

**FY 2011 Report on Monitoring and Management
of the Black-capped Vireo (*Vireo atricapilla*)
on Travis County's Balcones Canyonlands Preserve**



Photo: Black-capped vireo, Vireo Ridge Tract (Bret Whitney)

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Department of Transportation and Natural Resources
Natural Resources & Environmental Quality Division**



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INTRODUCTION

In the United States and Canada, 448 native bird species breed in terrestrial habitats (Rich et al. 2004). 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 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; Grzybowski et al. 1994; Grzybowski 1995, Oklahoma Dept. of Wildlife Cons. 1999; U.S. Fish and Wildlife Service 1991). Between 1996 and 2005, BCVI populations in Texas have been reported in only 38 south-central and central 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 1996a). 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 (USFWS 1996b). 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 2,000 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 1996c). Currently, Travis County manages 7,339 acres designated part of the BCP.

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 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 2011 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 2011 breeding season, BCVI territory surveys were conducted in two locations (Figure 2). The primary site is located on the Jollyville Unit, which is owned and managed by Travis County and part of the Cypress Creek Macrosite of the BCP. The second site is on

the Lake Travis Bluffs subsection of the Lucas tract, which is owned and managed by Travis County and part of the Cypress Creek Macrosite of the BCP.

The Jollyville Unit is comprised of 1,875 acres (759 ha) and includes the following tracts: Buntan, Collins, Cuevas, Cuevas East, Grandview Hills, Nootsie, Snowden, Vireo Ridge, and Vista Point (Figure 2). The Jollyville Unit is located approximately 13 miles (21 km) northwest of downtown Austin. Both golden-cheeked warbler (*Setophaga chrysoparia*, hereafter GCWA) 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 that riparian soils in these drainages are composed primarily of soils of the 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 much the uplands and slopes. Open grasslands are found in some valleys and ridge tops, and riparian vegetation, which is dominated by black walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*) and elms (*Ulmus spp.*), occupies riparian areas along creeks and drainages.

The Lucas tract (Figure 2), which includes the Lake Travis Bluffs subsection, totals 297 acres (120 ha) located approximately 1.5 miles (2.4 km) northeast of Mansfield Dam that impounds Lake Travis (Colorado River). Primary access points are either on RM 620, which bounds the property to the south, or Comanche Trail, which bisects the property into eastern and western sections. GCWA inhabits this tract as well as the Bone Cave harvestman (*Texalla reyesi*) and the Tooth Cave spider (*Neoleptoneta myopica*), both federally-listed endangered invertebrates. The Lucas tract is part Lake Travis Unit of the Cypress Creek Macrosite.

Topography includes upland plateaus, steep slopes and ravines. Ravines drain directly into Lake Travis on the western portions of the property and into Bullick Hollow Creek, a tributary of Lake Travis, on the eastern portion. The Travis County soil survey defines the surface soil types as part of the Brackett Association (USDA 1974). The uplands are dotted with karst features, including caves and sinks.

Vegetation types found on the Lucas tract contain closed canopy oak-juniper (*Quercus sp.-Juniperus ashei*) woodlands, which cover the majority of the uplands, slopes and canyons.

Riparian vegetation, dominated by black walnut (*Juglans nigra*) and elms (*Ulmus* spp.), occupies riparian areas along drainages. Prior to Travis County ownership, small portions of this tract were cleared for livestock pens and hunting lanes. Malta starthistle (*Centaurea melitensis*), Chinaberry (*Melia azedarach*) and Roosevelt weed (*Baccharis neglecta*) are common in these disturbed areas. The Lake Travis Bluffs section, acquired in 2011, is an 18.5 acre parcel that was previously cleared for development. Subsequently, most of the entire area has grown into excellent BCVI habitat dominated by shin oak (*Quercus sinuata*), sumacs (*Rhus* spp.) and Texas redbuds (*Cercis canadensis*).

WEATHER

Beginning in October 2010 and continuing through September 2011, most of Texas experienced a record drought. This drought, the most intense one-year period since 1895 (when statewide climactic records were first recorded), was punctuated by an extremely dry spring and summer. March 2011 ranked the driest month of March on record. This resulted in most of Texas, including Central Texas, to be classified under “Exceptional Drought Conditions” or a D4 drought by September 2011. Some areas would even have ranked higher if the U.S. Drought Monitor range was extended past D4. In addition to being dry, it was also the hottest summer on record with average temperatures from June through August over 2° F above the previous Texas record (Nielsen-Gammon 2011).

The effects of this drought depleted water from creeks, streams and reservoirs. Widespread tree and vegetation die-offs were observed resulting in a record fire season in Texas. The cumulative damage on native plant and animal species is unknown and may not be understood for some time.

HABITAT RESTORATION

Beginning in FY2001, and continuing every winter thereafter, Travis County has conducted BCVI habitat restoration within BCVI Habitat Management Areas (HMAs) (Figure 3). These HMAs are located within Travis County BCP lands and they have been designated as having the potential to be restored to BCVI habitat. HMA locations are targeted based on known historic vireo occupancy and soil and vegetative components necessary for vireo habitat. More HMAs will be developed as additional land with restoration potential is acquired. In FY11, new HMAs were established primarily on the New Life (Cypress Creek HMA) and Richards tracts (Figure 3).

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. The following woody species benefit from Ashe juniper removal: shin oaks, possumhaw (*Ilex decidua*), yaupon (*Ilex vomitoria*), Texas redbud, wafer-ash (*Ptelea trifoliata*), Carolina buckthorn (*Frangula caroliniana*) and sumacs. Several sections of habitat, 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 three to five years following initial habitat manipulation.

In the winter (January/February) of 2011, approximately 7.3 acres (3.0 ha) on the Lucas tract (Figure 3) were mechanically manipulated; this action increased the cumulative total of restored habitat on Travis County managed lands to approximately 136.8 acres (55.4 ha). Additionally, previously manipulated areas on the Ribelin tract were selectively hand-cleared with cuttings mulched on site. This hand-cleared area is located in and adjacent to occupied BCVI habitat. 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 initial larger scale brush removal. Other locations being considered for targeted habitat restoration in the future include areas on the Lucas, Ribelin, New Life and Cuevas East tracts due to their history of occupancy and proximity to currently occupied habitat (Figure 2).

Restoration activities 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 BCVIs during the preceding breeding season, presence of occupied golden-cheeked warbler habitat, diversity of desired woody species, and available budget. 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 2011,

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 1:3,000 or less. 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 (ESRI, Inc., Redlands, CA) geodatabase with the Texas State Plane (with NAD 1983 projection) coordinate system. All males encountered were assigned a unique number (“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.

Territory mapping methods generally followed International Bird Census Committee (IBCC) guidelines (1970). Bibby’s (2000) “consecutive flush” method 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 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 particular 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.” 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. If any of the criteria for pairing success was met or if a male was observed in the same general location on at least three different occasions with at least a week between observations, it was considered to have established a breeding territory.

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. 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.

In addition to the territory mapping work conducted on the Jollyville Unit and the lake Travis Bluffs section of the Lucas tract (Lake Travis Unit), presence/absence surveys were conducted at the following eight additional sites: 1) a portion of Vireo Ridge (Jollyville Unit) referred to as “35 acres” that had been restored in both 2006 and 2007; 2) the east-west running ridge of the Vista Point tract (Jollyville Unit), referred to as “Coffee Cup Ridge” that was restored in 2008; 3) an area on the Ribelin tract that was occupied by a BCVI in 2009; 4) areas along a power line easement on the Ribelin tract that were restored in 2009 and 2010; 5 and 6) two previously restored areas in the Steiner Ranch Preserve; 7) a previously occupied area in 2009 and 2010 on the Cuevas East tract; and 8) an area on the New Life tract that was occupied in 2007 prior to County ownership (Figure 2). Survey efforts on the Ribelin tract actually exceeded what is required by the protocol as a result of the site being located on a GCWA survey plot. Subsequently, this location was visited 10 times throughout the breeding season.

BCVIs were surveyed for a total of 131 hours from March 25 (first detection) to September 2, 2011 (last detection). Data can be interpreted as a comprehensive census due to the relatively large amount of time spent monitoring these birds. However, due to limited survey effort, results from other County-managed tracts should be interpreted merely as a baseline estimate of abundance (Verner 1985).

Banding

In an effort 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, Travis County staff updates and shares data, including banded bird resightings and nest locations in an effort to coordinate banding attempts. Travis County intends to continue the BCVI banding program initiated by this project.

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 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 one week (i.e. six days between observations). In calculating territory number, all BCVI territories, whether they were observed entirely or partially on Travis County managed 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. The breeding success rate is the proportion of full territories that successfully fledged young (Koloszar and Becker 2000).

RESULTS

In 2011, BCVI abundance on all Travis County BCP tracts totaled 10 males (Figures 4 and 5). Nine males were observed on the Jollyville Unit and one was observed on the Lake Travis Unit. Nine males established territories, and all of these territories were located in areas where habitat restoration had previously occurred (Figures 4 and 5). No BCVI territories were established in entirely new areas on the Jollyville Unit. One territory was established on the Lake Travis Bluffs section of the Lucas tract on the lake Travis Unit. BCVIs were not detected in any of the areas surveyed for presence/absence. Table 1 presents a summary of BCVI data collected during the 2011 breeding season in addition to data collected by various agencies exclusively on the Jollyville Unit since 1989.

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

| Year Surveyed | Agency** | Abundance | No. Territories |
|---------------|-------------------|----------------------|-----------------|
| 1989 | DLS | 11 | 5 |
| 1990 | DLS | 11 | 5 |
| 1991 | DLS | 14 | 9 |
| 1992 | TXDOT | Unknown ¹ | Unknown |
| 1993 | TXDOT | 25 | 20 |
| 1994 | TXDOT | 27 | 27 |
| 1995 | TXDOT | 23 | 23 |
| 1996 | SWCA | 19-22 | 15 |
| 1997 | No Data | Unknown ¹ | Unknown |
| 1998 | No Data | Unknown | Unknown |
| 1999 | No Data | Unknown | Unknown |
| 2000 | SWCA | 3 ² | 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 |
| 2009 | Travis County TNR | 13 ³ | 11 |
| 2010 | Travis County TNR | 13 | 11 |
| 2011 | Travis County TNR | 9 | 8 |

*Study area is only referred to as “Jollyville Unit” since 2001. ** See Literature Cited for appropriate report citation.

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).

In 2011, all nine territories were considered successfully paired (Table 2). Only four territories fledged offspring, yielding at least 11 ‘hatch year’ (HY) individuals observed in the field. Productivity in 2011 (Table 3), whether measured relative to successful territories (2.8 HY per terr.) or all territories (1.0 HY per terr.), is probably underestimated due to the low number of nests located prior to fledging. 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.

Table 2. Abundance, territory number, and pairing success for BCVIs (*Vireo atricapilla*) on Jollyville Unit, Travis County, Texas, March-September 2001-2011.

| 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 | 127.5 | 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 |
| Year | Total Hours Surveyed | Abundance | No. Territories | Successfully Paired | Pair Success Rate (%) |
| 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 |

^a Adjusted values to reflect BCVI found only on the Jollyville Unit.

^b Total hours surveyed for 2003 could not be verified and may be overestimated.

^c The male located at Lake Perspectives (Lake Travis Unit) was not included in this dataset.

^d The male located at Lucas-lake Travis Bluffs (Lake Travis Unit) was not included in this dataset.

Table 3. Breeding success and productivity for BCVI (*Vireo atricapilla*) territories on Jollyville Unit, Travis County, Texas, March-September 2001-2011.

| Year | No. of territories with breeding success ¹ | Breeding success rate (%) | No. Fledglings | No. fledglings/ successful territory ² | No. fledglings/ total no. territories ³ |
|------|---|---------------------------|----------------|---|--|
| 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 |
| 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 |

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

² Represents the average number of fledgling from territories with breeding success.

³ Represents the average number of fledgling from all successfully paired territories.

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

A total of 11 2011 season BCVI nests were located this year. Two additional nests, one each from the 2009 and 2010 breeding seasons were also discovered that were not found previously. Detailed data regarding nest substrate, height, and orientation were collected post breeding season for each nest found (Table 4). Table 5 lists the nest substrates and outcome for each nest identified. Four nests were second attempts with one following a successful nest. Of the 11 nests located, three (27.3%) successfully fledged at least one young.

A total of eight (72.7%) nests failed either due to predation (n=2, 28.6%), cowbird (*Molothrus sp.*) parasitism (n=2, 28.6%) or were abandoned/fate unknown (n=4, 36.4%). One parasitized nest was discovered with a cowbird egg in it, and then later discovered torn down (either from predation or possibly cowbird activity). This nest had already been abandoned. The second parasitized nest was discovered empty with two damaged BCVI eggs (one still in the nest) as well as a cowbird egg located on the ground (along with the second BCVI egg). One nest that was abandoned contained two eggs. Interestingly, the male was observed sitting on these eggs approximately two weeks past the likely hatch time (14-17 days). One individual HY was observed where no nest was located and monitored.

Table 4. Features of all BCVI nests located on Travis County BCP lands in 2011.

| ID# | Substrate(s) | Primary substrate height (m) | Concealment | Nest height (cm) | Distance from stem (cm) | Distance from foliar edge (cm) | Orientation | Comments |
|-----|---|------------------------------|--|------------------|-------------------------|--------------------------------|--------------|----------------------------------|
| 1 | Shin oak | 2.5 | Shin oak | 100 | 53 | 34 | North | Failed in egg stage |
| | (<i>Quercus sinuate</i>) | | Ashe juniper (<i>Juniperus Ashei</i>) Wafer ash (<i>Ptelea trifoliata</i>) | | | | | |
| 1b | Texas oak | 2.5 | Shin oak | 82 | 55 | 24 | East | Failed in egg stage; parasitized |
| | (<i>Q. buckleyi</i>) | | Greenbrier (<i>Smilax bona-nox</i>) False indigo (<i>Amorpha fruticosa</i>) | | | | | |
| 3 | Texas redbud (<i>Cercis canadensis</i>) | 2.1 | Texas redbud | 117 | 27 | 24 | Northeast | Failed in egg stage; parasitized |
| 7 | Evergreen sumac <i>Rhus virens</i> | 2.0 | Ashe juniper Shin oak | 84 | 37 | 22 | n/a (center) | Successful; (4 HY) |
| 8 | Texas oak | 4.0 | Texas oak | 134 | 117 | 29 | Southeast | Failed; stage unknown |
| 8b | Youpon (<i>Ilex Vomitoria</i>) | 2.5 | Shin oak | 50 | 63 | 1518 | East | Successful; (2 HY) |

| ID# | Substrate(s) | Primary substrate height (m) | Concealment | Nest height (cm) | Distance from stem (cm) | Distance from foliar edge (cm) | Orientation | Comments |
|-----|---|------------------------------|--|------------------|-------------------------|--------------------------------|-------------|--|
| 9 | Live oak (<i>Q. virginiana</i>) | 1.4 | Shin oak | 57 | 48 | 16 | Northeast | Successful; (4 HY) |
| 9b | Carolina buckthorn (<i>Frangula caroliniana</i>) | 1.4 | Ashe juniper | 75 | 21 | 13 | Southeast | Failed; stage unknown |
| 12 | Texas redbud | 3.5 | Little bluestem (<i>Schizachyrium scoparium</i>) | 60 | 50 | 45 | Northwest | Failed; stage unknown |
| 12b | Texas oak | 4.0 | Wafer ash | 60 | 41 | 55 | Northwest | Failed; Possible infertile egg |
| 14 | Carolina buckthorn | 3.0 | Gum bumelia (<i>Sideroxylon lanuginosum</i>) Ashe juniper | 143 | 67 | 13 | West | Failed in egg stage |
| n/a | Wafer ash | 1.3 | Texas persimmon (<i>Diosperos texana</i>) | 69 | 25 | 28 | North | Fate unknown, presumed failed (2010) |
| n/a | Carolina buckthorn | 1.5 | Possumhaw (<i>Ilex decidua</i>) Skunkbush (<i>Rhus aromatica</i>) | 31 | 115 | 27 | West | Fate unknown, presumed failed (2009) |

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: compass direction of nest relative to its substrate.

Table 5. Chronologic nest data for BCVI (*Vireo atricapilla*) territories on Jollyville Unit, Travis County, Texas, March-September 2011.

| 1 st nest substrate | Result | 2 nd nest located | 2 nd nest substrate | Result |
|--------------------------------|-----------------------------------|------------------------------|--------------------------------|--|
| Shin oak | nest predated in egg stage | yes | Texas oak | Predated and/or parasitized; failed. Third nest never discovered, however was deemed successful with at least one HY observed. |
| Texas redbud | Failed in egg stage - parasitized | no | n/a | n/a |
| Evergreen sumac | Successful nest, 4 HYS | no | n/a | n/a |
| Texas oak | Failed; stage unknown | yes | Yaupon | Successful nest, 2 HYS |
| Live oak | Successful nest, 4 HYS | yes | Carolina buckthorn | Failed; stage unknown |
| Texas redbud | Failed; stage unknown | yes | Texas oak | Failed/abandoned |
| Carolina buckthorn | Failed in egg stage | no | n/a | n/a |

In all, a total of five individual adult BCVIs wearing color bands were observed on Travis County properties in 2011. Two BCVIs were returning males (banded in 2008) and one was a returning female (banded in 2009, not seen in 2010). An adult male, one adult female and one HY BCVI were banded in the 2011 field season. Adult males showed a 25% return rate (two of eight banded birds observed in 2010). The two returning males occupied the same territories they held in 2009 and 2010. There were no banded females observed in 2010, so female return rate could not be calculated. Nestlings were not banded due to permit restrictions.

DISCUSSION

Both overall abundance and the number of territories marked the lowest numbers since BCVIs have been managed by Travis County (2001, Table 1). The cause of the drop in BCVI numbers is unclear, but normal population fluctuations as well as the prolonged drought both could be factors. Of the 19 (68.4%) adult BCVIs banded prior to 2011 (2008-2010), 89.5 (17 of 19) of these males would be four (4Y) or after fourth year (A4Y) adults in 2011. The average lifespan of the BCVI is five to six years (Graber 1961) indicating a relatively older group in this data set. Interestingly, of the two returning males, the first, referred to as “Dos” was at least 6 years old (A5Y) and “Celt”, the second returning male was a 5Y.

Pairing success has stayed at 100% for the third straight year and marked the fifth straight year of greater than 90% pair success. This may indicate that habitat patch size and landscape effects may not be having a negative impact on pairing success. Overall productivity was at its highest levels since 2008. Three successful nests were located and monitored, thus providing a definitive count of offspring. In one case a single fledgling was observed accompanying a male in a territory in which a nest had not been located. In that case the recorded number of offspring is conservative. Additional territories may have produced young and were not detected which results in underestimated productivity numbers. Survey effort may also have an impact. The amount of survey hours in 2011 was less than 2010. This reduced effort was primarily due to the fewer number of territories being monitored. An increase in future survey effort could result in the location of additional nests and presumably yield more accurately assessed productivity values.

Territory establishment in 2011 occurred in the same general core areas on the Jollyville Unit as in previous years (Travis County 2001-2010). Although the same areas are being utilized, often by returning males (documented by resighting of banded birds), 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).

There was a somewhat unexpected addition of two territories in the preserve. One was the result of the County's purchase of the 18.5 acre Lake Travis Bluffs parcel that appeared to contain some high-quality habitat. Although the presence of any BCVI had not been previously documented, upon surveying this property for the first time, a pair of BCVI was found to have established a territory. The second, unexpected territory was established adjacent to the Grandview Hills neighborhood where residential development has mostly been completed. Although over the past decade two territories normally had been established at this location, a third territory was, unexpectedly, created for the first time since 2003 when a large portion of excellent habitat was destroyed for neighborhood expansion. It is worth noting that only one territory was documented in this location in 2010 causing some speculation that potential negative impacts resulting from the proximity to development had made this location less suitable and possibly eventually devoid of any BCVI territories.

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 dominated primarily by encroaching Ashe juniper reduced the openings in the deciduous cover; these openings are 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 mechanical efforts of BCVI habitat restoration, significant portions of the Jollyville Unit HMA now show characteristics of prime BCVI habitat.

All of the 2011 BCVI territories on the Jollyville Unit were established primarily in previously manipulated areas which may be considered “restored”. This has been the observed trend since 2006. These observations indicate that BCVIs continue to respond positively to habitat restoration efforts undertaken since 2001 where it appeared that the remaining BCVIs were shifting annually from lesser quality habitat into higher-quality restored areas. It should be noted, however, that large areas of apparently restored habitat still have not been reoccupied and other areas that, although have been occupied, appear to have enough space for additional territories. Countless factors influence territory establishment, but regional natural population fluctuations, declining amounts of suitable habitat, as well as the location of the preserve on the far eastern edge of BCVI range all must contribute to overall population trends. It is worth mentioning again that the 2011 historic drought likely negatively impacted the population. Clear impacts include decreased habitat suitability e.g., decreased invertebrate population or sparse vegetation cover, which in turn could affect reproductive success.

Prior to 2008 there was no banding program in place, precluding staff from determining return rates, recruitment and associated data. From 2003 to 2009 BCVI territory and abundance numbers slowly declined despite a period of growth in 2007 and 2008. This year, at least two ‘second year’ males, i.e. males in their first reproductive season, were recruited. With the fourth season of the banding program now complete, some light has been shed on this issue. The bulleted list below summarizes relevant demographic information:

- Proportion of SY males (pSY): In 2010, the pSY was 27.3% (three of 11 males). In 2011, the pSY was at least 20% (two of 10 males), although this number is conservative since at least three males were never successfully aged. This figure has been used as an estimate of recruitment. A minimum pSY value (29%) has been suggested as a measure of a stable population (USFWS 1996a).
- Site fidelity: In 2010, the return rate for adult males on the Jollyville unit was 70% (seven of 10 banded males). In 2011, however, only two of eight marked males (25%) returned, both to territories they have occupied continuously since 2008. In

addition, an adult female was resighted in the same habitat patch on the Grandview hills tract in which she had been banded in 2009. This female was not observed in 2010, therefore she is not considered in the calculation of annual return rates.

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. Thus, low detection rates of these isolated territories may affect estimates of abundance.

Generally it is assumed that males attempting to establish territories isolated from other BCVI territories in marginal habitat tend to be younger. In 2009, the banding program indicated two SY males settling in areas sufficiently isolated as to make countersong unlikely. Similarly, in 2011, one SY male established a lone territory, albeit in fairly high-quality habitat isolated from any other occupied areas. This is partly consistent with current theory which posits that older, more experienced and dominant males will hold and defend the same territories year after year presumably because of reproductive advantages attributed to higher quality habitat. It has also been found that younger males are forced to occupy habitat located on the fringes of established colonies (Grzybowski 1990). This was evident by the newly established third territory adjacent to the Grandview Hills area. This SY male was rarely detected and was only determined to be a unique territory based on the presence of one banded female and HYs associated with the other two adjacent territories. This male was banded in 2011.

Continued research and monitoring of BCVI on the Jollyville Unit is essential to determine whether the 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 would 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 and eventually lead to local extinctions. Information regarding productivity and dispersal is limited because it is difficult and slow to obtain. 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 Jollyville Unit within the central Texas portion of the BCVI's range.

RECOMMENDATIONS

- Continue to conduct intensive BCVI monitoring, including annual color-banding. Such research could help address many questions concerning the long-term viability of the Jollyville Unit colony and its 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 should 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. Research should be focused upon answering questions of immediate relevance to management and recovery priorities.
- Collect and compile age-specific survivorship and reproductive information for marked birds. This information may provide a more accurate picture of population dynamics in cases where field data is believed to be incomplete or biased (e.g. using mean values to account for number of HYs per nest rather than number of fledglings observed in the field).
- Continue to facilitate opportunities for graduate students to collect and analyze quantitative habitat and vegetation data in order to construct habitat suitability and dispersal models. Longitudinal studies are needed to compare the results of habitat restoration treatments over time. Ideally, such data would be collected in a GIS-compatible format and at a scale that would allow preserve-wide spatial analysis. Such analyses could improve our ability to locate existing areas of high quality habitat as well as areas with high potential for successful restoration. Additionally, further research is needed to better understand dynamics of vegetative succession and its relationship to BCVI habitat suitability and reproductive success in this region.
- Refine and standardize BCVI monitoring procedures, giving special attention to minimum hours of survey and nest searching needed. This is especially important 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 properties owned and managed by Travis County should be visited regularly 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 the best techniques for creating suitable BCVI breeding habitat.
- Create a more structured GCWA survey methodology for monitoring territories and productivity in both potential and managed BCVI habitat. Efforts should be made to document any co-occurrences of GCWA and BCVIs during the breeding season in order to investigate and evaluate the possibility of creating areas of mixed or composite habitat.
- Judicious use of recorded BCVI vocalizations should continue in accordance with USFWS protocols, especially in areas where few and/or isolated BCVIs have been detected. This recommendation is also useful to determine absence of a target species. 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.
- No BCVI nest attempts failed due to red imported fire ant (RIFA) predation in 2011. The prolonged drought decreased the amount of visible RIFA mounds in BCVI habitat during the 2011 season, however, control of this nuisance species should continue within restored BCVI habitat areas as soon as the weather allows RIFA to be reestablished.

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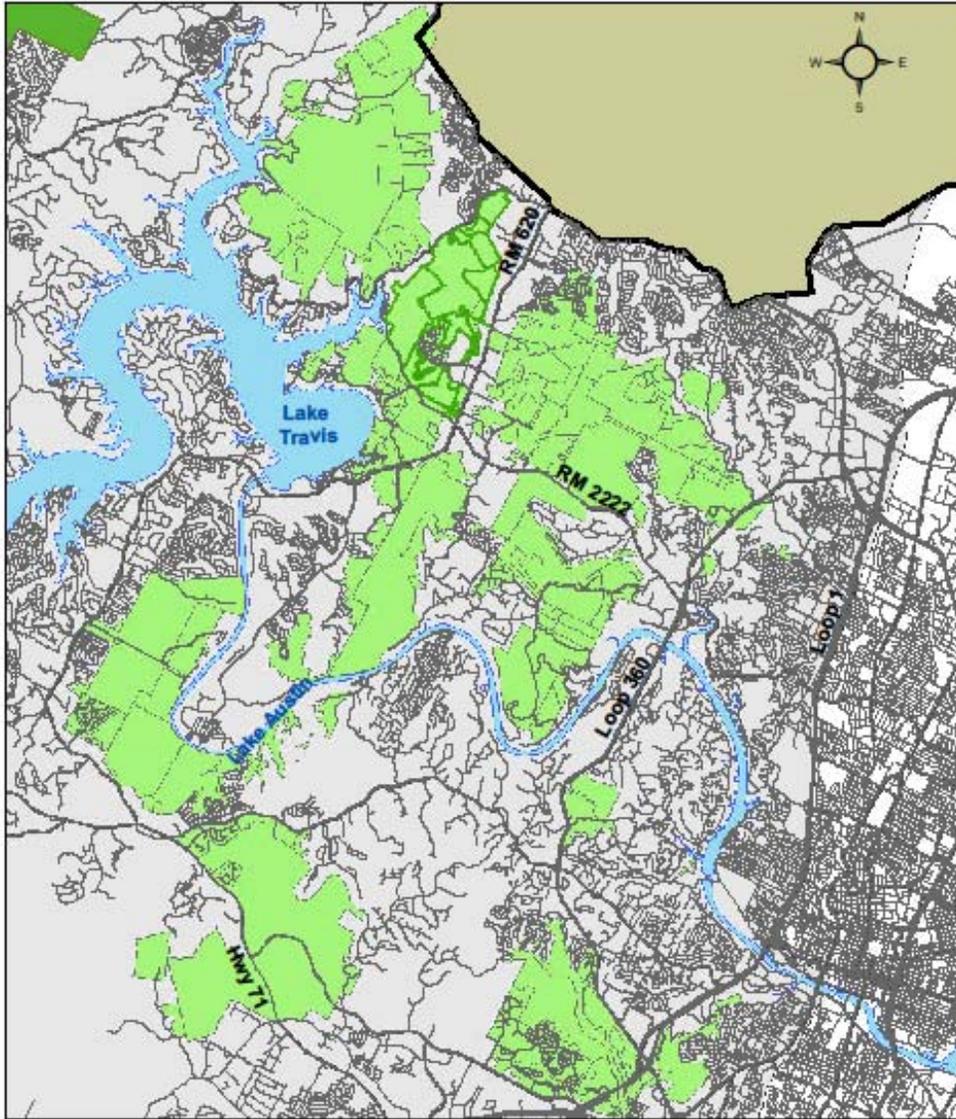
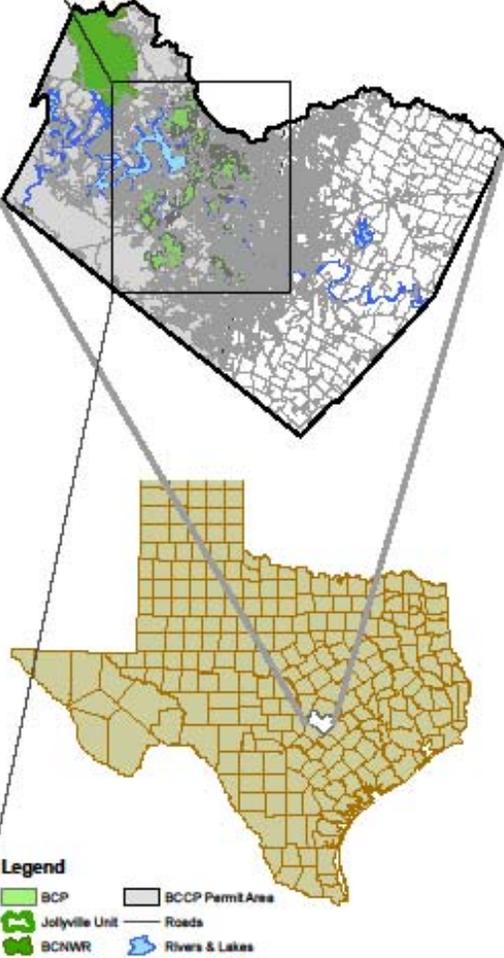


Figure 1: Balcones Canyonlands Preserve Location Map Travis County, TX.



Legend

- BCP
- Jollyville Unit
- BCNWR
- BCCP Permit Area
- Roads
- Rivers & Lakes

