Monitoring of the Black-capped Vireo (*Vireo atricapilla*): 2005 Field Season

Travis County Parks and Natural Resources

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INTRODUCTION

This report presents the results of the 2005 black-capped vireo surveys (*Vireo atricapilla*, hereafter vireo) conducted by Travis County Natural Resources personnel. The breeding range of this neotropical migrant has decreased markedly within the last few decades. Historically, vireos in the United States were found only in Kansas, Oklahoma, and Texas during the breeding season (Grzybowski 1995). Presently, 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. 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 vireo populations. Vireo populations in Travis County have been significantly reduced as natural disturbances, such as fire, are suppressed and urban/suburban development continues to expand. In 1996, less than 100 individual vireos were estimated to occur in Travis County (USFWS 1996). 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); a minimum of 2000 of these acres will be designated as vireo habitat, most of which will have to be created through habitat restoration efforts (USFWS 1996).

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. At present, most of the County-owned vireo habitat occurs on the Jollyville Unit's Vireo Ridge tract (Figure 1) and is of marginal quality, although some is moving towards good to excellent quality as restoration continues. 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 vireo habitat is located along the southwestern boundary of the Vireo Ridge tract adjacent to the Grandview Hills subdivision.

Beginning in the winter of 2002 and continuing every winter thereafter, Travis County conducted vireo habitat restoration activities on both the Jollyville Unit's Vireo Ridge and Steiner Ranch properties. Presently, an accumulative total of 90 acres of poor quality vireo habitat has been altered through the selective removal of undersirable woody species such as *Juniperus ashei*.

In November 2005, 14 acres on the the Jollyville unit, adjacent to occupied habitat, were manipulated. Additionally, since 2002 approximately 23,000 feet (7,010 m) of lanes have been cut through occupied, marginal habitat in order to create the patchy, mid-successional physiognomy associated with vireo breeding habitat. Appoximately five acres were cleared in January 2005 on Steiner Ranch, which is adjacent to city-managed vireo habitat. A fifth phase of restoration is planned for January 2006, during which an additional 10-12 acres (4-5 ha) will be selectively cleared within the Jollyville Unit. This will bring the accumulative total up to 100 acres of restored vireo habitat.

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 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 neighborhood located off of Wilson Parke Road. Both the golden-cheeked warbler (*Dendroica chrysoparia*) and the vireo 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. 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 sp.-Juniperus ashei*) 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 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. 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. 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 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 tract were monitored for the presence of vireos while staff surveyed for golden-cheeked warblers. Vireos were surveyed for a total of 140 hours from 3 March to 20 July 2005. 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 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 into an ArcView 3.2 (ESRI, Inc., Redlands, CA) database script. Coordinate system used was Texas State Plane (with NAD 1983 projection). Spatial and demographic data were entered into the database via the 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, associated with that territory number.

Territory mapping methods generally followed International Bird Census Committee (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. When found, 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. In territories where no nest was found but fledglings were present, staff recorded the maximum number of fledglings and included this in productivity and breeding success estimates.

Data Analysis

Abundance is defined as the sum of all individual male vireos detected 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, only territories that fell entirely within the county-managed 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 328 observations of black-capped vireos recorded on the Jollyville Unit in 2005 (314 male, 10 female, 2 hatch year (HY), 2 unknown; Figure 2). Vireo abundance totaled 12 males with 11 establishing breeding territories (Figures 3 and 4). No territories were detected entirely off County-managed properties in 2005. No vireos were detected on the Steiner Ranch tract. No color-banded vireos were found during the 2005 season. Table 1 presents a summary of vireo data collected during 2005 in addition to recent data collected by various agencies on what is now called the Jollyville Unit.

Eight of the 11 territories (72.7%), were considered successfully paired (Table 2). One territory successfully fledged young in 2005. Only one HY was confirmed from the territory. Productivity among successful territories decreased from previous years, with a value of 0.12. Considering total number of territories, productivity data yield a value of 0.09 (Table 3). These numbers show a marked decrease when compared to previous 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. In 2005, nine territories were established in areas where habitat restoration had occurred. This shows an increase by one from last year (Figures 3 and 4).

A total of three vireo nests were located with two in the same territory. All three nests were determined to have failed. Although no nests were found parasitized, nearly 50 female cowbirds were removed from the Vireo Ridge tract in 2005. Also, both a male and female bronzed cowbird were observed in the area.

DISCUSSION

Vireo abundance and territory numbers did not show much deviation from totals in 2004. However, these values are still low compared to previous years (Table 2). Vireo productivity also notably decreased. Only one successful brood, consisting of at least one fledgling, was detected. Three females from other territories were observed carrying food but no HY was ever seen. Reasons for the low productivity are unclear. However, an increase in search efforts for the 2006 survey season should positively influence HY detections and productivity values as well.

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, 2003 and 2004). 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, 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 Grandview Hills and Vireo Ridge tract boundaries. Excellent habitat, previously utilized on property adjacent to the Grandview Hills tract, has now been completely cleared and partially developed in preparation for development. Further development is planned through 2006.

The primary colony of vireos on the Jollyville Unit continues to respond positively to restoration efforts undertaken since 2001. Vireos were found utilizing portions of areas that had been recently cleared. For the first time, three territories were established on the primary restoration site on the northern most section of the Vireo Ridge tract. Two territories, previously recorded from 2003 and 2004, in the eastern section of the tract were absent in 2005.

. Vireos tend to be “semi-colonial” and establish territories near other vireos (Ward and Schlossberg 2001). Isolated territories (individual or small-clustered) were recorded for the first three survey years (2001-2003). However, none were found in 2004 or 2005. 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.

Although all three nests failed, most likely due to predation, habitat degradation continues to be a primary concern and may also be affecting productivity. Typical vireo nesting habitat (see Grzybowski 1995 for description) is uncommon on the Jollyville Unit, although early restoration areas, primarily from years 2001 and 2002, are beginning to show characteristics of prime vireo habitat. This tract is typically dominated by dense stands of Ashe juniper which have reduced the openings in the deciduous cover generally associated with optimal vireo habitat. Also, the vegetative growth pattern in occupied areas of the this tract tends to be vertical rather than the horizontal, mid-successional stage preferred by vireos. Such growth may provide fewer preferred nesting sites. Though it is common for open nesting species, especially vireos, to have several renesting attempts, successful second nests were never observed during 2005 (Martin 1992, Koloszar and Becker 2000). 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 central Texas 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 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 vireo 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/or 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.

- Travis County should consider the acquisition of additional historic vireo breeding sites 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 which technique best creates or restores suitable vireo breeding habitat.

- Surveys for golden-cheeked warblers should continue annually to ensure that restoration 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 vireos 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.

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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
2005	Travis County TNR	12	11

[1] Restricted access on the property.

[2] Detected while on brief site visit.

Table 2. Abundance, territory number, pairing success and pairing success rate for black-capped vireos (*Vireo atricapilla*) on Jollyville Unit, Travis County, Texas, March-August 2001-2005.

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
2005	12	11	8	72.7

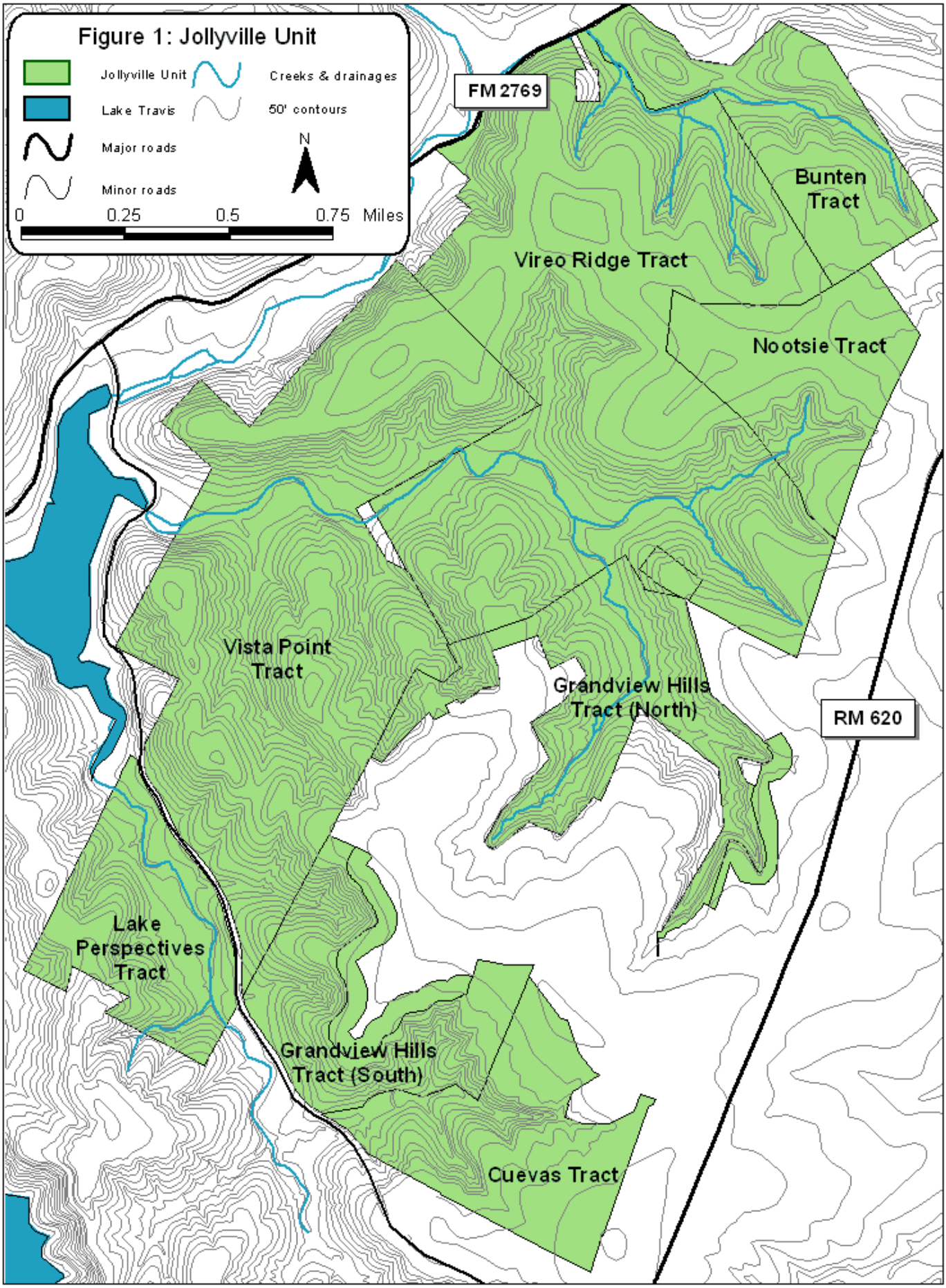
-- data not collected

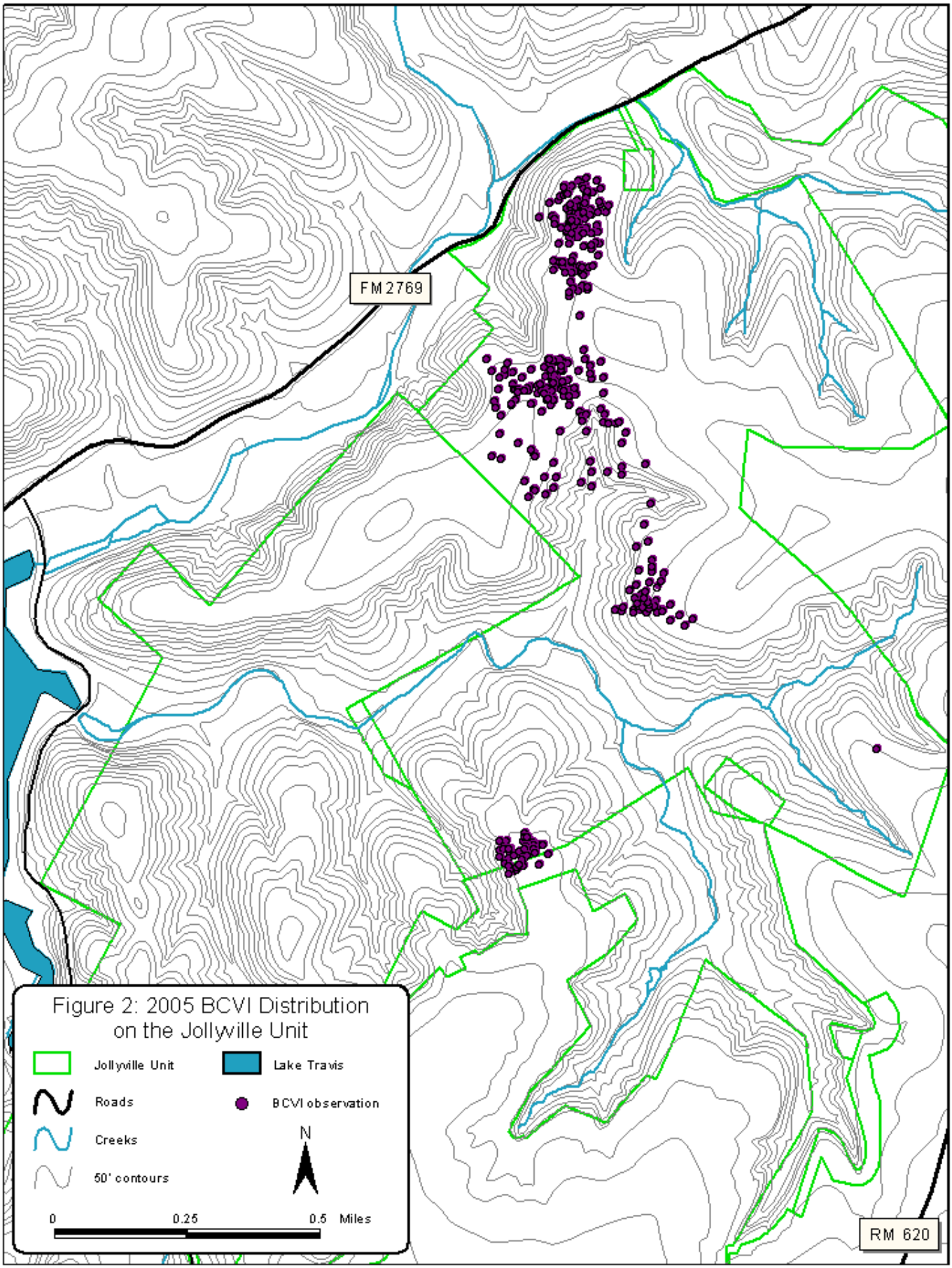
Table 3. Pair success and productivity for black-capped vireo (*Vireo atricapilla*) territories on Jollyville Unit, Travis County, Texas, March-August 2001-2005.

				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
2005	1	72.7	1	0.12	0.09

-- 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
0.25
0.5
0.75 Miles
FM 2769
Bunten Tract
Vireo Ridge Tract
Nootsie Tract
Vista Point Tract
Grandview Hills Tract (North)
RM 620
Lake Perspectives Tract
Grandview Hills Tract (South)
Cuevas Tract


FM 2769
RM 620
Figure 2: 2005 BCVI Distribution on the Jollyville Unit
Jollyville Unit
Lake Travis
Roads
BCVI observation
Creeks
50' contours
N
0
0.25
0.5 Miles

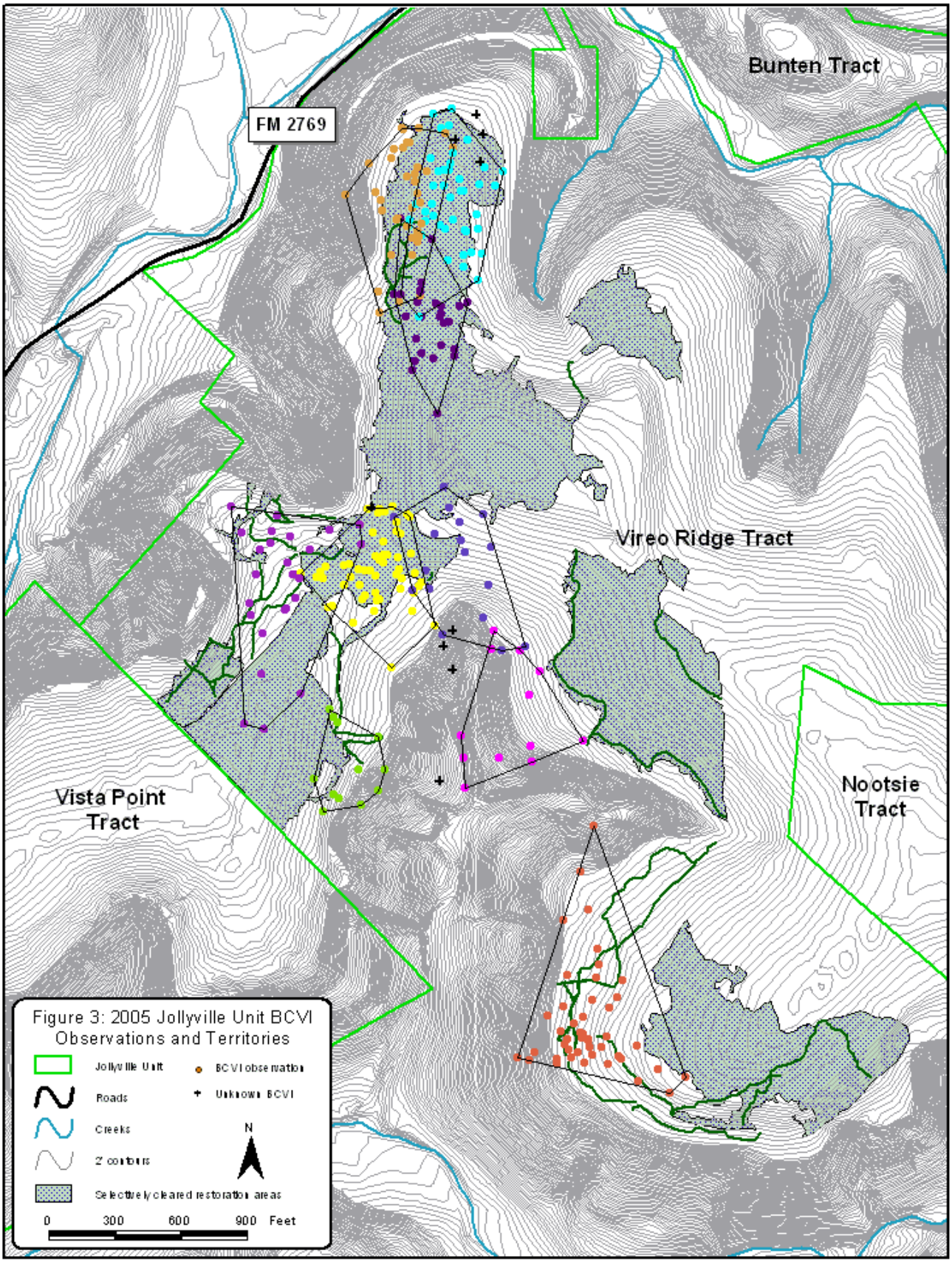


Fig 3. Polygons enclose like symbols that denote repeated observations of a territorial male, or the female and fledglings associated with that male. Like symbols not enclosed by a polygon indicate repeated observations of a BCVI that did not meet the breeding territory criteria or was not within the plot boundary.

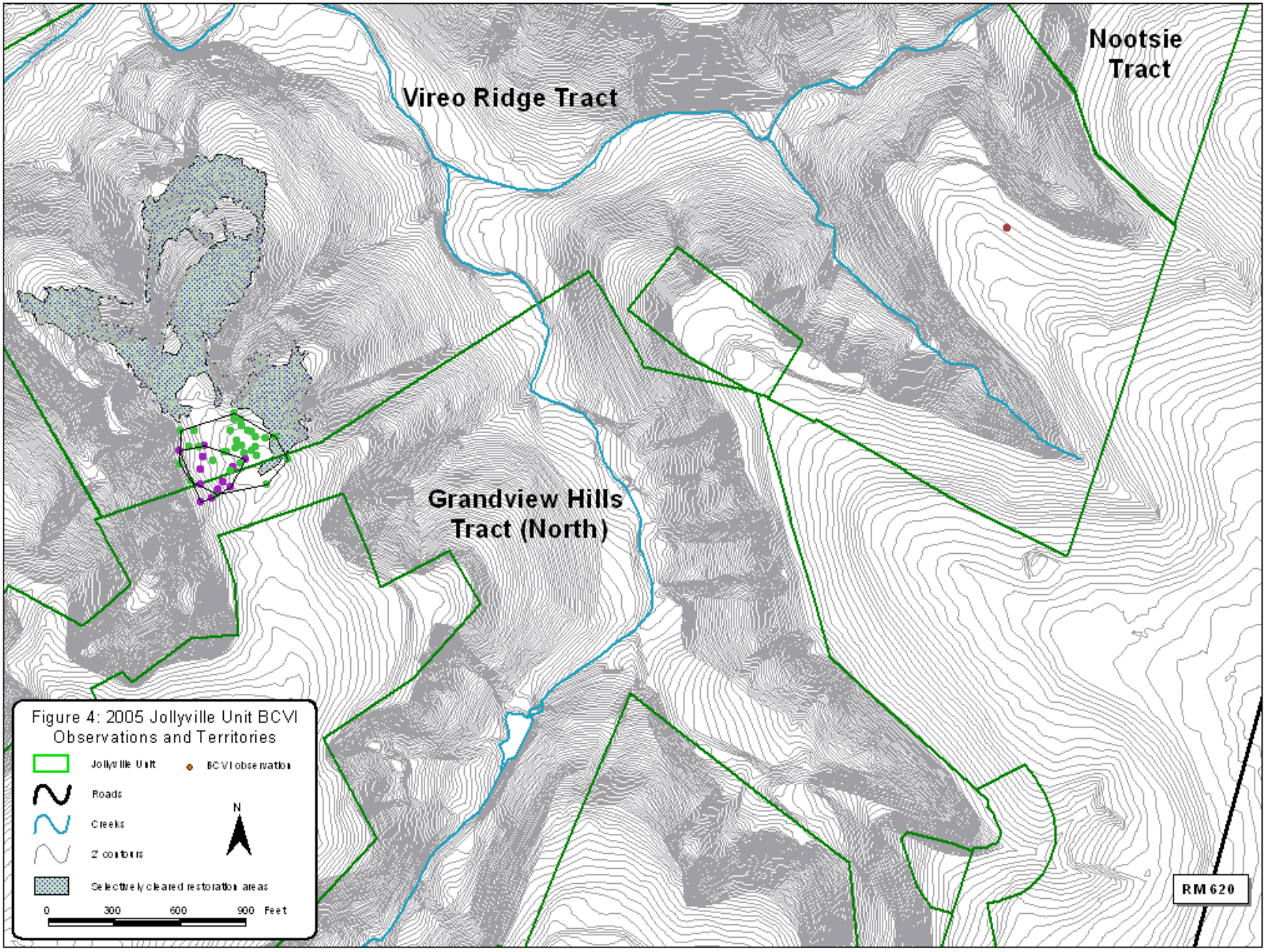


Fig 4. Polygons enclose like symbols that denote repeated observations of a territorial male, or the female and fledglings associated with that male. Like symbols not enclosed by a polygon indicate repeated observations of a BCVI that did not meet the breeding territory criteria or was not within the plot boundary.