Monitoring of the Black-capped Vireo (*Vireo atricapilla*)
2004 Field Season

Travis County Parks and Natural Resources

PROJECT NUMBER 0810-0501

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INTRODUCTION

This report presents the results of the 2004 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. 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 central and south-central Texas, three areas in Oklahoma, and central Coahuila, Mexico. (U.S. Fish and Wildlife Service [USFWS] 1991; 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 (USFWS 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. To prevent further losses, the U.S. Fish and Wildlife Service issued the Balcones Canyonlands Conservation Plan (BCCP) section 10(a)(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); at least 2000 of these acres should provide vireo habitat, most of which will have to be created through habitat restoration.

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 to be managed as a unit now called Jollyville (**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 due to historic suppression of natural disturbances. Additional 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. Optimal black-capped vireo habitat 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 67 acres of primarily poor vireo habitat selectively manipulated for restoration each winter since 2002 (Travis County Parks and Natural Resources 2003). The majority of this habitat manipulation occurred adjacent to occupied habitat using a flail mower or similar vegetation clearing equipment. Additionally, approximately 23,000 feet (7010 m) of lanes have been cut through occupied, marginal habitat, in order to create the patchy physiognomy associated with vireo habitat. All habitat manipulation to date has occurred on the Jollyville Unit. A fourth phase of restoration is planned for January 2005, during which an additional 15-20 acres (6-8 ha) will be selectively cleared adjacent to areas utilized by vireos. Approximately seven of these acres are located on the Steiner Ranch tract adjacent to the City of Austin's Cortaña tract.

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 1799 acres (728 ha) and includes the following tracts: Cuevas, Grandview Hills, Lake Perspectives, Vireo Ridge, Bunten and Vista Point (**Figure 1**). It is located approximately 13 miles (21 km) northwest of downtown Austin. Primary access points are on FM 2769 and adjacent to the Granview Hills neighborhood. 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 Preserve. 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). Existing vireo habitat occurs in limited quantity along areas adjacent to both RM 620 and the City of Austin's BCP Cortaña Preserve.

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 127.5 hours from 4 April to 23 August 2004. 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). 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, entered into the avian location database as "mate present".

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.

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. Furthermore, 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 403 observations of black-capped vireos recorded on the Jollyville Unit in 2004 (393 male, 7 female, 3 hatch year; **Figure 2**). Vireo abundance on the Jollyville Unit totaled 13 males with 12 observed to have breeding territories (**Figures 3 and 4**). No territories were detected entirely off County-managed properties in 2004. No vireos were detected on the Steiner Ranch Preserve. No color-banded vireos were found during the 2004 season. **Table 1** presents a summary of vireo data collected during 2004 in addition to recent data collected by various agencies on what is now called the Jollyville Unit.

Of the 12 reported territories, 9 (75.0%) were considered successfully paired (**Table 2**). Only six (50.0%) territories successfully fledged at least one young (**Table 3**). There were no indications of a second successful brood. Of the six broods observed, five (83.3%) produced at least two young. In total, at least 13 young were detected, resulting in a productivity of 1.1 (based on all territories), which is an increase from 0.8 in 2003. Furthermore, based on the number of successful territories, productivity increased to 2.2 (**Table 3**) from 1.8 the previous two years.

There were no vireos found utilizing entirely new areas on the Jollyville Unit. Unlike 2003, where three territories were detected adjacent to Travis County managed property, only one such territory was detected in 2004. Eight territories were utilizing areas where large areas had been recently manipulated for habitat restoration and an additional two territories were found in areas where lanes were cleared (**Figures 3 and 4**).

A total of two vireo nests were located. One nest successfully fledged, while the status of the second nest was never determined. Dander at the bottom of this nest indicated that the nestlings had possibly fledged, but no interactions between the adults and young were ever witnessed on subsequent site visits. There was no indication of nest parasitism by brown-headed cowbirds (*Molothrus ater*) on black-capped vireos.

DISCUSSION

Vireo abundance and territory numbers on and adjacent to the Jollyville Unit dropped considerably in 2004 from the previous years. Although there could be several reasons for the decrease in territory numbers, it should be mentioned that survey effort (403 observations, 127.5 survey hours), due to staffing shortage, was at it's lowest since 2001, thus the potential of detecting periphery vireos was diminished somewhat. Additionally, there was no increase in vireo abundance through land acquisition (i.e. occupied vireo habitat) as occurred in past years.

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 Parks and Natural Resources 2001, 2002 and 2003). However, the distribution of vireo territories on the preserve appears to have changed slightly between years. 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), and habitat restoration activities on the preserve. Another factor influencing territory distribution is residential development, which has increased adjacent to the Grandview Hills and Vireo Ridge tract boundaries. Excellent habitat utilized in the past seasons there has now been mostly cleared in preparation for development.

Overall, it appears the primary colony of vireos on the Jollyville Unit continues to respond positively to the restoration efforts undertaken since 2001. Vireos were again found utilizing portions of areas that had been recently cleared. In fact, for the first time since restoration has occurred on the tract, a vireo nest was located within a restored area.

For the first time since 2002, no isolated territories were located. Vireos tend to be "semi-colonial" and establish territories near other vireos (Ward and Schlossberg 2001). 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 2004. 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.

- 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.

- 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 2005. Several acres will be restored on Steiner Ranch in January 2005 specifically 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 manage brown-headed cowbird populations 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 annually 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 2004. 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	21	20
2004	Travis County TNR	13	12

[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 2001-2004.

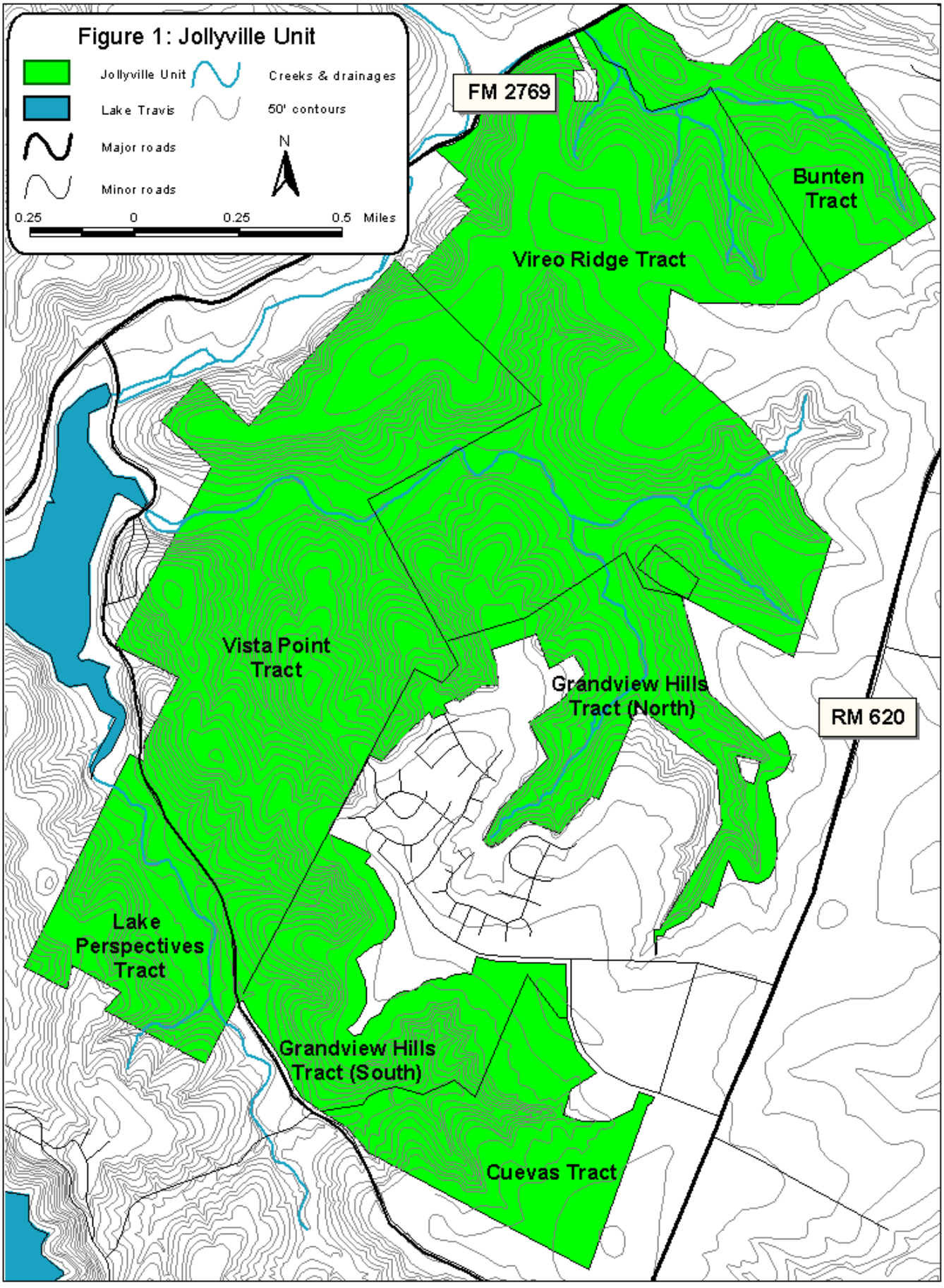
Year	Abundance	No. Territories	Successfully Paired	Pair Success Rate (%)
2001	--	13	--	--
2002	21	19	18	94.7
2003	21	20	14	70.0
2004	13	12	9	75.0

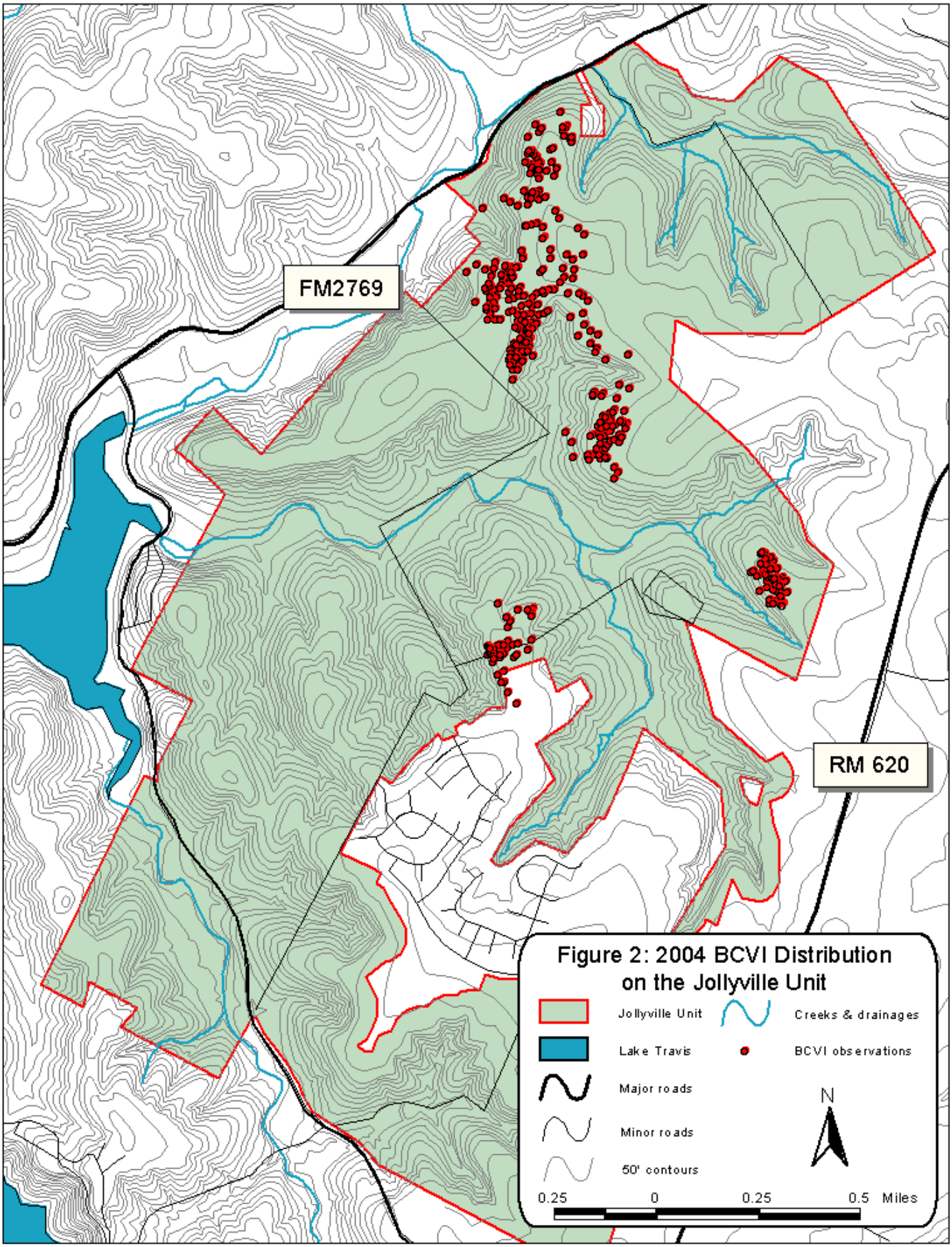
-- data not collected

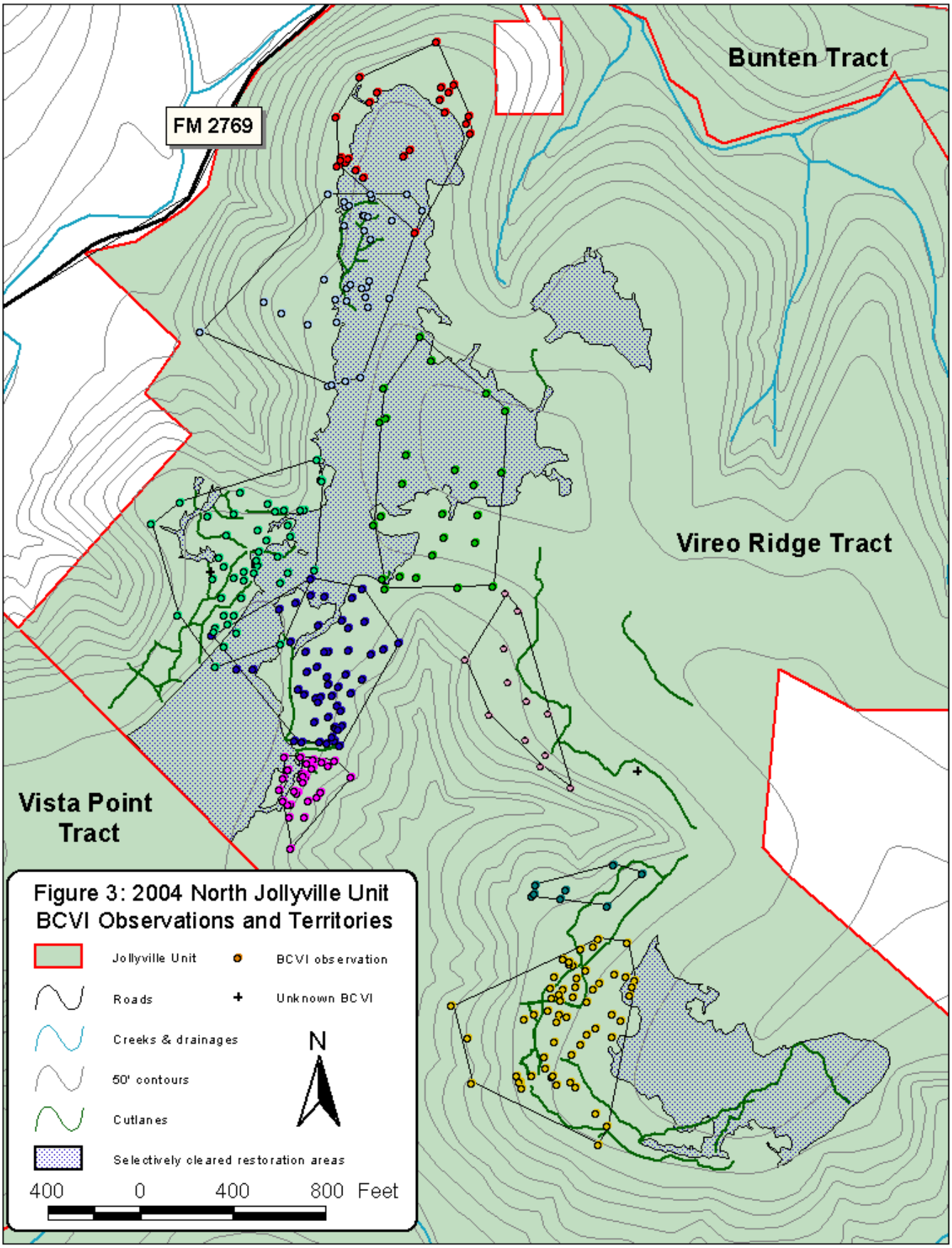
Table 3. Pair success and productivity for black-capped vireo territories on Jollyville Unit, Travis County, Texas, March-August 2001-2004.

				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
2004	6	50.0	13	2.2	1.1

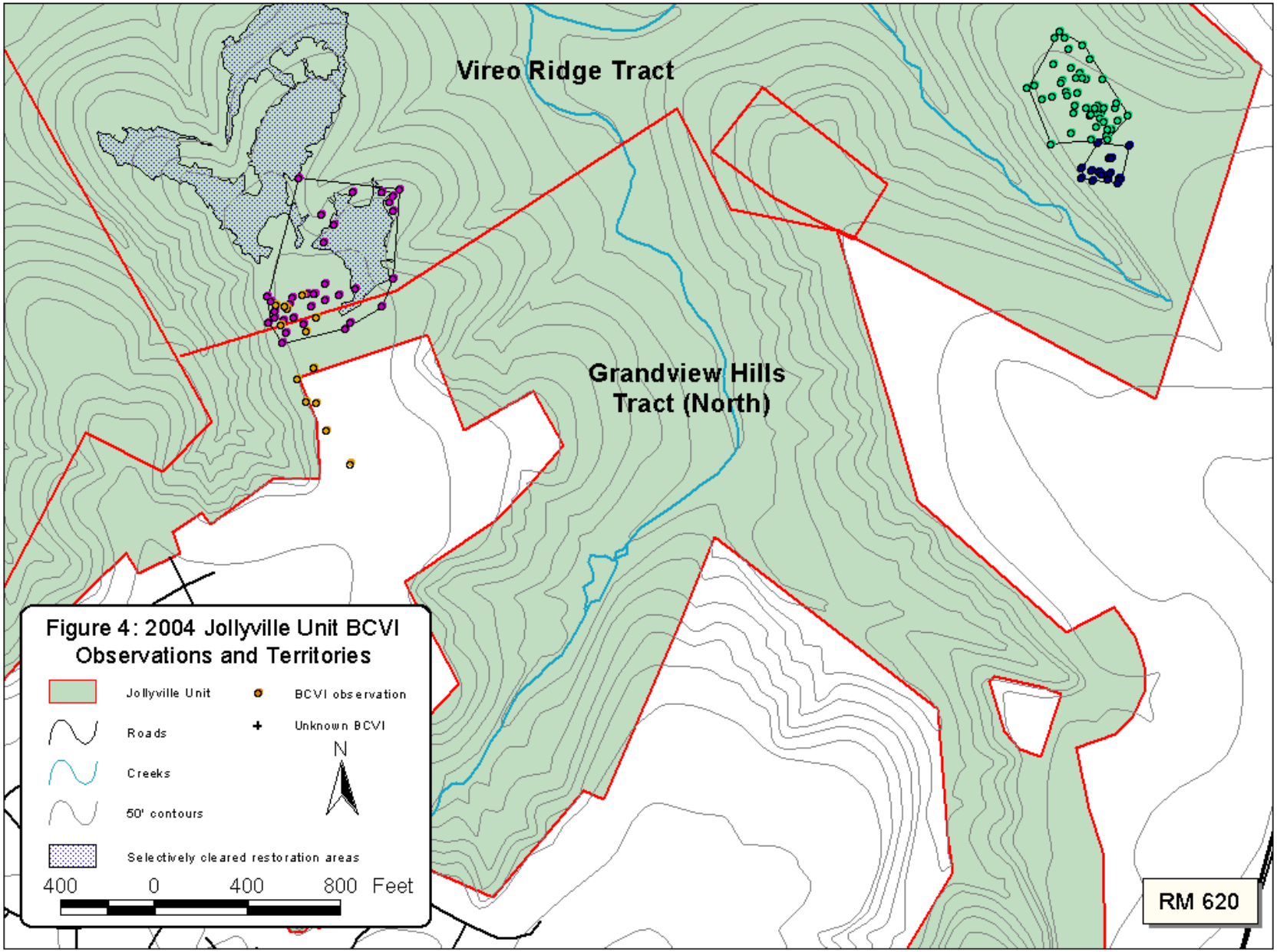
-- data not collected
* Represents the number of all territories that fledged at least one young.


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
FM 2769
Bunten Tract
Vireo Ridge Tract
Vista Point Tract
Grandview Hills Tract (North)
RM 620
Lake Perspectives Tract
Grandview Hills Tract (South)
Cuevas Tract


FM2769
RM 620
Figure 2: 2004 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 observations of the same male, female or fledglings belonging to that territory.



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