FY 2023 Report on Monitoring and Management of the Black-capped vireo (*Vireo atricapilla)* on Travis County-managed Tracts of the Balcones Canyonlands Preserve



Photo: Tom Hausler. Male black-capped vireo at nest, Kotrla Unit, 2019.

Travis County

Department of Transportation and Natural Resources

Natural Resources & Environmental Quality Division

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TABLE OF CONTENTS

INTRODUCTION.....1

STUDY SITES.....2

HABITAT RESTORATION 4

METHODS 6

Data Collection 6

Banding 7

Data Analysis.....8

RESULTS.....8

DISCUSSION.....23

LITERATURE CITED……..…29

LIST OF FIGURES

Figure 1. Balcones Canyonlands Preserve Location Map, Travis County, TX……...32

Figure 2. BCVI Survey Locations and Observations on the BCP 2023, Travis County, Texas……..33

Figure 3. BCVI Survey Locations and Observations on Travis County Parks 2023, Travis County, Texas……34

Figure 4. BCVI Observations and Territories on the Jollyville Unit, Travis County, Texas (2023)…….....35

Figure 5. BCVI Observations and Territories on the Kotrla Unit, Travis County, Texas (2023)……..……..…….....36

Figure 6. BCVI Observations and Territories on the Lucas & Steiner Ranch tracts, Travis County, Texas (2023)……..……..……...37

Figure 7. BCVI Observations and Territories on Milton Reimers Ranch Park, Travis County, Texas (2023)……..……38

Figure 8. BCVI Observations and Territory on Pace Bend Park, Travis County, Texas (2023)……..……39

LIST OF TABLES

Table 1. Summary of Jollyville Unit and Travis County BCVI survey data collected by various agencies, Travis County, Texas. 1989-2023……. 10

Table 2. Abundance, territory number, and pairing success rate for BCVIs (Vireo atricapilla) on Jollyville Unit, Travis County, Texas, March-Sept. 2001-2023…… 11

Table 3. Breeding success and productivity for BCVI (Vireo atricapilla) territories on Jollyville Unit, Travis County, Texas, March-September 2001-2023…….. 12

Table 4. Abundance, territory number, pairing success for BCVIs (Vireo atricapilla) on Kotrla Unit, Travis County, Texas, March-September 2014-2023……... 13

Table 5. Breeding success and productivity for BCVI (Vireo atricapilla) territories on Kotrla Unit, Travis County, Texas, March-September 2001-2023……... 13

Table 6. Features of BCVI nests located on Travis County BCP lands in 2023……... 15

Table 7. BCVI (Vireo atricapilla) nest locations on Travis County BCP, Travis County, Texas, in 2023…….. 19

Table 8. Color-banding details for BCVIs (Vireo atricapilla) on Travis County properties, 2023…… 21

Table 9. 2023 Proportion of second-year males (pSY) and site fidelity on Travis County BCP, Travis County, Texas. 2010-2023…… 22

INTRODUCTION

In the United States and Canada, nearly 450 native bird species breed in terrestrial habitats (Rosenberg *et al.* 2016). Approximately 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 from widespread diminishing habitat quantity and quality due to urban growth, unsustainable agriculture and forestry, climate change, and direct mortality from anthropogenic sources (Rosenberg *et al.* 2016). 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 public about bird conservation issues to slow or prevent further population declines.

The black-capped vireo (*Vireo atricapilla*; hereafter BCVI or vireo) 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. Historically, BCVIs in the United States were found in Kansas, Oklahoma, and Texas during the breeding season (Grzybowski 1995). Presently, the BCVI breeding range includes five counties in Oklahoma, 40 counties in central and south-central Texas, and south into central Coahuila, through Nuevo Leon and into southwestern Tamaulipas, Mexico (USFWS 2016). In 2018, the black-capped vireo was delisted and removed from the endangered species list (USFWS 2018). Regardless of the delisting, Balcones Canyonlands Preserve (BCP) partners are committed to providing continued management and protection to BCVIs occurring on the BCP, as outlined in the Balcones Canyonlands Conservation Plan (USFWS 1996; hereafter BCCP). Obligatory management activities include acquiring and actively managing a minimum of 2,000 acres of vireo habitat on the BCP, monitoring the BCVI population, and controlling cowbirds, if deemed necessary.

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 the following:

- 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 (*Juniperus ashei*) 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, Bailey and Thompson 2007).

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, fewer than 100 individual BCVIs were estimated to occur in Travis County (USFWS 1996). Analyses of survey data indicate that in the early part of the 2000s, the BCVI population estimate in Travis County was fewer than 50 individuals (Wilkins *et al.* 2006). More recent survey data from the BCP managing partners and Travis County portions of the Balcones Canyonlands National Wildlife Refuge reveals that the population, although fluctuating, has increased to over 200 territories.

This report summarizes BCVI monitoring, and habitat management efforts conducted by Travis County Natural Resources staff (Staff) in FY 2023 (October 1, 2022 – September 30, 2023; hereafter FY23). Annual BCVI population data collected on Travis County-managed lands is analyzed 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.

STUDY SITES

During the 2023 breeding season, BCVI territory surveys were conducted within Travis County BCP and Parks tracts (Figures 1-3) on portions of the Jollyville Unit, the Kotrla Unit, the Lucas tract, the Steiner Ranch tract (Figure 2), Travis County Milton Reimers Ranch Park (Reimers Park) and Pace Bend Park (Figure 3). Both golden-cheeked

warblers (*Setophaga chrysoparia*) and BCVIs inhabit these properties in close proximities, except on the two Parks tracts. Secondary locations where BCVIs historically were present, or contain suitable habitat, were checked periodically for presence/absence of BCVIs on other areas of the Jollyville Unit, Kotrla Unit, Ribelin tract, Sam Hamilton East tract, and northern parts of the Steiner Ranch conservation easement (Steiner Ranch Preserve). The following site descriptions are included for only the two primary Travis County BCP Units (Jollyville and Kotrla) where BCVIs established territories.

The Jollyville Unit is comprised of 2,122 acres (859 ha) and includes the following tracts: Blackmore, Bunten, Collins, Cuevas, Cuevas East, Grandview Hills, Nootsie, Snowden, Vireo Ridge, and Vista Point (Figure 2). 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 that riparian soils in these drainages are composed primarily of soils of the Volente complex (USDA 1974). Brackett and Tarrant soils are found on steep slopes. Tarrant soils also occur in level upland areas.

The Jollyville Unit contains closed canopy, oak-juniper woodlands, which cover most of the canyons and slopes. Historic harvest of mature Ashe juniper has allowed shrubby, secondary-growth junipers to dominate much the uplands and slopes. Open grasslands are found in some valleys and ridge tops, and riparian vegetation, which contains black walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*), cedar elm (*Ulmus crassifolia*), and oaks (*Quercus* sp.) occur in areas along creeks and drainages. Portions of the ridge tops are often dominated with shin oak (*Quercus sinuata*), the signature species dominating most occupied BCVI habitat in Central Texas. Other common woody species include Texas redbuds (*Cercis canadensis* var*. texensis*), grape (*Vitus* sp.), Texas ash (*Fraxinus texensis*), Texas oak (*Quercus buckleyi*) agarita (*Mahonia trifoliolata*), twist leaf yucca (*Yucca rupicola*), wafer ash (*Ptelia trifoliata*), Carolina buckthorn (*Frangula caroliniana*), *Ilex* sp. and sumacs.

The Kotrla Unit totals approximately 1575 acres (637.4 ha) and is comprised of the 500-acre Kotrla tract, the 450-acre Scott & White tract, the 4-acre Enders tract, and the newly acquired 620-acre Flying K Ranch tract (Figure 2). These tracts are in the Lake Travis macrosite in far northwest Travis County in Leander, Texas. This unit contains habitat for both protected songbirds and likely provides substantial connectivity between the core BCP area and the Balcones Canyonlands National

Wildlife Refuge. The upland areas are relatively flat and are underlain by the hard-gray limestone of the Edwards formation. These areas are classified as Karst Zone 2, and several known caves and sinks are scattered throughout the upland area.

Upland plateau areas contain substantial Ashe juniper and areas of concentrated shin oak growing in shrub form. In particular, the dominant savannah (old pastureland) on the southern ridge contains suitable BCVI habitat. This savannah area continues into the new Flying K tract and offers potential for restoration to create a larger, contiguous swath of BCVI habitat. Other areas, particularly in the northern region, might be made suitable by on-going restoration efforts. Dominant vegetation throughout this unit is like that of the Jollyville Unit.

A substantial canyon runs generally northwest to southeast through the Unit. The Flying K tract is dominated by canyons and ravines that slope to the east and south off the plateau. The sloped areas are steep and heavily wooded. The tree canopy is generally taller than that on the upland areas, although the species composition is similar. There is a substantial deciduous component to the tree composition on these slopes, particularly Texas oak. A substantial colony of rare Texabama croton (*Croton alabamensis* var*. texensis*) occurs densely in this canyon and in isolated stands throughout much of the Unit's uplands.

HABITAT RESTORATION

Beginning in FY 2001, and continuing every winter thereafter, Travis County has conducted BCVI habitat restoration within BCVI Habitat Management Areas (HMAs). These HMAs are located within Travis County BCP lands and have been designated as having the potential to be restored to BCVI habitat. HMA locations are targeted based on known historic vireo occupancy and the presence of soil and vegetative components necessary for vireo habitat. More HMAs will be developed as additional land with restoration potential is acquired.

Poor quality BCVI habitat has been altered through a variety of techniques to create the patchy, early to mid-successional physiognomy associated with BCVI breeding habitat. By selectively removing undesirable monoculture woody species such as Ashe juniper, the growth and shrubby structure of other woody species can be improved. Some important woody species that benefit from Ashe juniper reduction include shin oak, possumhaw (*Ilex decidua*), yaupon (*Ilex vomitoria*), Texas redbud, wafer-ash, Carolina buckthorn, and sumac. Several areas have been restored to become good to excellent quality habitat. It has been observed on the Jollyville HMA

that BCVIs begin occupying restored areas three to five years following initial habitat manipulation, although in 2021 and 2022, BCVIs used areas within a year of considerable restoration activities. Restoration activities are commonly conducted in January and February of each year, but contractual labor, increased staffing, and new equipment has allowed for activities to occur anytime between September and February.

Follow up clearing is required to maintain BCVI habitat at an early to mid-successional stage. In most previously manipulated areas, much of the refined hand clearing is completed in subsequent years rather than at the onset of the initial larger scale brush removal, which is typically completed mechanically. Portions of areas cleared in 2001-2007 are noticeably growing out of ideal BCVI habitat. Sections of these previously restored areas were targeted in FY23. Most of these areas will require continued maintenance and will be a focal point over the next five to eight years. Other locations being considered for future habitat restoration and maintenance in the future include areas on the Jollyville Unit, Kotrla Unit, and the Lucas, Ribelin, New Life and Cuevas East tracts due to their history of occupancy and proximity to currently occupied habitat. The Kotrla Unit has a particularly high value for restoration due to its large swaths of shin oaks and recent occupation by BCVIs.

In FY23, Travis County staff targeted restoration efforts on the Vista Point tract in the Jollyville Unit. An approximate six-acre patch of overgrown, previously restored area on this tract was manipulated to create the early to mid-successional vegetative stage preferred by BCVIs. Additionally, a contracted land-clearing company, utilizing a forestry mower and chainsaws, focused on approximately 14-acres in a section of previously restored areas on Vireo Ridge. As with any maintenance of a previously restored area, these sites were not added to the cumulative acres of restored habitat. Prescribed fire was utilized on the Kotrla HMA in winter 2019, 2020 and 2022, but no burns were conducted in 2021 or 2023. A prescribed fire is being considered on this tract in FY24.

The cumulative total of restored habitat on Travis County managed BCP lands is 215 acres (87 ha). On Reimers Park (not BCP) it is estimated that over 300 acres of potential and occupied BCVI habitat exists because of previous wildfire, recent prescribed fires, and overall land management efforts. It is reasonable to predict that this Travis County Park may soon contain a substantial BCVI population.

Restoration activities, including new areas and maintenance of previously restored areas, will continue where habitat potential has been identified on the HMAs. Target areas for restoration vary from year to year based primarily on the following: habitat utilized by BCVI during the preceding breeding season, presence of occupied GCWA habitat, diversity of desired woody species, and available budget. Efforts are made to document any co-occurrences of GCWA and BCVI during the breeding season to investigate and evaluate the possibility of creating areas of mixed or composite habitat. Travis County staff utilizes a flexible multi-year BCVI habitat restoration plan which defines areas targeted for restoration and allows for additional areas to be added or removed based on new land acquisitions, changes in land use and updated management techniques and recommendations.

METHODS

Data Collection

Detailed protocol for BCVI territory mapping, nest monitoring, and presence/absence surveys are described in an unpublished report by Travis County (2009). In FY 23, 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 either plotted on hard-copy, digital ortho-photo maps with a scale of 1:4,000 or less or, directly on cellular phones using the Arc Field Maps App. Garmin handheld global positioning units (GPS) used in concert with a compass, especially when hand-mapping, improved accuracy of observations. The following data were 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 10.7 (ESRI, Inc., Redlands, CA) geodatabase with the Texas State Plane (with NAD 1983 projection) coordinate system. All males encountered were assigned a unique territory ID (“territory number”) to signify them as individuals. Female locations were either recorded as independent locations or with the corresponding territory number of a territorial male where applicable. If color-banded, the band combination was used as the territory number.

Territory mapping methods generally followed International Bird Census Committee (IBCC) guidelines (1970). The “consecutive flush” method was employed to increase accuracy in assigning observations of BCVIs to specific territories or “clusters” (Bibby *et al.* 2000). However, this method was modified to be less intrusive to avoid harassment and/or human induced behaviors (Holiman and Craft 2000). No more than

10 locations for an individual bird were mapped at one time. The presence of returning color-banded BCVI allowed identification of individuals in many cases. When band status was unknown or when dealing with unmarked BCVI, conspecific singing, or counter-singing was used to differentiate between males. BCVIs that could not be positively identified were designated as “unknown” individuals.

Nests were located opportunistically during normal territory mapping surveys. Disturbance was minimized by refraining from intensive nest searches. When found, nests were checked every five to seven days from the date of discovery until an outcome could be determined. Physical checks were only performed, if necessary, to ascertain clutch size, nestling counts or for cowbird parasitism. 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 being attended. Fledglings observed being tended by a male or female confirmed breeding success within a territory; the total number of fledglings observed at any one time was used as a conservative measure of productivity. Occasionally, nests are located post-season, and their fate usually documented as undetermined. At times, based on behaviors during the breeding season or the physical nature of the nest, a fate may be determined.

In addition to territory mapping, presence/absence surveys for BCVIs occurred in areas on the Jollyville Unit, the Ribelin tract and the Kotrla Unit (Figure 2). Additional, unique presence/absence surveys were conducted on 1) the power line easement on the Sam Hamilton East tract; 2) the Lucas tract; 3) and the Wheless tract (Figure 2). Potential habitat and recently occupied areas at Reimers Park were surveyed by Travis County Natural Resources staff with informal assistance by Parks staff. Once BCVIs were detected, Natural Resources and Parks staff began monitoring any potential territories (Figure 6).

BCVIs were surveyed for a total of 289 hours from March 24 (first detection) to August 8, 2023 (last detection). Data can be interpreted as a comprehensive census due to the relatively large amount of time spent monitoring these birds throughout the nesting season.

Banding

To build a long-term demographic data set, the banding program initiated in 2008 as part of a graduate study of avian dispersal, has continued. The original project investigated interpatch dispersal patterns within a fragmented preserve network

(Simper 2009). Throughout the survey season, staff update and share data, including banded bird resightings and nest locations, to coordinate banding attempts. In 2023, a total of 16 adult BCVIs were banded (13 males, three female). Since 2008, 117 adult BCVIs have been banded on Travis County-managed properties. Additionally, in 2023, 14 nestlings that fledged from four nests were banded on Travis County tracts as part of a joint City of Austin-Travis County project to monitor dispersal. Two additional nestlings were banded but were depredated. Travis County intends to continue the BCVI banding program alongside the City of Austin's banding program to better understand the Travis County-area population.

Data Analysis

BCVI abundance is defined as the sum of all individual male BCVIs detected at a given study site, regardless of territory status. Overall species distribution is comprised of all locations where BCVIs were detected (i.e., registrations) and includes males, females, fledglings, and multiple sightings of the same individual. An individual male was considered to have established a breeding territory if the following behaviors were observed: 1) accompanying a female, 2) tending a nest or fledglings, or 3) singing in the same locality on three separate occasions each separated by at least one week (i.e., six days between observations). In calculating territory numbers, all BCVI territories, whether they were observed entirely or partially on Travis County property, were considered 'full' territories (as opposed to 'edge' or partial territories). Due to limitations of time and survey effort, the set of registrations shown on attached maps do not represent a definitive description of territory boundaries.

Pairing success rate was calculated as the proportion of territories within which a female was observed, or a nest was located (Anders 2000). Productivity data is represented in the following two ways: 1) the total number of fledglings divided by the total number of territories and 2) the total number of fledglings divided by the number of successful territories. A territory was considered successful if at least one fledgling was observed with a territorial male or female or if a monitored nest was deemed successful based on field observations (i.e., presence of dander in the nest). The breeding success rate is the proportion of full territories that successfully fledged young (Koloszar and Becker 2000).

RESULTS

In 2023, BCVI abundance and territory numbers were similar to recent record highs, with 36 males detected throughout Travis County-managed properties. Twenty-eight

territories were established with 27 determined to be paired. Of the eight extra unique BCVIs added to abundance, five were “single day” occurrences where individual males were likely passing through the area. Three others were detected on multiple days but failed to establish territories before disappearing. BCVIs were located on the Jollyville Unit (Figure 4), the Kotrla Unit (Figure 5), the Lucas and Steiner Ranch tracts (Figure 6), Reimers Park (Figure 7) and Pace Bend Park (Figure 8). One Reimers Park territory was a single-day occurrence of a BCVI pair actively nest site searching, but whose final territorial area was unable to be located. Two, non-territorial instances (abundance) of males were located on the Ribelin and Cuevas tracts and not represented on any figures in this report.

Of the 28 territories, 27 were established in areas that had some recent form of disturbance either by County-managed mechanical restoration, prescribed fire or previous owner vegetation clearing for livestock pasture management. One territory on the Kotrla Unit was established in an area that shows no recent signs of disturbance by the previous owners. Of the territories located in disturbed areas, 14 were in areas mechanically restored by Travis County (Kotrla and Jollyville Units, Lucas tract). Seven were located on old pastureland that had been recently burned through the County’s prescribed burn program (Kotrla Unit and both Parks). Five territories were in areas that had a mix of mechanical clearing, prescribed fire, and old pastureland. One territory (Steiner) was established on a powerline corridor which undergoes routine clearing.

In FY23, Travis County managed three core populations, those with at least three territories occupying a proximal area. The Jollyville Unit had 11 territories with an additional four floating males that never established territories. The Kotrla Unit also had 11 territories. There were three territories and one non-territorial male at Reimers Park. One territory was established each at the Lucas and Steiner Ranch tracts as well as Pace Bend Park. No territories were detected on the Ribelin tract for the second consecutive year after several years of constant or expanding population.

The Jollyville Unit has historically contained Travis County’s largest BCVI numbers and for many years, was Travis County’s only protected population. Because of this, data unique to this Unit have regularly been teased out to reflect historic context. Table 1 presents a summary of BCVI data collected during the 2023 breeding season in addition to data collected by various agencies exclusively on the Jollyville Unit since 1989. This table also indicates total abundance and territories on all Travis County properties (including BCVI detected from Travis County properties on adjacent

properties). As Travis County BCP expanded, territories were discovered off the Jollyville Unit as new suitable habitat was protected and created.

Table 1. Summary of Jollyville Unit and Travis County BCVI survey data collected by various agencies, Travis County, Texas. 1989-2023.

Year Surveyed	Agency	Jollyville Unit* Abundance	Jollyville Unit* No. Territories	Abundance/ No. Territories (all Travis County lands)
1989, 90	DLS	11	5	n/a
1991	DLS	14	9	n/a
1992	TXDOT	Unknown[1]	Unknown	n/a
1993	TXDOT	25	20	n/a
1994	TXDOT	27	27	n/a
1995	TXDOT	23	23	n/a
1996	SWCA	19-22	15	n/a
1997-99	No Data	Unknown[1]	Unknown	n/a
2000	SWCA	3[2]	Unknown	n/a
2001	Travis County TNR	19	13	19/13
2002	Travis County TNR	21	19	21/19
2003	Travis County TNR	21	20	22/20
2004	Travis County TNR	13	12	13/12
2005	Travis County TNR	12	11	12/11
2006	Travis County TNR	12	9	13/9
2007	Travis County TNR	14	13	18/15
2008	Travis County TNR	15	15	15/15
2009	Travis County TNR	13[3]	11	15/11
2010	Travis County TNR	13	11	13/11
2011	Travis County TNR	9	8	10/9
2012	Travis County TNR	9	8[4]	9/8
2013	Travis County TNR	13	9	15/11
2014	Travis County TNR	14	12	14/12
2015	Travis County TNR	15	13	21/16
2016	Travis County TNR	14	12[4]	19/14
2017	Travis County TNR	6	6	12/9
2018	Travis County TNR	9	9[4]	17/12
2019	Travis County TNR	7	5	22/13
2020	Travis County TNR	14	9	32/22
2021	Travis County TNR	14	11	37/28[5]
2022	Travis County TNR	14	12	36[5]/27

Year Surveyed	Agency	Jollyville Unit* Abundance	Jollyville Unit* No. Territories	Abundance/ No. Territories (all Travis County lands)
2023	Travis County TNR	15	11	36/28

*Study area is only referred to as "Jollyville Unit" since 2001. [1] Restricted access on the tract. [2] Detected while on brief site visit.
[3] Does not include individual detected on Lake Perspectives tract (now part of the Lake Travis Unit).
[4] One banded male established two separate, unique territories. [5] Includes one added to these totals adjacent to Travis County property.

In 2023, 27 territories were considered successfully paired. Seventeen territories fledged offspring, yielding at least 64 "hatch year" (HY) individuals. On the Jollyville Unit alone, 10 of the 11 territories were considered successfully paired (Table 2). Of these, eight territories fledged offspring, yielding at least 28 HYs observed in the field (Table 3). Only one territory (on Kotrla) definitively had more than one successful nest. Kotrla Unit data are now represented in separate tables (Tables 4 and 5).

Table 2. Total survey effort and abundance, territory number, pairing success for BCVIs (*Vireo atricapilla*) on Jollyville Unit, Travis County, Texas, March-September 2001-2023.

Year	Total Hours Surveyed•	Abundance	No. Territories	Successfully Paired	Pair Success Rate (%)
2001	100	18[a]	15[a]	13[a]	86.7[a]
2002	179	21	19	18	94.7
2003	290[b]	21	19[a]	14	73.7[a]
2004	128	13	12	9	75
2005	140	12	11	8	72.7
2006	146	11[a]	9	8	88. 9
2007	178	14	13	12	92.3
2008	199	15	15	14	93.3
2009	204	13[c]	11	11	100
2010	181	13	11	11	100
2011[d]	131	9	8	8	100
2012	141	9	8	8	100
2013	154	13	9	9	100
2014	190	14	12	11	91.7
2015	179	15	13	11	84.6
2016	142	14	12	11	91.7
2017	146	6	6	6	100
2018	194	11	9	9	100
2019	466	7	5	4	80.0
2020	273	14	9	9	100
2021	337	14	11	9	81.8
2022	263	14	12	11	91.7

Year	Total Hours Surveyed•	Abundance	No. Territories	Successfully Paired	Pair Success Rate (%)
2023	289	15	11	10	90.9

[a] Adjusted values to reflect BCVI found only on the JV Unit. • Total hours for entire season on all properties, not only JV Unit
[b] Total hours surveyed for 2003 could not be verified and likely overestimated. [c] The male located at Lake Perspectives (Lake Travis Unit) was not included in this dataset. [d] The territory located at Lucas-Lake Travis Bluffs (Lake Travis Unit) was not included in this dataset.

Current protocol counts either the number of fledglings directly observed in the field, or the number of nestlings discovered in a nest that is later demonstrated to be successful. Because of their dull-colored plumage, cryptic behavior, and unpredictable flights, we expect observer counts of fledglings to be biased low. On the Jollyville Unit, productivity in 2023 (Table 3), whether measured relative to successful territories (2.9 HY/ territory) or all territories (2.1 HY/ territory), is likely accurate due to intensive survey effort.

Table 3. Breeding success and productivity for BCVI (*Vireo atricapilla*) territories on Jollyville Unit, Travis County, Texas, March-September 2001-2023.

Year	No. of territories with breeding success[1]	Breeding success rate (%)	No. Fledglings	No. fledglings/ successful territory[2]	No. fledglings/ total no. paired territories[3]
2001	4	26.7*	12	3.0*	0.9*
2002	13*	68.4*	25*	1.9*	1.4*
2003	9	47.4*	16	1.8	1.1
2004	6	50.0	13	2.2	1.4
2005	1	9.1	1	1.0	0.1
2006	8	88.9	15	1.9	1.9
2007	8	61.5	24	3.0	2.0
2008	10	66.7	29	2.9	2.1
2009	7	63.6	12	1.7	1.1
2010	8	72.7	10	1.3	0.9
2011	4	50.0	11	2.8	1.4
2012	7	87.5	21	3.0	2.6
2013	6	66.7	19	3.2	2.1
2014	8	66.7	23	2.9	2.1
2015	7	53.8	30	4.3	2.6
2016	8	66.7	29	3.6	2.4
2017	4	66.7	15	3.8	2.5
2018	4	44.4	15	3.8	1.7
2019	4	80.0	15	3.8	3.8
2020	6	66.7	17	2.8	1.9
2021	6	54.5	26	4.3	2.9
2022	8	66.7	23	2.9	2.1
2023	8	72.7	28	3.5	2.8

[1] Represents the number of all territories that fledged at least one young. * Adjusted values to reflect BCVI found only on the JV Unit.
[2] Represents the average no. of fledgling from territories with breeding success.
[3] Represents the average no. of fledgling from all successfully paired territories.

Table 4. Abundance, territory number, pairing success for BCVIs (*Vireo atricapilla*) on Kotrla Unit, Travis County, Texas, March-September 2014-2023.

Year	Abundance	No. Territories	Successfully Paired	Pair Success Rate (%)
2014*	1	0	Unknown	n/a
2015	2[1]	1	0	0
2016	2	0	n/a	n/a
2017	1	1	1	100
2018	3	2	2	100
2019	5	2	2	100
2020	7	6[2]	5	83.3
2021	10	8[1]	8	100
2022	13	9	7	77.8
2023	11	11	11	100

*Detected once during pre-ownership site visit; [1]One male was detected just off Travis County property (Kotrla tract).
[2] One territory polygynous

Table 5. Breeding success and productivity for BCVI (*Vireo atricapilla*) territories on Kotrla Unit, Travis County, Texas, March-September 2016-2023.

Year	No. of territories with breeding success[1]	Breeding success rate (%)	No. Fledglings	No. fledglings/ successful territory[2]	No. fledglings/ total no. paired territories[3]
2014*	Unknown	Unknown	Unknown	Unknown	Unknown
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	1	100	3	3.0	3.0
2018	1	50.0	2	2.0	1.0
2019	2	100	8	4.0	4.0
2020	4	66.7	14	3.5	2.8
2021	2	25.0	5	2.5	0.6
2022	2	22.2	9	4.5	1.2
2023	6	54.5	22	3.7	2.0

[1] Represents the number of all territories that fledged at least one young.
[2] Represents the average no. of fledgling from territories with breeding success.
[3] Represents the average no. of fledgling from all successfully paired territories.
* No survey conducted; detected once during a site visit, pre-County ownership.

Nests. Forty-eight BCVI nests were located in 2023 (Table 6). Of these, 41 nests were monitored until a fate was determined. Including all nests (both monitored and unmonitored, n=48), 17 (35.4%) successfully fledged at least one young. One territory had a successful brood (n=4) where no nest was ever located (Pace Bend). Twenty-two (45.8%) nests failed, having been depredated or partially depredated/abandoned due to unknown predators. Three nests were abandoned during egg stage. Five nests

were found after the fate was determined and assumed to be depredated or abandoned based on field observations. Lastly, one nest was destroyed by strong winds just before egg laying began. No nests were parasitized or showed signs of mite infestation.

Additional notable nest fate details. These include nests that were not monitored:

- For the third time (2021, 2022) at least one territory (n=3) had four nest attempts. Only one of these produced young (n=3) with two territories having four failed nests each.
- Three territories had three nest attempts, with only one producing HYs from one nest (n=3).
- One territory had two successful nests (Jollyville).
- Eight territories had two nest attempts, with only one being successful. One additional territory had both nest attempts fail. Five territories had only one nest attempt, with three fledging at least one young.
- One nest on Jollyville, broke last season's nest height record (2.78m) reaching a height of 2.92m (9.6ft) in an Ashe juniper. This nest was depredated.
- Several nest's eggs showed indication of possible Bewick's Wren (*Thyromanes bewickii*) punctures. At least one nest was abandoned possibly due to the damage.
- One nestling was observed to be disfigured and partially/completely blind. This nest was depredated with two additional banded nestlings.

Timing and behavior indicated that several territories likely had failed early- and late-season nests that were never located. Detailed data regarding nest substrate, height, and orientation were collected post breeding season for each nest found (Table 6). Table 7 details the location data for each nest.

Table 6. Features of BCVI (*Vireo atricapilla*) nests located on Travis County land in 2023.

Substrate	Primary substrate height (~m)	Additional Concealment	Nest height (cm)	Distance from stem (cm)	Distance from foliar edge (cm)	Orientation	Comments
Shin oak (*Quercus sinuata*)	1.5	Texas Ash (*Fraxinus texensis*)	50	34	18	21°	Successful; 1st attempt (2 HYs, 1 egg)
Shin Oak	4	Ashe juniper (*Juniperus ashei*)	147	58	28	324°	Successful; 2nd attempt (2 HYs)
Ashe juniper	4	Shin Oak	97	97	21	20°	Abandoned; 1st attempt (4 eggs*)
Ash juniper	3	Live oak (*Quercus fusiformis*) Texas persimmon (*Diospyros texana)*	100	46	35	266°	Abandoned; 2nd attempt (4 eggs)
Ashe juniper	7	n/a	292	88	20	0°	Depredated; 3rd attempt (4 nestlings)
Shin oak	3	n/a	100	21	12	92°	Successful; 1st attempt (4 HYs)
Shin oak	3.5	n/a	94	74	27	132°	Depredated; 2nd attempt (3 eggs)
Shin oak	3	Evergreen sumac (*Rhus virens*)	100	51	14	144°	Successful; 1st attempt (3 HYs, 1 egg*)
Shin oak	1.5	Ash Juniper Evergreen sumac	100	34	30	232°	Failed; 2nd attempt (3+ eggs)
Shin oak	1.5	Ash Juniper	100	18	15	302°	Abandoned; 3rd attempt (pre-lay)
Shin oak	5	Ash Juniper	200	59	20	106°	Depredated; 4th attempt (2 nestlings, 2 eggs)

Substrate	Primary substrate height (~m)	Additional Concealment	Nest height (cm)	Distance from stem (cm)	Distance from foliar edge (cm)	Orientation	Comments
Shin oak	3.5	n/a	99	70	17	339°	Depredated 1st attempt (3 nestlings, 1 egg)
Live oak	5	Ash Juniper	150	55	16	186°	Successful; 2nd attempt (4 HYs)
Shin oak	3.5	n/a	200	36	12	66°	Successful; 1st attempt (3 HYs**)
Shin oak	3	n/a	138	23	21	310°	Successful; 1st attempt (4 HYs**)
Shin Oak	3	Elbow Bush (*Forestiera pubescens)*	103	29	19	192°	Abandoned; 2nd attempt (4 eggs)
Shin oak	4.5	Ash Juniper Live Oak	81	82	11	335°	Depredated; 1st attempt (3 nestlings)
Mexican buckeye (*Ungnadia speciosa)*	3.5	Live oak Evergreen sumac Briklebush (*Brickellia californica)*	109	41	22	255°	Depredated; 2nd attempt (3 eggs)
Evergreen Sumac	2	Beebrush (*Aloysia gratissima)*	90	10	25	130°	Successful; 1st attempt (4 HYs)
Carolina buckthorn *(Rhamnus caroliniana)*	3	Texas persimmon Beebrush	97	86	29	162°	Depredated; 1st attempt (Unknown)
Live oak	6.5	Ashe juniper Shin oak	147	55	24	80	Successful; 2nd attempt (4 HYs)
Red bud *(Cercis canadensis)*	2.5	Shin oak	62	105	28	236°	Depredated; 1st attempt (3 nestlings, 1 egg)

Substrate	Primary substrate height (~m)	Additional Concealment	Nest height (cm)	Distance from stem (cm)	Distance from foliar edge (cm)	Orientation	Comments
Texas persimmon	9	Ash juniper Elbow bush	141	40	23	52°	Depredated; 2nd attempt (4 HYs)
Texas ash	7	Texas oak *(Quercus buckleyi)*	136	70	18	200°	Successful; 3rd attempt (3 HYs)
Texas oak	3	Texas persimmon Flameleaf sumac (*Rhus lanceolata)*	80	93	27	240°	Successful; 1st attempt (3 HYs, 1 egg)
Texas ash	5	Shin oak Lindheimer's silktassel (*Garrya ovata*)	123	36	32	342°	Failed; 2nd attempt (Found empty)
Texas ash	4	n/a	135	52	14	92°	Depredated; 1st attempt (4 HYs)
Texas persimmon	3	Shin oak Flameleaf sumac Texas ash	88	13	27	120°	Successful; 1st attempt (4 HYs)
Texas oak	5	Texas ash	124	60	27	334°	Depredated; 2nd attempt (3 HYs)
Shin oak	3	Flameleaf sumac Texas persimmon Hackberry *(Celtis occidentalis)* Yaupon holly *(Ilex vomitoria)*	64	21	16	90°	Depredated; 1st attempt (2+ eggs)
Texas ash	7	Agarita (*Mahonia trifoliolata)* Gum bumelia *(Sideroxylon lanuginosum)*	74	62	38	300°	Depredated; 2nd attempt (4 eggs)
Texas ash	7	Mustang grape *(Vitis mustangensis)*	128	79	21	320°	Failed; 3rd attempt (Found empty)
Shin oak	4	Texas ash	160	93	23	358°	Depredated; 4th attempt (4 nestlings)

Substrate	Primary substrate height (~m)	Additional Concealment	Nest height (cm)	Distance from stem (cm)	Distance from foliar edge (cm)	Orientation	Comments
Ash Juniper	4	n/a	167	22	29	310°	Successful; 1st attempt (4 HYs)
Wafer ash *(Ptelea trifoliata)*	4	Ash juniper Cedar elm *(Ulmus crassifolia)*	98	37	20	164°	Depredated; 1st attempt (3+ nestlings)
Texas ash	8	Ash juniper Lindheimer's silktassel	173	68	14	134°	Depredated; 2nd attempt (4 nestlings)
Texas ash	6	Shin oak	75	110	16	12°	Failed; 3rd attempt (Found empty)
Shin oak	3	n/a	75	37	26	40°	Failed/weather related; 1st attempt (Pre-lay)
Shin oak	3	Evergreen sumac	52	7	19	336°	Partial depredated/ Abandoned; 2nd attempt (3/1 nestlings)
Texas persimmon	3	Agarita Ash juniper	65	46	4	76°	Depredated; 3rd attempt (3 nestlings, 1 egg)
Live oak	7	n/a	90	108	8	266°	Partial depredated/ fully depredated; 4th attempt (3 eggs/1 nestling)
Shin oak	5	Wafer ash Texas ash	97	44	33	50°	Depredated; 1st attempt (3 eggs)
Texas ash	5	Ash juniper Shin oak	114	12	21	224°	Successful; 2nd attempt (4 HYs)
Shin oak	4	Greenbrier *(Smilax rotundifolia)*	101	8	25	274°	Successful; 1st attempt (4HYs)
Ash juniper	3.5	n/a	127	47	23	70°	Depredated 1st attempt (4 nestlings)

Substrate	Primary substrate height (~m)	Additional Concealment	Nest height (cm)	Distance from stem (cm)	Distance from foliar edge (cm)	Orientation	Comments
Live oak	3.5	n/a	73	83	18	166°	Successful; 2nd attempt (4 HYs)
Ash juniper	6.5	Live oak	129	40	23	220°	Successful; 1st attempt (4 HYs**)
Huisache (*Vachellia farnesiana*)	3.5	n/a	77	90	23	190°	Depredated; 2nd attempt (3 HYs**)

Definitions: Substrate: plant species in which the nest is located. Primary substrate height indicates the over-story vegetation height. Concealment: plant species or other substrates that is primarily responsible for concealing the nest. Orientation: compass direction of nest relative to its substrate.

* indicated possible egg damage from Bewick's Wren ** nestlings banded

Table 7. BCVI (*Vireo atricapilla*) nest locations, Travis County, Texas, 2023.

Nest ID	Color Band Combination	Nest Attempt	UTM E	UTM N	LAT	LONG
Randall Boggs #1	BL/SI:MV/PI	1	609621	3368059	30.439700	-97.858400
Randall Boggs #2	BL/SI:MV/PI	2	609707	3368034	30.439400	-97.857500
Batbird #1	BK/SI:WH/DB	1	609555	3368100	30.440000	-97.859100
Batbird #2	BK/SI:WH/DB	2	609576	3368121	30.440200	-97.858800
Batbird #3	BK/SI:WHDB	3	609518	3368035	30.439500	-97.859500
NewVuvu #1	Unbanded	1	609606	3368444	30.443100	-97.858500
NewVuvu #2	Unbanded	2	609587	3368385	30.442600	-97.858700
Sherbert #1	PI/WH:OR/SI	1	609730	3368116	30.440200	-97.857200
Sherbert #2	PI/WH:OR/SI	2	609716	3368147	30.440500	-97.857400
Sherbert #3	PI/WH:OR/SI	3	609742	3368117	30.440200	97.857100
Sherbert #4	PI/WH:OR/SI	4	609699	3368325	30.442100	-97.857500
RGP #1	RD/SI:GR/PI	1	609770	3368325	30.442100	-97.856800
RGP #2	RD/SI:GR/PI	2	609733	3368200	30.440900	-97.857200
Chester Cheeto	OR/SI:RD/RD	1	610175	3367773	30.437000	-97.852600
35 acres UB #1	Unbanded	1	610690	3367226	30.432000	-97.847300
35 acres UB #2	Unbanded	2	610678	3367172	30.431600	-97.847470
Bronco #1	DB/OR:BL/SI	1	609564	3367039	30.430500	-97.859100
Bronco #2	DB/OR:BL/SI	2	609597	3367030	30.430400	-97.858700
UB Denali	Unbanded	1	609656	3366993	30.430000	-97.858100

Nest ID	Color Band Combination	Nest Attempt	UTM E	UTM N	LAT	LONG
Magpie #1	WH/SI:BK/BL	1	609663	3366880	30.429000	-97.858100
Magpie #2	WH/SI:BK/BL	2	609668	3366906	30.429300	-97.858000
Blk Panther #1	PI/BK:nb/SI	1	602256	3380996	30.557000	-97.933800
Blk Panther #2	PI/BK:nb/SI	2	602377	3380870	30.555900	-97.932600
Blk Panther #3	PI/BK:nb/SI	3	602382	3381005	30.557108	-97.932500
Anti-Sherbert #1	WH/PI:OR/SI	1	602186	3381173	30.558600	-97.934500
Anti-Sherbert #2	WH/PI:OR/SI	2	602235	3381115	30.558100	-97.934000
Bowser #1	RD/SI:DG/DG	1	602164	3381278	30.559600	-97.934700
Mario #1	RD/SI:DB/BL	1	602014	3381165	30.558600	-97.936300
Mario #2	RD/SI:DB/BL	2	602027	3381138	30.558300	-97.936200
Nightwing #1	BK/BL:BK/SI	1	601822	3381102	30.558000	-97.938300
Nightwing #2	BK/BL:BK/SI	2	601848	3381144	30.558400	-97.938000
Nightwing #3	BK/BL:BK/SI	3	601952	3381082	30.557800	-97.937000
Nightwing #4	BK/BL:BK/SI	4	601883	3381174	30.558700	-97.937700
Conan #1	OR/BL:OR/SI	1	602559	3380731	30.554600	-97.930700
YIBU #1	YE/SI:BL/DG	1	602175	3381291	30.559700	-97.934600
YIBU #2	YE/SI:BL/DG	2	601972	3381082	30.557800	-97.936800
YIBU #3	YE/SI:BL/DG	3	602093	3381284	30.559700	-97.935500
Luigi #1	DG/DG:BL/SI	1	601692	3381137	30.558400	-97.939700
Luigi #2	DG/DG:BL/SI	2	601658	3381166	30.558600	-97.940000
Luigi #3	DG/DG:BL/SI	3	601773	3381037	30.557400	-97.938800
Luigi #4	DG/DG:BL/SI	4	601777	3381082	30.557900	-97.938800
Beast #1	DB/SI:BL/DB	1	602456	3382504	30.570600	-97.931600
Beast #2	DB/SI:BL/DB	2	602545	3382505	30.570600	-97.930600
Logan #1	YE/YE:BL/SI	1	602422	3382539	30.570900	-97.931900
Captain #1	DB/RD:DB/SI	1	585074	3359519	30.364600	-98.114700
Captain #2	DB/RD:DB/SI	2	584915	3359445	30.363900	-98.116300
Waldo #1	WH/SI:WH/RD	1	609069	3363012	30.394200	-97.864700
Waldo#2	WH/SI:WH/RD	2	608979	3362999	30.394100	-97.865600

Color-banding. A total of 25 individual adult BCVIs wearing color bands were observed on Travis County properties in 2023. Of these, 21 were adult males and four were adult females. Sixteen BCVIs were newly banded in 2023 (thirteen males, three females; Table 8). Nine adults were banded in previous years (eight males, one female). Two were banded in 2018 [now A7Y]; one in 2019 [6Y]; and two in 2021 [A4Y and 4Y] and four in 2022 [3, 3Y (one female), one A3Y]. Additionally, 16 nestlings were color-banded. Two of these were depredated.

Table 8. Color-banding details for BCVIs (*Vireo atricapilla*) on Travis County properties, 2023.

Location	Color Band Combination	Band Date	Sex	Age
Jollyville Unit	OR/SI:RD/RD	6/15/23	M	ASY
Jollyville Unit	DB/OR:BL/SI	5/12/23	M	ASY
Jollyville Unit	WH/SI:BK/BL	4/20/23	M	AHY
Jollyville Unit	MV/SI:DB/OR	5/22/23	uk	L*
Jollyville Unit	PI/BK:WH/SI	5/22/23	uk	L
Jollyville Unit	RD/BK:BK/SI	5/22/23	uk	L
Jollyville Unit	OR/RD:WH/SI	5/22/23	uk	L
Jollyville Unit	nb/BK:BK/SI	6/19/23	uk	L
Jollyville Unit	nb/DB:DB/SI	6/19/23	uk	L
Jollyville Unit	nb/DG:BL/SI	6/19/23	uk	L
Jollyville Unit	OR/YE:BL/SI	5/12/23	uk	L
Jollyville Unit	BL/WH:nb/SI	5/12/23	uk	L
Jollyville Unit	nb/BL:BK/SI	5/12/23	uk	L
Kotrla Unit	RD/SI:DG/DG	6/16/23	M	SY
Kotrla Unit	RD/SI:DB/BL	4/19/23	M	ASY
Kotrla Unit	BK/BL:BK/S	4/19/23	M	ASY
Kotrla Unit	OR/BL:OR/SI	4/19/23	M	ASY
Kotrla Unit	DG/SI:OR/WH	6/22/23	M	SY
Kotrla Unit	YE/SI:BL/DG	5/8/23	M	ASY
Kotrla Unit	DG/DG:BL/SI	4/19/23	M	ASY
Kotrla Unit	DB/SI:BL/DB	5/8/23	M	SY
Kotrla Unit	YE/YE:BL/SI	5/8/23	M	SY
Kotrla Unit	WH/SI:nb/WH	6/22/23	F	SY
Kotrla Unit	nb/BL:YE/SI	6/22/23	F	ASY
Steiner Ranch	RD/SI:BK/BL	5/16/23	uk	L
Steiner Ranch	DB/BL:BL/SI	5/16/23	uk	L
Steiner Ranch	BL/SI:OR/WH	5/16/23	uk	L
Steiner Ranch	BL/SI:BK/DB	5/16/23	uk	L
Pace Bend Park	NB/SI:YE/GR	6/12/23	M	SY
Pace Bend Park	NB/BL:DG/SI	6/12/23	F	SY

* L = nestling

Adult males showed a 42.9% return rate (three of seven males banded in 2022 observed in 2023; Table 9). Six males and one female returned generally to their same 2022 territorial areas. Two males shifted from their 2022 territorial areas. One male established a territory approximately 1046 m (.65 mi) from his 2022 territorial area. A second male shifted 1610 m (2.5 mi) to a completely different area of the preserve (Vireo Ridge to Steiner Ranch). The one female banded last year (2022) was observed in the same territorial area in 2023. Her mate was unbanded in 2022 so it is

unclear if she mate-switched based on age determination. Banding on Travis County Park property (Reimers Park) began in 2020 and the one male banded then has returned every subsequent year to the same territorial area. No new BCVIs were banded at Reimers Park, however a pair was banded at Pace Bend Park for the first time on record in 2023. Table 9 summarizes relevant demographic information since 2010.

Prior to 2008 there was no banding program in place, precluding staff from determining return rates, recruitment and associated data. In 2023, of the thirteen males newly banded, five were 'second year' males, i.e., males in their first reproductive season. All newly banded males established territories.

- Proportion of SY males (pSY): The proportion of second year males has been used as an indicator of recruitment. A minimum pSY value (29%) has been suggested as a measure of a stable population (USFWS 1996). In 2023, the overall pSY, based on marked, territorial males, was 23.8% (five of 21).

- Site fidelity: In 2023, three of seven banded males observed in 2022 returned indicating a 42.9% return rate on Travis County properties. One female returned from 2022.

Table 9. Proportion of second-year males (pSY) and site fidelity on Travis County BCP, Travis County, Texas. 2010-2023.

Year	pSY	Site Fidelity (males)	Site Fidelity (females)
2010	27.3	70.0	n/a
2011	20.0*	25.0	n/a
2012	28.6*	66.7	50.0
2013	57.1	16.7	100.0
2014	62.5*	42.9	50.0
2015	43.8**	71.4	50.0
2016	71.4	16.7	66.7
2017	20.0*	42.9	n/a
2018	33.3	40.0	n/a
2019	33.3	55.6	n/a

Year	pSY	Site Fidelity (males)	Site Fidelity (females)
2020	53.8	55.6	n/a
2021	39.1	57.1	33.3
2022	35.3	40.0	n/a
2023	23.8	42.9	100

* conservative number, at least three (2011), one (2012), two (2014) and one (2017) male were unsuccessfully aged.
** unofficial number based primarily on observations of territorial (n=7 of 16) males and not solely marked BCVIs.

DISCUSSION

2023 posted the second highest abundance and territory numbers since the program's inception (2001) and marking the third year in a row of higher-than-average (pre-2020) population. Territory numbers reached a record high on the Kotrla Unit (n=11, +2) and the population on the Jollyville Unit has also maintained high numbers since 2020.

The Jollyville Unit population had fallen to its lowest numbers on record in 2019 (n=5). Since then, the population has more than doubled and appears to be staying constant with minor fluctuations in abundance and territory numbers. The increase in abundance, territories and productivity on the Jollyville Unit indicates that male BCVIs are finding suitable habitat. The resent focus over the last few years on habitat maintenance on the Jollyville Unit has had a positive effect on this population. Unoccupied, recently restored areas are looking very promising and are likely to be reoccupied soon. However, an unusual concern for the Jollyville population is that no SY males were color-banded and all, but one (AHY) marked bird was ASY indicating a less-than ideal age structure. Three of the color-banded territorial males were six years or older. Age structure will be looked at more closely over time by site to determine if they are sources or sinks.

For the second time since 2015, no territorial BCVIs were detected on the Ribelin tract. This area was steadily establishing territories on both Travis County and City of Austin lands indicating the continued utilization of power line corridors by BCVIs. It is unclear why the abrupt end to occupation occurred. The area will be closely monitored again in 2024 since much of the area, including portions on the neighboring tract to the west, are growing into what appears to be suitable habitat.

The Kotrla Unit colony has been successful in terms of productivity for a seventh consecutive season. This Unit, as expected, has become a core area for Travis

County's BCVI population matching the success of the Jollyville Unit population. Once again, the Kotrla Unit showed an increase in territories as vegetation management, including prescribed fires, has improved the habitat. Nine territorial males occupied the core BCVI area on this Unit with one of these using the newly acquired Flying K tract. An additional two territories established on the northwest side of the Unit. The Flying K tract has large areas of potential habitat that may be restored in the coming years. Although less concerning than the Jollyville population age structure, the pSY on the Kotrla Unit was 36.4%. Although a good percentage, this was an approximate 50% drop in SY males on this Unit from last year. Breeding success doubled from the low rates of the two previous years, rising above 50%. An increase in Brown-headed cowbird trapping effort may have assisted in the increase, with no nests discovered parasitized in 2023. With the addition of prescribed fire and the proximity to the large BCVI population with likely recruitment from the Balcones Canyonlands National Wildlife Refuge, this Unit's BCVI population should continue grow and flourish. Over the long term, this Unit offers Travis County the opportunity to expand available quality habitat and could become the site of the largest BCVI colony on the BCP.

Reimers Park has also become an area of interest for Travis County land managers. Since a wildfire swept through much of the park in 2011, areas have become, at least visually, excellent habitat. A rotation of annual prescribed fires has maintained many acres of potential habitat. Nearly every season, following the 2011 wildfire, at least one male BCVI has been detected – but rarely did they stay and establish territories. In 2019, one male was the first to establish a territory although it appeared unpaired. Although BCVIs were detected on occasion before 2020 with an occasional territory being established, 2020 marked the first paired territories (2) with one producing at least one HY, a first for this park. In 2021 and 2022, abundance, territories and productivity continued to grow, indicating that the area is becoming more suitable. 2023 was slightly less active with a drop in abundance (-3) and numbers of territories (-2), however for the third straight year at least one nest was successful. It is conceivable that Reimers Park could soon rival any of the Travis County BCP core areas for the largest colony and will continue to be monitored.

What drives changes in BCVI numbers and territory establishment is unclear, but regional population fluctuations, climate, changes in migration patterns through the area, declining connectivity, and changes in quality of habitat are likely factors. The Preserve's location on the far eastern edge of BCVI range also contributes to overall

population trends. Regardless, a variety of active habitat restoration measures should benefit this species on Travis County-managed properties.

Several factors may influence territory distribution, including the intrinsic habitat characteristics of the site, the age structure of the population, overall population density, and habitat restoration activities in protected areas (Grzybowski *et al*. 1994; Anderson and Gutzwiller 1996). Territory establishment in 2023 occurred in the same general core areas on the Jollyville Unit as in previous years (Travis County 2001-2022). Although the same areas are being utilized, often by returning males, the distribution of BCVI territories on the Jollyville Unit has changed each year. Similarly, habitat utilization and territory establishment has become repetitive on Kotrla and Reimers Park. Ribelin had displayed similar use until 2022 but for unknown reasons the power line easement was unoccupied for the second season. As with most years, a unique solo male will pop up and establish a territory in an altogether new area or one not utilized for a period. Examples of these areas include the Steiner and Lucas tracts.

One entirely new tract (non-BCP) is Pace Bend Park where for the first time on record a successful territory was established and produced young. This County-managed Park has had a recent history of prescribed burning where apparent habitat has been created. Based on initial surveys, it is feasible that a population of BCVIs becomes established. It is worth mentioning that much of the park has been under-utilized by the public and has become wilder. This is likely to change in 2024 with plans to increase public use.

In general, BCVIs tend to be “semi-colonial” and establish territories near other BCVIs (Ward and Schlossberg 2001). However, isolated territories composed of either individual pairs or small clusters have occasionally been located (Grzybowski 1990). 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. Understandably, these isolated unique territories might have low detection rates, even in areas where presence/absence surveys are conducted, thus, affecting abundance estimates.

Habitat loss and degradation is a primary concern for BCVI recruitment onto Travis County BCP properties. 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, dominated primarily by encroaching Ashe juniper, reduced canopy openings. Additionally, the successional change in vegetation structure tends towards closed canopy woodlands, rather than the low, shrubby, mid-successional stage preferred by BCVIs. Through mechanical efforts of BCVI habitat restoration, significant portions of the Jollyville Unit HMA still show characteristics of prime BCVI habitat. However, portions are beginning to grow out of optimal habitat and may have contributed to the decline in BCVI numbers. Several areas that were common to have BCVI territories have become less utilized and likely will need increased habitat manipulation.

All the 2023 BCVI territories on the Jollyville Unit and the Kotrla Unit were established primarily in previously manipulated areas which may be considered “restored”. This has been the observed trend since 2006. In the case of the Kotrla Unit, previous owners manipulated the uplands to improve grazing, which eventually modified the habitat into the shrub land that Travis County now manages for BCVI. These observations indicate that BCVIs continue to respond positively to habitat restoration efforts undertaken in the past. It should be noted, however, that not all areas of apparently restored habitat have been reoccupied. There are some areas that have been occupied in the past that appear to have enough suitable habitat for additional territories.

Travis County is committed to continued research and monitoring of BCVI, particularly on the Jollyville and Kotrla Units, to determine whether they, or any other colony, is a source population or a population sink. Source populations contribute to the general overall population and help to maintain satellite colonies. Population sinks are maintained solely through immigration and contribute nothing to species-wide abundance (Pulliam 1988). Data obtained from continued banding efforts will improve estimates of inter-population connectivity as well as age-specific survival and reproduction. If adequate connectivity with neighboring sub-populations is not maintained, then BCVI numbers on isolated preserve tracts may decline precipitously, leading to local extinctions and deficient levels of colonization. Information regarding productivity and dispersal is limited because it is difficult and slow to obtain. The addition of nestling banding in 2023 on both Travis County and City of Austin should provide new insight. Additional survey seasons and continued research will help gauge the effectiveness of habitat restoration projects and prioritize sites for future restoration. Without comprehensive productivity, survivorship, and dispersal information, as well as complimentary data from surrounding properties, we cannot

make a definitive statement regarding the role of the BCP within the central Texas portion of the BCVI's range.

Travis County will continue to conduct intensive BCVI monitoring, including annual color-banding. Such research could help address many questions concerning the long-term viability of any of the larger colonies and their relationship to other sub-populations in the region. The long-term data sets generated from such studies would facilitate yearly comparisons and improve the accuracy of model-generated population forecasts. Data collected will continue to include the following: abundance, age structure, dispersal patterns, distribution of subpopulations, habitat associations throughout the breeding season, nest success, recruitment, return rates and age-specific measures of productivity and survivorship. Future research should be focused upon answering questions of immediate relevance to management and continued recovery priorities.

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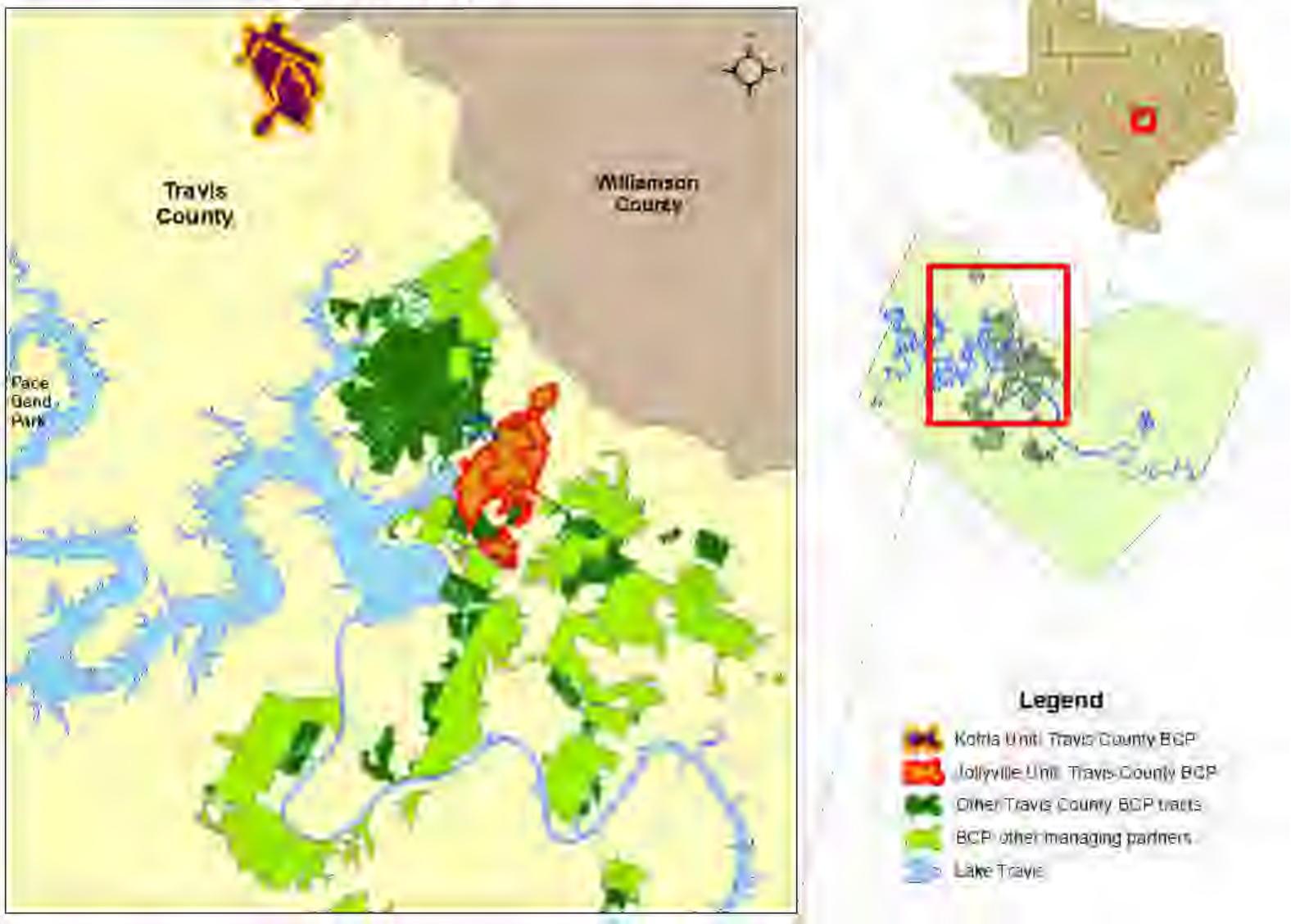
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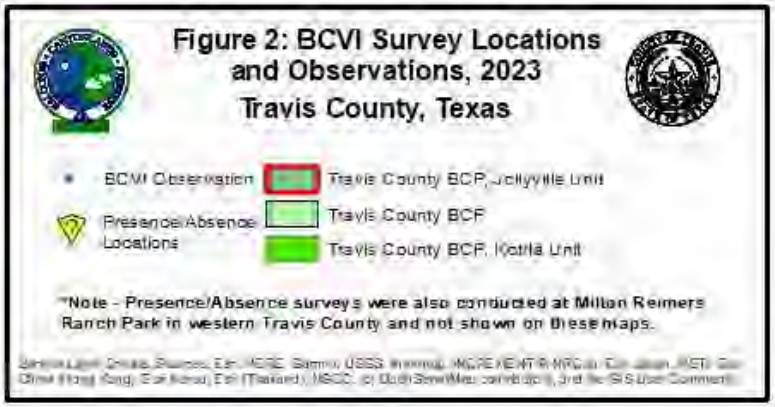
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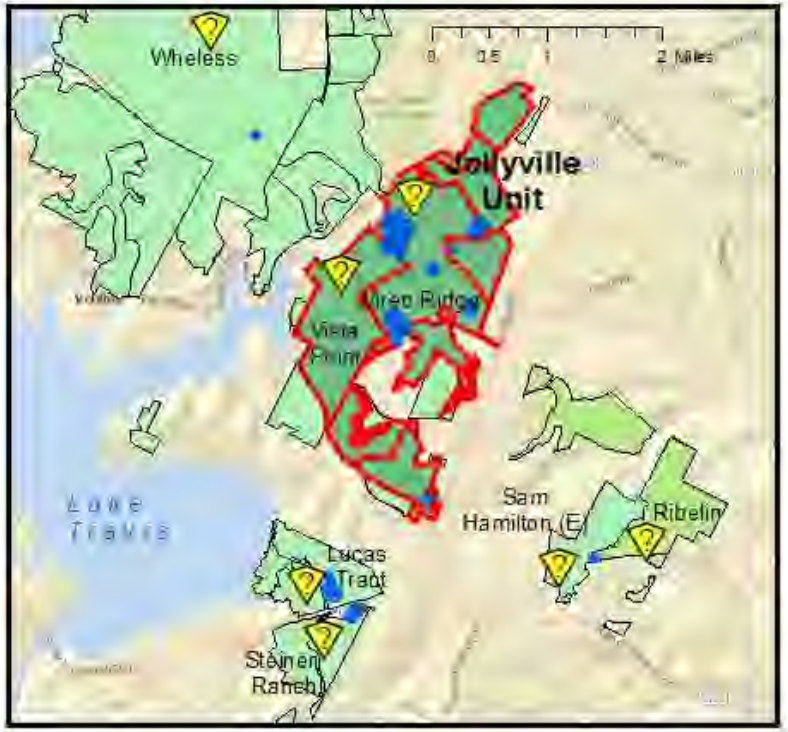
Figure 1: Balcones Canyonlands Preserve Location Map
Travis County, TX.

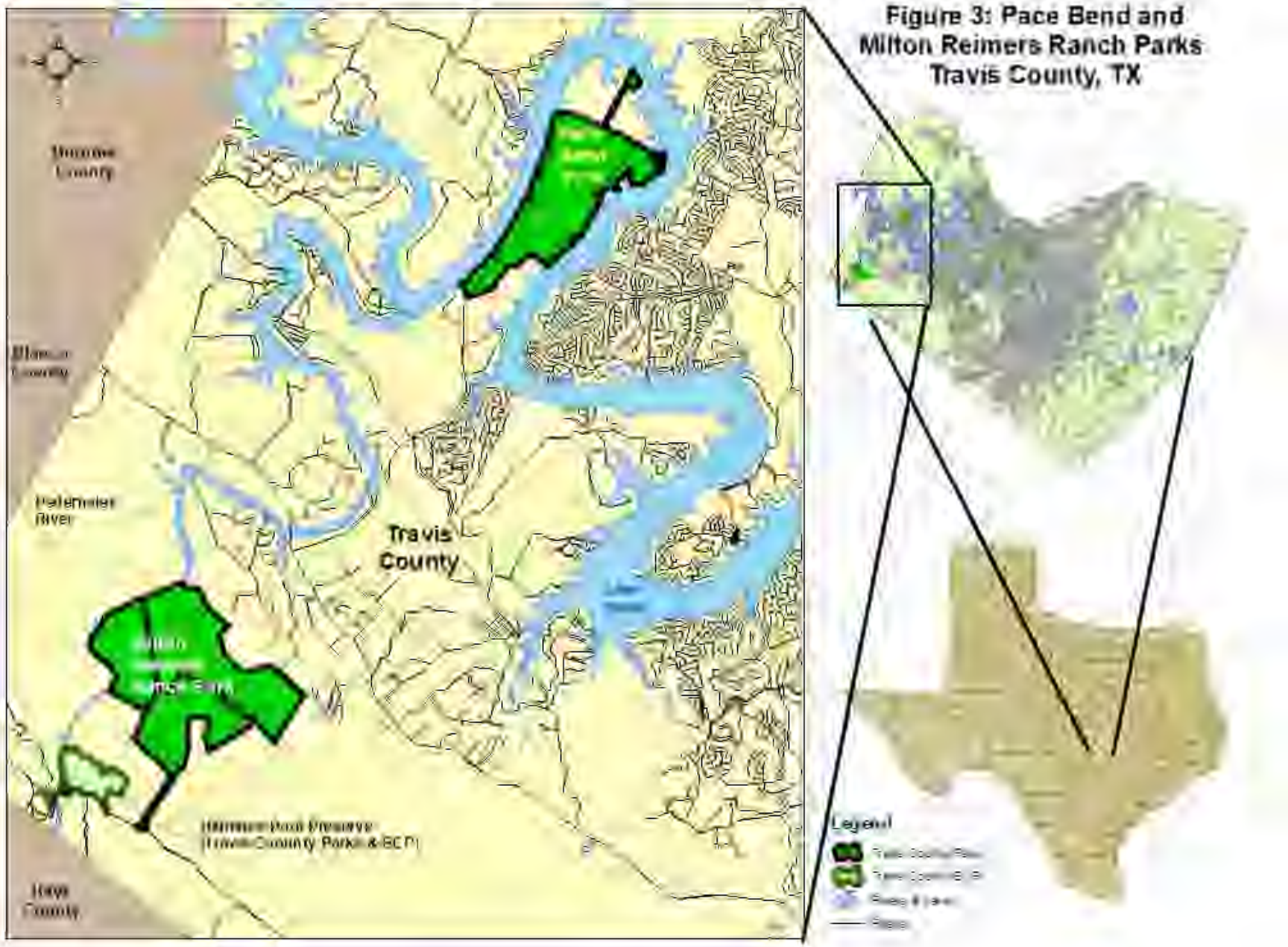


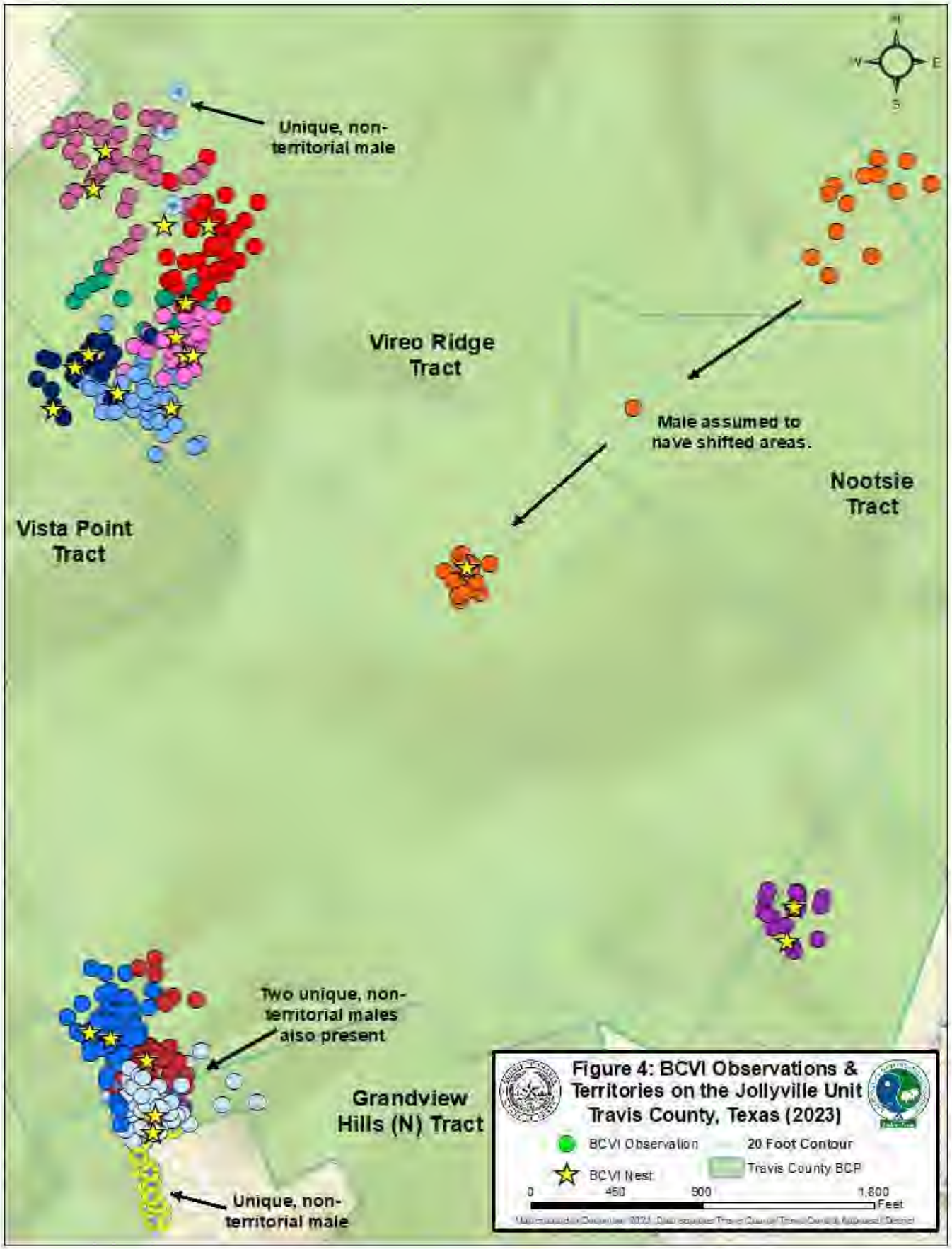

Figure 2: BCVI Survey Locations and Observations, 2023
Travis County, Texas
BCVI Observation
Presence/Absence Locations
Travis County BCP, Jollyville Unit
Travis County BCP
Travis County BCP, Kotrla Unit
*Note - Presence/Absence surveys were also conducted at Milton Reimers Ranch Park in western Travis County and not shown on these maps.

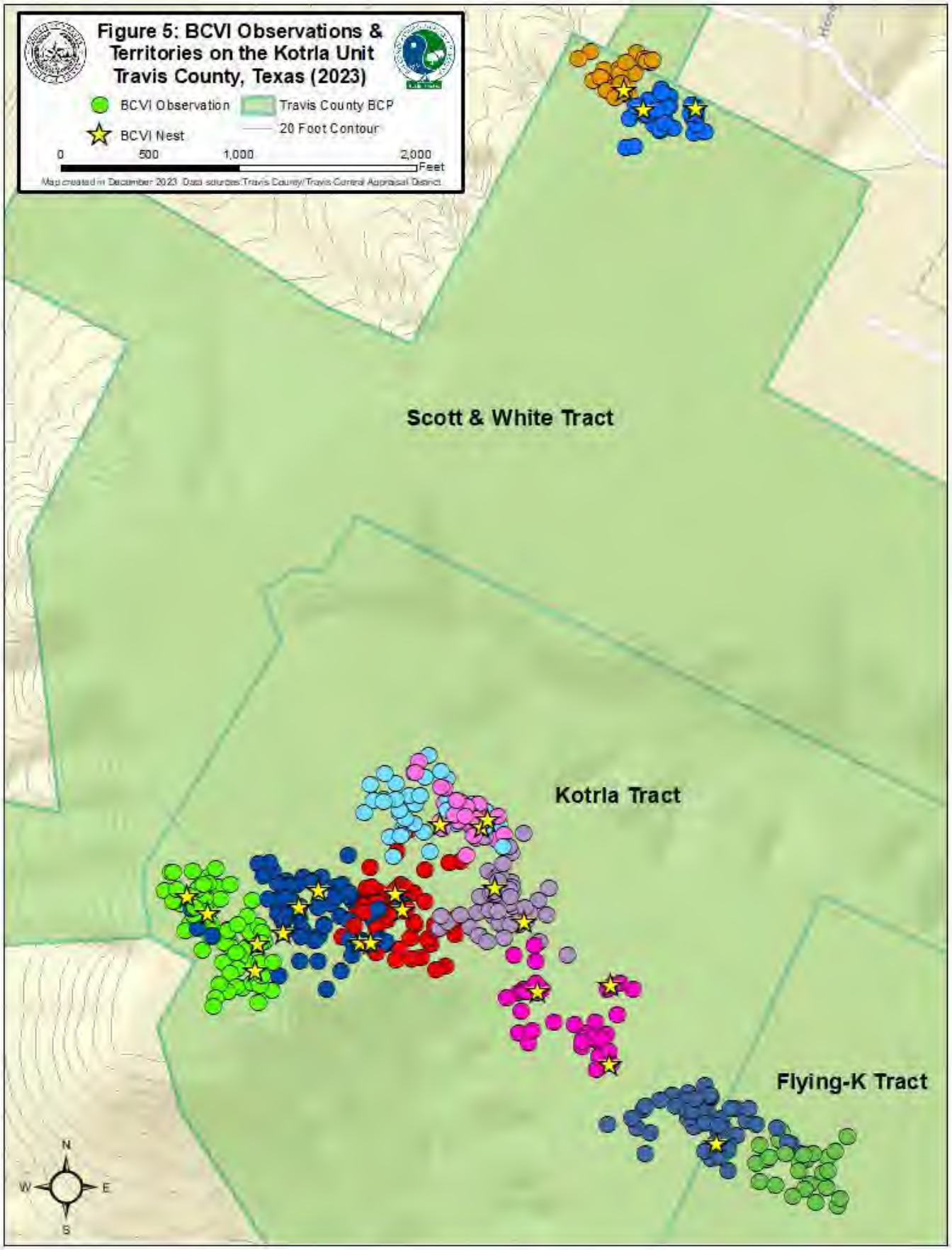

Williamson County
Travis County
Kotrla Unit
0 0.325 0.65 1.3 Miles

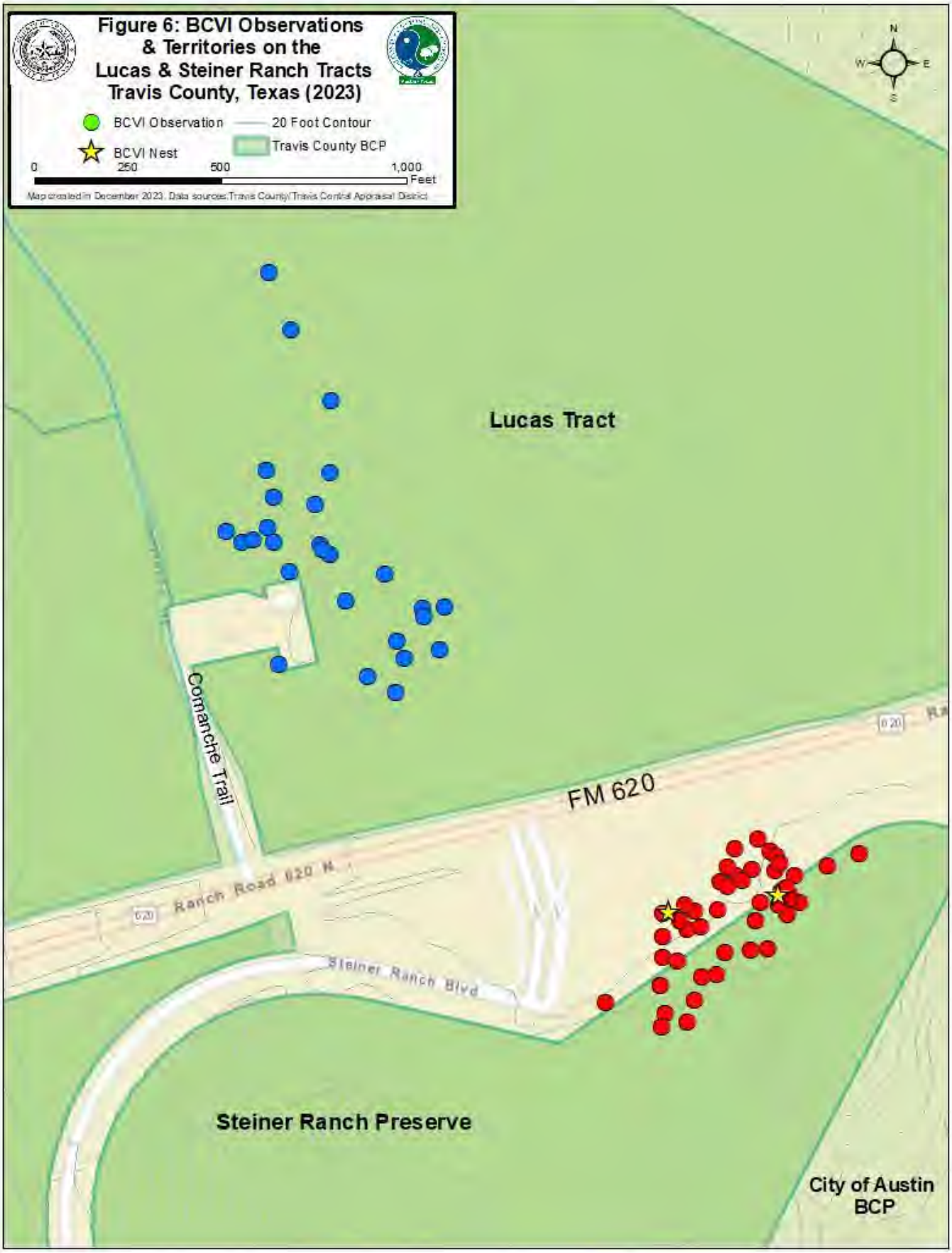

Jonestown
Lago Vista
Lakeway
0 1.5 3 6 Miles


Wheless
Jollyville Unit
Vista Point
Lake Travis
Lucas Tract
Steiner Ranch
Sam Hamilton (E.)
Ribelin
0 0.5 1 2 Miles


Figure 3: Pace Bend and
Milton Reimers Ranch Parks
Travis County, TX
Travis
County
Legend


N
W
E
S
Unique, non-territorial male
Vireo Ridge Tract
Male assumed to have shifted areas.
Nootsie Tract
Vista Point Tract
Two unique, non-territorial males also present
Grandview Hills (N) Tract
Unique, non-territorial male
Figure 4: BCVI Observations & Territories on the Jollyville Unit
Travis County, Texas (2023)
BCVI Observation
BCVI Nest
20 Foot Contour
Travis County BCP
0
450
900
1,800
Feet


Figure 5: BCVI Observations & Territories on the Kotrla Unit Travis County, Texas (2023)
BCVI Observation
BCVI Nest
Travis County BCP
20 Foot Contour
0
500
1,000
2,000
Feet
Map created in December 2023. Data sources: Travis County/Travis Central Appraisal District
Scott & White Tract
Kotrla Tract
Flying-K Tract
N
W
E
S


Figure 6: BCVI Observations
& Territories on the
Lucas & Steiner Ranch Tracts
Travis County, Texas (2023)
BCVI Observation
20 Foot Contour
BCVI Nest
Travis County BCP
0
250
500
1,000
Feet
Map created in December 2023. Data sources: Travis County/Travis Central Appraisal District
N
W
E
S
Lucas Tract
Comanche Trail
FM 620
620
Ranch Road 620 N
Steiner Ranch Blvd
Steiner Ranch Preserve
City of Austin
BCP

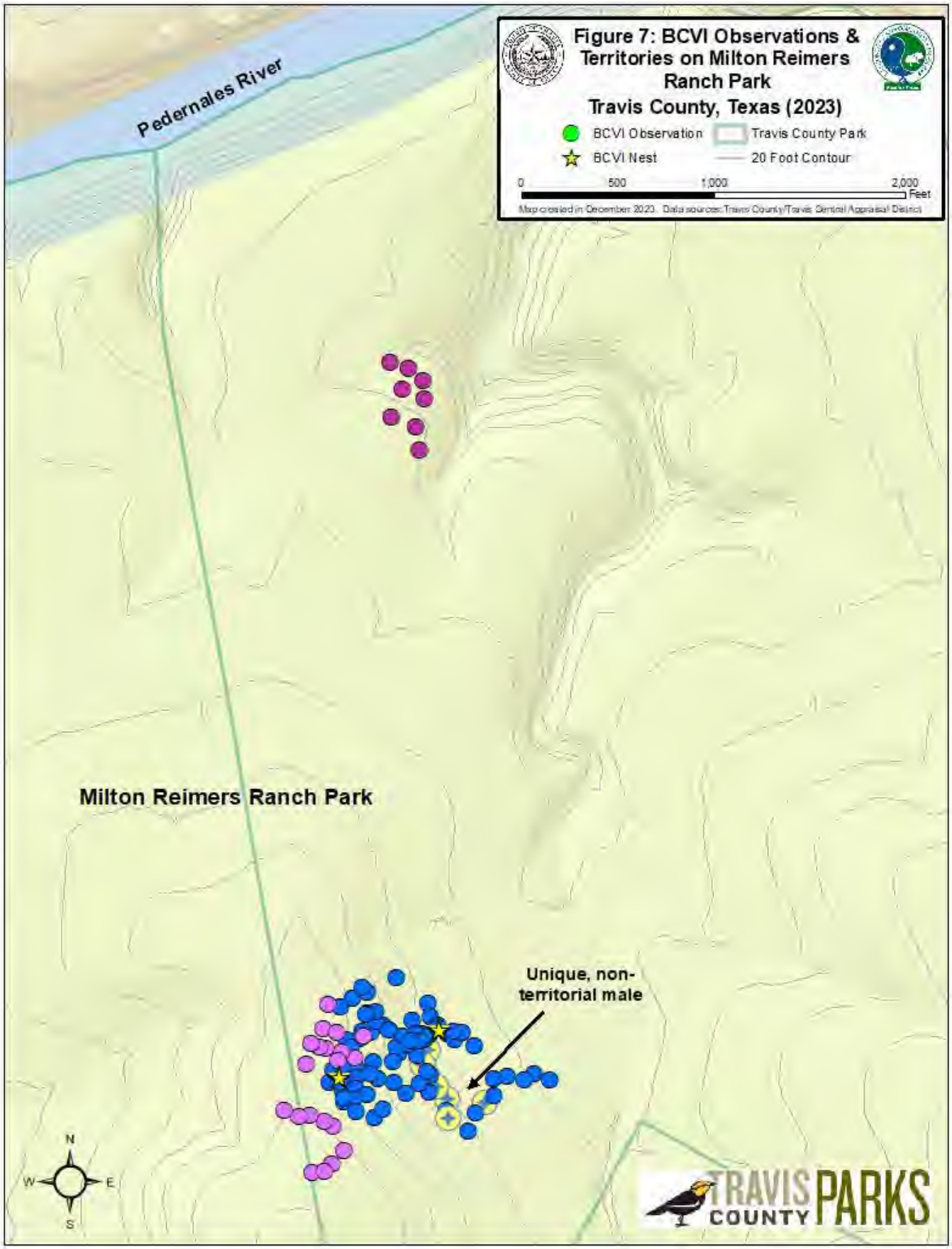

Figure 7: BCVI Observations & Territories on Milton Reimers Ranch Park
Travis County, Texas (2023)
BCVI Observation
BCVI Nest
Travis County Park
20 Foot Contour
0
500
1,000
2,000
Feet
Map created in December 2023. Data sources: Travis County/Travis Central Appraisal District
Pedernales River
Milton Reimers Ranch Park
Unique, non-territorial male
N
W
E
S
TRAVIS COUNTY PARKS


Figure 8: BCVI Observations & Territory on Pace Bend Park
Travis County, Texas (2023)
BCVI Observation
BCVI Nest
Travis County Park
20 Foot Contour
0
550
1,100
2,200
Feet
Map created in December 2023. Data sources: Travis County/Travis Central Appraisal District
Lake Travis
Gracy Cove
Pace Bend Park
Lake Travis
TRAVIS COUNTY PARKS
N
W
E
S