Monitoring and Management of the Black-capped Vireo (*Vireo atricapilla*) in Western Travis County, Texas: 2008 Field Season



Photo: Black-capped vireo, Vireo Ridge Tract (J. Brown)

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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 and protecting 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 among 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: three counties in Oklahoma; portions of central and south-central Texas; 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). A USFWS review of the BCVI population status was completed as required by the Endangered Species Act in 2006 (Wilkins et al. 2006).

Available BCVI habitat, and subsequently BCVI populations, in Travis County have been significantly reduced as natural disturbances, such as fire, are suppressed and suburban development continues to expand. Additionally, browse pressure from white-tailed deer (*Odocoileus virginianus*) overpopulation can negatively affect BCVI habitat structure (Grzybowski 1995). 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 BCVI population estimate in Travis County is fewer than 50 individuals (Wilkins et. al 2006).

The USFWS 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 a minimum of 30,428 acres of endangered species habitat in western Travis County to be set aside and managed within the Balcones Canyonlands Preserve (BCP), see **Figure 1**; 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 5,430 acres of preserve land of which 4,611 acres is designated part of the BCP. Currently, less than 150 acres of Travis County managed BCP land could be classified as BCVI habitat. BCVI habitat has been described 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 to mid-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." (Grzybowski 1995)

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).

This report presents the results of the 2008 BCP surveys for BCVI conducted by Travis County Natural Resources personnel. Annual BCVI population data collected from Travis County managed lands 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

During the 2008 breeding season, BCVI surveys were conducted in two locations. The primary site is located on the Jollyville Unit, owned and managed by Travis County and part of the Cypress Creek Macrosite of the BCP. The second site is located on the Steiner Ranch Preserve. This site is the result of a conservation easement agreement between the USFWS and various participants related to the greater Steiner Ranch development. Although the Steiner Ranch Preserve is not officially part of the BCP, Travis County manages this easement under the same management guidelines as the rest of the BCP.

The Jollyville Unit is comprised of 2,011 acres (814 ha) and includes the following tracts: Bunten, Cuevas, Grandview Hills, Lake Perspectives, Mirtsching, Nootsie, Snowden, Vireo Ridge, and Vista Point (**Figure 2**). 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, secondary-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 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 (**Figure 3**). 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 the Steiner Ranch Preserve 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 RM 620 and the City of Austin's BCP Cortaña tract. Historically, both areas have had significant BCVI populations.

HABITAT RESTORATION

The 2000 acre minimum designation of BCVI habitat required by the BCCP has been a challenging goal for the BCP partners. Due to the rate of land use change over the past few decades and fire suppression, most BCVI habitat has already been developed, or is growing out of suitability. BCVI habitat that does exist within the BCP is primarily maintained and/or created through habitat restoration efforts. As mentioned earlier, Travis County currently manages less than 150 acres of BCP land that could be classified as BCVI habitat.

BCCP Goals for BCVI recovery, outlined in the BCP Land Management Plan (2007), 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 2**). Additionally, isolated pockets of potential habitat can also be found on Travis County's Vista Point and Grandview Hills tracts of the Jollyville Unit and on the north end of Steiner Ranch Preserve (**Figure 3**). Most existing, unrestored BCVI habitat, whether occupied or not, is of poor to marginal quality. Upon the inclusion of the various tracts that make up the Jollyville Unit, very little high, or even moderate, quality BCVI habitat existed. The only optimal BCVI habitat, prior to any restoration efforts, was located along the southwestern boundary of the Vireo Ridge tract adjacent to the Grandview Hills subdivision. This area had been cleared previously for development prior to Travis County ownership but had since grown back into BCVI habitat.

Beginning in the winter of 2001-2002, and continuing every winter thereafter, Travis County has conducted BCVI habitat restoration within two BCVI Habitat Management Areas (HMAs) (**Figures 4 and 5**). These HMAs are located within Travis County BCP lands that have been designated as having potential for restored BCVI habitat sites. These HMA locations are targeted based on known historic vireo occupancy and having soil and vegetative components necessary for vireo habitat.

Through a variety of techniques, poor quality BCVI habitat has been altered through the selective removal of undesirable monocultures of 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*), yaupon (*Ilex vomitoria*), Texas redbud (*Cercis canadensis*), wafer-ash (*Ptelea trifoliata*), Carolina buckthorn (*Rhamnus caroliniana*) and sumacs (*Rhus* spp.), to create the patchy, early to mid-successional physiognomy or appearance associated with BCVI breeding habitat. Several sections, particularly those restored from 2001 to 2004, have become good to excellent quality habitat. It has been observed on the Jollyville HMA that BCVIs begin occupying restored areas in three to five years of initial manipulation activity.

In November 2007 and January 2008, approximately 16 acres (6.5 ha) on the Jollyville Unit HMA were mechanically manipulated. These restoration areas are located adjacent to occupied BCVI habitat (**Figure 4**). An additional 12 acres (4.9 ha) were manipulated in the Steiner Ranch HMA in January 2008 (**Figure 5**). An eighth phase of restoration is planned for winter 2008-2009 within the Jollyville Unit HMA, during which a minimum of 15-20 acres (6-8 ha) of previously manipulated areas will be revisited for maintenance. As BCVI habitat tends to be early to mid-successional, follow up clearing is required to maintain it at this stage. Also, in most previously manipulated areas, much of the refined hand clearing is not completed during initial larger scale brush removal and must be completed in subsequent years.

Areas manipulated for habitat restoration on the Jollyville Unit are illustrated in **Figure 4** for each year restoration activities were conducted. Areas manipulated on the Steiner Ranch Preserve (in 2005 and 2008) are illustrated in **Figure 5.** As of February 2008, approximately 122 acres (49.4 ha) have been manipulated on the Jollyville Unit HMA with an additional 17 acres cleared on the Steiner Ranch HMA (only in 2005 and 2008) (**Figures 4 and 5**). Travis County has manipulated an average of approximately 20 acres (8 ha) for BCVI habitat restoration each year since 2001.

Restoration activities will continue where habitat potential has been identified on the HMAs and well as on other BCP tracts where BCVIs were known to exist and where it does not conflict with other protected species habitat. The Lucas tract (**Figure 2**), acquired in late 2008 will be considered for BCVI habitat restoration in the future due to its known historical occupancy and its proximity to both the Steiner Ranch HMA and the City of Austin's occupied BCVI habitat on the Cortaña tract. The Lucas tract will be surveyed in 2009 for both BCVI and golden-cheeked warbler and results of these baseline surveys will contribute to future management decisions. Target areas for restoration vary from year to year based primarily on habitat utilized by BCVI the preceding breeding season, the presence of golden-

cheeked warbler habitat, diversity of desired woody species and available budget. Travis County Natural Resources staff is currently preparing a multi-year BCVI habitat restoration plan that will be completed in 2009.

CURRENT RESEARCH

William Simper, a Texas State University graduate student was permitted to do scientific research on the Jollyville Unit as one of fifteen study sites (or, patches) for a project investigating the relationship of BCVI dispersal patterns to structural characteristics of the landscape (matrix). These patches, located on both the BCP and the Balcones Canyonlands National Wildlife Refuge, were chosen because they were known to be occupied by breeding BCVIs, had a history of occupancy, or have undergone restoration specifically for the purpose of providing BCVI habitat. The first phase of the project was implemented in the spring of 2008. The field component of the project involved locating and marking individual birds (both adults and nestlings) with unique color leg band combinations, then resighting or recapturing those birds in a subsequent breeding season (beginning in 2009). Throughout the survey season, County staff was in contact with Simper to coordinate site visits and to share data, including an update to which individual birds had been color banded and nesting locations. For more detailed information on this project see *Report of Activities Conducted* submitted by William Simper which is an appendix of the 2008 BCP Annual Report to USFWS.

METHODS

Data Collection

All potential BCVI habitat on the Jollyville Unit was surveyed at least once a week throughout the 2008 breeding season. Additionally, Tracts four and five of the Steiner Ranch Preserve were also visited minimally for the presence of BCVIs. BCVIs were surveyed for a total of 199 hours from 25 March to 19 September. 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, date, behavior, sex, age, presence of a mate, number of fledglings and color band combination (if banded). BCVI locations and corresponding data were later recorded into an ArcGIS 9.2 (ESRI, Inc.,

Redlands, CA) geodatabase 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 10 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. Systematic checks for nests were made for all breeding territories. Possible harassment towards BCVI productivity was minimized by not conducting intensive nest searches on this small population. When found, nests were checked every five to seven 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, all BCVI territories, whether they were observed entirely, or partially, on Travis County managed property were considered a full territory. 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 (Koloszar and Becker 2000).

RESULTS

Over all there were 804 observations of BCVIs recorded in 2008 (743 male, 44 female, 14 hatch years [HY], and three unknown adults) (**Figure 6**). These sightings include multiple observations of individuals both on, and adjacent to, Travis County managed properties. BCVI abundance totaled 15 males. All 15 males were observed on the Jollyville Unit and all established territories (**Figures 7 and 8**). No BCVIs were detected on County managed land in Steiner Ranch Preserve. For the first time since the Travis County monitoring program's inception, color-banded BCVIs were observed during the 2008 season as part of the current Simper's research. A total of 30 individual BCVIs (nine male, one female and 20 nestlings) were color-banded. Of the 20 nestlings, four were predated. For a complete list of color combinations and associated location data see *Report of Activities Conducted* submitted by William Simper which is an appendix of the 2008 BCP Annual Report to USFWS. Table 1 presents a summary of BCVI data collected during the 2008 breeding season in addition to data collected by various agencies on the Jollyville Unit as a whole since 1989.

Table 1. Summary of BCVI survey data collected by various agencies in the study area (referred to as Jollyville Unit since 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
2007	Travis County TNR	14	13
2008	Travis County TNR	15	15

[1] - Restricted access on the tract. [2] - Detected while on brief site visit.

In 2008, 14 of the 15 territories (93.3%) were considered successfully paired (Table 2). Additionally, 10 territories successfully fledged young yielding a total of 29 HYs. In general productivity among successful territories in 2008 (2.9) was very similar to 2007 (3.0). Considering the total number of territories, productivity data yields a value of 1.9 (Table 3), the highest rate since this data has been collected (2001).

Table 2. Abundance, territory number, pairing success and pairing success rate for BCVIs (*Vireo atricapilla*) on Jollyville Unit, Travis County, Texas, March-September 2001-2008.

Year	Total Hours Surveyed	Abundance	No. Territories	Successfully Paired	Pair Success Rate (%)
2001	100	18*	15*	13*	86.7*
2002	179	21	19	18	94.7
2003	290**	21	19*	14	73.7*
2004	127.5	13	12	9	75.0

Year	Total Hours Surveyed	Abundance	No. Territories	Successfully Paired	Pair Success Rate (%)
2005	140	12	11	8	72.7
2006	146	11*	9	8	88.9
2007	178	14	13	12	92.3
2008	199	15	15	14	93.3

* Adjusted values to reflect BCVI found only on the Jollyville Unit

** Total hours surveyed for 2003 could not be verified and may be overestimated

Table 3. Pair success and productivity for BCVI (*Vireo atricapilla*) territories on Jollyville Unit, Travis County, Texas, March-September 2001-2008.

Year	No. of territories with breeding success[1]	Breeding success rate (%)	No. Fledglings	No. fledglings/ successful territory	No. fledglings/ total no. territories
2001	4	26.7*	12	3.0*	0.8*
2002	13*	68.4*	25*	1.4*	1.3*
2003	9	47.4*	16	1.8	0.8
2004	6	50.0	13	2.2	1.1
2005	1	9.1	1	1.0	0.1
2006	8	88.9	15	1.9	1.7
2007	8	61.5	24	3.0	1.8
2008	10	66.7	29	2.9	1.9

[1] Represents the number of all territories that fledged at least one young.

* Adjusted values to reflect BCVI found only on the Jollyville Unit

There were no BCVI territories found in entirely new areas on the Jollyville Unit. In 2008, fifteen territories were established in areas in which habitat restoration had previously occurred (**Figures 7 and 8**). This is an increase of two territories from the thirteen that were established in 2007.

A total of 18 BCVI nests were located in 2008 (**Figures 7 and 8**). Detailed data was collected post breeding season for each nest found in 2008 including nest substrate, height, orientation, etc. Individual nest data is provided as **Appendix B** to this report. Table 4 lists the nest substrates and outcome for each located nest. Four nests were second attempts. Of the 18 nests located, five (27%) successfully fledged at least one young. A total of 13 (72%)

nests failed either due to predation (n=4) or were abandoned/fate unknown (n=9). No nests were known to have been parasitized by cowbirds (*Molothrus sp*.) during the 2008 breeding season. A total of 13 individual HYs were observed where no nest was located.

Table 4. Nest data for BCVI (*Vireo atricapilla*) territories on Jollyville Unit, Travis County, Texas, March-September 2008.

Nest substrate	Result	2nd nest located	Nest substrate	Result
Texas oak	4 nestlings predated	Yes	Wafer-ash	4 HYs banded and fledged
Texas redbud	2 eggs predated	Yes	Texas ash[1]	Failed, undetermined
Texas oak	undertermined[2]	Yes	Shin oak	4 HYs banded and fledged
Wafer-ash	Predated, 4 eggs	Yes	Wafer-ash	4 HYs banded and fledged
Texas ash	3 HYs banded and fledged	No	n/a	n/a
Texas redbud	1 HY banded and fledged[3]	Yes	Texas redbud	undetermined[2]
Carolina buckthorn	undertermined[2]	n/a	n/a	n/a
Shin oak	Predated, 2 eggs	No	unknown	Successful, 2 HYs
Wafer-ash	3 HYs fledged[4]	n/a	n/a	n/a
Shin oak	undertermined[2]	No	unknown	4 HYs fledged
Texas redbud	undertermined[2]	n/a	n/a	n/a
Yaupon	undertermined[2]	n/a	n/a	n/a
Yaupon	undertermined[2]	n/a	n/a	n/a

[1] *Fraxinus texrnsis* [2] discovered empty [3] 2 other eggs failed to hatch [4]found post-fledge

DISCUSSION

There was an increase in BCVI territory numbers on the Jollyville Unit for the second consecutive year (Table 2). BCVI abundance continues to appear stable and slightly increasing. BCVI breeding success increased from 2007 (66.7%) and productivity for both successful (2.9) and total (1.9) territories were the very similar to data collected in 2007 (Table 3). 2008 pairing success (93.3%) was the second highest rate recorded since 2001 and marked three consecutive years of over 88% (Table 2). Similarly, the average numbers of HYs produced (both in terms of successful territories and total number of territories) as well as the total 68 HYs produced from 2006 to 2008, represent a three-consecutive year high. Reasons for the pairing and breeding success remain unclear although a correlation can be made with the gradual improvement of habitat through restoration activity. In 2008 survey effort increase by 21 hours from 2007, while effort to locate and monitor nests in 2008 was similar to effort in the 2007 breeding season.

Territory establishment in 2008 occurred in the same general core areas on the Jollyville Unit as in previous years; see annual reports submitted to USFWS from 2001 through 2007 (see Literature Cited). Although the same general areas are being utilized, the distribution of BCVI territories on the Jollyville Unit has changed each year. Several factors 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 Grandview Hills and Vireo Ridge tract boundaries. Excellent habitat, previously utilized by BCVIs, on vacant property adjacent to the Grandview Hills tract, has now been completely cleared for construction activity and continues to be developed.

Habitat loss and degradation is a primary concern for BCVI recruitment onto Travis County BCP properties and may be affecting productivity. Typical BCVI nesting habitat was uncommon on the Jollyville Unit when first acquired by Travis County in 2000 and 2001. Habitat change through vegetational succession, primarily encroaching Ashe juniper, had reduced the openings in the deciduous cover generally associated with optimal BCVI habitat. Additionally, the vegetative growth pattern in historically occupied areas tends to be vertical, rather than the horizontal, mid-successional stage, preferred by BCVIs. Through the efforts of mechanical BCVI habitat restoration, significant portions of the Jollyville Unit HMA now show characteristics of prime BCVI habitat.

All 2008 BCVI territories on the Jollyville Unit were established primarily in previously manipulated areas that could now be considered “restored”. This has been the observed trend since 2006. These observations seem to indicate that BCVIs continue to respond positively to habitat restoration efforts undertaken since 2001. There was an increase of two territories within the restored areas from 2007 totals. Prior to 2007, it was difficult to determine if new BCVIs were being recruited onto the Jollyville Unit because each year, from 2003 to 2006, 1) BCVI territory and abundance numbers had slowly declined, 2) it appeared that the remaining BCVIs were shifting annually from lesser quality habitat into higher-quality restored areas, and 3) the BCVI’s were not banded, precluding staff from determining return rates. With the increase in territory numbers in 2007 and 2008, it appears that recruitment has occurred.

During the 2008 breeding season ten individual adult and 20 nestlings BCVIs were color-banded on the Jollyville Unit through a research project conducted by a Texas State University graduate student (see Current Research above). This is a multi-year project, which

will begin to look at and gather data on age structure, return rates and recruitment for the Jollyville Unit HMA BCVI population. Understanding the dynamics of this population is vital to supporting and evaluating the success of further restoration activities and land acquisitions.

In general BCVIs tend to be "semi-colonial" and establish territories near other BCVIs (Ward and Schlossberg 2001). However isolated territories, either individual or small-clusters, have occasionally been located. These territories are often difficult to detect as noted by Ward and Schlossberg (2001). They found that in low-density populations of BCVIs, song rates and duration of song bouts were much lower than in high-density populations. Thus low detection rates of these isolated territories may affect estimates of abundance. However, additional research is still needed to better understand BCVI habitat dynamics and its relationship to reproductive success on the Jollyville Unit and in Travis County.

Continued monitoring and research 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 and research 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

- Continue to facilitate opportunities to do intensive, long term BCVI monitoring program, including annual color-banding. 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.

- Continue to 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. Additionally, further research is needed to better understand BCVI habitat dynamics and its relationship to reproductive success at the Jollyville Unit and within Travis County.
- Develop standard BCVI monitoring procedures that include minimum hours of survey and nest searching needed, especially for new properties with potential BCVI habitat.
- BCVI habitat and potential habitat for restoration 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.
- 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 techniques best create or restore suitable BCVI breeding habitat.
- Create a more structured golden-cheeked warbler survey methodology for monitoring territories and productivity in both potential and managed BCVI habitat.
- 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.
- Because several BCVI nest attempts possibly failed due to red imported fire ant predation, control of this nuisance species needs to be conducted within restored BCVI habitat areas.

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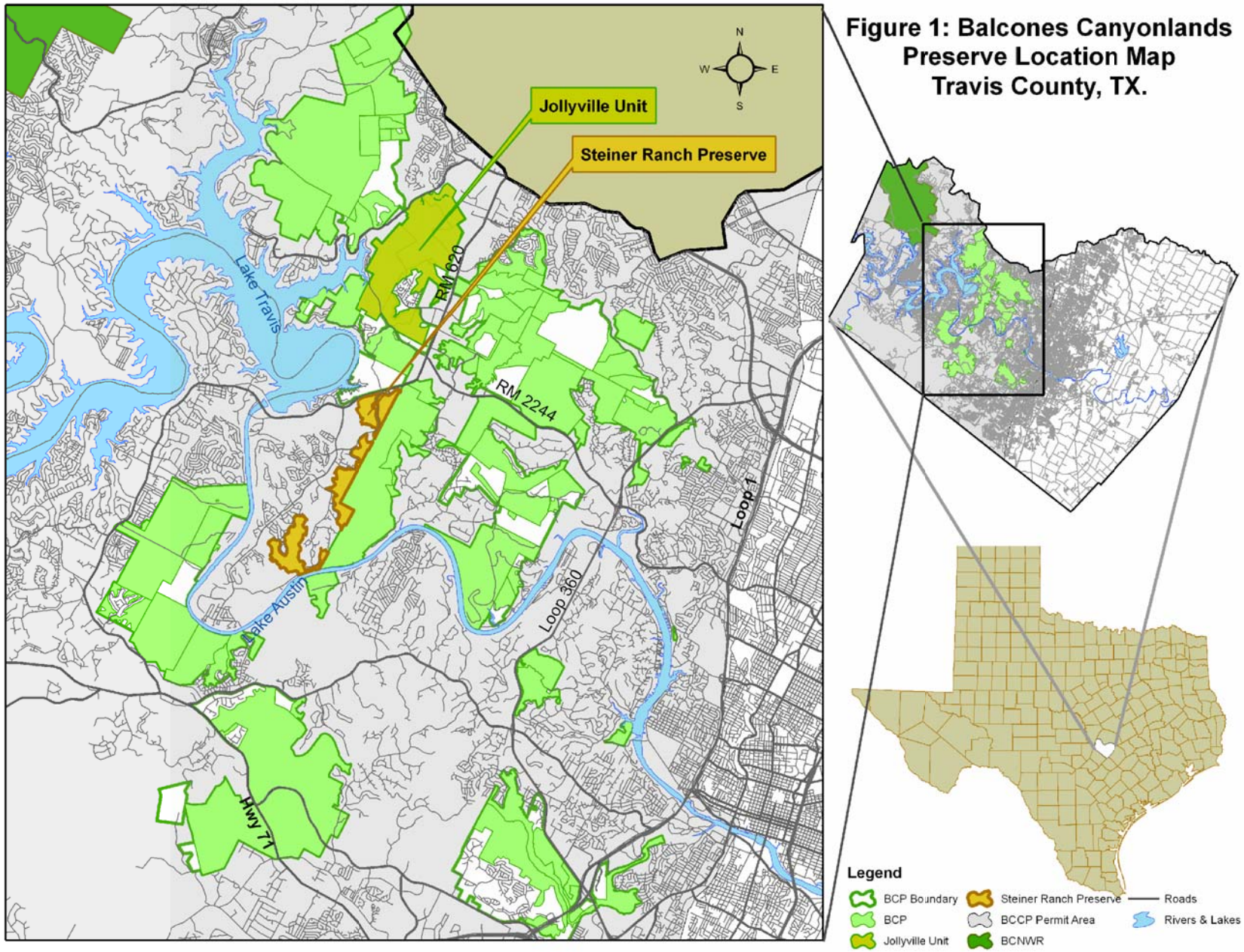
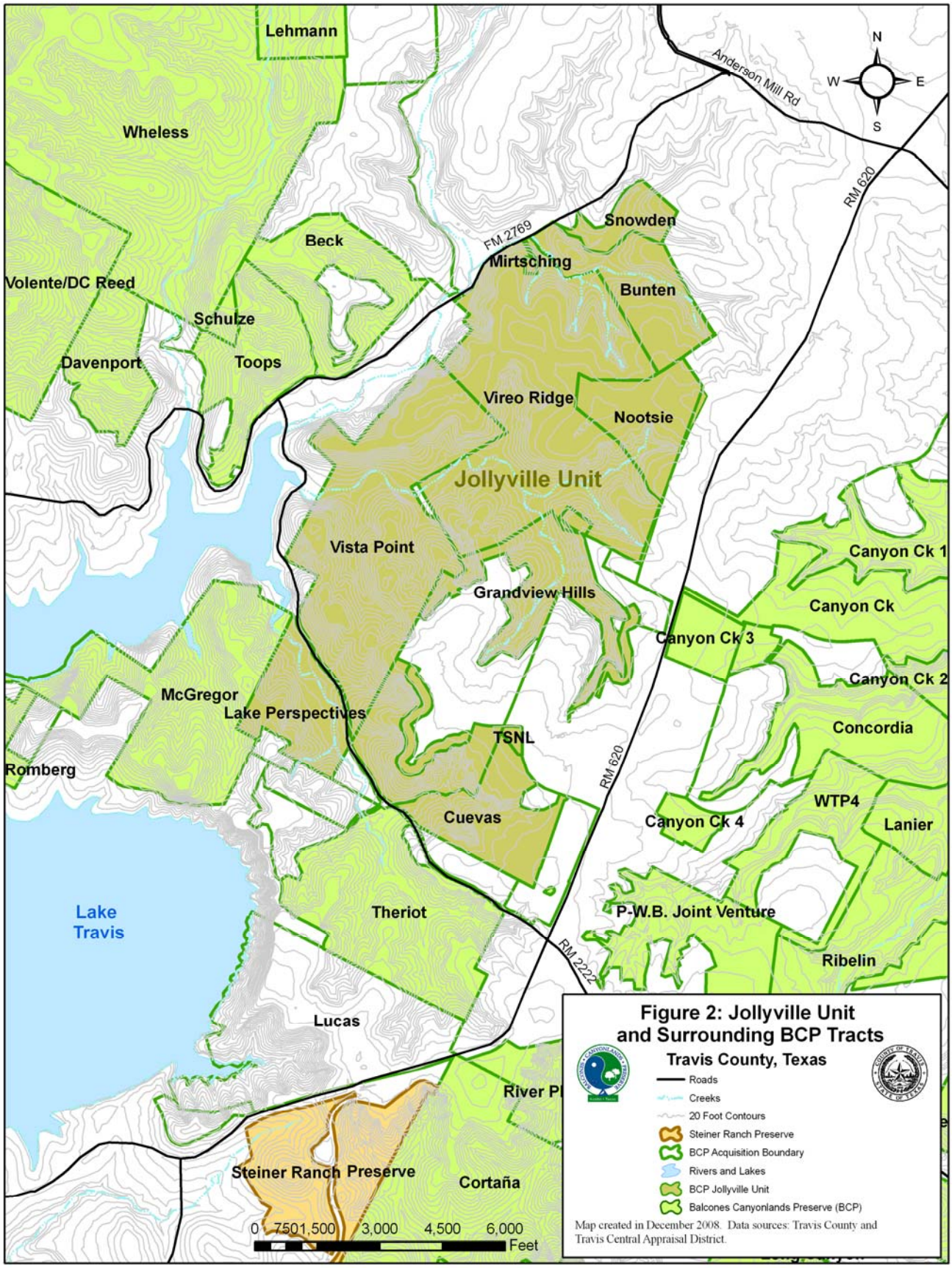
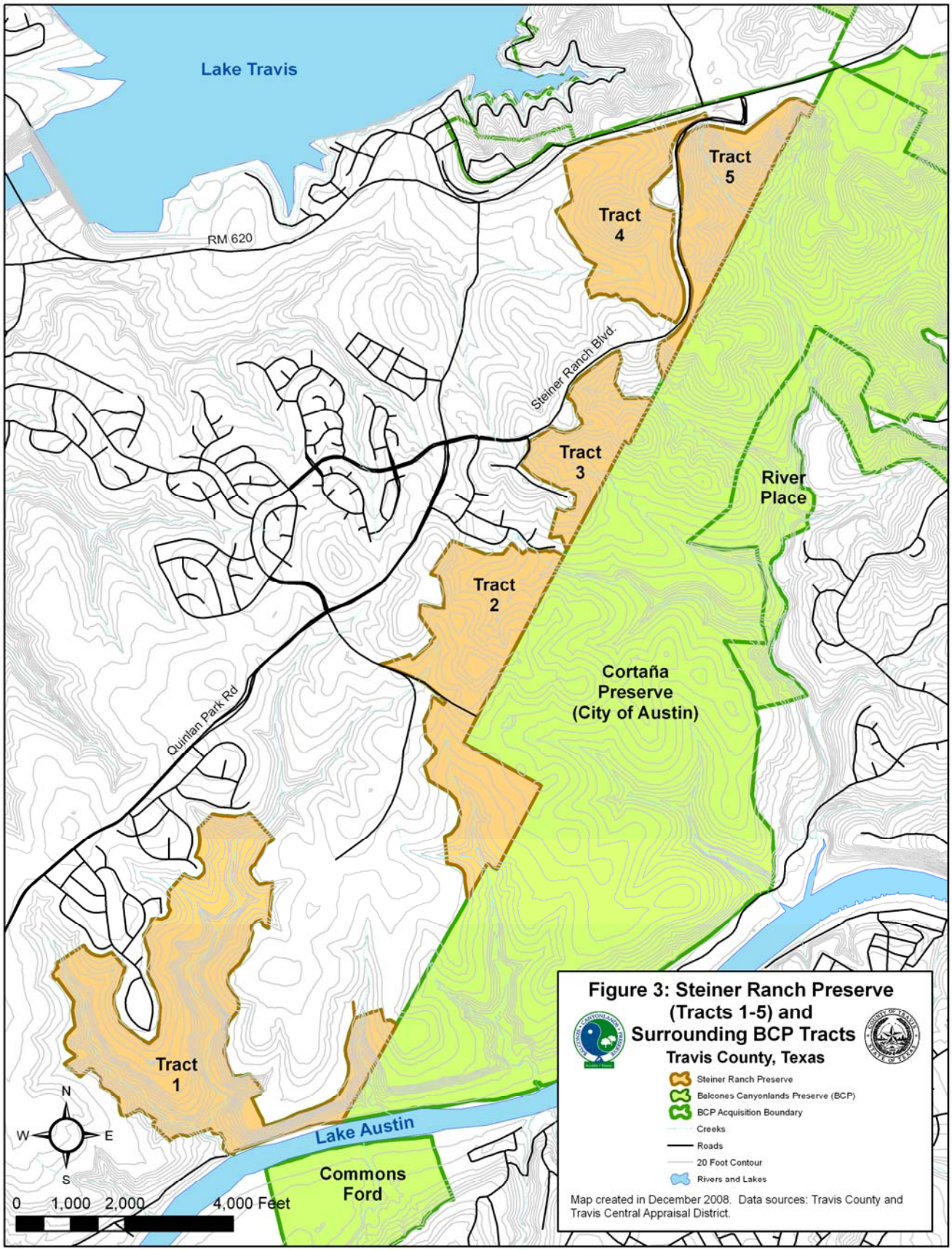
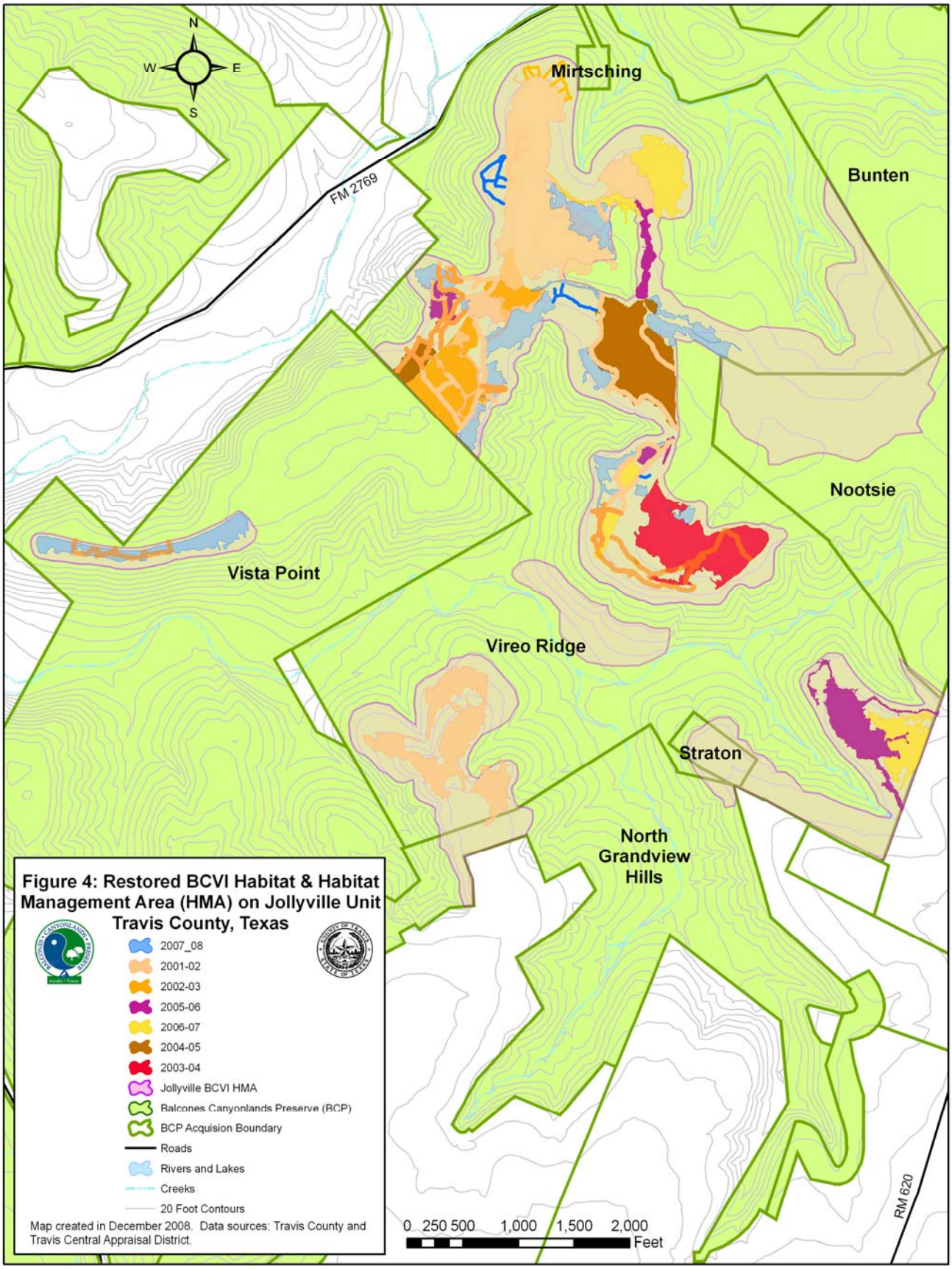
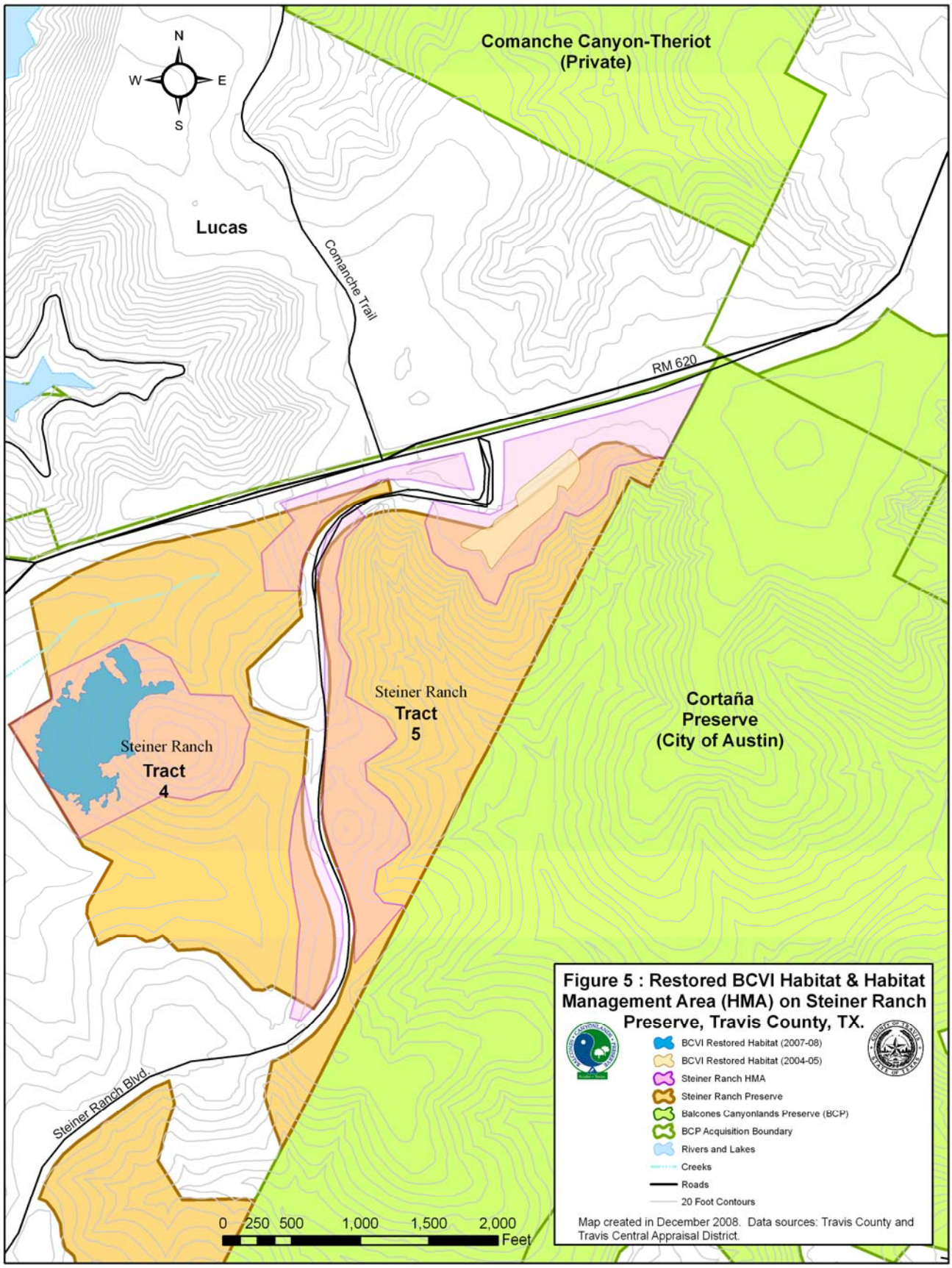


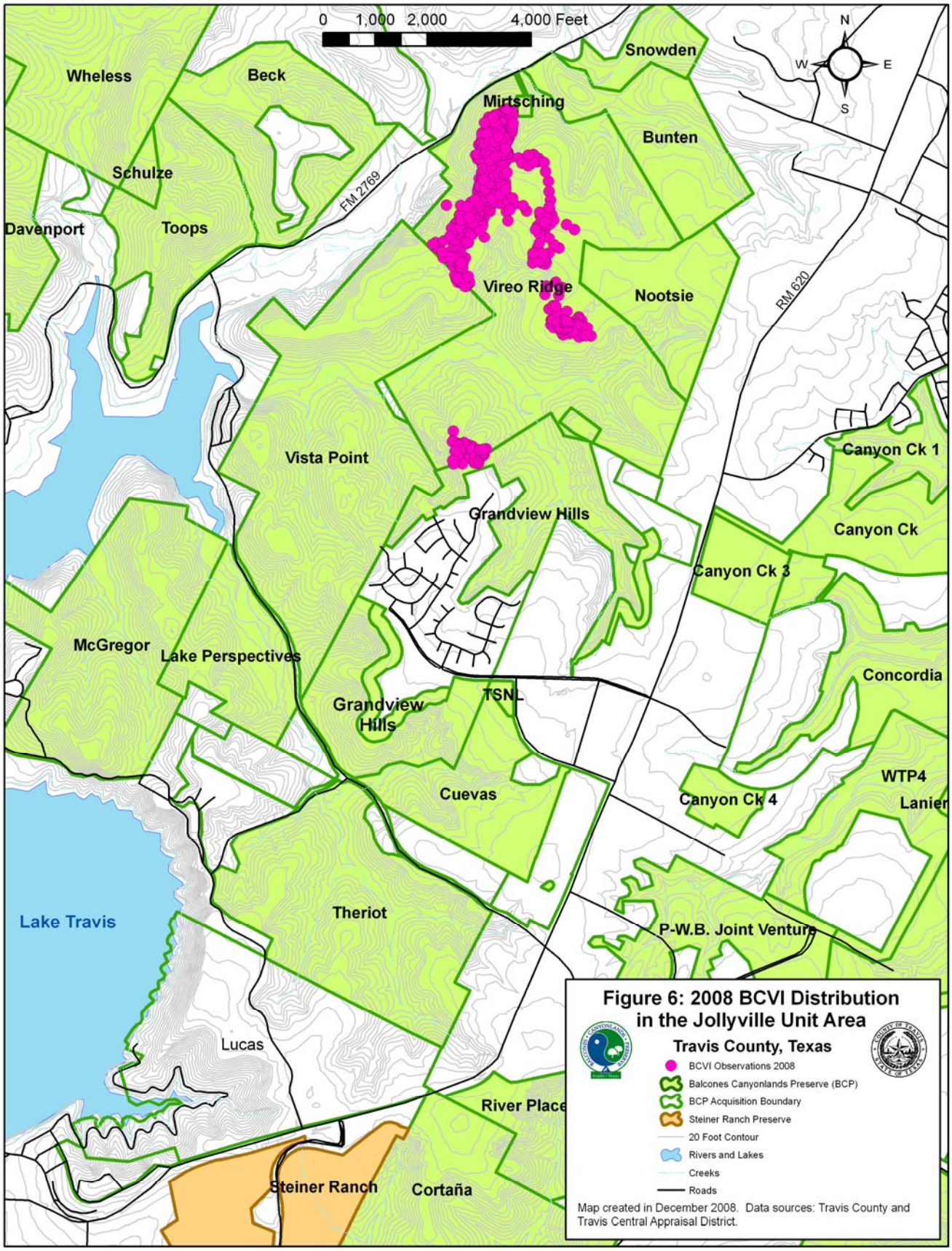
Figure 1: Balcones Canyonlands Preserve Location Map Travis County, TX.
Jollyville Unit
Steiner Ranch Preserve
N
W
E
S
Lake Travis
RM 620
RM 2244
Loop 1
Loop 360
Lake Austin
Hwy 71
Legend
BCP Boundary
BCP
Jollyville Unit
Steiner Ranch Preserve
BCCP Permit Area
BCNWR
Roads
Rivers & Lakes

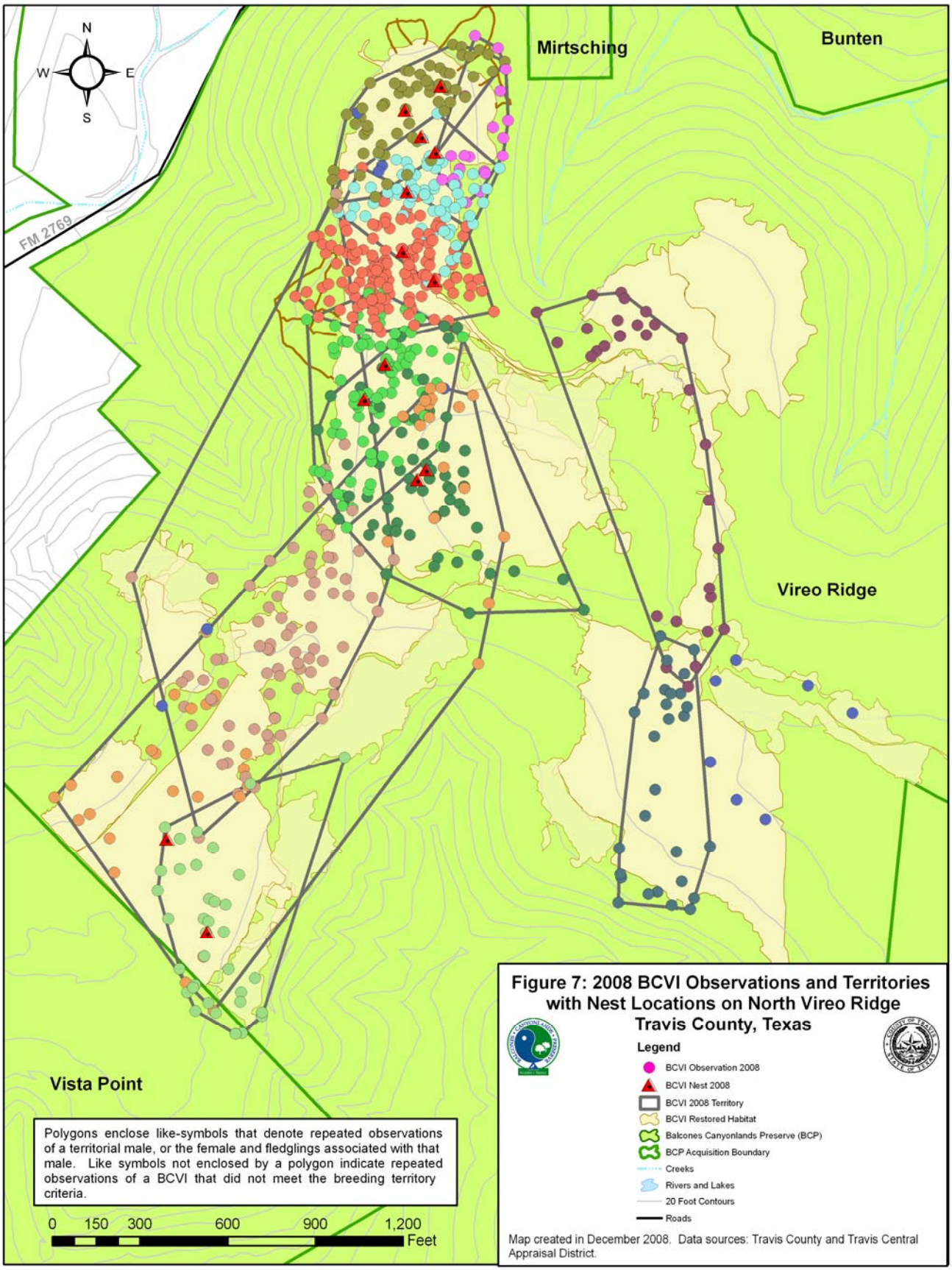

Lehmann
Wheless
Anderson Mill Rd
N
W
E
S
RM 620
FM 2769
Beck
Snowden
Mirtsching
Bunten
Volente/DC Reed
Schulze
Davenport
Toops
Vireo Ridge
Nootsie
Jollyville Unit
Vista Point
Grandview Hills
Canyon Ck 1
Canyon Ck
Canyon Ck 3
Canyon Ck 2
McGregor
Lake Perspectives
Concordia
TSNL
Romberg
RM 620
WTP4
Cuevas
Canyon Ck 4
Lanier
Lake
Travis
Theriot
P-W.B. Joint Venture
RM 2222
Ribelin
Lucas
River Pl
Steiner Ranch Preserve
Cortaña
0 7501,500 3,000 4,500 6,000
Feet
Figure 2: Jollyville Unit
and Surrounding BCP Tracts
Travis County, Texas
Roads
Creeks
20 Foot Contours
Steiner Ranch Preserve
BCP Acquisition Boundary
Rivers and Lakes
BCP Jollyville Unit
Balcones Canyonlands Preserve (BCP)
Map created in December 2008. Data sources: Travis County and
Travis Central Appraisal District.

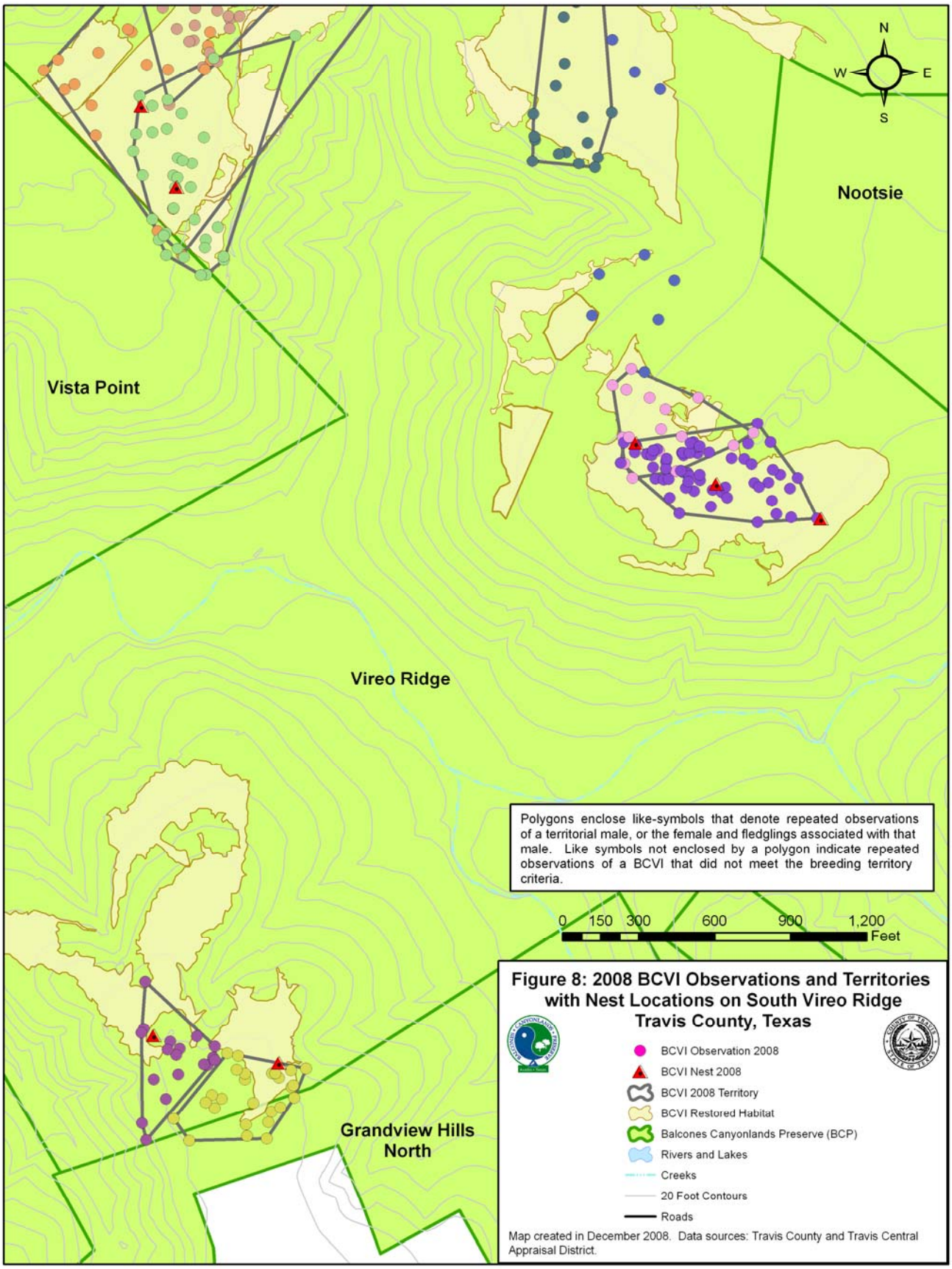

Lake Travis
RM 620
Tract 5
Tract 4
Steiner Ranch Blvd.
Tract 3
River Place
Tract 2
Cortaña Preserve (City of Austin)
Quinlan Park Rd
Tract 1
Lake Austin
Commons Ford
N
W
E
S
0 1,000 2,000 4,000 Feet
Figure 3: Steiner Ranch Preserve (Tracts 1-5) and Surrounding BCP Tracts
Travis County, Texas
Steiner Ranch Preserve
Balcones Canyonlands Preserve (BCP)
BCP Acquisition Boundary
Creeks
Roads
20 Foot Contour
Rivers and Lakes
Map created in December 2008. Data sources: Travis County and Travis Central Appraisal District.


N
W
E
S
FM 2769
Mirtsching
Bunten
Nootsie
Vista Point
Vireo Ridge
Straton
North
Grandview
Hills
RM 620
Figure 4: Restored BCVI Habitat & Habitat Management Area (HMA) on Jollyville Unit
Travis County, Texas
2007_08
2001-02
2002-03
2005-06
2006-07
2004-05
2003-04
Jollyville BCVI HMA
Balcones Canyonlands Preserve (BCP)
BCP Acquision Boundary
Roads
Rivers and Lakes
Creeks
20 Foot Contours
Map created in December 2008. Data sources: Travis County and Travis Central Appraisal District.
0 250 500 1,000 1,500 2,000
Feet


N
W
E
S
Comanche Canyon-Theriot
(Private)
Lucas
Comanche Trail
RM 620
Steiner Ranch
Tract
5
Steiner Ranch
Tract
4
Cortaña
Preserve
(City of Austin)
Steiner Ranch Blvd.
0 250 500 1,000 1,500 2,000
Feet
Figure 5 : Restored BCVI Habitat & Habitat Management Area (HMA) on Steiner Ranch Preserve, Travis County, TX.
BCVI Restored Habitat (2007-08)
BCVI Restored Habitat (2004-05)
Steiner Ranch HMA
Steiner Ranch Preserve
Balcones Canyonlands Preserve (BCP)
BCP Acquisition Boundary
Rivers and Lakes
Creeks
Roads
20 Foot Contours
Map created in December 2008. Data sources: Travis County and Travis Central Appraisal District.


0 1,000 2,000 4,000 Feet
N
W
E
S
Wheless
Beck
Snowden
Mirtsching
Bunten
Schulze
FM 2769
Davenport
Toops
Vireo Ridge
Nootsie
RM 620
Vista Point
Canyon Ck 1
Grandview Hills
Canyon Ck
Canyon Ck 3
McGregor
Lake Perspectives
Concordia
TSNL
Grandview Hills
WTP4
Cuevas
Canyon Ck 4
Lanier
Lake Travis
Theriot
P-W.B. Joint Venture
Lucas
River Place
Steiner Ranch
Cortaña
Figure 6: 2008 BCVI Distribution in the Jollyville Unit Area
Travis County, Texas
BCVI Observations 2008
Balcones Canyonlands Preserve (BCP)
BCP Acquisition Boundary
Steiner Ranch Preserve
20 Foot Contour
Rivers and Lakes
Creeks
Roads
Map created in December 2008. Data sources: Travis County and Travis Central Appraisal District.


N
W
E
S
FM 2769
Mirtsching
Bunten
Vireo Ridge
Vista Point
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.
0 150 300 600 900 1,200
Feet
Figure 7: 2008 BCVI Observations and Territories with Nest Locations on North Vireo Ridge
Travis County, Texas
Legend
BCVI Observation 2008
BCVI Nest 2008
BCVI 2008 Territory
BCVI Restored Habitat
Balcones Canyonlands Preserve (BCP)
BCP Acquisition Boundary
Creeks
Rivers and Lakes
20 Foot Contours
Roads
Map created in December 2008. Data sources: Travis County and Travis Central Appraisal District.


N
W
E
S
Nootsie
Vista Point
Vireo Ridge
Grandview Hills North
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.
0 150 300 600 900 1,200
Feet
Figure 8: 2008 BCVI Observations and Territories with Nest Locations on South Vireo Ridge
Travis County, Texas
BCVI Observation 2008
BCVI Nest 2008
BCVI 2008 Territory
BCVI Restored Habitat
Balcones Canyonlands Preserve (BCP)
Rivers and Lakes
Creeks
20 Foot Contours
Roads
Map created in December 2008. Data sources: Travis County and Travis Central Appraisal District.

APPENDIX:

Summary of 2008 BCVI Nest Data

Territory #	Substrate(s)	Primary substrate height	Concealment	Nest height	Distance from stem	Distance from foliar edge	Orientation	Comments
1	Texas Oak *Quercus texana*	5.03 m	Texas Oak	134 cm	71 cm	34 cm	228°	failed
2	Texas Redbud *Cercis canadensis*	2.6 m	Texas Redbud	69 cm	11 cm	24cm	228°	failed
5	Yaupon *Ilex vomitoria*	2.5 m	Yaupon	85 cm	59 cm	28 cm	323°	failed
7	Texas Ash *Fraxinus texensis*	4.3 m	Texas Ash	180 cm	63 cm	26 cm	210°	successful
7	Carolina Buckthorn *Frangula caroliniana*	2.6 m	Carolina Buckthorn	67 cm	58 cm	33 cm	32°	failed
9	Wafer Ash *Ptelea trifoliata*	2.9 m	Wafer Ash	66 cm	70 cm	33 cm	22°	failed
11	Yaupon *Ilex vomitoria*	3.5 m	Yaupon	130 cm	95 cm	14 cm	20°	failed
3	Texas Oak *Quercus texana*	7 m	Texas Oak	160 cm	120 cm	30 cm	225°	failed
3	Shin oak *Quercus sinuata*	3 m	Shin Oak and TX Redbud	55 cm	20 cm	80 cm	53°	successful
2	Green Ash *Fraxinus pennsylvanica*	7.5 m	Green Ash and Yaupon	261 cm	120 cm	32 cm	190°	failed
1	Wafer Ash *Ptelea trifoliata*	1.8 m	Wafer Ash	100 cm	46 cm	18 cm	80°	successful
9	Wafer Ash *Ptelea trifoliata*	3 m	Wafer Ash	83 cm	106 cm	30 cm	126°	successful
13	Wafer Ash *Ptelea trifoliata*	2.4 m	Wafer Ash	90 cm	20 cm	10 cm	20°	fate unknown
14	Shin oak *Quercus sinuata*	2.1 m	Shin Oak	76 cm	25 cm	91 cm	300°	failed
12	Texas Redbud *Cercis canadensis*	1.6 m	Texas Redbud	97 cm	38 cm	23 cm	140°	fate unknown
12	Shin oak *Quercus sinuata*	2.5 m	Shin Oak	80 cm	110 cm	40 cm	40°	failed

Territory #	Substrate(s)	Primary substrate height	Concealment	Nest height	Distance from stem	Distance from foliar edge	Orientation	Comments
4	Texas Redbud *Cercis canadensis*	3.5 m	Texas Redbud	50 cm	32 cm	22 cm	340°	successful
4	Texas Redbud *Cercis canadensis*	2.73	Texas Redbud	80 cm	13 cm	15 cm	300°	failed

Definitions: Substrate: plant species in which the nest is located
Concealment: plant species or other substrates that is primarily responsible for concealing the nest
Orientation: nest relative to its substrate in degrees