FINAL PERFORMANCE REPORT

Federal Aid Grant No. F19AP00249 (E-88-R-2)

Reinstatement of Management and Monitoring Efforts for a Remnant Population of Black-capped Vireos in Blaine County, Oklahoma

Oklahoma Department of Wildlife Conservation

Grant Period: January 1, 2019 – December 31, 2019

Reporting Period: January 1, 2019 – December 31, 2019

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Principal Investigator: Jeremy D. Ross, Oklahoma Biological Survey, University of Oklahoma

I. ABSTRACT:

During the breeding season of 2019 we conducted a series of walking surveys to locate territorial males of an outpost population of Black-capped Vireo (*Vireo atricapilla*; hereafter "BCVI") in the Salt Creek canyons of Blaine County, Oklahoma (centered at 36°01'00"N, 98°27'00"W). We surveyed the Salt Creek Canyon area for audible and/or visual evidence of BCVI territorial males, paired females, and nesting attempts. We were able to locate 41 active territories in the area, with another two detections of suspected "roamer" males. Associated with territorial males were at least 10 females and 5 nests, though we spent less time seeking out nest locations than active territories. We used our delineations of BCVI territories to examine the linkage between Eastern Red Cedar (*Juniperus virginiana*) removal efforts from the early 2000's with current BCVI occupancy. The majority of previously-managed plots in the study area (20 of 33) hosted at least one territorial BCVI in 2019. Moreover, the centroids of 12 of 36 male territories found on canyon slopes in 2019 were located 20m or less from the managed areas, representing a far higher rate of occupancy than locations plotted at random over 500 iterations (mean = 3.50; $p<0.001$). This strongly suggests that a lasting benefit to the species, at least with the edaphic habitats created by the combination of steep slopes, gypsum capstone, and highly saline soil and water conditions.

II. BACKGROUND:

The Black-capped Vireo (*Vireo atricapillus*) is an at-risk songbird that was recently removed from the list of Endangered Wildlife and Plants in 2018 by the U.S. Fish and Wildlife Service due to reaching rangewide population recovery goals. Major factors had attributed to its decline including brood parasitism by cowbirds, alteration and loss of shrubland habitat through fire suppression and subsequent maturation, various forms of agricultural conversion, and development projects (Grzybowksi 1995).

Breeding populations of the Black-capped Vireos in the United States are distributed exclusively in Texas and Oklahoma (Grzybowski 1995). At the Northern extent of their range there exists an outpost population within the Salt Creek Canyons of Blaine County, Oklahoma (Fig. 1,

Appendix). This first-discovered population of the species in Oklahoma was once locally abundant (Bunker 1910; Graber 1957), though it quickly declined to zero during the 1970s and early '80s (Grzybowski et al. 1986). In 1990, the Oklahoma Chapter of the Nature Conservancy, in conjunction with the Oklahoma Department of Wildlife Conservation and the Ecological Services office of the USFWS in Tulsa, initiated a recovery effort for the Blaine County BCVI population. As a part of this collaboration, strips of Eastern Redcedars were selectively removed throughout the property.

Despite intensive habitat restoration and monitoring efforts, the population peaked at between 17-19 territorial males and 12-14 females; therefore, the project was scaled back significantly and frequent monitoring was ceased in the mid-2000s. During the spring of 2015, Joe Gryzbowski returned to the Salt Creek Canyon site and found at least 7 BCVI males on territory, some near historic territories. Therefore, monitoring efforts were relaunched through a previous grant segment in 2017 (Ross et al. 2018).

In the present report we outline another round of full-coverage surveys across this area in 2019 and provide estimates about the approximate abundance of territorial males and opportunistically record evidence of successful reproduction.

III. OBJECTIVE:

The objectives for this project were as follows:

1) Estimate the number of Black-capped Vireos in the Salt Creek Canyon population for the 2019 nesting season.

2) Monitor reproductive success of these vireos.

3) Strengthen fine and coarse-scale habitat suitability models first developed from data collected in 2017.

4) Survey areas of predicted suitability for vireos outside of Salt Creek Canyons on adjacent private lands.

IV. PROCEDURES:

Black-capped Vireo Territorial Mapping

We focused our survey efforts in the main canyon and two tributary canyons at the headwaters of Salt Creek (see Appendix). This represented the long-term core of the Blaine County BCVI breeding range. Starting on April 20th, we began exhaustive audio-visual searches of the area. These searches were conducted four times during the April through June breeding period and were focused on the canyon slopes, consistent with the habitats that BCVI regularly occupy in the main canyon. Our walking survey paths regularly crossed habitats of likely unsuitability (e.g., riparian zones, plateau prairies), therefore we did not bias our searches on any preconception of habitat suitability. These efforts often provided us with repeated detections of territorial BCVI males, from which we calculated a centroid of the distribution for subsequent analyses of managed area occupancy. When a vireo was detected, we made every effort to

observe its legs to determine if it had previously been marked during 2017 with a numbered aluminum band and unique combination of colored plastic leg bands (Ross et al. 2018).

Reproductive Monitoring

Breeding efforts beyond territorial establishment are also of critical importance for this population, therefore we attempted to observe males for any indications of breeding status. This included associating with a possible mate, copulating with a female, nest building, incubation, feeding nestlings, or tending fledglings. If nests were located, we noted the likely stage of building, laying, or nestling development, as well as the species of tree in which it was built, the number of BCVI and cowbird eggs, and any other identifying characteristic. Nest locations were recorded using a GPS unit and its status was monitored upon subsequent revisits.

Black-capped Vireo occupancy of prior management plots

The Blaine County population of Black-capped Vireos has persisted many years. Given the drastic canyon slopes and the erodible nature of the gypsum capstone, the landscape features of this area are likely playing a large part in maintaining the availability of successional habitats known to be necessary to support BCVI (Bunker 1910; Graber 1957; Grzybowski 1995). During the particularly rainy spring of 2019 there was widespread evidence of large capstone boulders breaking off and plowing down the hillslopes (See Appendix Fig. 2). This edaphic nature of the system, however, does not appear to be entirely effective at eliminating the proliferation of Eastern Red Cedar (*Juniperus virginiana,* hereafter "cedar").

Large, continuous stands of cedars provide little to no habitat value for vireos. This had long been recognized and, in an effort to restore BCVI breeding habitat, a multi-year management program was implemented from 2001-2005 by The Nature Conservancy to remove swathes of cedars from select patches along the canyon slopes of the Salt Creek and its tributaries (Fig 3). During the early 2000's management era a total of 35 parcels averaging 0.96ac/ea (33.63ac in total) were cleared of large cedar trees. Of these management areas, 33 parcels covering 32.09ac were contained within our 2019 BCVI study area. Provided that these parcels had been thinned of cedars 14-18 years prior to 2019, we hypothesized whether BCVI territories showed any lasting non-random association with managed parcels. Based on prior observations in the area, we predicted that more active territories would be found to border and overlap management plots than expected by chance.

V. RESULTS AND DISCUSSION:

Between April 20th and June 30th, 2019, we located 41 male BCVI that were singing, mate-guarding, nest building, or tending young (red waypoints in Appendix Figure 1). In another two cases we observed a "roamer" male singing around suitable habitat, but they were not subsequently detected. We encountered 10 female BCVI with or nearby the territorial males. Each female was apparently paired and most displayed breeding behaviors. Although we could not dedicate as much time to seeking nests, we were able to locate 5 of various stages of use within active territories. None of the nests contained eggs of Brown-headed Cowbirds

(*Molothrus ater*), although only two of the nests that could be inspected contained any eggs. We were not able to confirm successful fledging of any of the nests.

Our opportunistic searches for BCVI banded outside of this grant in 2017 found at least 5 returning males on territory. We clearly observed the legs of an additional 29 males and 3 females to confirm that they were not banded. The legs of the remaining 9 males (7 territorial and 2 roamers) and 7 females were not observed well enough to confirm their marked or unmarked status. In 2017 there were 17 males and 3 females fitted with a unique combination of numbered aluminum and colored plastic leg bands. This indicates a minimum 2-year return rate of 29.4%. Of the 5 males, they were banded in their second-year (SY) in 3 cases, after-second-year (ASY) in one case, and unknown for the last. Thus, with the majority of returns comprised of birds captured in their first breeding season there appears to be a sustained recruitment, at least among those young males. Whether those individuals were hatched in Blaine County or not remains unknown.

Management plot occupancy results

The majority of previously-managed plots in the study area (20 of 33) hosted at least one territorial BCVI in 2019. However, this included any overlap with the entirety of where males were seen rather than the more conservative centroid placement. When we considered only the location of territorial centroids we found that 12 of the 36 males that occurred within the canyon slope zone were located either directly within managed areas or 20m proximate to the delineated boundaries (see Appendix Fig 3). This was far lower among the simulated data, which across the 500 simulations indicated a mean number of males occupying management plots at 3.50 (s.d. = 1.838) and closely fit a Poisson distribution with mean and variance each at 3.53 ($r^2 = 0.99353$; Fig 4). This distribution indicated only a 0.031% probability that the observed number of 12 males occupying management areas would have been met or exceeded by chance. Therefore, it is highly unlikely that the BCVI territories were distributed independently of the management areas and strongly suggests a lasting attraction of these areas as breeding habitat. Although we do not have the data to determine if breeding was more successful in these areas relative to non-managed areas, these results do indicate that cedar removal can be a long-term strategy to at least bolster recruitment into these gypsum hills populations of western Oklahoma.

The analysis presented should be noted as being a conservative approach in terms of using centroid points rather than any territory overlap. During our random-walk surveys throughout the surveyed areas of the canyon slopes our team would regularly encounter a singing male that was occupying managed areas as part of their movements (Appendix Fig 5). When singing these males are readily detected at distances up to 200m and under low-wind conditions they can be detected as much as 400m away. We exercised great caution to avoid biasing our attention to areas of cleared cedar and, therefore, the results are unlikely to be an artefact of detectability or surveyor effort discrepancies.

Cedar management areas along these canyon slopes appear to have remained open for 14+ years with only modest evidence of cedar re-invasion. The significant association of BCVI territories with these clearings strongly suggests a lasting benefit, although further study is needed to

determine if breeding is on par or better in these areas relative to unmanaged plots. Nonetheless, slopeside cedar removal appears to provide a long-term way to maintain open and successional habitat, at least in these steep canyons of elevated salinity. This suggests great promise for the sustainability of Black-capped Vireos at this outpost population, since this management can maintain availability of suitable habitat while also providing landowners increased forage production and reduced wildfire danger. And though such actions certainly demand high up-front costs (e.g., equipment and labor), its demonstrated value for long-term habitat management suggests a strongly favorable cost-benefit ratio over the long term.

VI. SIGNIFICANT DEVIATIONS:

No significant deviations.

VII. **Prepared by**: Dr. Jeremy D. Ross
Assistant Professor, Oklahoma Biological Survey
University of Oklahoma

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Approved by: Matt Fullerton, Endangered Species Biologist
Russ Horton, Assistant Chief Wildlife Division
Oklahoma Department of Wildlife Conservation

Approved by: Andrea Crews, Federal Aid Coordinator
Oklahoma Department of Wildlife Conservation

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APPENDIX

Figure 1: Map of Black-capped Vireo males detected defending territories in 2019 across the Salt Creek Canyons area of Blaine County, Oklahoma.

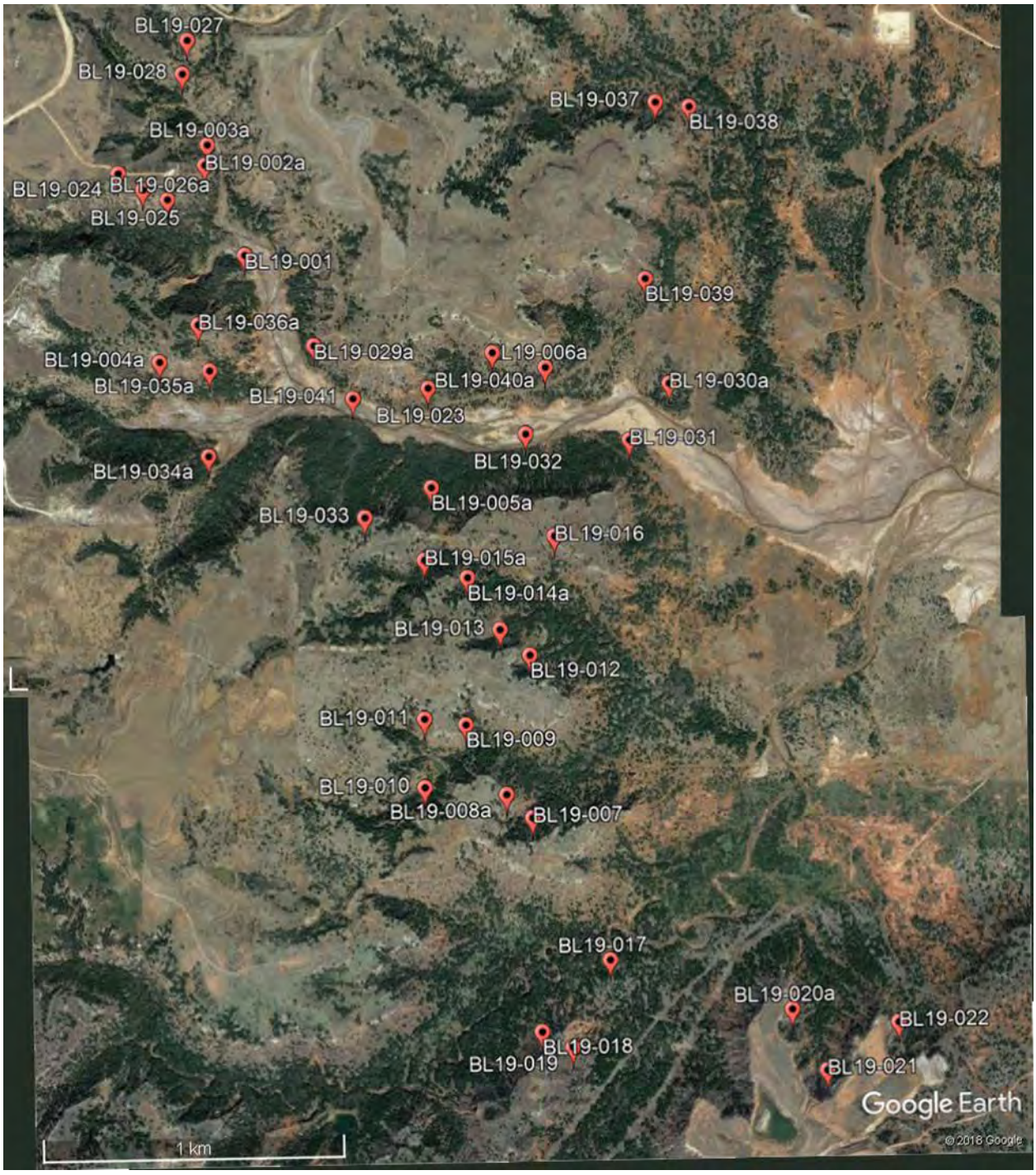

Figure 2: Looking downslope from the origin of a gypsum capstone landslide. Note the damaged trees and scoured soil indicating the path of the boulder with estimated volume of 42m^3 and weight of 124 metric tons.

Figure 3: Map of Black-capped Vireo males detected defending territories in 2019 across the Salt Creek Canyons area of Blaine County, Oklahoma.

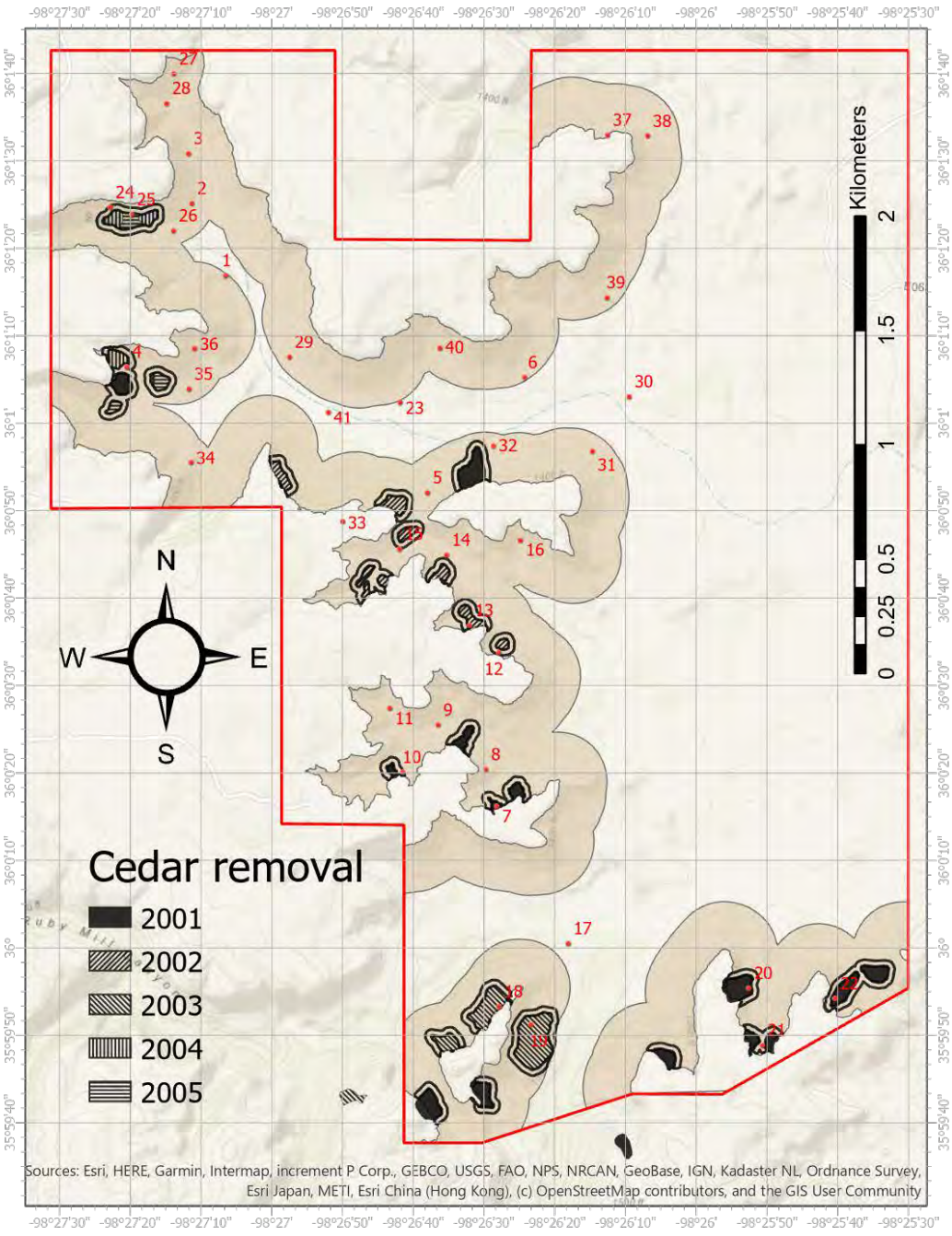

Figure 4: Histogram of 500 simulation results where the 36 BCVI centroids were randomly redistributed within the canyon slope zone. The distribution closely fit a Poisson distribution with mean (& variance) = 3.53. The actual number of males occupying management areas (12 of 36) was significantly non-random ($p<0.001$)

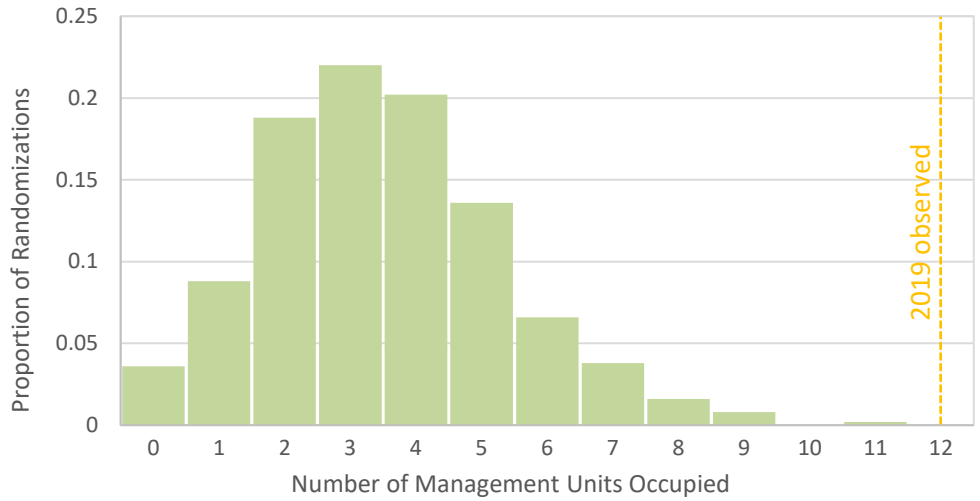

Figure 5: 2019 photo of an area cleared in 2001. Cedar recruitment was limited in the area and the deciduous-dominated patch was occupied by a territorial male.