) and includes the following tracts: Grandview Hills, Lake Perspectives, Vireo Ridge, Bunten and Vista Point. It is located approximately 13 miles (21 km) northwest of downtown Austin with two primary access points on FM 2769 (**Figure 1**). Both the golden-cheeked warbler (*Dendroica chrysoparia*) and the black-capped vireo inhabit this property. 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. Total vertical relief is 250 feet (76.2 m). Riparian soils are in the Volente complex; Brackett and Tarrant soils are found on steep slopes (USDA 1974). Tarrant soils also occur in upland areas. Closed canopy oak-juniper (*Quercus-Juniperus*) woodlands 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 areas along creeks and drainages.

The Steiner Ranch Preserve comprises five separate tracts totaling 819 acres (331 ha), and is located approximately nine miles (14 km) west of downtown Austin on RM 620. The property is contiguous to the City of Austin's BCP Cortaña tract. Total vertical relief is 552 feet (168 m) with elevations decreasing on a southwest bearing. Topography of the four northern tracts consists of upland hills incised by a number of draws. 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. Vegetation ranges from open juniper brakes on uplands and shallow slopes to closed canopy juniper-oak woodlands on steeper, mesic slopes. Brackett series soils predominate on rolling uplands and gentle slopes while Tarrant series soils occur on steep slopes and in canyons (USDA 1974). Small patches of vireo nesting habitat occurs adjacent to both RM 620 and the City of Austin's BCP Cortaña tract.

METHODS

Data Collection

All potential vireo habitat on the Jollyville Unit was surveyed repeatedly throughout the breeding season. Additionally, tracts 4 and 5 of the Steiner Ranch Preserve were monitored for the presence of vireos while staff surveyed for golden-cheeked warblers. Vireos were surveyed for a total of 290 hours from 25 March to 8 August 2003. Due to limitations inherent to territory mapping methods (Verner 1985), results should be interpreted as indices rather than complete counts.

Territory mapping was used to estimate vireo abundance and territory numbers. All observations (both visual and auditory) of male, female and juvenile vireos were plotted on hard-copy, digital, ortho-photo maps with a scale of 1:3000 or less. The following data were recorded: location, date, behavior, sex, age, presence of a mate and number of fledglings. Vireo locations and corresponding data were later recorded in an ArcView (ESRI, Inc., Redlands, CA) avian location database using the Texas State Plane Coordinate System. Spatial and demographic data were entered into the database via an ArcView script (Horne 2000). Any male that could be differentiated from surrounding males was given a unique number for further tracking. Females or fledglings associating with a unique male were given the same unique number.

Territory mapping methods generally followed IBCC guidelines (1970). Bibby's (1993) "consecutive flush" was employed to increase accuracy in assigning observations of vireos 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. Counter-singing and contemporaneous conspecific singing were relied upon in most cases to differentiate between individual males. Vireos that could not be differentiated from surrounding individuals with any confidence were designated as "unknown." Playback tapes of vireo vocalizations were used infrequently late in the season in accordance with USFWS protocol to elicit vireo responses (Department of the Interior, U. S. Fish and Wildlife Service 2003).

Pairing status of male vireos was determined by observing one or more of the following conditions: a male associating with a female; the nest of 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. If a male was seen at least three different times using the same general location with at least a week between observations, it was considered to have established a breeding territory.

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. Nests were checked every 4-5 days from the date of discovery until an outcome could be determined. Nest stage, contents, and behavior of the attending adult were recorded during each nest check. For territories where no nest was found but fledglings were present, staff recorded the maximum number of fledglings present and included this in productivity and breeding success estimates.

Data Analysis

Abundance is the sum of all individual male vireos at a given study site (regardless of territory status). Species distribution comprises all locations where vireos 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 some portion of them. In calculating territory number, territories that fell entirely or partially within the tract boundaries were considered "full" 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).

A territory was considered successful if at least one fledgling was 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 (Koloszar and Becker 2000). Productivity data were represented in two ways: the total number of fledglings per successful territories and the total number of fledglings per total number of territories.

RESULTS

There were 915 observations of black-capped vireos recorded on the Jollyville Unit in 2003 (877 male, 37 female, 1 hatch year; **Figure 2**). Vireo abundance on the Jollyville Unit totaled 22 males (**Figures 3 and 4**). This includes a single observation of a male vireo on the Lake Perspectives tract. Two territories were located partially off the Jollyville Unit while an additional two were detected entirely off Travis County-managed property. One male vireo was detected (six observations) on Tract 5 of the Steiner Ranch Preserve (**Figure 5**), but its breeding status was never determined. No color-banded vireos were found during the 2003 season. **Table 1** presents a summary of vireo data collected during 2003 in addition to recent data collected by various agencies on what is now called the Jollyville Unit.

Of the 22 males reported, 20 were determined to have territories, and 14 (70.0%) were considered successfully paired (**Table 2**). Only nine (45.0%) territories successfully fledged at least one young (**Table 3**). There were no indications of a second successful brood. Of the nine broods observed, seven (77.8%) produced at least two young. In total, at least 16 young were detected, resulting in a productivity of 0.8 (based on all territories), which is a decrease from 1.4 in 2002. However, based on the number of successful territories, productivity was the same in 2002 and 2003 (1.8; **Table 3**).

Three territories were located in 2003 in and adjacent to a newly acquired portion of the Jollyville Unit (**Figure 4**). On the remainder of the Jollyville Unit, there were 17 territories. This is a decrease of two territories from the previous year in this area alone. At least thirteen vireos utilized areas that had recently been manipulated for habitat restoration (**Figures 3 and 4**).

A total of five vireo nests were located. One was determined to be an early season nest, but whether it was depredated or even used was never determined. The remaining four nests were determined to have been depredated. Of these, two nests belonged to one vireo pair. A third nest attempt for this territory was never located nor were young ever detected. There

was no indication of nest parasitism by brown-headed cowbirds (*Molothrus ater*) on black-capped vireos. However, within the study area an adult blue-grey gnatcatcher (*Polioptila caerulea*) was observed tending to a cowbird young and an abandoned white-eyed vireo (*Vireo griseus*) nest containing a cowbird egg was located.

DISCUSSION

Vireo abundance on the Jollyville Unit remained unchanged from 2002 to 2003, while the number of territories increased slightly. However, the 2003 survey included an additional property and therefore more acreage of vireo habitat. While the number of territories on the existing property declined by two, this change is minimal and probably not statistically significant.

Vireo territory establishment on the Jollyville Unit primarily occurred in areas inhabited by vireos since the County began surveying the site in 2001 (Travis County Natural Resources 2001 and 2002). However, the distribution of vireo territories on the preserve appears to have changed slightly between years. For example, several of the 2003 territories were located in areas occupied by vireos in 2001 but not in 2002. Furthermore, there was an additional territory detected in an isolated pocket of vireo habitat that spans the southwest corner of the Jollyville Unit and private property. There are many factors that could influence territory distribution, including the intrinsic habitat characteristics of the site, the age structure of the population, the overall population density (Grzybowski et al. 1994; Anderson and Gutzwiller 1996), nearby residential development, and habitat restoration activities on the preserve.

Overall, it appears the primary colony of vireos on the Jollyville Unit continues to respond positively to the restoration efforts undertaken since 2001. However, in 2003 there seemed to be a greater re-establishment rate in areas that had been selectively cleared versus areas through which lanes had been cut (Travis County Natural Resources 2002). While selective clearing occurred in larger expanses of vireo habitat, lanes were cut through narrow bands of marginal habitat on the periphery of the 2002 colony. Cut lanes may have further reduced the amount of available habitat in these locations, possibly contributing to their abandonment. It is not clear, however, whether the lanes alone caused this abandonment or whether other environmental variables contributed as well. Nevertheless, future restoration efforts should be focused away from these small areas of marginal habitat until larger, adjacent areas have been restored and are inhabited by vireos.

Although vireos tend to be "semi-colonial" and establish territories near other vireos (Ward and Schlossberg 2001), several territories in 2002 and 2003 were isolated from the main colony. It is possible, however, that additional territories were overlooked adjacent to these isolated (individual or small clustered) territories. Low vireo 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 vireos, song rates and duration of song bouts were much lower than in high-density populations.

Habitat degradation continues to be a primary concern and may be affecting productivity. Though not quantified, typical vireo nesting habitat (see Grzybowski 1995 for description) is rarely exhibited on the Jollyville Unit. On this site, dense stands of Ashe juniper have reduced the openings in deciduous cover generally associated with optimal vireo habitat. Additionally, the vegetative growth pattern in occupied areas of the Jollyville Unit tends to be vertical rather than horizontal in structure. Such growth may provide fewer preferred nesting sites. Though it is common for open nesting species, especially vireos, to have several renesting attempts (Martin 1992, Koloszar and Becker 2000), successful second nests were never observed during 2003. Suitable nest sites may not have been available, thus limiting renesting attempts/success (Martin 1992). Further research is needed to better understand vireo habitat dynamics and its relationship to reproductive success at the Jollyville Unit.

Continued monitoring of the Jollyville Unit vireos is essential to determine whether the colony is a source or sink 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 and 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 Austin metapopulation.

RECOMMENDATIONS

- An intensive vireo 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 Austin 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.

- 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.

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

- Feasibility of habitat restoration for vireos on other County properties should be assessed in 2004. Areas on the Steiner Ranch Unit (Tracts 4 and 5) may be good candidates for restoration efforts because they contain historic breeding habitat and are in close proximity to the vireo colony on the Cortaña tract (City of Austin).

- Travis County should consider the acquisition of additional historic vireo breeding sites a priority in order to increase the local population of vireos.

- Neighboring private landowners with historic or potential vireo 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 participate in brown-headed cowbird trapping efforts and to appropriately manage black-capped vireo habitat.

- Habitat restoration efforts will continue on tracts that support vireo populations and on surrounding tracts that harbor potential habitat. Restoration methods will be evaluated to determine those that best create or restore suitable vireo breeding habitat. Surveys for golden-cheeked warblers should be conducted to ensure that restoration activities do not negatively affect them.

- Conspecific tape playback should continue to be utilized during the field season in accordance with USFWS protocols, especially in areas where few vireos are detected, or to determine absence of target species (Department of the Interior, 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. Although no vireo nests were found parasitized, nearly 100 female cowbirds were removed from the area in 2003. Shooting female cowbirds in habitat is also recommended.

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TABLES

Table 1. Summary of black-capped vireo 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	22	20

1 Restricted access on the Parke.

2 Detected while on brief site visit.

Table 2. Abundance, territory number, pairing success and pairing success rate for black-capped vireos on Jollyville Unit, Travis County, Texas, March-August 2001-2003.

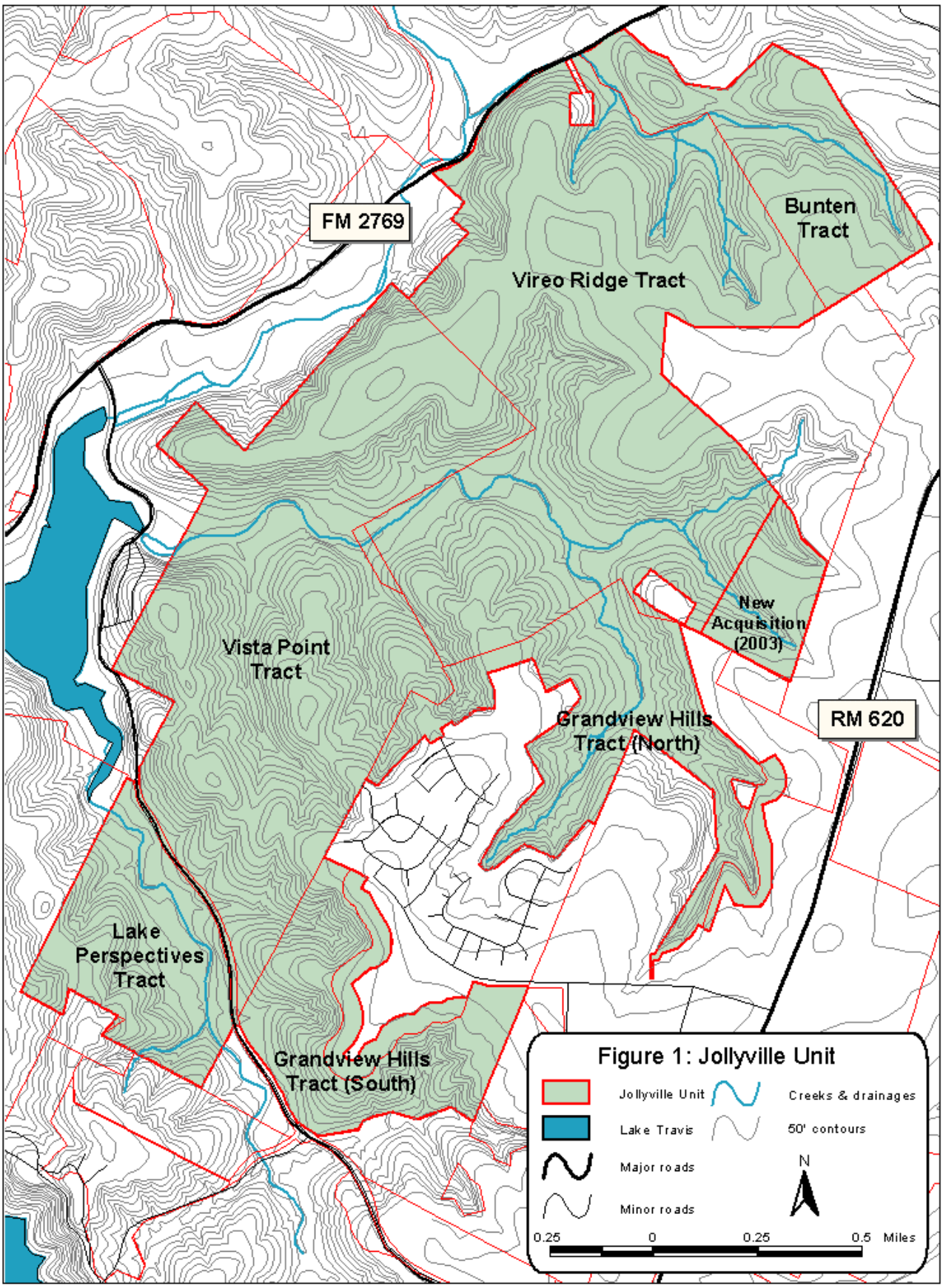
Year	Abundance	No. Territories	Successfully Paired	Pair Success Rate (%)
2001	--	13	--	--
2002	21	19	18	94.7
2003	22	20	14	70.0

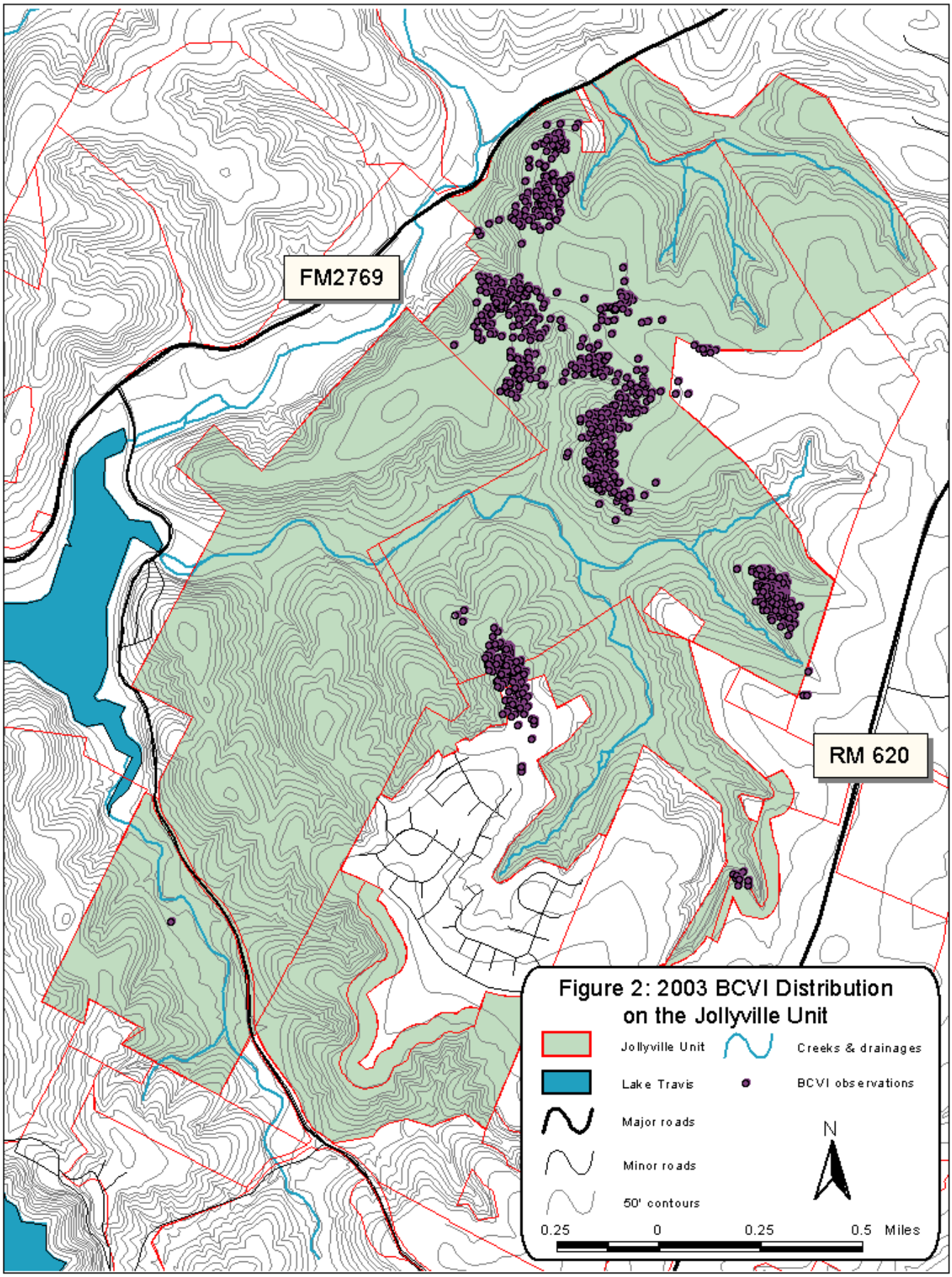
-- data not collected

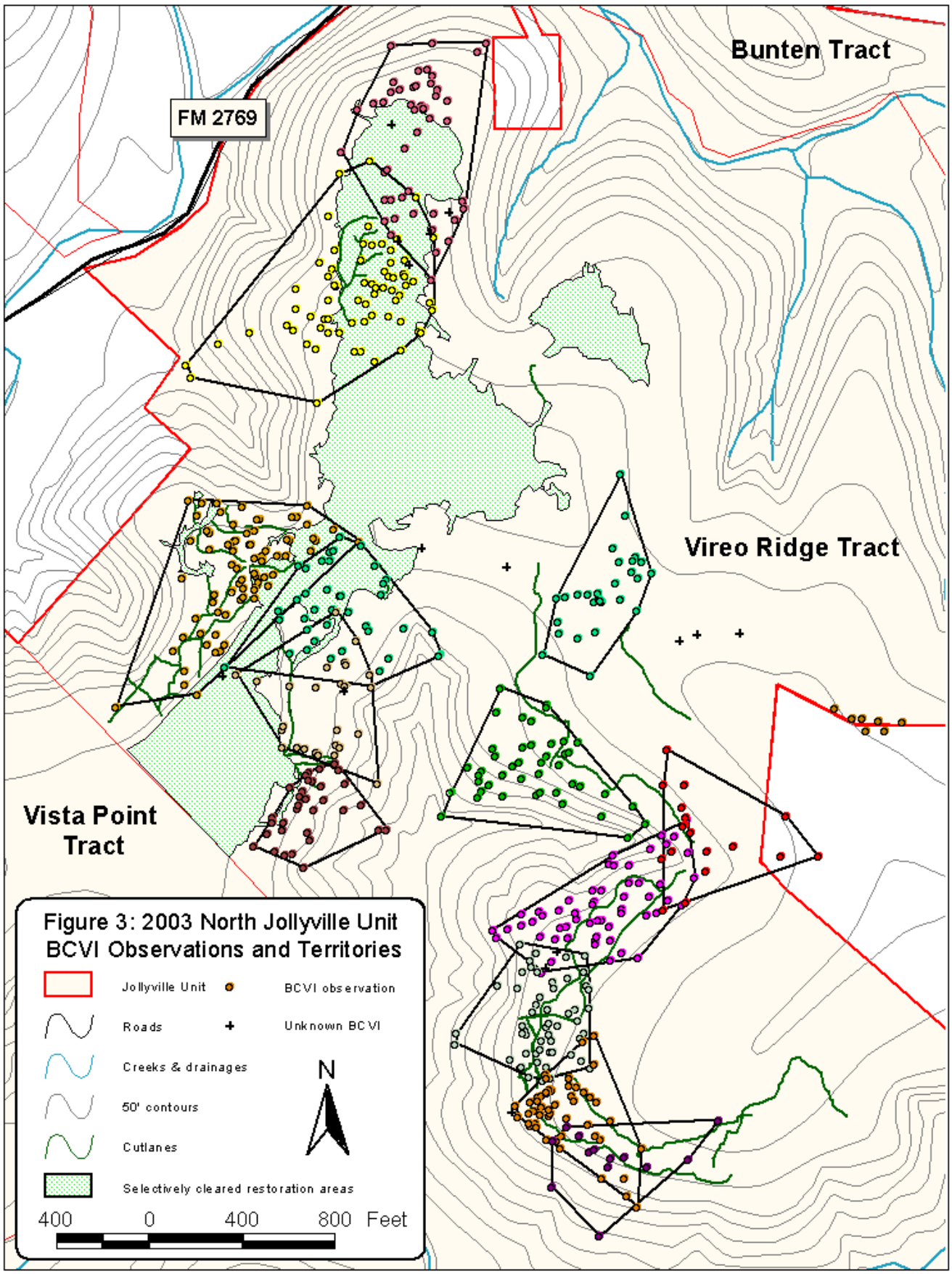
Table 3. Pair success and productivity for black-capped vireo territories on Jollyville Unit, Travis County, Texas, March-August 2001-2003.

				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	1.8	1.4
2003	9	45.0	16	1.8	0.8

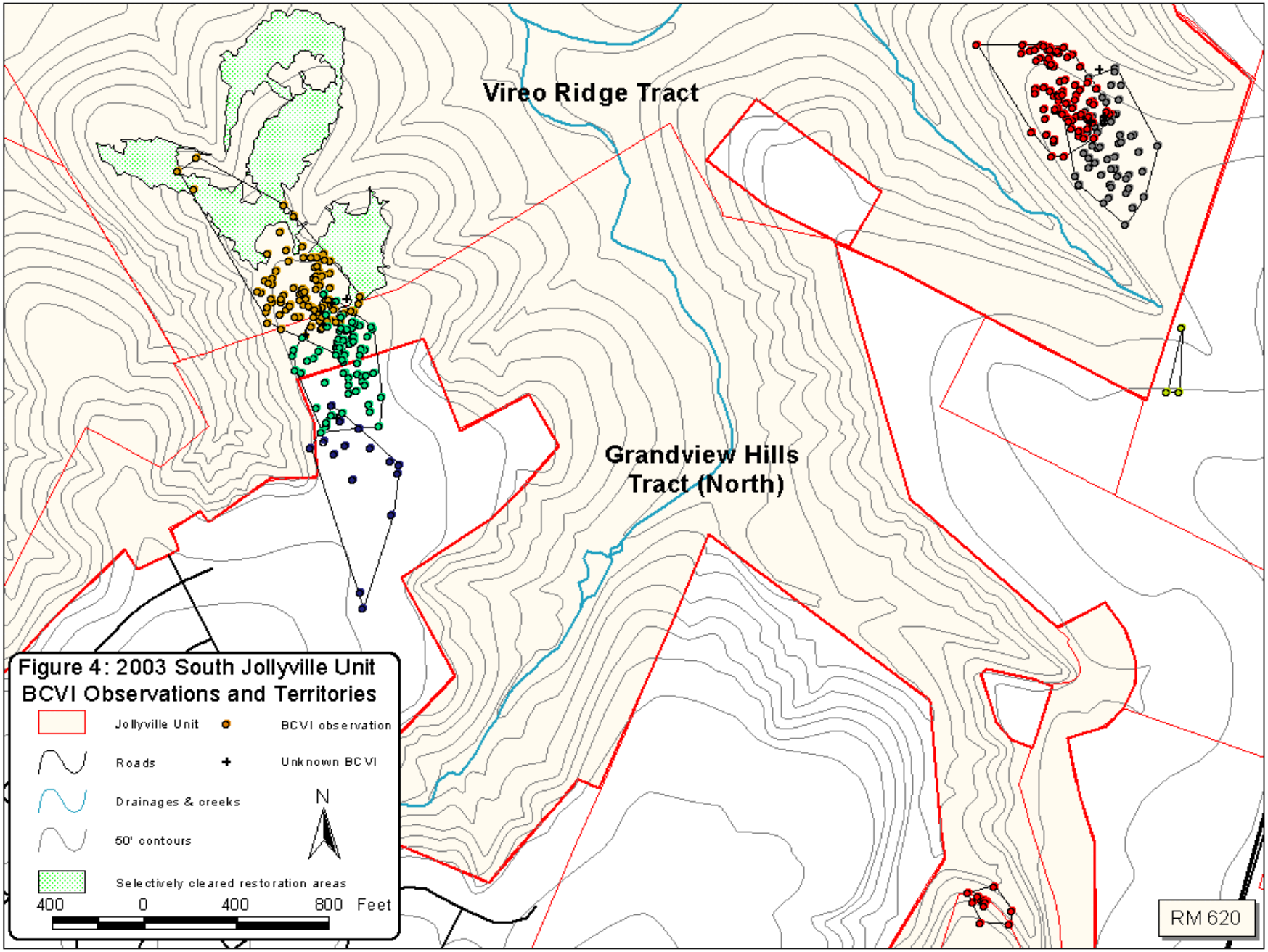
-- data not collected
* Represents the number of all territories that fledged at least one young.


FM 2769
Bunten Tract
Vireo Ridge Tract
New Acquisition (2003)
Vista Point Tract
Grandview Hills Tract (North)
RM 620
Lake Perspectives Tract
Grandview Hills Tract (South)
Figure 1: Jollyville Unit
Jollyville Unit
Lake Travis
Major roads
Minor roads
Creeks & drainages
50' contours
N
0.25 0 0.25 0.5 Miles

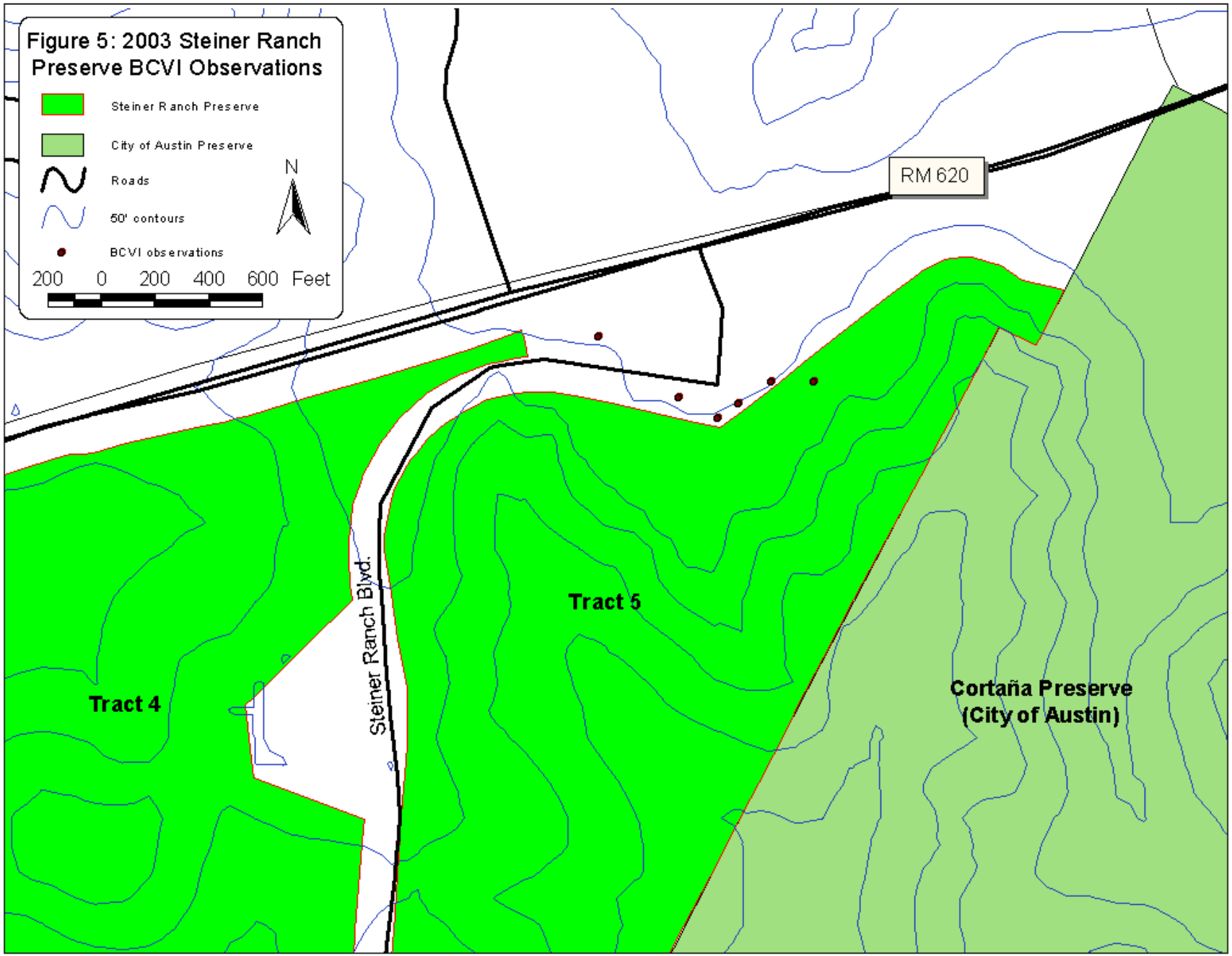

FM2769
RM 620
Figure 2: 2003 BCVI Distribution on the Jollyville Unit
Jollyville Unit
Lake Travis
Major roads
Minor roads
50' contours
Creeks & drainages
BCVI observations
N
0.25 0 0.25 0.5 Miles



Polygons enclose like-symbols that denote repeated observation of the same male, female or fledglings belonging to that territory.



Polygons enclose like-symbols that denote repeated observations of the same male, female or fledgling belonging to that territory.


Figure 5: 2003 Steiner Ranch Preserve BCVI Observations
Steiner Ranch Preserve
City of Austin Preserve
Roads
50' contours
BCVI observations
N
200 0 200 400 600 Feet
RM 620
Steiner Ranch Blvd.
Tract 4
Tract 5
Cortaña Preserve (City of Austin)