

**2011 Balcones Canyonlands National Wildlife Refuge
Golden-cheeked Warbler (*Setophaga chrysoparia*)
And
Black-capped Vireo (*Vireo atricapilla*)
Annual Monitoring Report**



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INTRODUCTION

This report summarizes the results of the Balcones Canyonlands National Wildlife Refuge's 2011 golden-cheeked warbler (*Setophaga chrysoparia*) and black-capped vireo (*Vireo atricapilla*) endangered species monitoring program. This report only includes activities conducted by Refuge staff and volunteers. Additional monitoring and research activities for the black-capped vireo were conducted by David Morgan with Texas A&M University and Lauren Seckel with Washington State University. Their activities are reported separately and are not included in this report.

In late March 2011, Scott Rowin was hired to replace Dr. Chuck Sexton as the next Wildlife Biologist for the Refuge. Prior to his arrival, it was decided this year Refuge staff would focus their monitoring efforts on golden-cheeked warblers, and research projects by David Morgan and Lauren Seckel would adequately monitor the black-capped vireo.

In 2011, the primary surveyors on staff were: Wildlife Biologist Scott Rowin, Biological Technicians Helen Becker and Gina Mazza, and SCEP student Cassidi Cobos. Volunteers Frank and Connie Madia assisted with enumeration surveys on the Damrow tract.

BACKGROUND

The golden-cheeked warbler (hereafter, warbler) is a neotropical migrant passerine that breeds only in central Texas where mature oak-juniper (*Quercus spp.* - *Juniperus ashei*) habitat occurs (Ladd and Gass 1999). Due to accelerating loss of breeding habitat over the past several decades, this species was listed as federally endangered by the U.S. Fish and Wildlife Service in 1990 (USFWS 1990).

The black-capped vireo (hereafter, vireo) is also an endangered, neotropical migrant that breeds in portions of Oklahoma, Texas, and Mexico (Grzybowski 1995). This species was listed by the U.S. Fish and Wildlife Service in 1987. Major threats to the species' survival are habitat loss, habitat fragmentation, and parasitism by brown-headed cowbirds.

The Balcones Canyonlands National Wildlife Refuge was established in 1992 in part to promote the recovery of these species. The Refuge is located at the corners of Travis, Williamson, and Burnet Counties, Texas and currently consists of approximately 23,822 acres. Of this acreage, approximately 15,000 acres have been identified in the Draft Refuge Habitat Management Plan as areas to be managed for the warbler, some of which are currently not occupied, and approximately 1,500 acres are identified for the vireo, some of which are also not occupied. The remaining acreage is typically identified and managed as grassland, savannah, or riparian habitat. (Note: some habitat type acreage on conservation easements has not been

mapped on the Draft Refuge Habitat Management Plan. As such, the numbers above will vary once finalized.)

OBJECTIVES

The primary objectives of the Refuge's warbler monitoring program have been to estimate population size, territory density and trends, productivity, and distribution. The warbler population on the Refuge has generally been monitored using a standardized, region-wide program. Population and productivity trends are tracked on a series of 100-acre plots located on the Balcones Canyonlands National Wildlife Refuge and nearby partnering agency, the Balcones Canyonlands Preserve (BCP). The BCP and Refuge collect data on territory density, territory location, pairing success, breeding success, and productivity. Both partners also conduct territory enumerations over additional project specific sites to ascertain warbler and vireo distribution and to attempt to get a rough estimate of overall territory density.

Due to the less extensive distribution of vireos throughout the Refuge, no formal monitoring plots for this species exist. Rather, discrete segments of the Refuge's vireo population are monitored on a regular basis by Refuge staff and/or outside researchers. Information similar to that described above is gathered for the vireo.

METHODS

STUDY SITES

The Refuge currently monitors a set of five permanent 100-acre plots, first established in 1997 and 1998. Three of these plots are in "prime" warbler habitat and two were established as "transition" plots in previously cleared habitat to monitor growth into possible good warbler habitat. The prime plots are Rodgers southeast, Victoria, and Kindred. The two transitional plots are Rodgers and Webster. Not all plots have been censused every year.

Prime plots are defined as those with >75 percent excellent warbler habitat, i.e. habitat with >70 percent canopy cover and appropriate vegetation composition and structure. Transitional plots comprise areas containing zero to a few warbler territories and may improve as warbler habitat within the next 30 years (BCP 2007).

In the 2011 field season, warbler territory and productivity data were mapped on two 100-acre "prime" study plots, Rodgers southeast, and Victoria. These sites were monitored for a minimum of 60 hours over ten visits during the breeding season (BCP 2007). No data were collected on the remaining three study plots.

Enumeration data were collected at five additional sites to ascertain warbler and vireo distributions and to attempt to get a rough estimate of overall territory density. Three of these sites were monitored for warblers: Hawks Nest Hollow, Cowbell (House) Canyon, and Rodgers Unit E. Eckhardt northeast was monitored for vireos, and Damrow had overlapping vireo and warbler territories.

100-ACRE MONITORING PLOTS

Territory and productivity data were gathered in 2011 on two prime plots: Victoria and Rodgers Southeast (Figures 1 and 2). Data collected this year are summarized in Tables 1 and 2. No playback tapes of warbler songs or calls were used during this season's 100-acre monitoring.

Territory size and configuration are based on observations prior to May 25, 2011. Observations after May 25 are recorded, but not used to delineate territory boundaries as fledging is well underway and territories boundaries have begun to breakdown. Warbler observations were recorded with a GPS datalogger (Garmin GPSMap 62st) and were later transcribed on field maps and entered into ArcGIS. These are shown as points on Figures 1 and 2. Each territory is identified by a unique color. Question marks (?) on these figures represent warbler observations that could not be assigned to an individual territory.

In 2011, the number of territories on 100-acre plots was calculated using Verner's (1985) method (each full territory counted as 1.0 territory and each edge territory counted as 0.5 territories). Verner's counting method was recommended by Weckerly and Ott (2008) based on their analyses of the ten-year datasets for the BCP and avoids the upward bias inherent in the IBCC (1970) methodology (both full territories and edge territories each counted as 1.0 territory).

Productivity and mated status were estimated for all monitored territories and is shown on Tables 1 and 2. Data for the previous three survey years are also provided. With the exception of data collected in 2002 on the Victoria tract, level of effort varied significantly between 2011 and previous year's data (Tables 1 and 2). Since there is likely a direct correlation between the level of effort and the amount/reliability of data gathered, data collected in 2011 may not be comparable to results from prior years. This information is, however, provided as a reference, and possible trend data, particularly for territory density. It is also important to note that because females and juveniles are often difficult to detect, estimates of their numbers are assumed to be biased low. The observed spatial and temporal changes in territory

densities from one year to the next may also be explained by natural year-to-year variability inherent in biological populations, or possible observer bias as observers change from one year to the next.

A male was determined to be paired if he was observed associating with a female, observed tending young, or a nest was located for that male. The pairing success rate is the number of males determined to have paired divided by the total number of full and edge territories. A territory was considered to have been successful if the male or female was observed tending one or more fledglings. The breeding success rate is the number of territories determined to have produced at least one fledgling divided by the total number of full and edge territories. Average productivity is presented as the sum of all fledglings divided by the number of pairs that successfully bred (as defined above).

In 2011, a total of 35 full and edge territories were monitored for pairing and productivity data. Average pairing rate for the territories on Victoria was 85% and 80% on Rodgers Southeast. Average breeding success for Victoria and Rodgers Southeast was 70% and 47%, with an average of 2.6 and 3 fledglings per successful territory (Tables 1 and 2). A total of 54 (21 Rodgers, 33 Victoria) warbler fledglings were identified on the 100-acre monitoring plots. It is assumed the relatively low (47%) breeding success on Rodgers Southeast is due in part to fledglings that were missed during surveys.

Table 1. Summary of Survey Results for Victoria Prime 100-acre Monitoring Plot and past three survey years of data.

Year	Total Hours Surveyed	Total # of Territories	# of Full Territories	# of Partial Territories	Total # of Territories per 100 ac. (1/2 edge)	Minimum Total # of Territories Paired	Min. # Territories with at least 1 Fledgling
2011	148.25	20	10	10	15	17 (85%)	14 (70%) (average # HY = 2.6)
2007	25	17	7	10	12	0	0
2003	28.25*	13	10	3	11.5	1	0
2002**	141.5	10 (one additional outside plot not counted)	6	4	8	9 (90%)	9 (90%) (average # HY = 2)

* Number of hours often not recorded. Assumed 2 hours per visit unless otherwise noted, which is generally consistent with other visits that year.

** Christina Eckton Challenge Cost Share agreement for 2001 and 2002. Minimal difference in results for 2001 and 2002.

Table 2. Summary of Survey Results for Rodgers SE 100-acre Monitoring Plot and past three survey years of data.

Year	Total Hours Surveyed	Total # of Territories	# of Full Territories	# of Partial Territories	Total # of Territories per 100 ac. (1/2 edge)	Minimum Total # of Territories Paired	Min. # Territories with at least 1 Fledgling
2011	136.25	15	10	5* (likely 3 additional in SW corner)	12.5 (14 if * considered)	12 (80%)	7 (47%) (average # HY = 3)
2010*	37.25	15	8	7	11.5	3	0
2008	42.25	16	12	4	14	7	1
2004	46.75	21	15	6	18	6	1

* Data for 2010 was collected by Dr. Chuck Sexton, but was analyzed by Scott Rowin in 2011.

Of interesting note, three warbler nests were located this year on the 100-acre monitoring plots, one on Rodgers Southeast, and two on Victoria. Of these, two successfully fledged young, while the other appeared to be abandoned. Both successful nests were in Ashe Juniper trees. The abandoned nest was in a shin oak tree. The first golden-cheeked warbler fledglings were noted within two separate territories on the Victoria tract on April 26, 2011. All fledglings on that date were approximately 1-2 days post fledging. In total, a minimum of 54 fledgling warblers were documented within the two 100-acre monitoring sites. Additionally, as shown on Figure 2, there may be three additional edge (partial) territories in the southwest corner of Rodgers southeast prime plot. These territories were not delineated or counted due to the lack of observation, which after reviewing data sheets was determined to possibly be due to the lack of time spent in this corner.

No brown-headed cowbird parasitism was noted. No color banded warblers were noted

ENUMERATION SURVEYS

Enumeration surveys were conducted this year at five sites on the Refuge to ascertain warbler and vireo distributions and to attempt to get a rough estimate of overall territory density (Figures 3-6). Three of these sites were monitored for warblers: Hawks Nest Hollow, Cowbell (House) Canyon, and Rodgers Unit E. Eckhardt Northeast was monitored for vireos, and Damrow had overlapping vireo and warbler territories. Periodic use of playback tapes was used at each site to elicit a response or confirm banding status for both warblers and vireos. Table three summarizes the enumeration results and Figures 3-6 identify all territories. Territories are shown as points on Figures 3-6. Each territory is identified by a unique color. Question marks

(?) on these Figures represent warbler or vireo observations that could not be assigned to an individual territory.

Table 3. Summary data for 2011 Enumeration Surveys.

Location	# Acres Surveyed	Total Hours Surveyed	Total # of Territories Identified	Min. # of Territories paired (female)	Min. # of Territories with at least one Fledgling
Damrow	47	32.5	5 warbler 1 vireo	3 warbler 1 vireo	2 warbler
Cowbell and Rodgers Unit E	115	49.25	32 warbler	8	2
Hawks Nest Hollow	62	40	9 warbler (8-type 2, 1-type 3)	3	0
Eckhardt NE	119	27	3 vireo	2	0

An enumeration is a survey of all male warblers in a given area. This methodology provides information on distribution of the species over a large area. Enumerations conducted this year met the minimum requirements regarding a minimum of five visits per site, but did not necessarily meet the minimum requirement of 1 surveyor hour per 25 acres of potential habitat each day as identified in USFWS 2010. Incidental sightings of females, fledglings, and nests are also recorded, as are observations of parasitism and potential predators. This type of survey effort allows staff to cover larger areas, but the results are less accurate than those obtained on the 100- acre plots. Surveyors attempted to sort out individual warblers to increase the accuracy of the count. However, significantly less time is spent on enumeration surveys per acre than on 100-acre prime plots. Therefore, enumerations provide only rough estimates of territory number and size due to a limited number of sightings. Because enumeration survey effort varies among tracts and among years, results are not comparable.

As with the 100-acre plot monitoring, territory size and configuration are based on observations prior to May 25, 2011. Observations after May 25 are recorded, but not used to delineate territory boundaries as fledging is well underway and territories boundaries have begun to breakdown. Warbler observations were recorded with a GPS

datalogger (Garmin GPSMap 62st) and were later transcribed on field maps and entered into ArcGIS.

The focus of the enumeration surveys for Cowbell (House) Canyon, Rodgers Unit E, and Damrow was to document presence/absence of golden-cheeked warblers and black capped vireos for possible future habitat manipulation projects. For the purposes of data analysis, Cowbell (House) Canyon and Rodgers Unit E were analyzed as a single unit. Both sites are immediately adjacent to each other and have significant overlap in territorial use of each site. Cowbell (House) Canyon is the south facing canyon (limited to upper slope of canyon) and Rodgers Unit E is the plateau immediately above and extending to the northeast (Figure 4). All other monitoring sites are far removed from each other with no possibility of territorial overlap.

Damrow

The Damrow tract was surveyed primarily by volunteers Frank and Connie Madia. Refuge staff also surveyed this site on two occasions, during which a vireo territory (mated) was identified. Additionally, Refuge staff identified two warbler territories that breed successfully, one with 3 fledglings and the other with a single fledgling. In total, approximately five warbler territories and one vireo territory were located within this 47-acre tract. These territories likely extend onto the adjacent, but unsurveyed habitat. Surveying this site is extremely difficult due to the very dense second growth Ashe Juniper. Because of this there are several question marks on Figure 3 representing a warbler observation that could not be assigned to one of the territories.

Cowbell (House) Canyon and Rodgers Unit E

Thirty two territories were identified within Cowbell (House) Canyon and Rodgers Unit E. Because of the minimal amount of time spent in any one location, a few territories on Rodgers Unit E (Figure 4) were identified based upon a single detection. As discussed earlier, there is a direct correlation with the level of effort (hours surveyed per acre of habitat) and the quality/reliability of data gathered. In 2011, 49.25 hours were spent surveying approximately 115 acres. Of these hours 34.5 were spent on Rodgers Unit E and 14.75 were on Cowbell Canyon. These enumeration surveys are minimal level survey and it is possible additional territories could be located within the area. Additionally, the distribution of these observations, particularly on the plateau, does not represent the full extent of its use by the warbler. As demonstrated on the Rodgers Southeast 100-acre monitoring plot (Figure 2), provided suitable habitat is present, warblers regularly occur in both slope and adjacent plateau habitat.

Hawks Nest Hollow

The focus of the enumeration surveys for Hawks Nest Hollow was to conduct follow up surveys in an attempt to document impacts (positive or negative) to golden-cheeked warblers after a recent mechanical (2010) and prescribed fire (2011) treatment within occupied warbler habitat. Baseline surveys at this site were previously conducted in 2009 and 2010. As shown on Table 4 the number of territories within type 2 habitat has remained generally consistent, whereas a decline in the number of warbler observations and/or territories may have occurred within type 3 habitat. Table 4 summarizes data gathered from all surveys at Hawks Nest Hollow.

Table 4. Summary of 2009-2011 data for Hawks Nest Hollow.

Year	# of Days Surveyed	# of Survey Hours	# of Territories in Type 2	# of Territories in Type 3
2011	8	40	8	1 partial
2010	6	24.75	7	4-6
2009	9	33.5	8	1 full and 2 partial

As this was the first year post treatment, additional surveys were conducted in an attempt to document fledgling and pairing success. Of the nine territories identified, a minimum of 3 territories were paired. No fledglings were identified despite a concerted effort to try and locate them (Table 3). This survey and past surveys were not designed to determine cause and effect. Therefore, it is not known what was the cause or if fledglings were present, but simply overlooked. It is however concerning that the lack of observed fledglings raises the possibility that habitat treatments were detrimental to productivity this year. Baseline surveys in 2009 and 2010 also failed to locate any fledglings. However, in 2009 several observations were made of food being carried by adult warblers, suggesting fledglings were present but not detected. In 2010, the last survey was conducted on April 21, 2010, prior to the date in which fledglings would be expected (first 1-2 day-old fledglings in 2011 were seen on April 26, 2011).

Eckhardt Northeast

Surveys on Eckhardt Northeast were initiated late in the season (June 10, 2011) and should not be considered as representative of the actual vireo population for this site. These surveys were conducted to assist outside researchers David Morgan and Lauren Seckel, as they were unable to survey this area due to a lack of resources for their projects. Three vireo territories, two of which were mated, were identified on this site (Table 3). Based upon our findings, it is likely Lauren Seckel will add this site to her list of sites for intensive monitoring and color banding in 2012.

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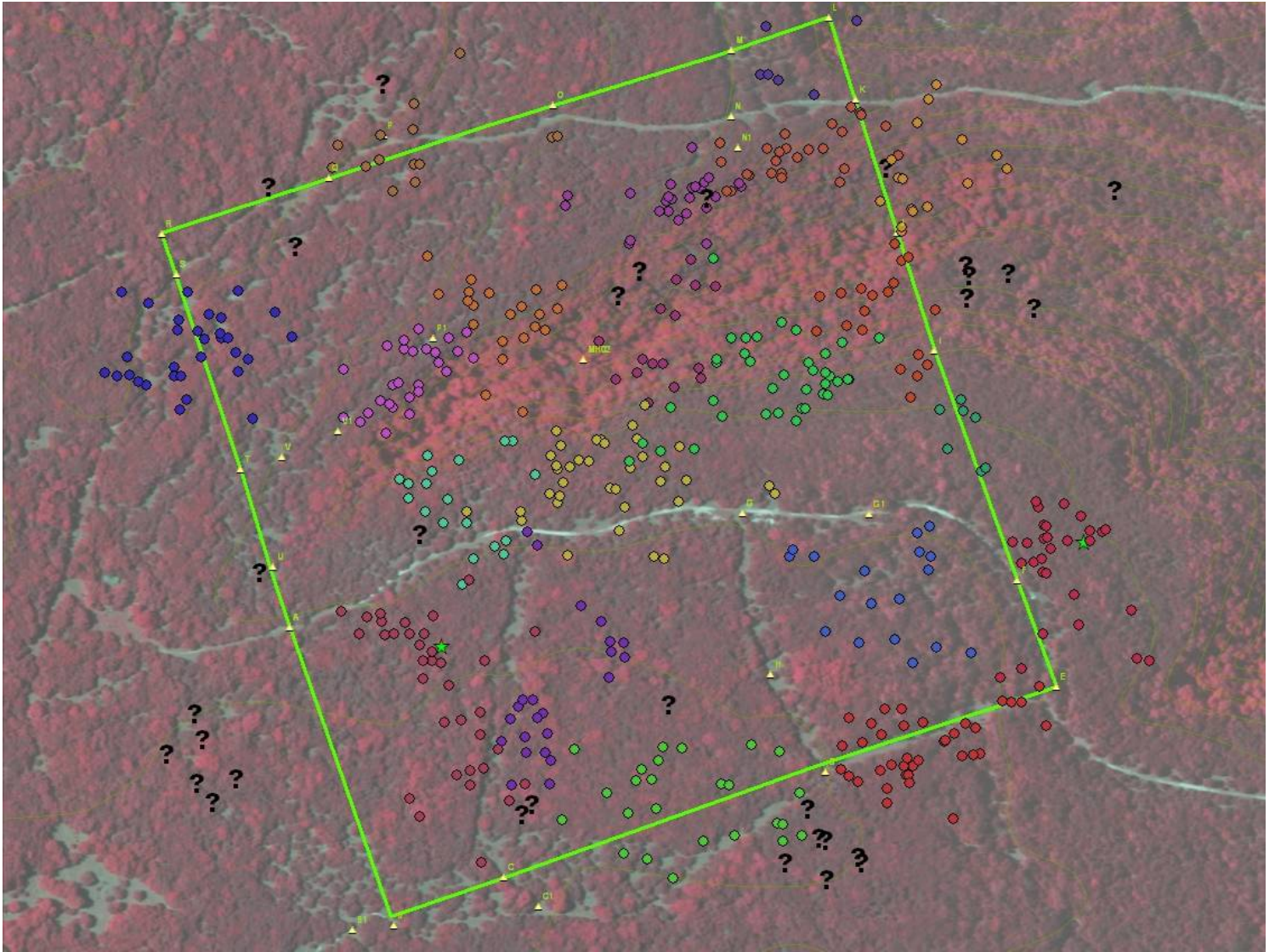


Figure 1. 2011 Golden-Cheeked Warbler Territorial Distribution on Victoria Prime 100-acre Monitoring Plot. Each Unique Color Represents a Separate Territory. Lime Green Stars Represent Nest Locations.

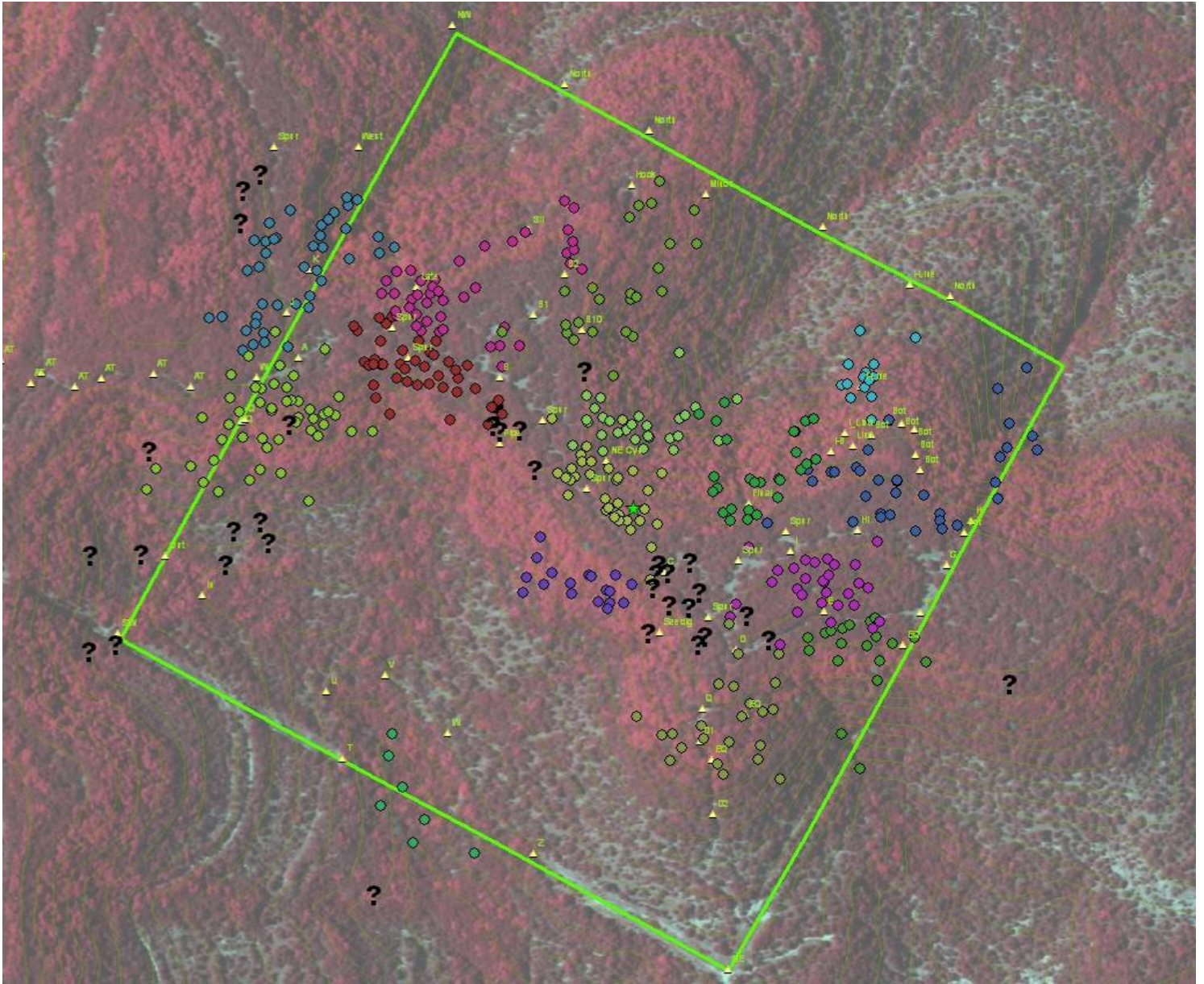


Figure 2. 2011 Golden-Cheeked Warbler Territorial Distribution on Rodgers Southeast Prime 100-acre Monitoring Plot. Each Unique Color Represents a Separate Territory. Lime Green Stars Represent Nest Locations.

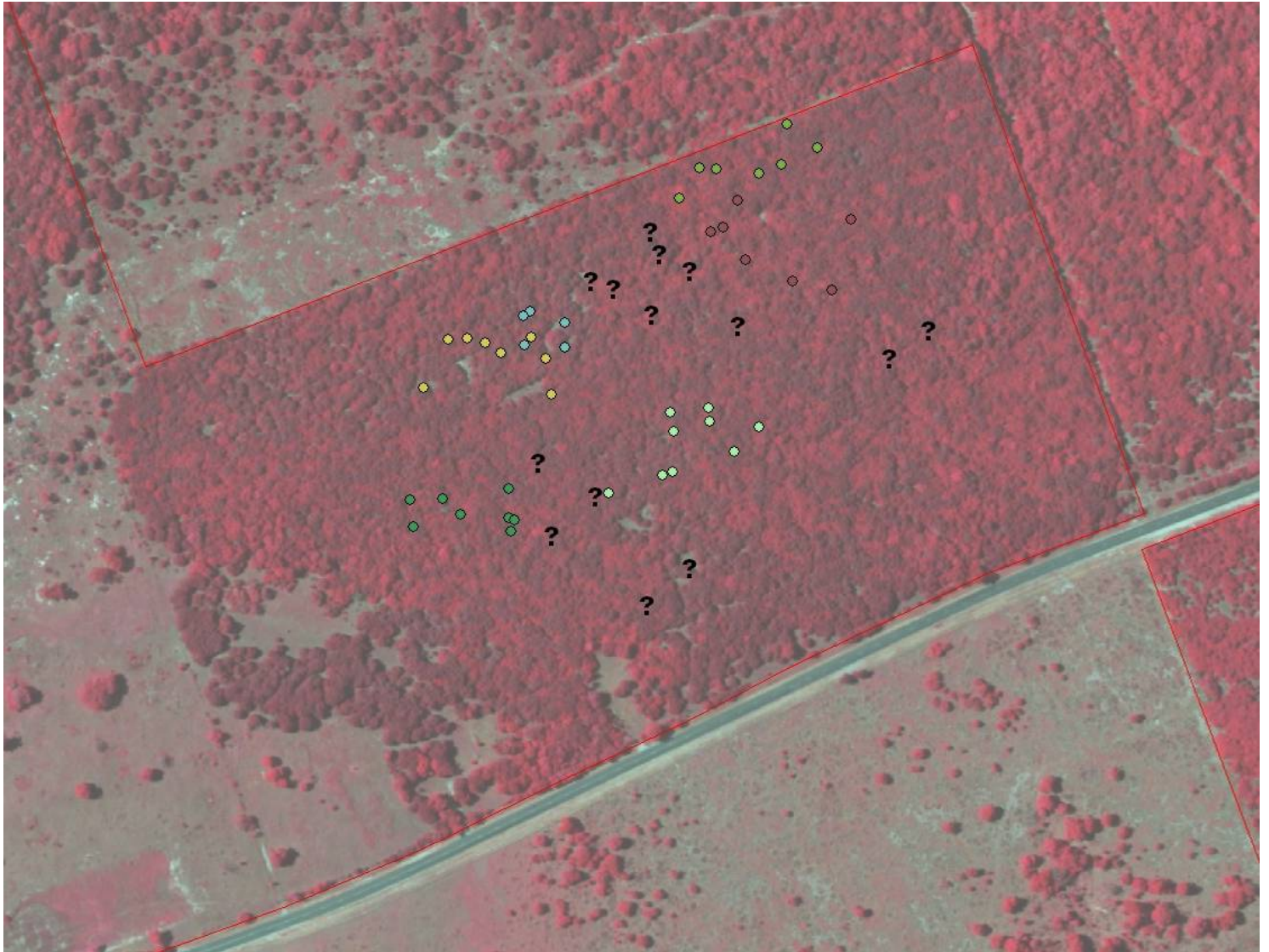


Figure 3. 2011 Golden-Cheeked Warbler and Black-Capped Vireo Enumeration Survey on Damrow Tract. Each Unique Color Represents a Separate Territory. The Vireo Territory Is Identified as Light Blue In the North-central Portion of the Tract. All Other Points Are Warbler Observations.

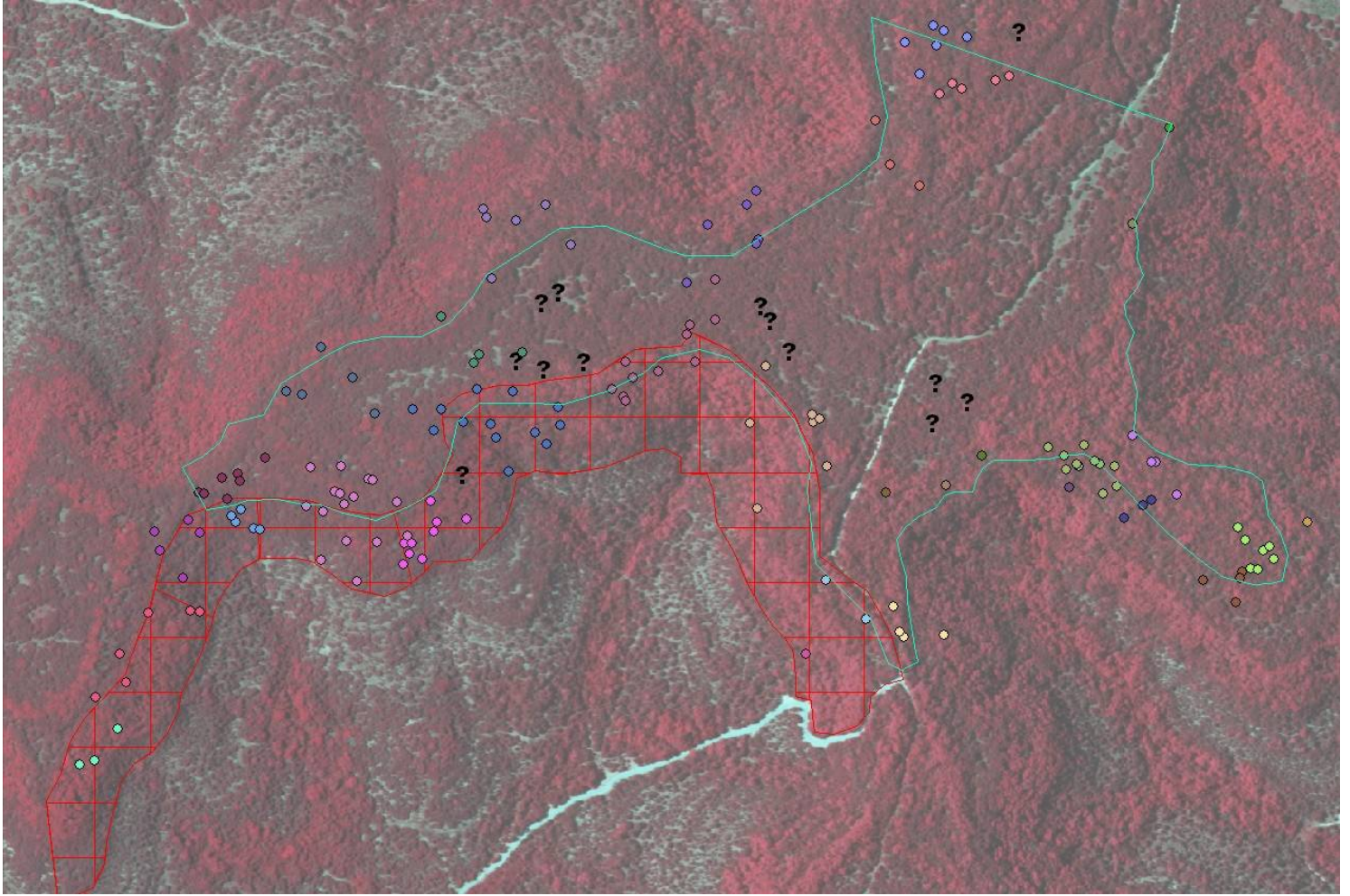


Figure 4. 2011 Golden-Cheeked Warbler Enumeration Survey on Cowbell (House) Canyon and Rodgers Unit E. Each Unique Color Represents a Separate Territory. Cowbell Canyon is Shown as the Red Crosshatched South Facing Canyon. Rodgers Unit E is the Adjacent Plateau Outlined with a Light Blue Polygon.



Figure 5. 2011 Golden-Cheeked Warbler Enumeration Survey on Hawks Nest Hollow. Each Unique Color Represents a Separate Territory. Type 2 Habitat Survey Unit is Shown as the Southern Light Green Polygon. Type 3 Habitat Survey Unit is the Northern Light Green Polygon. The Central Square Polygon Represents a Deer Exclosure Fence.

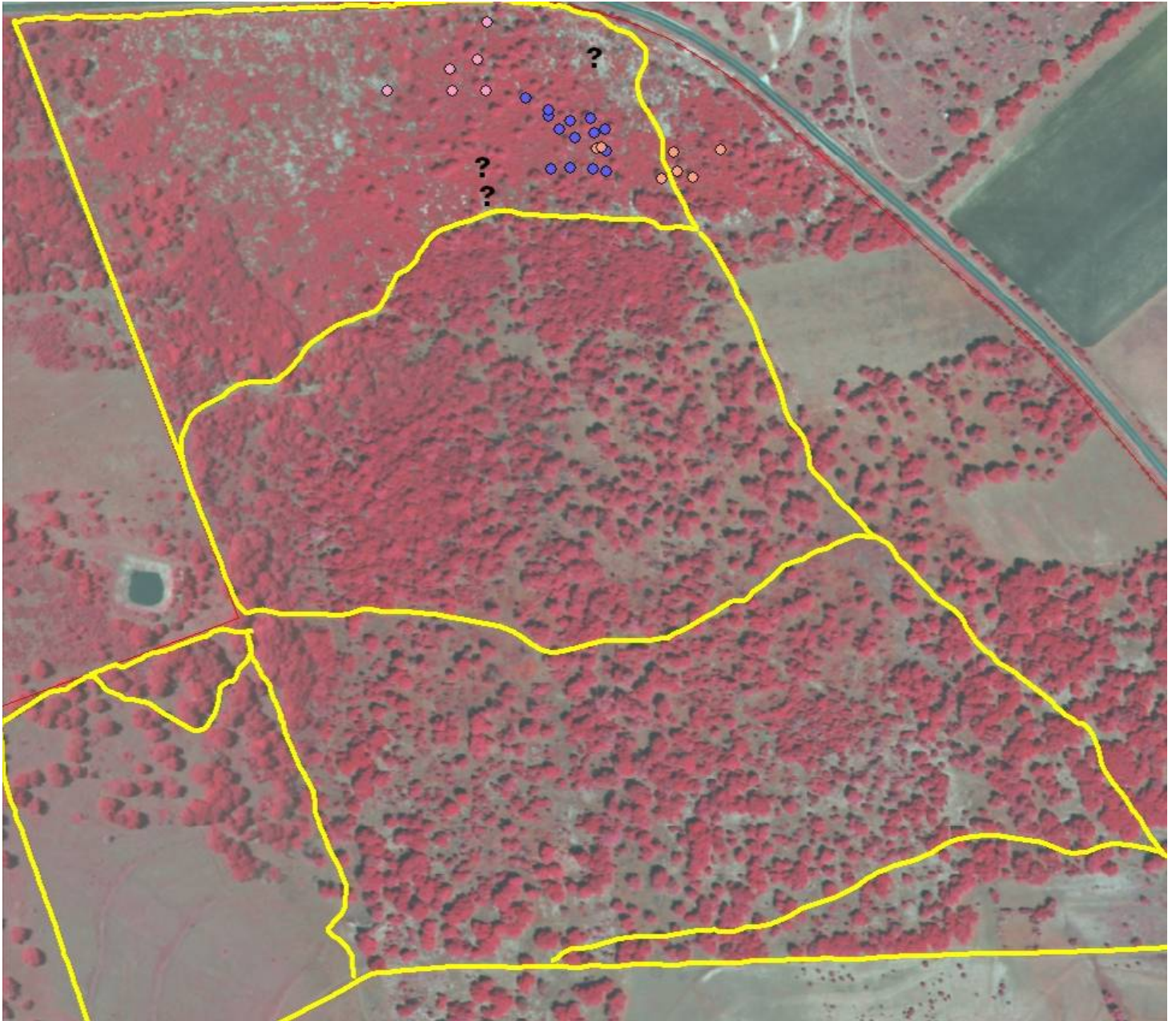


Figure 6. 2011 Black-Capped Vireo Enumeration Survey on Eckhardt Northeast. Each Unique Color Represents a Separate Territory. Yellow Lines are Roads. The Three Central Polygons Outlined by the Roads Were Surveyed.