City of Austin 2019
Black-capped Vireo *(Vireo atricapilla)*
Monitoring and Management Program

Balcones Canyonlands Preserve Annual Report



Female black-capped vireo © Gil Eckrich

City of Austin, Austin Water
Wildland Conservation Division
Balcones Canyonlands Preserve Program
Austin, Texas

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Disclaimer: The data and information presented in this report are provisional and subject to revision.

City of Austin 2019
Black-capped Vireo (*Vireo atricapilla*) Monitoring and Management Program
Balcones Canyonlands Preserve Annual Report

This report summarizes the results of the City of Austin's 2019 black-capped vireo (*Vireo atricapilla*) species monitoring and habitat management program. The 2019 field season was the twenty-second year of monitoring this formerly endangered species (delisted in May 2018) on the City of Austin's Balcones Canyonlands Preserve (BCP) tracts. We found ten vireo males holding territories across the Forest Ridge (five territories), Kent Butler (two territories), and Cortaña (three territories) tracts. Pairing success was 90% (67-100%). Of the 20 nests observed, 55% failed due to predation or abandonment.

INTRODUCTION
Background
The black-capped vireo (hereafter vireo) is a neotropical migrant that breeds in portions of Oklahoma, Texas, and Mexico (Grzybowski 1995). The U.S. Fish and Wildlife Service listed this species as endangered in 1987 (USFWS 1987). Major threats to the vireo's survival include habitat loss, habitat fragmentation, over-grazing/browsing, natural vegetation succession, and parasitism by brown-headed cowbirds (*Molothrus ater*). Rapid westward expansion of development from the City of Austin led to the creation of the Balcones Canyonlands Conservation Plan (a Habitat Conservation Plan). The U.S. Fish and Wildlife Service issued a 10(a)(1)(B) permit to the City of Austin and Travis County in 1996, to mitigate for the incidental "take" of habitat loss due to development, and to facilitate the local recovery of the vireo and seven other endangered species (USFWS 1996). The permit requires a minimum of 12,300 hectares of endangered species habitat in western Travis County be set aside as a preserve (the BCP) for these species. The BCP is owned and managed by several public and private entities, including the City of Austin, Travis County, Lower Colorado River Authority, The Nature Conservancy, Travis Audubon Society, and St. Edwards University/Wild Basin. The vireo was removed from the federal list of endangered and threatened wildlife effective May 16, 2018, citing recovery of the species (USFWS 2018a). The U.S. Fish and Wildlife Service developed a post-delisting plan to monitor abundance and threats to ensure that the species does not decline (USFWS 2018b).

Vireos have been documented on several BCP tracts that are managed by the City of Austin. The largest known colony in Travis County formerly existed at the Wild Basin/Vireo Preserve. A 1961 wildfire created several hundred hectares of vireo habitat in this area. The population of this vireo colony likely peaked sometime in the 1970s, but declined steadily from 32 territories (22 breeding pairs) in 1987 to one territory in 1997 (Steed 1988; Grzybowski 1989; DLS Associates 1989, 1990; Abbruzzese 1998), with intermittent sightings of single males thereafter (City of Austin 2011, 2012, 2016).

A small breeding colony of vireos (three to five territories) occupied habitat on the Cortaña tract and the adjacent River Place mitigation tract to the northeast from 2000 to 2011. However, the number of territories dwindled to only one in 2011, and no vireos established territories from 2012 through 2014. A male

established a territory on this site in 2015; he was possibly mated, but no evidence of nesting was confirmed. From 2016 to 2018, three to five males established territories on Cortaña (City of Austin 2018). On the Forest Ridge tract, two to seven vireo territories have been established each year from 2009 to 2018 (City of Austin 2018). On the Kent Butler Ecological Reserve (hereafter Kent Butler), one or two vireo pairs nested along electric transmission line corridors in 2008 and 2009, and again from 2013 to 2018.

Though other areas on City property have been managed to create vireo habitat in recent years – Vireo Preserve, the Bohls tract, a ridge in the center of the Cortaña tract, and a small patch on the Lime Creek tract – vireos have rarely been detected at those sites, and have not been found to establish a territory. Other records for vireos on the City of Austin's BCP tracts for the past decade include intermittent sightings of males on the Commons Ford and Sam Hamilton West tracts.

Objectives

The Balcones Canyonlands Conservation Plan (USFWS 1996) states that "baseline monitoring will be gathered in accordance with the Land Management Plan Guidelines and approved land management plans, and should concentrate on determining basic population levels on preserve lands, key population parameters, and other ecological parameters that may affect the target species." The Tier IIA-8 land management plan (BCP 2007) identifies "distribution, abundance, productivity, and recruitment" as key population parameters to monitor. The City of Austin's vireo monitoring program continues to focus on estimating abundance, territory delineations, pairing, nesting, and productivity for all vireos detected each year.

The land management plan (BCP 2007) emphasizes vegetation management and monitoring to maintain vireo habitat. Vireos occupy shrublands of mixed deciduous and evergreen species with irregular height and distribution. Open spaces between clumps of woody vegetation are also important, so optimal vireo habitat appears as a mosaic of shrubby patches separated by grassy or rocky spaces. Shrubs that have a skirt of vegetative cover extending down to the ground are especially important to conceal nests. Within the BCP, which is primarily closed-canopy forest, vireo habitat typically occurs where oaks and other hardwoods re-sprout from well-established root systems. Because re-sprouting requires some form of disturbance (e.g., from fallen trees, mechanical manipulation, fire), restoration projects in conjunction with habitat monitoring are undertaken on various City of Austin tracts to promote vireo habitat (see Black-capped Vireo Habitat Management).

METHODS

Sites and Survey Effort

Monitoring and color banding methods for vireos are similar to those for golden-cheeked warblers (hereafter warbler; see Methods in City of Austin and Travis County 2018). However, because the vireo population is much smaller than the warbler population on City BCP properties, monitoring takes the form of a complete census rather than a sampling. There are no defined plots; City of Austin BCP biologists search suitable habitat and monitor vireos where they are found for evidence of mated status and breeding success. Vireos are also not monitored as frequently as warblers, unless their territories are near a warbler

study plot, and less effort is devoted to finding nests. Intensive monitoring typically begins when the vireos first arrive in late March or early April and continues at least through the end of June, or until no indications of an active nest are observed. Because fledgling vireos were difficult to observe in dense vegetation, a range of fledglings is presented for some nests. The lower number is the tally of fledglings actually observed, and the higher number is the maximum that may have fledged given the number of eggs/chicks originally found in the nest, minus unhatched eggs or dead nestlings found after fledging. We assume a maximum of four fledglings for nests that were not found.

During the 2019 field season, biologists mapped vireo territories in three locations: within, and adjacent to, the warbler intensive study plots on the Forest Ridge and Kent Butler tracts, and in the shinnery of the Cortaña tract. In addition, biologists surveyed potential habitat on the Bohls tract and the Wild Basin/Vireo Preserve.

After biologists detected vireos around the Forest Ridge and Kent Butler warbler study plots, they incorporated monitoring of the vireos into the regular warbler surveys. Because much of the habitat on these two study plots is more typically associated with warblers, the exact size of the vireo habitat in each area is undetermined.

The Forest Ridge warbler plot was surveyed at least twice each week in conjunction with the warbler monitoring program from March 15 through June 15, and then weekly until July 23; vireos were first detected on March 22. After the first vireo was detected on the Kent Butler warbler plot on March 28, vireos were monitored once or twice a week through August 2. Vireos were detected in the Cortaña tract on April 22; after that date, staff monitored this site on May 1 and May 10, then weekly from May 31 through August 1.

Table 1. Summary of Black-capped Vireo Survey Effort on the Balcones Canyonlands Preserve, Travis County, Texas, Field Season 2019.

Study Plots	Observer(s)	Survey Hours (Mar. 19-Aug. 3)
Bohls	John Chenoweth	9
Cortaña	William Reiner, Darrell Hutchinson	56.5
Forest Ridge	Jonathan Scalise, Cristina Campbell	56.75
Kent Butler	William Reiner, Jonathan Scalise	37.75
Vireo Preserve / Wild Basin	Jim O'Donnell, Lisa O'Donnell	~8
Total		**168**

RESULTS AND DISCUSSION

Territory Delineations

In 2019, staff found ten vireo males holding territories on Forest Ridge (five territories), Kent Butler (two territories), and Cortaña (three territories). Two additional males were observed on the Cortaña tract but

did not establish territories. Intermittent sightings were also reported on Sam Hamilton West on May 2, May 6, and June 4. A male was observed on Wild Basin/Vireo Preserve on April 22 through April 25, and another was observed on June 16. Staff did not observe vireos on Bohls this year. Figures A-D provide maps of the 2019 vireo observations on City of Austin BCP tracts.

Banding and Return Rates

In 2019, two SY males were color-banded on the Cortaña tract on May 21 and June 6 (Table 2). The latter of these, banded RD/PI:WH/SI, was the first vireo to be detected in the central Cortaña site where staff have been working to create habitat since 2003. Staff attempted to band seven other males (one male on Kent Butler, two males on Cortana, and four males on Forest Ridge) with established territories but were unsuccessful. Of the nine male vireos on City BCP property in 2018 that were banded (including returns from previous years), three returned in 2019 (a return rate of 33%).

Table 2. Summary of Black-capped Vireos Banded on the Balcones Canyonlands Preserve, Travis County, Texas, Field Season 2019.

Date	Color Band Combination	USGS Band Number	Site	Sex	Age
5 May	OR/SI:RD/GR	2590-26329	Cortana	male	SY
6 June	RD/PI:WH/SI	2590-26331	Cortana	male	SY

Territory Mapping and Reproductive Success on the Forest Ridge Tract

Five territorial male vireos were observed on and adjacent to the Forest Ridge intensive warbler study plot in 2019 (Figure B). The only banded bird (YE/SI:RD/WH) of the five males on the plot was banded at Forest Ridge in 2017.

Eleven nests were found on the Forest Ridge tract, from five vireo pairs (Table 3). Three of the nests found on Forest Ridge failed due to predation, two nests were abandoned, and six nests successfully fledged at least one young each. Of the abandoned nests, one was confirmed abandoned during the building stage, the other was found with one egg in it but did not progress from there. Of the five territories, four pairs had six successful broods among them. One pair abandoned their territory shortly after their nest was predated. See Table 4 for a summary of reproductive success.

Territory Mapping and Reproductive Success on the Kent Butler Tract

Two territorial male vireos were observed on the northwest and southeast borders of the Kent Butler intensive warbler study plot (Figure C). Both males successfully paired to unbanded females. Six active nests were found, four of which were predated, but each territory had one successful nest that fledged at least two young (tables 3 and 4).

Territory Mapping and Reproductive Success on the Cortaña Tract

Three male vireos established territories in the shinnery at the north end of the Cortaña tract in 2019 (Figure D). Two successfully paired with unbanded females, one male held a territory but remained unpaired. A

fourth male, presumed to be DG/SI:DG/BK (banded in 2018 on the Kent Butler tract), but missing the left leg, returned but did not establish a territory. Another male, RD/PI:WH/SI (banded on the central portion of the Cortaña tract this year) also did not establish a territory. Staff found three active nests (Table 3). One nest fledged at least two young and the other two nests were predated. See Table 4 for a summary of reproductive success.

Table 3. Summary of Black-capped Vireo Nests Found on the Balcones Canyonlands Preserve, Travis County, Texas, Field Season 2019.

Plot	Male ID	Nest Substrate	Nest Fate	Number of Fledglings*
Cortaña	UB	*Quercus buckleyi*	Predated	
Cortaña	UB	*Quercus fusiformis*	Predated	
Cortaña	OR/SI:RD/GR	*Quercus sinuata*	Fledged	2-5
Forest Ridge	UB	*Dermatophyllum secundiflorum*	Predated	
Forest Ridge	UB	*Quercus fusiformis*	Fledged	2-3
Forest Ridge	UB	*Diospyrus texana*	Abandoned	
Forest Ridge	UB	*Dermatophyllum secundiflorum*	Predated	
Forest Ridge	YE/SI:RD/WH	*Quercus buckleyi*	Predated	
Forest Ridge	UB	*Dermatophyllum secundiflorum*	Fledged	1-4
Forest Ridge	UB	*Diospyros texana*	Fledged	1-3
Forest Ridge	UB	*Quercus sinuata*	Abandoned	
Forest Ridge	YE/SI:RD/WH	*Dermatophyllum secundiflorum*	Fledged	1-3
Forest Ridge	UB	*Dermatophyllum secundiflorum*	Fledged	3
Forest Ridge	UB	*Quercus buckleyi*	Fledged	1-3
Kent Butler	UB	*Quercus buckleyi*	Predated	
Kent Butler	OR/PI:OR/SI	*Quercus sinuata*	Predated	
Kent Butler	OR/PI:OR/SI	*Quercus buckleyi*	Predated	
Kent Butler	UB	*Quercus buckleyi*	Fledged	2-3
Kent Butler	UB	*Quercus buckleyi*	Predated	
Kent Butler	OR/PI:OR/SI	*Cercis canadensis*	Fledged	2-4
20 total nests: 9 predated or abandoned (55%), 9 successful (45%)				

* Fledgling vireos were difficult to observe in dense vegetation, so a range of fledglings is listed for some nests. The lower number is the tally of fledglings actually observed. The higher number is the maximum that may have fledged given the number of eggs/chicks originally found in the nest, minus unhatched eggs or dead nestlings found after fledging. We assume a maximum of 4 fledglings for nests that were not found.

Table 4. Summary of Black-capped Vireo Reproductive Success per Plot on the Balcones Canyonlands Preserve, Travis County, Texas, Field Season 2019.

Site	No. of Territories	No. of Territories w/ Female	Pairing Success	No. of Territories Producing ≥ 1 Young	Breeding Success	Total No. of Fledglings*	Productivity*	Productivity Per Successful Territory*
Cortaña	3	2	67	2	67%	8-13†	2.7-4.3	4-6.5
Forest Ridge	5	5	100	4	80%	9-19†	1.8-3.8	2.3-4.8
Kent Butler	2	2	100	2	100%	4-7	2-3.5	2-3.5
All Sites	**10**	**9**	**90%**	**8**	**80%**	**21-39†**	**2.1-3.9**	**2.6-4.9**

* Ranges indicate fledglings actually observed vs. maximum possible (see note with Table 3).
† Includes all fledglings found, including those from second broods.

Parasitism and Interaction with Predators

No brown-headed cowbirds (*Molothrus ater*) were observed during vireo surveys on the Forest Ridge, Cortaña, or Kent Butler tracts. No vireos were observed tending cowbird fledglings. BCP staff and volunteers had managed cowbirds at the Cortaña colony every year since vireos were first observed there in 2000. However, BCP staff ceased active trapping of cowbirds on City of Austin properties beginning in 2013, after vireos abandoned the Cortaña tract colony in 2012, and have not resumed pending evidence of parasitism. Staff will continue to monitor vireo territories for the presence of cowbirds, and remain committed to reducing or eliminating the threat of cowbird parasitism of vireo nests if needed. Vireos on the Cortaña tract appeared to give alarm "shrad" calls in response to the intrusion of Woodhouse's scrub-jays. City staff did not directly observe any other interactions between vireos and potential predators, nor any harassment of vireos by other species.

Non-Viable Eggs

Of the 20 nests we found, 20% contained non-viable eggs. We observed four nests that had both nestlings and one to two eggs that never hatched. One of these failed eggs appeared to have started hatching but was unsuccessful. The egg had a clean crack seemingly all the way around, and part of the shell had begun to overlap the other part.. The egg could not be inspected post fledging, because the nest was destroyed either during or soon after fledging.

Injuries

A male that arrived late to the Cortaña shinnery (observed June 25 and 28) was found to be missing its entire left leg. The right leg was banded DG/BK. Staff presume this male to have been DG/SI:DG/BK, a male that had been banded on the Kent Butler tract in 2018, but established a territory on the neighboring Ribelin tract (Travis County BCP). Travis County biologists reported seeing a banded one-legged vireo in this territory earlier in the spring of 2019, but that it had disappeared before being sighted on the Cortaña tract.

Golden-cheeked Warblers in Black-capped Vireo Habitat

In some areas, vireo habitat may progress to warbler habitat through natural succession. Likewise, natural or anthropogenic disturbance patterns may convert warbler habitat to the early successional stage preferred

by the vireo. These habitat types tend to overlap within the BCP. As in previous years, territorial warblers and vireos were observed in the same or neighboring areas on the Forest Ridge, Kent Butler, and Cortaña tracts in 2019. The Forest Ridge study plot supports a dense understory of vegetation that is used by both species. On the Kent Butler tract, four electric transmission lines cross the tract at the north edge of the warbler study plot. Vireos concentrate their activity in the shrubby growth within the utility corridors, where vegetation has been trimmed short in some places, to prevent damage to the wires. Warblers occupy habitat on both sides of the utility corridors, and in a wooded strip between them. One of the Kent Butler vireo territories overlapped with the warbler territories in the wooded strip and on either side of the transmission lines. The other Kent Butler vireo territory was in a densely vegetated canyon, with some dense undergrowth and tall canopy trees, which was also occupied by several warblers. On the Cortaña tract, warblers occupy steep, wooded canyons on three sides of the shinnery, as well as a low, wooded knoll in the middle of the shinnery. Warblers were occasionally observed in the shinnery, and vireos were often observed within the edges of the mature forest.

BLACK-CAPPED VIREO HABITAT MANAGEMENT

The Balcones Canyonlands Conservation Plan (USFWS 1996) requires maintaining or creating 810 hectares (2,000 acres) of vireo habitat within the BCP, and the land management plan (BCP 2007) provides additional, general guidelines to help achieve this goal. The Balcones Canyonlands Conservation Plan recommends focusing potential vireo management areas in portions of the BCP that are not currently occupied by the warbler. Focal areas for vireo habitat management on City of Austin BCP lands include parts of the Cortaña tract, infrastructure corridors (Kent Butler tract), Vireo Preserve, and Bohls tract. Previous management activities on these tracts are summarized in City of Austin (2016).

Expanding Vireo Habitat – Kent Butler

For the fifth consecutive year, a vireo pair successfully nested within one of the three areas mechanically manipulated in 2009, and vireos were frequently observed foraging in the area of improved habitat (City of Austin 2016).

Maintenance of Formerly Occupied Habitat – Cortaña (north)

With the recolonization of the northern portion of the Cortaña tract by vireos (City of Austin 2016), further habitat manipulation has been postponed. However, staff have harvested acorns of shin oaks (*Quercus sinuata* var. *breviloba*) from trees within the existing shinnery for use in habitat restoration. Some of these have been planted on a ridge immediately south of the shinnery that was cleared of most trees in 2005. This year, staff sowed 126 acorns here.

Habitat Creation – Cortaña (central)

Between 2003 and 2006, City staff coordinated mechanical clearing of junipers on 14.5 hectares in the center of the Cortaña tract, approximately 1.5 miles south of the existing shinnery. The intention was to create vireo habitat, but few suitable shrubs were growing on the site at the time. The resulting habitat has been a live oak savanna. However, on June 5, staff detected a male vireo in this area for the first time;

banded RD/PI:WH/SI on June 6; he remained until at least June 14, but relocated to the northern Cortaña shinnery by July 17.

Staff have planted shin oak acorns on the central Cortaña site, as they have been available for harvest from the Cortana shinnery and elsewhere on the BCP. Acorns are planted beneath established woody plants, especially junipers, in order to minimize desiccation and deer browse. The first planting, in autumn 2015, resulted in only four seedlings. However, acorns planted in 2016 and 2018 had a much better emergence rate, approaching 50% from the 2018 sowing. Few shin oaks produced acorns in 2019, but staff were still able to plant 655 more acorns in the area.

In October 2018, staff planted 560 acorns of each of three oak species (*Quercus buckleyi*, *Q. fusiformis*, and *Q. sinuata* var. *breviloba* = 1680 acorns total) in plots in the mid-Cortaña habitat creation area, to study survival rates for seedlings in uncaged/unshaded, caged/unshaded, caged/60 percent shade cloth, and uncaged/woodland canopy plots. We counted the number of seedlings in each plot in March and monthly from June through October 2019. By October 2019, survival of the unshaded seedlings ranged from 0 to 4 percent; survival in the shaded plots ranged from 10 to 29 percent (Figure E).

Restoring and Creating Habitat – Vireo Preserve

Efforts continue to protect and rebuild soils and promote native plant diversity. The Vireo Preserve supports many of the habitat types observed throughout the BCP, so lessons learned at this site should be applicable to other areas (City of Austin 2016, Travis County and City of Austin 2018). A vireo male was observed from April 22 through 25 and another on June 16, 2019.

Habitat Creation – Bohls

City of Austin (2016) summarizes mechanical and prescribed burn treatments conducted at this site.

Monitoring Effects of Habitat Management Efforts

Staff have established photo points and vegetation transects on the above tracts in order to track changes to habitat over time. Monitoring of these sites takes place before and after habitat manipulation events, and otherwise when feasible. No photo point monitoring was conducted in 2019.

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FIGURES

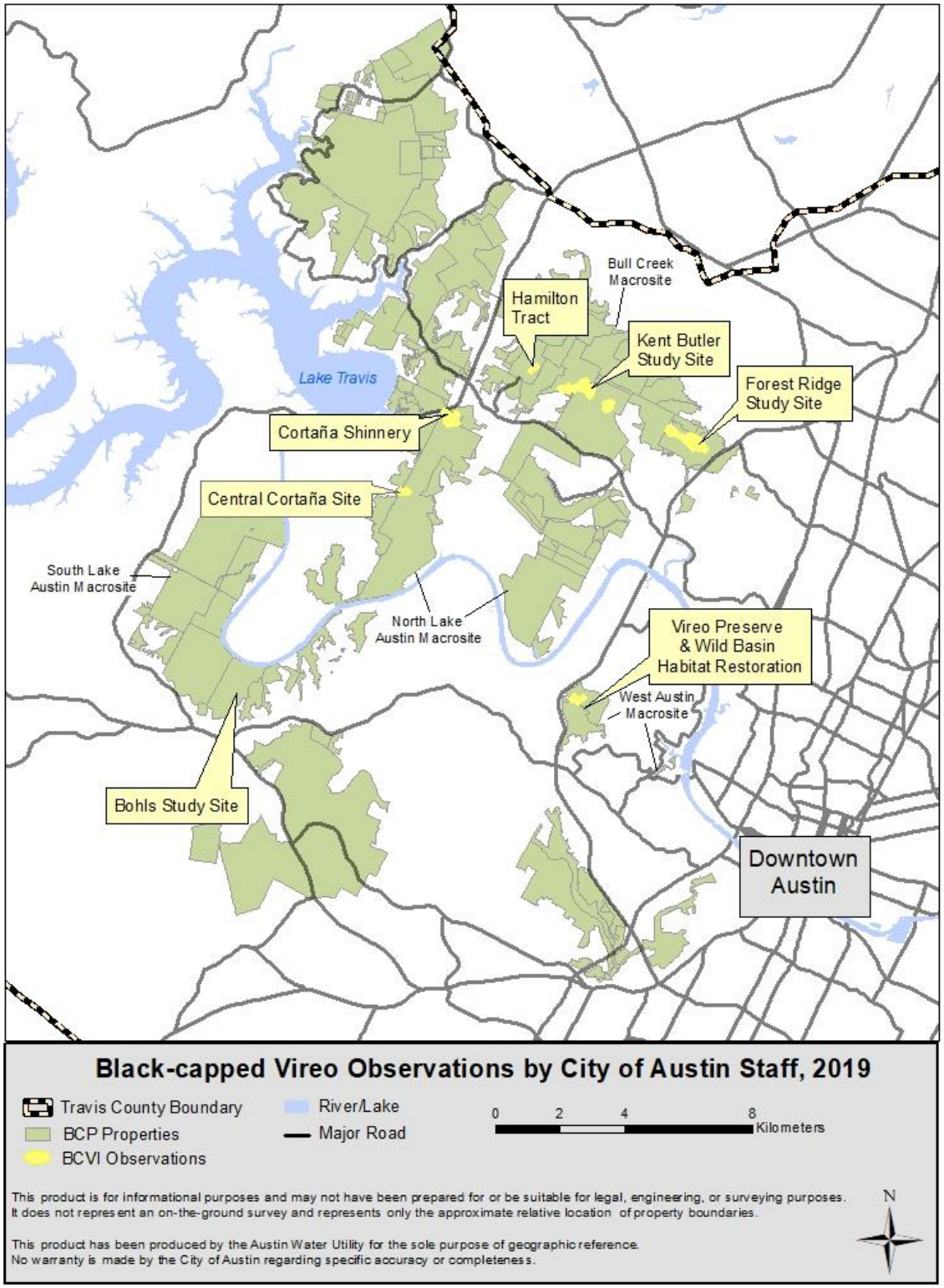


Figure A. Sites Where Black-capped Vireos were observed on City of Austin BCP Tracts, 2019.

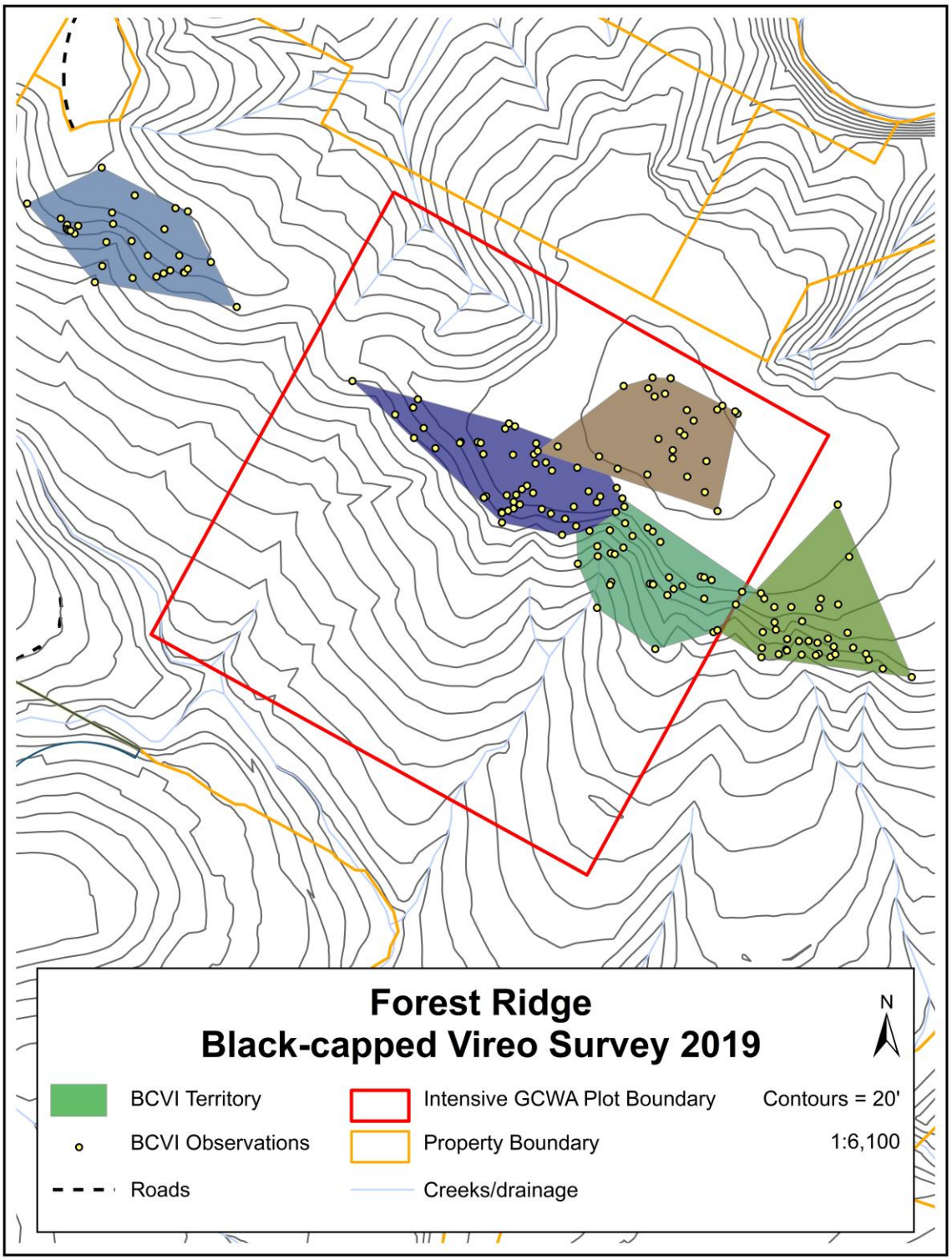


Figure B. Locations of Black-capped Vireos on Forest Ridge, 2019.

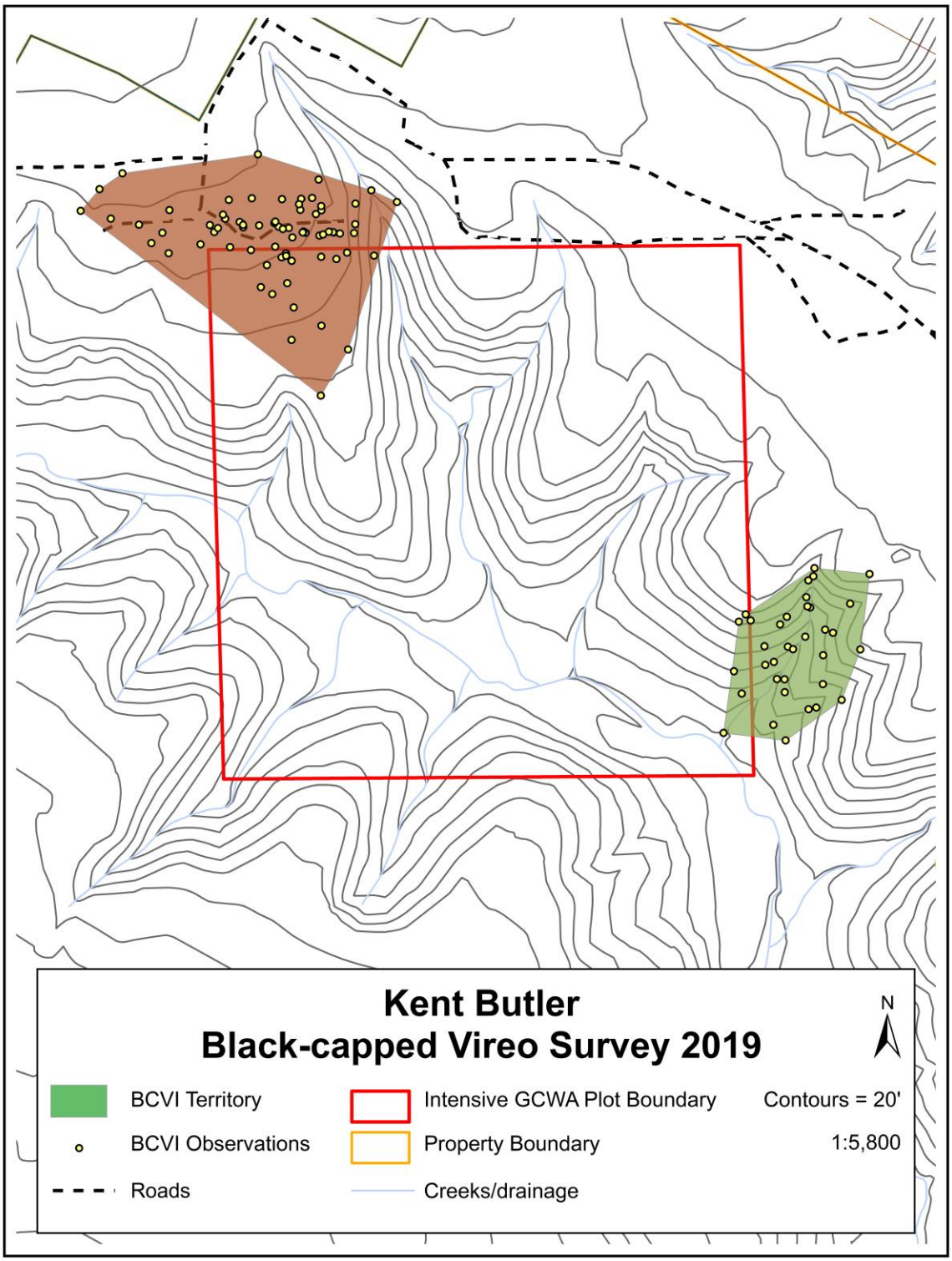


Figure C. Locations of Black-capped Vireos on Kent Butler Ecological Reserve, 2019.

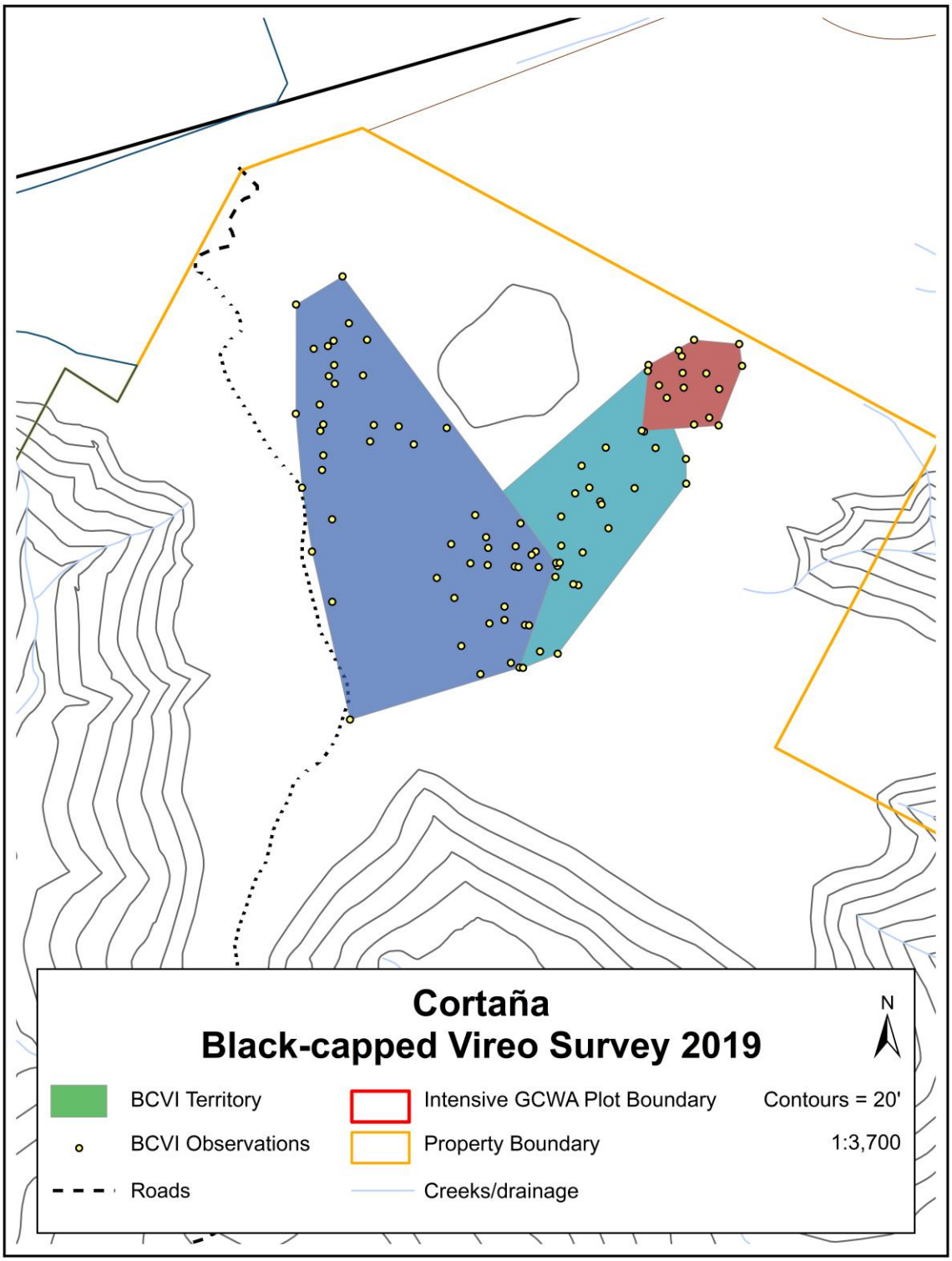


Figure D. Locations of Black-capped Vireos on Cortaña, 2019.

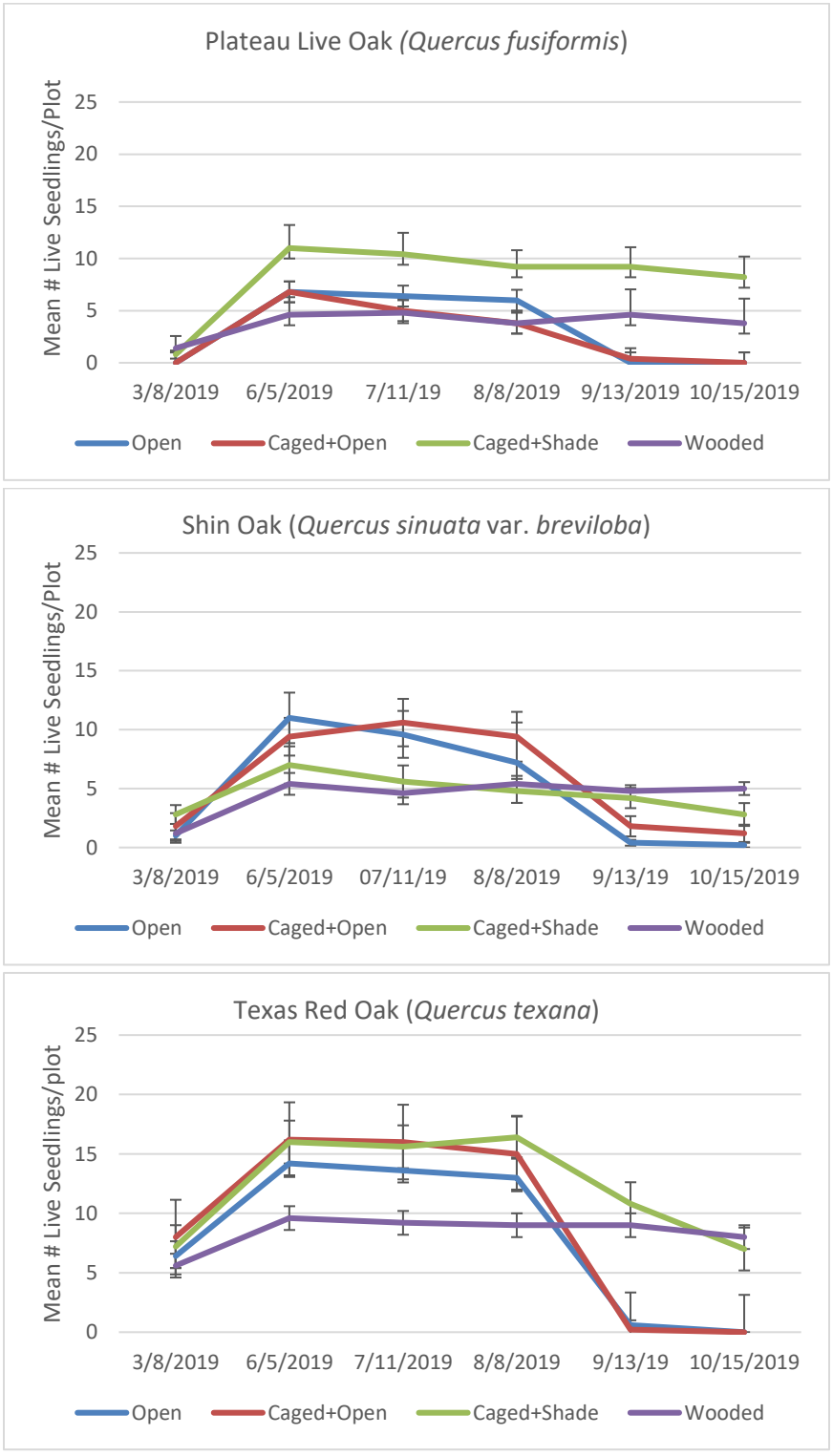


Figure E. Oak seedling survival in four treatments (uncaged/unshaded, caged/unshaded, caged with 60% shade cloth, uncaged/woodland) across five plots (mean count +/- SE) on the Cortaña tract, Balcones Canyonlands Preserve.