2013 Balcones Canyonlands National Wildlife Refuge
Golden-cheeked Warbler (*Setophaga chrysoparia*)
And
Black-capped Vireo (*Vireo atricapilla*)
Annual Monitoring Report

Color Banded Male Golden-cheeked Warbler

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INTRODUCTION

This report summarizes the results of the Balcones Canyonlands National Wildlife Refuge (BCNWR) 2013 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 and golden-cheeked warbler were conducted by Michaela Murphy and Marisa Martinez with Texas A&M University, for the black-capped vireo by Lauren Seckel with Washington State University, and for the golden-cheeked warbler by Frank Thompson and Jennifer Reidy with the University of Missouri. These activities are reported separately by the specific researcher and are not included in this report.

In 2013, the primary surveyors on staff were: Refuge Biologist Scott Rowin, Zone Biologist Jim Mueller, volunteer John Harrington, and Student Conservation Association Biological Technicians Liz Boeckmann and Joey Moore. All volunteers and staff received adequate training prior to color banding and surveying.

BACKGROUND

The golden-cheeked 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 is also an endangered, neotropical migrant that breeds in portions of Oklahoma, Texas, and Mexico (Grzybowski 1989). 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 24,440 acres (including conservation easements), with an anticipated future goal of having 46,000 acres. Of the acres currently or soon to be included within the Refuge, approximately 18,728 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 1,861 acres are identified for the vireo, some of which are also not occupied. Additionally, approximately 142 acres within the Refuge have been identified as areas that could be managed for either or both species. The remaining acreage is typically identified and managed as grassland, savannah, riparian habitat, or facilities.

Since 1998 monitoring of the golden-cheeked warbler population on BCNWR has been part of a standardized, regional program between BCNWR and Balcones Canyonlands Preserve (BCP) in Travis County with objectives that tied into the Recovery Plan for the species. The protocol was to map male golden-cheeked warbler territories within several 100-acre plots over 10 weeks based on ≥60 hours of surveys (Balcones Canyonlands Preserve Land Management Plan, 2007). Some plots were located in "prime" habitat, in which 75% of the plot had >70% canopy cover, and others in "transitional" habitats that were expected to mature into prime habitat. On BCNWR, 5 plots were established, 3 in prime and 2 in transitional habitats. Population and productivity trends were to be tracked on these 100-acre plots by collecting information on territory density, territory location, pairing success, breeding success, and productivity.

At the time of development it was believed population and productivity estimates for the BCNWR could be derived by extrapolating results from the five 100-acre plots and other short-term monitoring plots to similar habitats throughout the refuge. However, survey efforts on BCNWR over time have been sporadic and inconsistent due to lack of sufficient personnel, and as a result population and productivity data are limited. The latest population estimate for the Refuge was at least 810 golden-cheeked warbler territories (Sexton 2009). This estimate was derived by utilizing these survey results and professional judgment, but may not be a valid estimate of the golden-cheeked warbler population on BCNWR for the reasons identified above. Past monitoring efforts also do not provide sufficient information for evaluating success of management activities. Because of this Refuge staff reevaluated its golden-cheeked warbler monitoring program and began a new monitoring approach beginning in 2012. Beginning in 2012 BCNWR would conduct occupancy surveys across the entire refuge (including conservation easements) approximately every five years followed by productivity surveys in the interim four years (beginning in 2013). It is believed this would provide sufficient information to allow for needed management decisions and would allow for trends in occupancy and productivity to be monitored over time. This report focuses on the 2013 productivity surveys. See the 2012 Annual Report for more information on Occupancy Surveys.

Historically, discrete segments of the Refuge's vireo population have been monitored by Refuge staff and/or outside researchers. Since 2009 considerable help in monitoring the Refuge's black-capped vireo population has occurred through several Universities. With this help the Refuge has obtained good data on its black-capped vireo population and productivity. Because of this, no Refuge-wide monitoring protocol has been developed. However, the occupancy surveys mentioned above were designed to include the black-capped vireo. As with the warbler, Refuge staff will develop a standardized monitoring protocol for the vireo if/when the Universities are no longer able to monitor the Refuge's vireo population. In 2013 all black-capped vireo observation by Refuge staff and volunteers were casual observations of the species.

OBJECTIVES

The objective of the 2013 golden-cheeked warbler productivity surveys are to delineate golden-cheeked warbler territories as accurately as possible and to document pairing success, nesting/breeding success, and productivity (actual number of young per territory) to estimate long-term trends in these parameters spatially across the Refuge and across multiple habitat types. Substantial levels of effort and color banding will be provided for each territory to obtain observations of females, nests, and newly-fledged young for each territory to provide accurate estimates of productivity.

METHODS

Study Sites - In 2012 the Refuge completed occupancy surveys at 250 randomly generated points spread across the Refuge (including conservation easements). Of these points a certain number were determined to be occupied by golden-cheeked warblers. In an effort to generate points at which territory and productivity surveys were to be completed in 2013, a subset of these points was generated. This subset was created by querying all 250 points with positive warbler detections that occurred within 75 meters of the point as determined during the 2012 occupancy surveys. Since we had to ensure access to the warbler's entire territory, this subset was further refined to exclude any point that fell within 100 meters of the Refuge's boundary and to minimize any overlap between other projects, any point that fell within the 100-acre paired study sites was also excluded. This resulted in 77 possible points that could be surveyed. Of these, 41 were selected to ensure even distribution across the Refuge. Since this is an initial pilot study to determine the feasibility of completing such surveys, logistical considerations were also taken into consideration when selecting the 41 points. Given the fact that we are unlikely to be successful color banding at each of these points, it was hoped that we would be able to color band a single male warbler at 30 of the 41 points.

At each of the 30 points the golden-cheeked warbler male most closely associated with that point was color banded. After color banding observers focused on re-sighting the color-banded golden-cheeked warbler male, mapping the location and extent of its territory, searching for and monitoring nests, and looking for females and fledglings. Incidental observations of other unbanded male warblers were recorded, but only to the extent that it helped the observer better understand the color banded warbler's territory.

Survey Dates - To help ensure the male warbler settled into his territory and therefore would be less likely to move to another area, surveys and color banding began on March 18, 2013. Surveys of the color banded males continued until the observer had a full understanding of its territory and nesting status. The last survey was conducted on July 01, 2013. However, only observations up to May 25, 2013 were used to delineate the male's territory, as observations after this date are likely to be influenced by fledgling movements as territory boundaries begin to break down later in the season. Beginning on March 18 an attempt was made to color band a male warbler associated with each of the 30 points. We attempted to complete all color banding within two weeks thereby giving us the majority of the breeding season to observe the focal male. The last male was banded on April 01, 2013. However, it should be noted that we were unable to locate three males upon subsequent site visits, and therefore banded three additional males on April 17 and 22, 2013. In general, the survey season progressed as follows:

- March 18 to April 1 – Color band male golden-cheeked warblers
- April 1 to April 5 – As some males will have moved from their banding location, we conducted an initial location search for the color banded golden-cheeked warbler to determine its current location. This information was utilized to focus future survey efforts. Additional fire crew staff was utilized as this task was determined to be very time consuming with some territories.
- April 5 to May 25 – Territory mapping of color banded males, female searching, nest monitoring, and fledgling surveys. Re-band in early April if we were unable to relocate a color banded male golden-cheeked warbler after multiple searches (3 surveys).
- May 25 to July 01 – Fledgling, nest, and female searching. Continue to document color banded male locations; however this information is not used for territory delineations.

Survey Procedures - Survey procedures are described in Appendix 1, 2013 Balcones Canyonlands National Wildlife Refuge Standards for Conducting and Documenting Golden-cheeked Warbler Surveys.

Color-banding - We set up 6-meter mist nets within the territory of each unbanded male that was most closely associated with the randomly selected point described above. Once located, we attempted to lure the male into the net by playing recorded golden-cheeked warbler songs. We determined the age and gender of each individual captured using criteria established by Fort Hood. We affixed 3 colored bands and 1 USGS-issued metal band to the unbanded individuals we caught using color combinations issued by Fort Hood.

Age structure - To determine age structure, we divided the number of males aged as second year (SY), after second year (ASY), and after hatch year (AHY) by the total number of warblers banded.

Survey Effort - Of the 30 color banded territories, nine each were assigned to Scott Rowin, Joey Moore, and Liz Boeckman. Three were assigned to Jim Mueller. John Harrington provided support and floated between all territories. As the season came close to ending, all staff moved around to the territory that needed additional assistance.

Once banded, each surveyor planed on visiting their assigned territories every three days and spent approximately 2 hours each visit monitoring that location. This typically allowed the surveyor the ability to survey approximately 3 territories per day, including commute time between points, thereby allowing for a site to be surveyed approximately every 3rd day (not including weekends). Should fledglings not be observed within a territory, productivity visits continue until July 01. Once three or more fledglings were observed in a territory, less effort was focused on that territory. This additional time was then shifted to territories with less than 3 fledglings. Within territories that needed additional assistance, surveyors doubled up, with one surveyor following the male and the other following the female thereby assuring an accurate count of fledglings. Survey effort is represented as the total number of hours spent monitoring each territory.

Territory, Pairing, and Reproductive Success – We monitored each color banded male for approximately 2 hours every 3 days. All observations of the color banded male were confirmed visually and were recorded within 10 meters of the male using a

Garmin GPSmap 62st hand-held GPS. We also transcribed this information onto field maps as described in Appendix 1.

Based upon observations from April 1 to May 25 we delineated the minimum convex polygon that represented that male's approximate territory boundary. We calculated territory size based upon the minimum convex polygon. We determined a male was paired if we confirmed him associating with a female or feeding young. We calculated pairing success as the number of paired males divided by 29, the total number of territories monitored. Note, one territory (point # 180) was later excluded from intensive monitoring after it was determined the majority of its territory extended onto private property, for which we did not have access. We did however document pairing success with this territory, but do not include it in the calculations.

We determined a territory was successful if we confirmed the color banded male, or female (if in close proximity to banded male) was feeding fledgling(s). We only linked fledglings to territories if the male was color banded. We calculate territory success as the total number of territories with at least one fledgling divided by the 29 intensively monitored territories. We calculate fledgling success as the total number of territories with at least one fledgling divided by the number of successfully paired territories.

Productivity - We searched for fledglings from early-April through July 01. We attempted to obtain a complete count of fledglings produced for each territory. If a survey or multiple surveys produced three or more fledglings being fed by the male, female, or pair, and the surveyor felt confident with the total count, we considered the fledgling count complete and focused additional effort on other territories in future surveys. We continued searching for fledglings in all such territories until we had visual confirmation of three or more fledglings, or until the end of season (July 1), at which time we used the highest number of fledglings ever observed in the territory being attended by one or both of the territorial pair. During such observations, we recorded description and behavior of the fledglings to aid in future identification. It is assumed we accurately identified the reproductive status of all 29 intensively monitored territories. Therefore, we report productivity as the number of young divided by the 29 intensively monitored territories (USFWS 1995). We calculate parasitism rate as the total number of nest parasitized divided by 29. Because we were able to visit each territory approximately every three days throughout the breeding season, we consider our productivity estimates to be accurate.

Nest Monitoring - We attempted to located and monitor nests in as many color-banded warbler territories as possible. These nests were monitored approximately every three

days until their fate was determined. Once the breeding season concluded, basic vegetation data was collected at the nest site, including nest tree species, height and DBH of nest tree, nest height and distance to main trunk, percent canopy cover directly over nest, slope, and aspect. We also recorded habitat type as one of the following: 1) open understory, 2) juniper understory, 3) juniper woodland, 4) shin oak/live oak/juniper woodland, and 5) open canopy woodland.

Casual Observation Surveys – In addition to the warbler productivity study, casual observation surveys for black-capped vireos were conducted this year on portions of three tracts (3 creeks, Nagle/Barho house, and Webster). The intent of these surveys was to ascertain whether or not vireos were utilizing sites that appeared to support suitable habitat, but had never been surveyed before. Casual observation surveys generally consist of surveyors quickly moving through an area listening for male vireos calling. Surveys at each of these sites occurred on two separate occasions during mid-late June. Due to the less intensive nature of these surveys, these surveys only provide a general idea of whether or not a site is occupied.

RESULTS

Color Banding - We banded a total of 50 golden-cheeked warbler males in 2013 (Table 1). Thirty-three were for the Refuge-wide productivity study, of which three were never relocated. The remaining 17were banded for another concurrent study being conducted by Jennifer Reidy. Data associated with these males are provided in her annual report. With the exception of age structure, only results from the 30 color banded males that were intensively monitored as part of the Refuge-wide study is provided in this report.

Age structure -Of the 50 males banded in 2013, we aged 36 (72%) as ASY and 13 (26%) as SY, and 1(.02%) as AHY (Table 1). Due to the small sample size it may not be appropriate to consider the percentages as a valid representation of the entire Refuge, but doe provide important insight into the possible age structure of the Refuge. As additional data is gathered in the future a larger sample size will be generated, providing a higher level of confidence on Refuge-wide age structure and changes over time.

Survey Effort – A total of 943.5 surveyor hours, with an average of 31 hours per territory, was spent surveying the 29 territories.

Territory, Pairing and reproductive success - We caught and color banded 33 male golden-cheeked warblers as part of this study (Table 1). Of these, three (point #'s 65-

1. 205-1, and 226-1) were never relocated and no territory, pairing, or reproductive data is provided. We however banded an additional male at each one of these points and intensively monitored their territories. We monitored 30 warbler territories, but quickly realized one territory (point # 180) extended onto private property for which we did not have access. We discontinued monitoring this territory but did identify that it was paired prior to discontinuing the monitoring effort. For the remaining 29 monitored territories the minimum size was 2.10 acres, maximum size was 15.74 acres, mean size was 6.50 acres, and median size was 5.89 acres. Figures 1-9 identifies the locations and extent of each territory. Pairing success for the 29 territories was 93%, territory success was 79%, and fledging success was 85% (Table 2).

Productivity – We confirmed 73 fledglings from 23 successful territories (Table 2). The total number of fledgling produced from all 29 territories monitored resulted in 2.5 fledglings per territory monitored. Interestingly, SY males had a slightly higher productivity rate (2.75 fledglings per territory) than ASY males (2.48 fledglings per territory). It is often assumed that ASY males are more productive. However, it should be noted that only 4 males were identified as SY males in this study. Only one territory (Point # 131) was parasitized, resulting in a parasitism rate of .02%.

It should also be noted that we likely documented a within-season fledgling mortality. On May 7, 2013 one 5-8 day old fledgling was visually observed being fed by the color banded male at point 154. Upon subsequent surveys (May 13, 16, 21, and 29) no fledgling(s) was observed with the male or female. On May 30 and 31 both the male and female were observed carrying food, and on June 5th a nest with older nestling was located. This nest fledged 3 young between June 5 and 7, 2013. Possible explanation of this mortality may be due to cold overnight temperatures. On May 3rd a late season cold front hit central Texas with temperatures dropping overnight to the mid-30's to mid-40's. These cold temperatures remained until May 7. Multiple cold fronts hit central Texas this spring and it appears as though these fronts may have caused egg, nestling, and fledgling mortalities. As noted in Table 2 many nests fledged in late May to late June (last nest fledged June 25), suggesting one or more nest failures throughout the season for many of the monitored territories.

Nest Monitoring – We located and monitored eleven of the color-banded golden-cheeked warbler nests. Of these, 91% fledged, 73% were in Ashe Juniper trees. The mean height of the nest tree was 9 meters, with a mean height to the nest being 7.44 meters. Mean DBH of the nest tree was 17.15 centimeters and the mean canopy cover was 92.48%. All nests (100%) were located within type 4 habitat (shin oak/live oak/juniper woodland). Table 3 provides summary data for the monitored nests.

Casual Observation

A casual observation survey is a quick survey of all male warbler or vireos in a given area. This methodology provides information on distribution of the species over a large area but does not meet the minimum standards of a presence/absence survey (USFWS 2010). This type of survey effort allows staff and/or volunteers to cover larger areas, but the results are far less accurate than those obtained with other methods. Surveyors attempted to sort out individuals to increase the accuracy of the count. However, significantly less time is spent on casual observation surveys per acre than presence/absence surveys and therefore only provides a rough estimate of distribution. This season, specific casual observation surveys for black-capped vireo were completed at three sites. All observations were recorded with a Garmin GPSMap 62st and were later transcribed on field maps and entered into ArcGIS. Casual observation survey results are summarized in Table 4 and are included on Figures 10-12. Casual observations of golden-cheeked warbler males were also made during other surveys, but were strictly casual in nature and no data is provided on them in this report. This data however is included in the GIS files. Unbanded male golden-cheeked warblers identified during the productivity surveys described above are recorded in GIS as casual observations since no territory data was collected for them.

LITERATURE CITED

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Table 1: Summary data for 50 color banded golden-cheeked warblers in 2013 on BCNWR. Yellow highlight are the golden-cheeked warbler associated with this report. Unhighlighted are associated with Jennifer Reidy's project.

POINT #	DATE BANDED	Band #	COLOR COMBO	EASTING	NORTHING	SEX	AGE	COMMENTS
4	3/19/2013	2670-40901	NB/SI:DB/DG	589442	3393453	M	ASY	
48	3/29/2013	2670-40923	MV/SI:GR/RD	591941	3387089	M	ASY	
49	3/29/2013	2670-40924	OR/SI:NB/MV	591706	3386362	M	SY	
57	3/27/2013	2670-40943	DG/OR:PI/SI	589684	3388298	M	ASY	
65-1	3/20/2013	2670-40920	DG/SI:OR/RD	587622	3389215	M	ASY	*1ST OF TWO BIRDS BANDED
65-2	4/17/2013	2670-40950	RD/SI:WH/DB	587614	3389043	M	SY	***2ND OF TWO BIRDS BANDED AT POINT,ACTIVE
66	3/27/2013	2670-40942	MV/PI:NB/SI	586950	3388959	M	ASY	
99	3/21/2013	2670-40903	GR/DB:BL/SI	593851	3383936	M	ASY	
103	3/21/2013	2670-40902	BK/BL:BL/SI	594217	3383287	M	SY	
105	3/21/2013	2670-40904	BK/SI:DG/MV	593480	3382363	M	ASY	
111	3/22/2013	2670-40905	NB/RD:OR/SI	594431	3381952	M	ASY	difficult extraction, 2 males singing nearby
117	3/22/2013	2670-40906	OR/YE:WH/SI	595506	3380970	M	ASY	picked at orange band after release
122	3/22/2013	2670-40907	WH/SI:BK/DG	595595	3379894	M	ASY	
128	3/19/2013	2670-40916	OR/SI:WH/OR	596904	3379248	M	ASY	
131	3/19/2013	2670-40915	BL/DB:PI/SI	596956	3378185	M	ASY	
132	3/28/2013	2670-40944	MV/DG:NB/SI	597319	3378430	M	ASY	
145	3/22/2013	2670-40934	OR/MV:GR/SI	594492	3379113	M	SY	
152	4/1/2013	2670-40939	DB/YE:DB/SI	593503	3377456	M	ASY	
154	3/22/2013	2670-40933	DG/SI:GR/PI	594913	3376740	M	ASY	
160	3/18/2013	2670-40914	WH/GR:BK/SI	597249	3375218	M	ASY	
161	3/18/2013	2670-40913	PI/MV:MV/SI	598337	3375276	M	ASY	2 males in area and one unbanded female
176	3/19/2013	2670-40931	NB/YE:BK/SI	592829	3377233	M	ASY	
177	3/18/2013	2670-40911	GR/GR:DG/SI	599143	3374728	M	ASY	
179	3/18/2013	2670-40912	RD/MV:BL/SI	599552	3374846	M	ASY	
180	3/19/2013	2670-40917	BK/SI:DB/BK	599635	3374331	M	ASY	3 males singing in immediate area
203	3/20/2013	2670-40932	GR/SI:MV/MV	584276	3387128	M	ASY	
205-1	3/27/2013	2670-40936	PI/SI:DG/OR	584107	3386904	M	ASY	*1ST OF TWO BIRDS BANDED
205-2	4/22/2013	2670-40930	GR/DG:RD/SI	583957	3386702	M	ASY	***2ND OF TWO BIRDS BANDED AT POINT,ACTIVE
212	3/25/2013	2670-40910	NB/SI:PI/OR	585643	3386026	M	SY	
219	3/20/2013	2670-40919	BL/SI:MV/OR	586814	3384856	M	ASY	some white on R1, fair amount on R2
224	3/20/2013	2670-40918	YE/SI:DG/YE	588867	3384535	M	ASY	singing 1 min after release
226-1	3/28/2013	2670-40921	BK/SI:GR/DB	587534	3384111	M	SY	*1ST OF TWO BIRDS BANDED
226-2	4/17/2013	2670-40929	WH/OR:DG/SI	587470	3384015	M	SY	***2ND OF TWO BIRDS BANDED AT POINT,ACTIVE
FXS/64	3/28/2013	2670-40922	RD/SL:YE/BK	588271	3388916	M	ASY	
PON	3/26/2013	2670-40941	BL/DB:GR/SI	594253	3378394	M	ASY	R1 & R2 both sides adventitous molt
POS	3/26/2013	2670-40935	RD/BK:GR/SI	593992	3377677	M	ASY	
POS	3/28/2013	2670-40937	DB/GR:DG/SI	594238	3377491	M	SY	
POS	3/28/2013	2670-40938	NB/SI:BL/GR	593940	3377870	M	SY	
POS	4/1/2013	2670-40940	BK/SI:YE/RD	594636	3377856	M	ASY	female w/ male not caught, also second male caught already banded GR/SI/DB/OR
RON	3/23/2013	2670-40908	DG/SI:DB/MV	593150	3384703	M	ASY	
RON	3/23/2013	2670-40909	YE/SI:OR/MV	593369	3384493	M	SY	
RON	4/1/2013	2670-40925	GR/SI:YE/GR	593247	3384438	M	SY	
RON	4/1/2013	2670-40926	YE/GR:NB/SI	593308	3384592	M	ASY	
RON	4/1/2013	2670-40927	MVDB:YE/SI	593321	3384494	M	ASY	
RON	4/1/2013	2670-40928	DG/RD:MV/SI	592860	3384169	M	SY	
ROS	3/30/2013	2670-40945	BK/DB:GR/SI	593396	3383206	M	ASY	Released with left wing strain, fluttered but could not fly. Hopped of to west
ROS	3/30/2013	2670-40946	WH/SI:NB/DG	593270	3383417	M	ASY	
ROS	4/1/2013	2670-40947	NB/SI:DB/MV	593343	3383692	M	SY	
ROS	4/1/2013	2670-40948	GR/SI/BL/BK	593116	3383642	M	ASY	Female approached net
ROS	4/1/2013	2670-40949	BK/SI:DB/YE	592864	3383173	M	AHY	3 total males responded

Table 2: Summary data for 2013 golden-cheeked warbler productivity surveys on BCNWR. Red highlighted golden-cheeked warblers were never relocated. Yellow highlighted golden-cheeked warbler was not intensively monitored because much of its territory was located on private property.

POINT #	COLOR COMBO	Age	Paired? Y/N	TOTAL # FLEDGLINGS	Fledge Date (approximated)	COMMENTS
4	NB/SI:DB/DG	ASY	Y	3	5/1/2013	
48	MV/SI:GR/RD	ASY	Y	1	5/7/2013	
49	OR/SI:NB/MV	SY	Y	2	5/15/2013	Nest found on 5/9, fledged
57	DG/OR:PI/SI	ASY	N	0		no pairing or fledges detected
65-1	DG/SI:OR/RD	ASY	*NA*	*NA*		*1ST OF TWO BIRDS BANDED-never relocated
65-2	RD/SI:WH/DB	SY	Y	3	5/12/2013	***2ND OF TWO BIRDS BANDED AT POINT,ACTIVE
66	MV/PI:NB/SI	ASY	Y	0		ever found. Pair disappeared in early May. Never resighted
99	GR/DB:BL/SI	ASY	Y	3	5/3/2013	Nest found on 4/26, fledged
103	BK/BL:BL/SI	SY	Y	4	5/2/2013	
105	BK/SI:DG/MV	ASY	Y	3	6/25/2013	Nest found on 6/18, fledged
111	NB/RD:OR/SI	ASY	Y	3	5/26/2013	Nest found on 5/14, fledged
117	OR/YE:WH/SI	ASY	Y	0		paired, nest failed, no nestlings or fledglings ever found. Nest found on 5/14, failed
122	WH/SI:BK/DG	ASY	Y	3	5/10/2013	Nest found on 5/08, fledged
128	OR/SI:WH/OR	ASY	Y	3	5/1/2013	
131	BL/DB:PI/SI	ASY	Y	0		1 cowbird fledgling
132	MV/DG:NB/SI	ASY	Y	3	4/28/2013	
145	OR/MV:GR/SI	SY	Y	4	5/14/2013	
152	DB:YE/DB/SI	ASY	Y	4	5/7/2013	
154	DG/SI:GR/PI	ASY	Y	3	6/5/2013	1 fledgling seen 5/7. Appeared to have died. Nest found 6/5 with nestlings fledged
160	WH/GR:BK/SI	ASY	Y	3	5/7/2013	Nest found 4/25, fledged
161	PI/MV:MV/SI	ASY	Y	3	4/29/2013	
176	NB/YE:BK/SI	ASY	Y	4	5/10/2013	
177	GR/GR:DG/SI	ASY	Y	4	5/3/2013	nest found on 4-12-13 fledged on 5-2or3-2013.
179	RD/MV:BL/SI	ASY	Y	3	6/5/2013	Nest found on 5/28, fledged
180	BK/SI:DB/BK	ASY	Y	*NA*		Substantial portion of territory extended onto private land. Monitoring discontinued
203	GR/SI:MV/MV	ASY	N	0		no pairing or fledges detected
205-1	PI/SI:DG/OR	ASY	*NA*	*NA*		*1ST OF TWO BIRDS BANDED-never relocated
205-2	GR/DG:RD/SI	ASY	Y	3	5/9/2013	***2ND OF TWO BIRDS BANDED AT POINT,ACTIVE
212	NB/SI:PI/OR	SY	Y	4	4/28/2013	
219	BL/SI:MV/OR	ASY	Y	4	4/29/2013	Nest found 4/25/2013, fledged
224	YE/SI:DG/YE	ASY	Y	3	5/22/2013	
226-1	BK/SI:GR/DB	SY	*NA*	*NA*		*1ST OF TWO BIRDS BANDED-never relocated
226-2	WH/OR:DG/SI	SY	Y	0		never seen with fledglings. Disappeared after 5/24

Table 3: Summary nest data for 2013 golden-cheeked warbler productivity surveys on BCNWR.

Nest ID	49_nest_2013_01	99_nest_2013_01	105_nest_2013_01	111_nest_2013_01	117_nest_2013_01	122_nest_2013_01	154_nest_2013_01	160_nest_2013_01	177_nest_2013_01	179_nest_2013_01	219_nest_2013_01
Date Nest Veg. Completed	7/1/2013	6/28/2013	7/1/2013	7/3/2013	7/3/2013	7/3/2013	7/3/2013	7/1/2013	7/1/2013	7/1/2013	6/28/2013
Date Nest Found	5/9/2013	4/26/2013	6/18/2013	5/14/2013	5/14/2013	5/8/2013	6/5/2013	4/25/2013	4/12/2013	5/28/2013	4/25/2013
Date Fate Determined	5/15/2013	5/3/2013	6/25/2013	5/26/2013	5/17/2013	5/10/2013	6/6/2013	5/5/2013	5/3/2013	6/5/2013	4/29/2013
Fate	Fledge	Fledge	Fledge	Fledge	Failed	Fledge	Fledge	Fledge	Fledge	Fledge	Fledge
Tract Name	Armstrong	Rodgers	Rodgers	Rodgers	Webster	Webster	Penn East	Front Range	Victoria	Victoria	Hickory Pass
Easting	591748	593877	593539	594340	595516	595542	595088	597324	599101	599464	586991
Westing	3386266	3383802	3382341	3382096	3380982	3379727	3376649	3375258	3374724	3374893	3384852
Nest Tree Species	Juniper	Shin Oak	Juniper	Juniper	Juniper	Juniper	Juniper	Live Oak	Live Oak	Juniper	Juniper
Nest Tree Height (M)		6.4	7.7	11	5.3	11.3	7.8	9.1	8.9	10.9	11.6
Nest Height (M)		5.3	7.3	6.1	5.1	10	7.4	8	7	7.8	10.4
Distance to Main Trunk (cm)		100	75	150	0	25	250	200	0	200	10
Nest Tree DBH		12	14,12	18	7,6,10,11,6,12,6,10	17	30,20	14	15	34	15
%Canopy Cover North		89	94	91	77	95	92	87	93	95	92
%Canopy Cover East		94	69	87	87	95	92	86	85	85	91
%Canopy Cover South		94	81	84	92	93	77	89	85	85	95
%Canopy Cover West		86	95	75	95	94	94	88	95	92	92
Average Canopy Cover		90.75	84.75	84.25	87.75	94.25	88.75	87.5	89.5	89.25	92.5
Average X1.04		94.38	88.14	87.62	91.26	98.02	92.3	91	93.08	92.82	96.2
Slope		23	26	45	21	29	42	1	4	2	30
Aspect		42	30	281	80	134	149	184	304	32	345
Habitat Type	4	4	4	4	4	4	4	4	4	4	4
Comments	could not relocate nest	estimated nest location from memory, nest had fallen			nest broken on 5/17/2013. Still in place but with hole on 7/3/2013	fledge date +/- 2 days					juniper with grapevine helping camoflauge nest

Table 4: Summary data for 2013 black-capped vireo casual observation surveys on BCNWR.

Location	Area Surveyed	Minimum # Male black-capped vireo	# of Survey Visits	Total Surveyor Hours
3 Creeks	Canyon edges	3	2	7.25
Barho House/North Nagel	Barho – most of tract, Nagel – NE plateau/canyon edge	3	2	12.75
Webster - east	High intensity burn in NE corner of tract	0	2	13

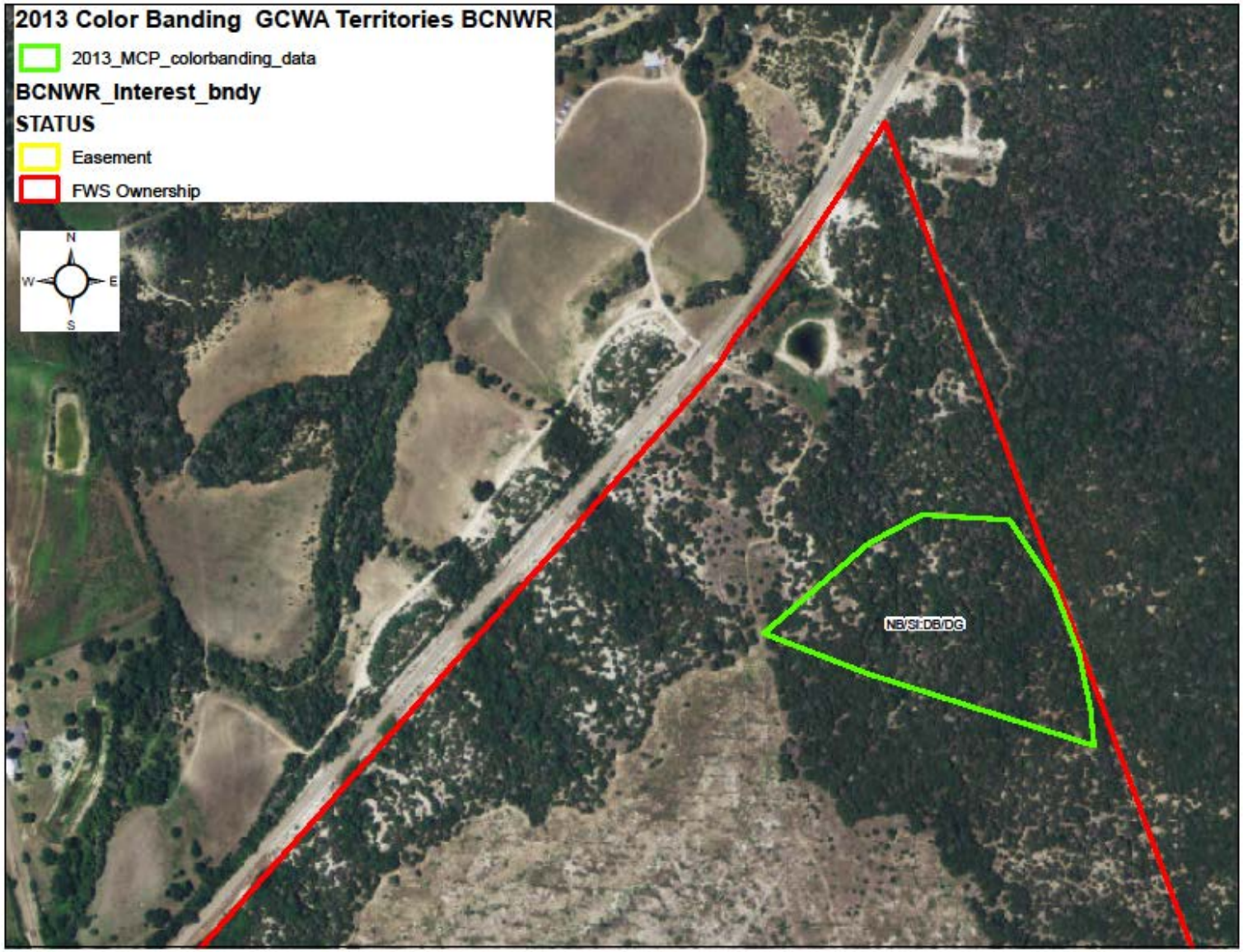

Figure 1: 2013 minimum convex polygons for golden-cheeked warbler Territories on Mullen, BCNWR.

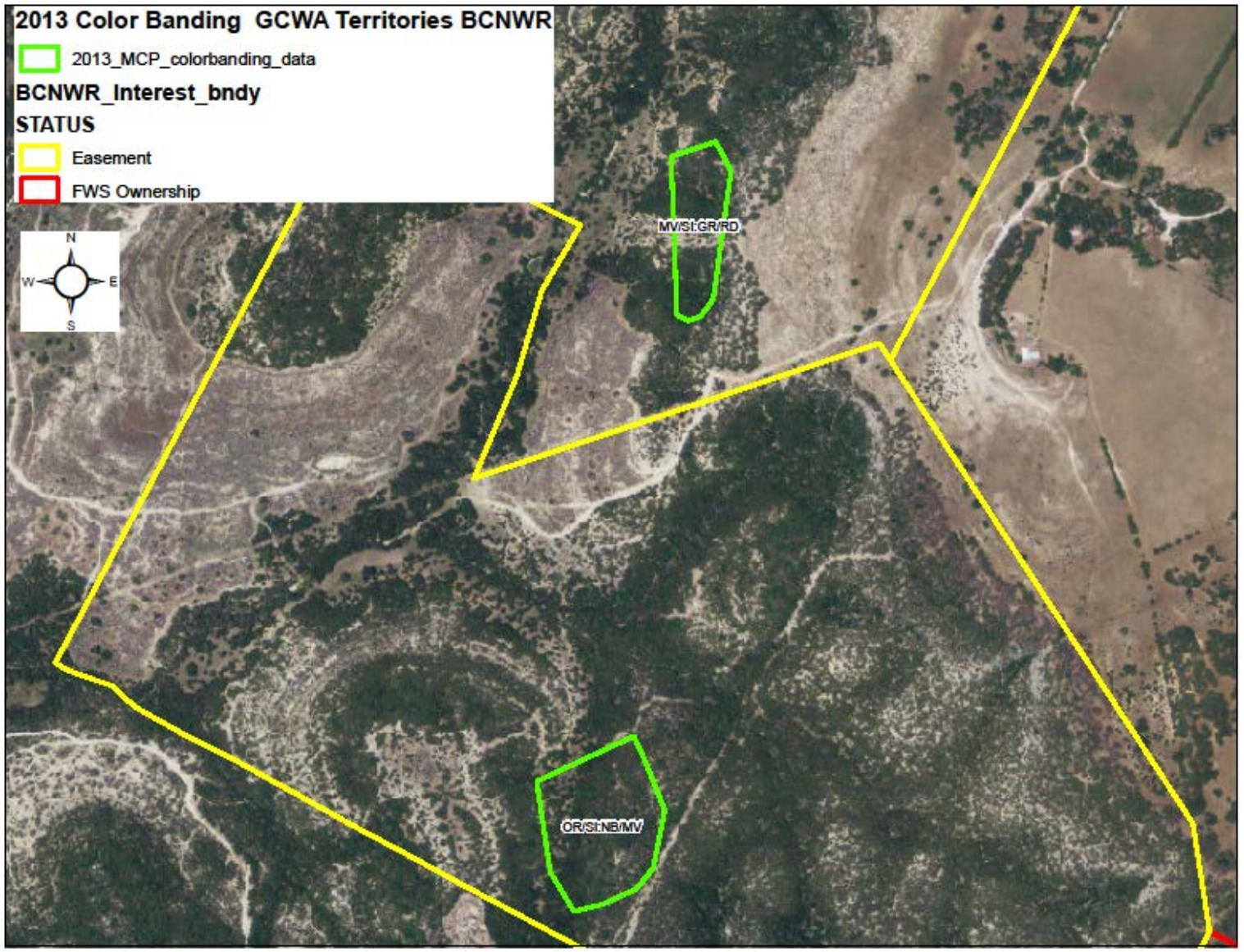

Figure 2: 2013 minimum convex polygons for golden-cheeked warbler Territories on Armstrong, BCNWR.

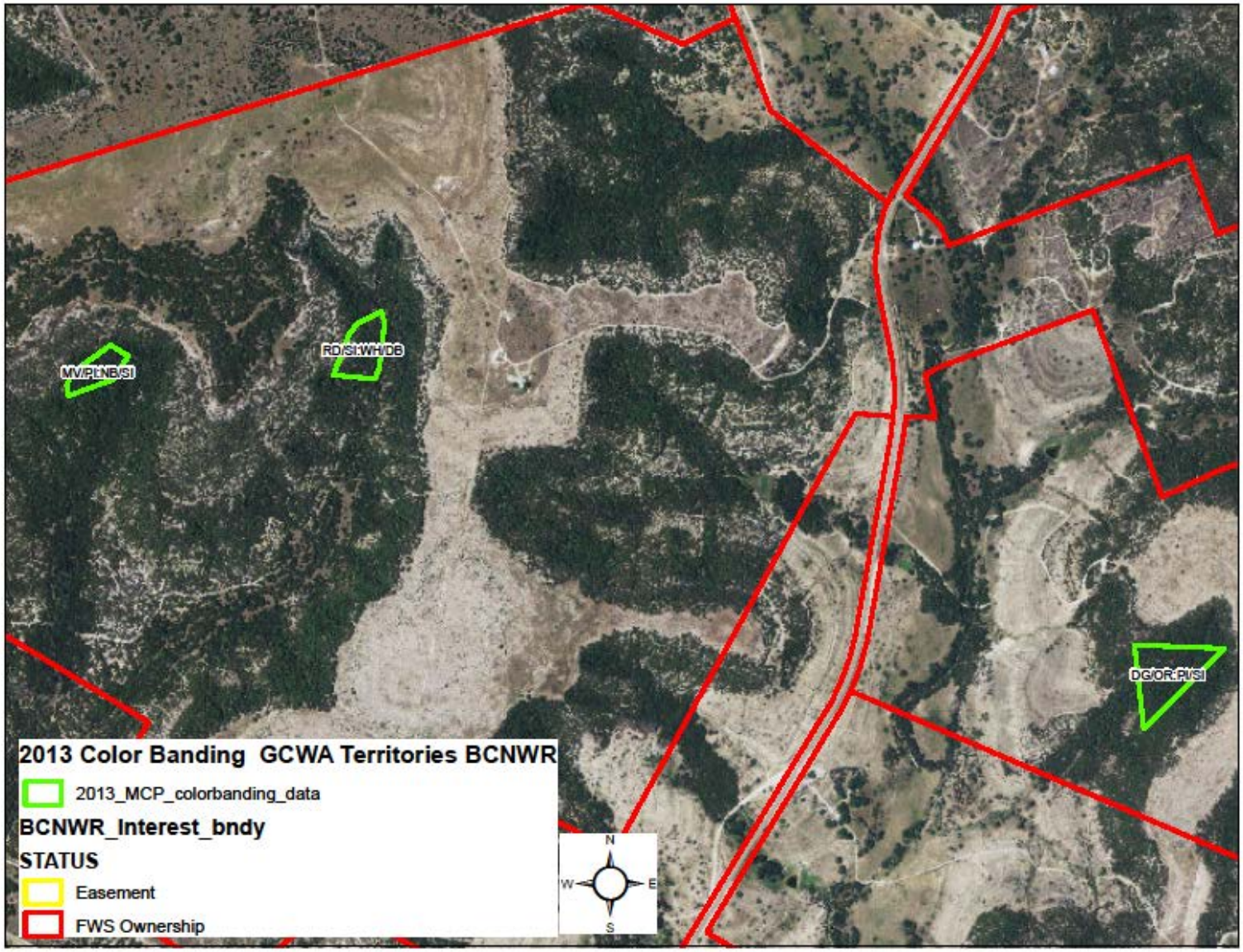

Figure 3: 2013 minimum convex polygons for golden-cheeked warbler Territories on Flying X and Nagel, BCNWR.

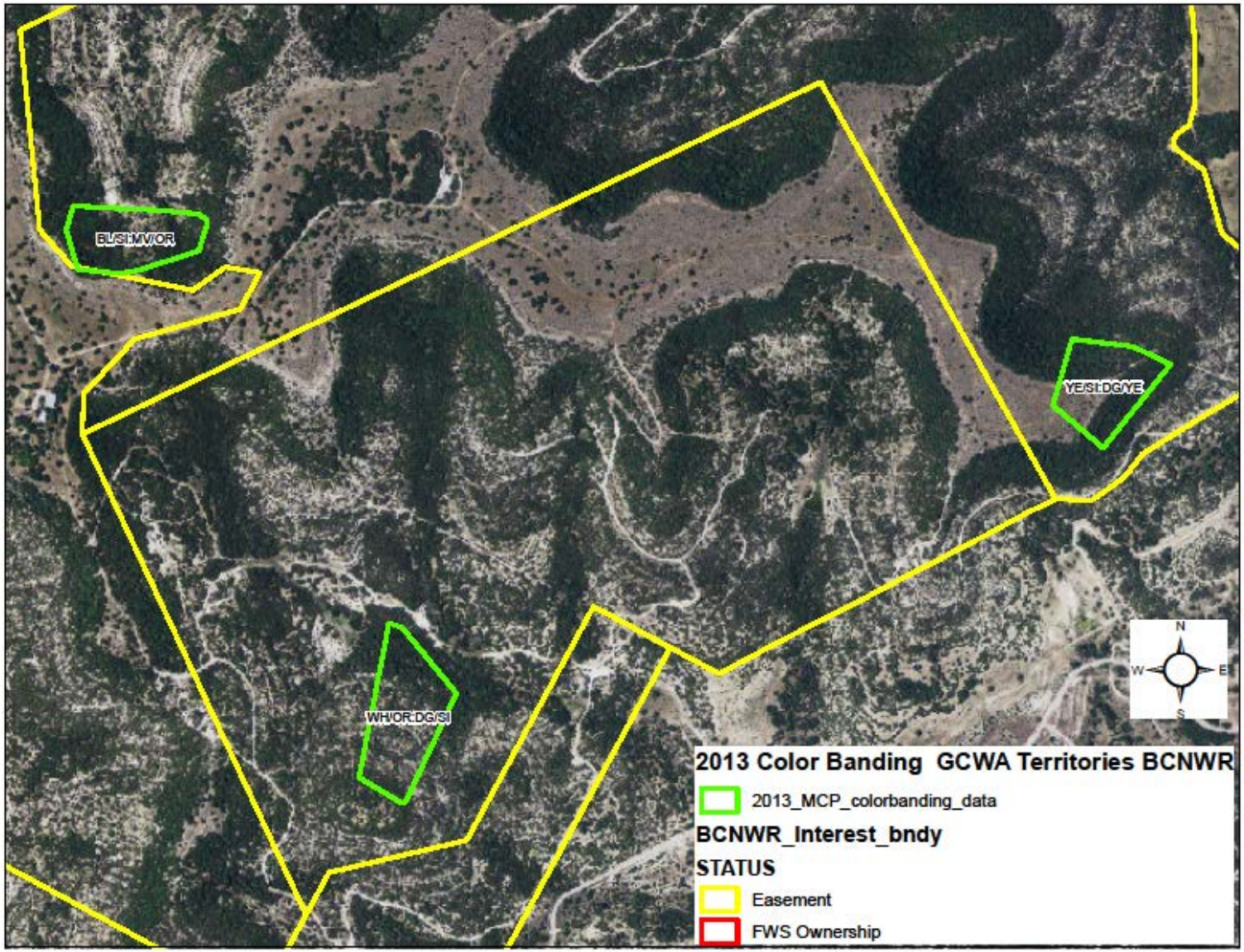

Figure 4: 2013 minimum convex polygons for golden-cheeked warbler Territories on Hickory Pass, BCNWR.

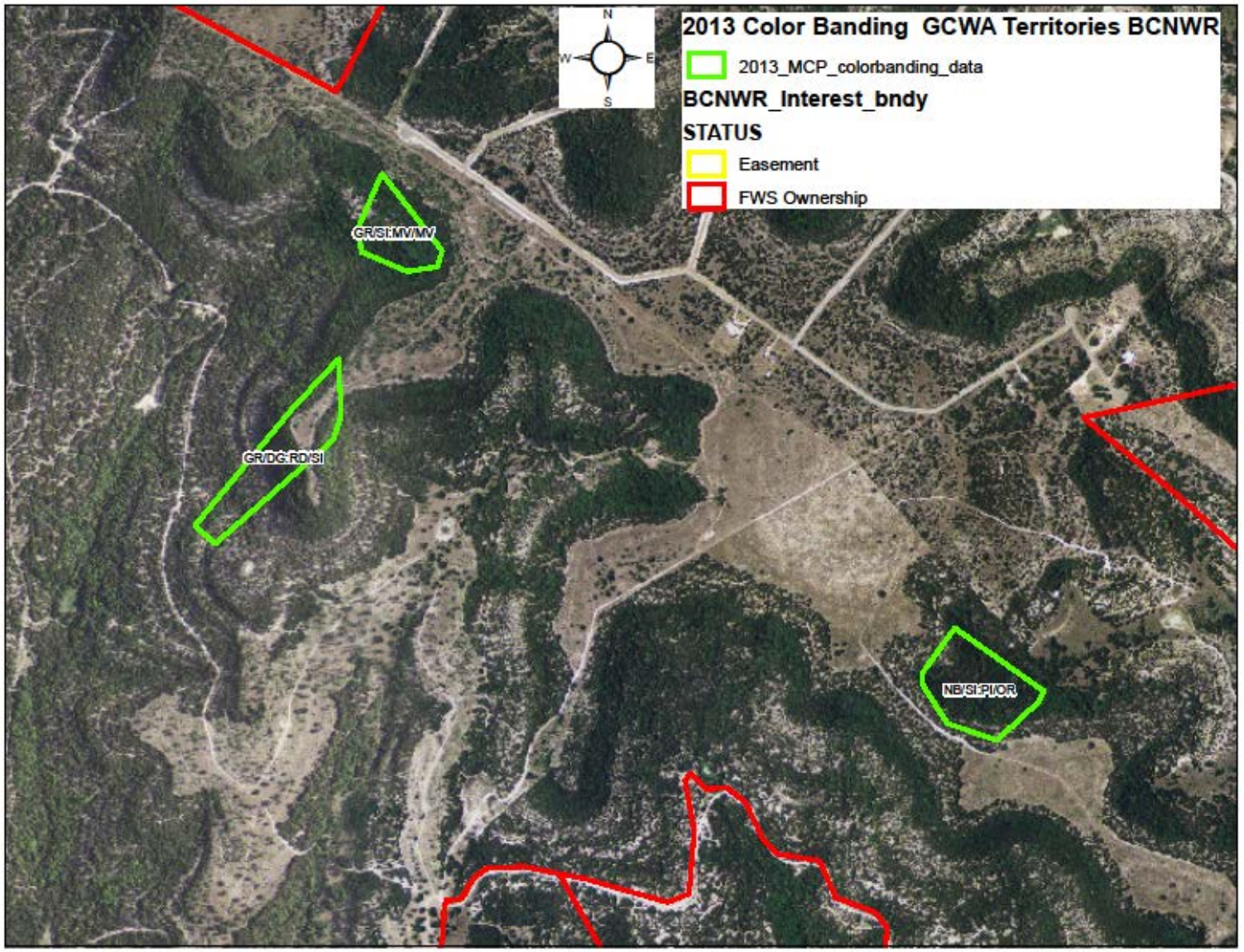

Figure 5: 2013 minimum convex polygons for golden-cheeked warbler Territories on Hickory Ridge, BCNWR.

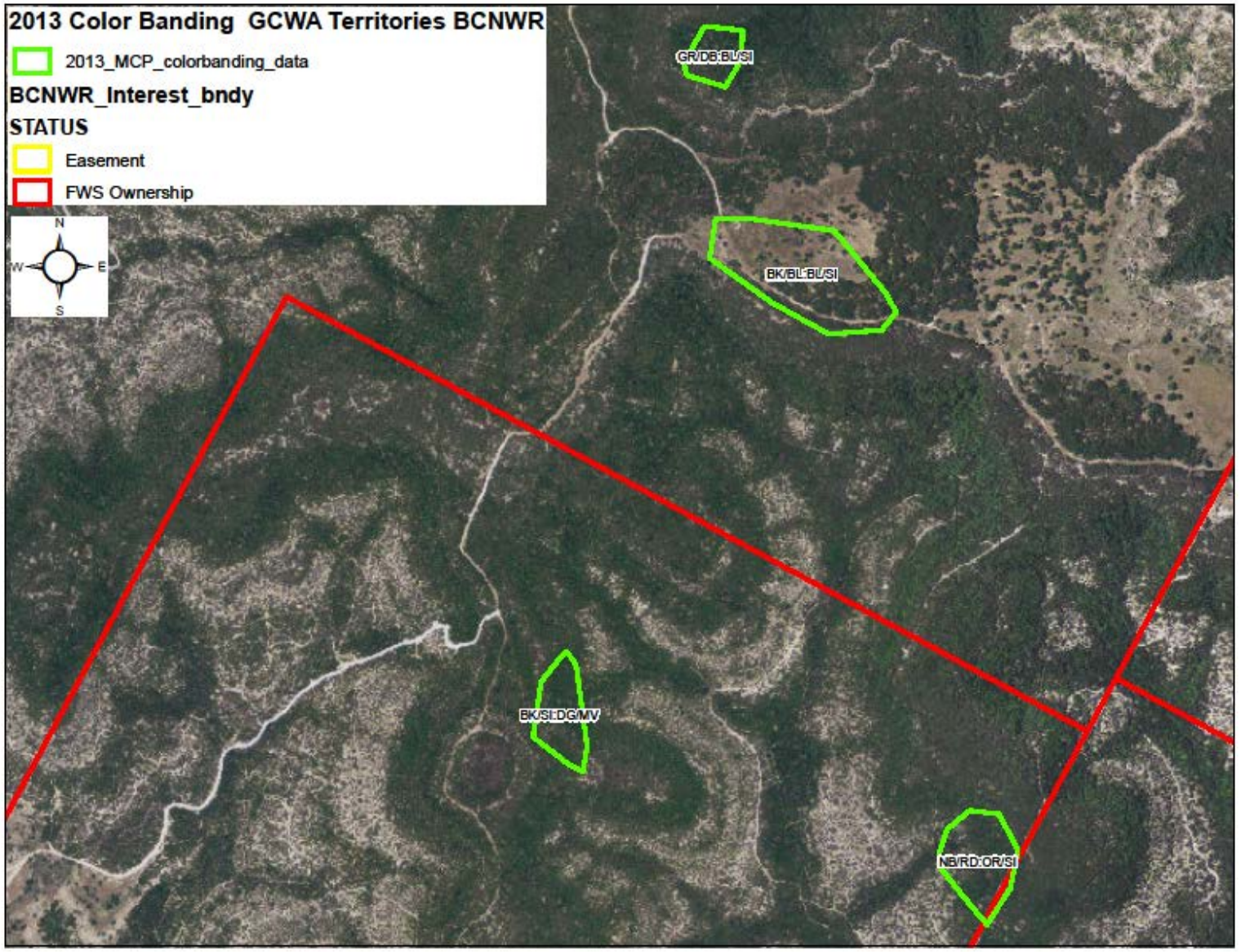

Figure 6: 2013 minimum convex polygons for golden-cheeked warbler Territories on Rodgers, BCNWR.

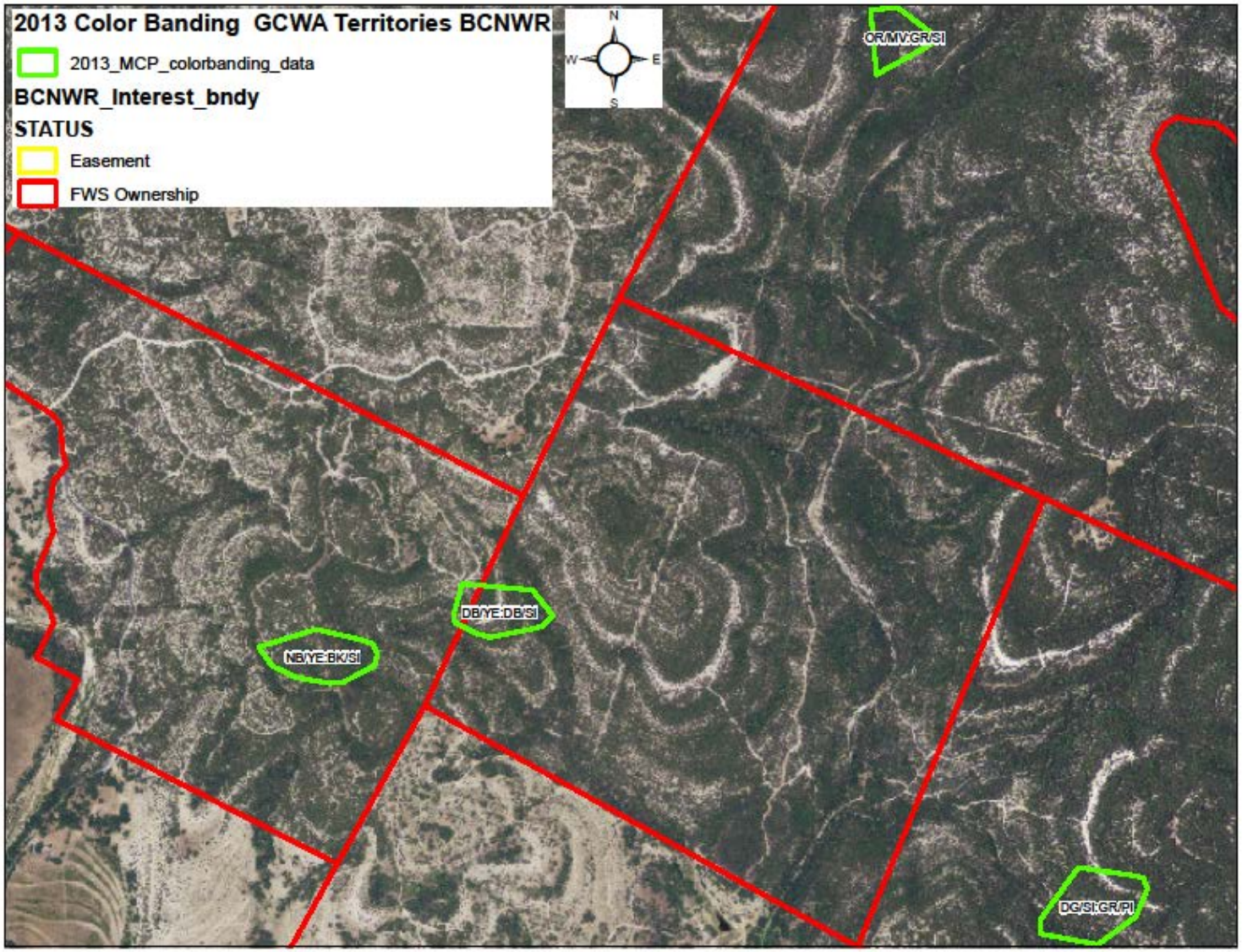

Figure 7: 2013 minimum convex polygons for golden-cheeked warbler Territories on Mckeever, Penn, and Rathgeber, BCNWR.

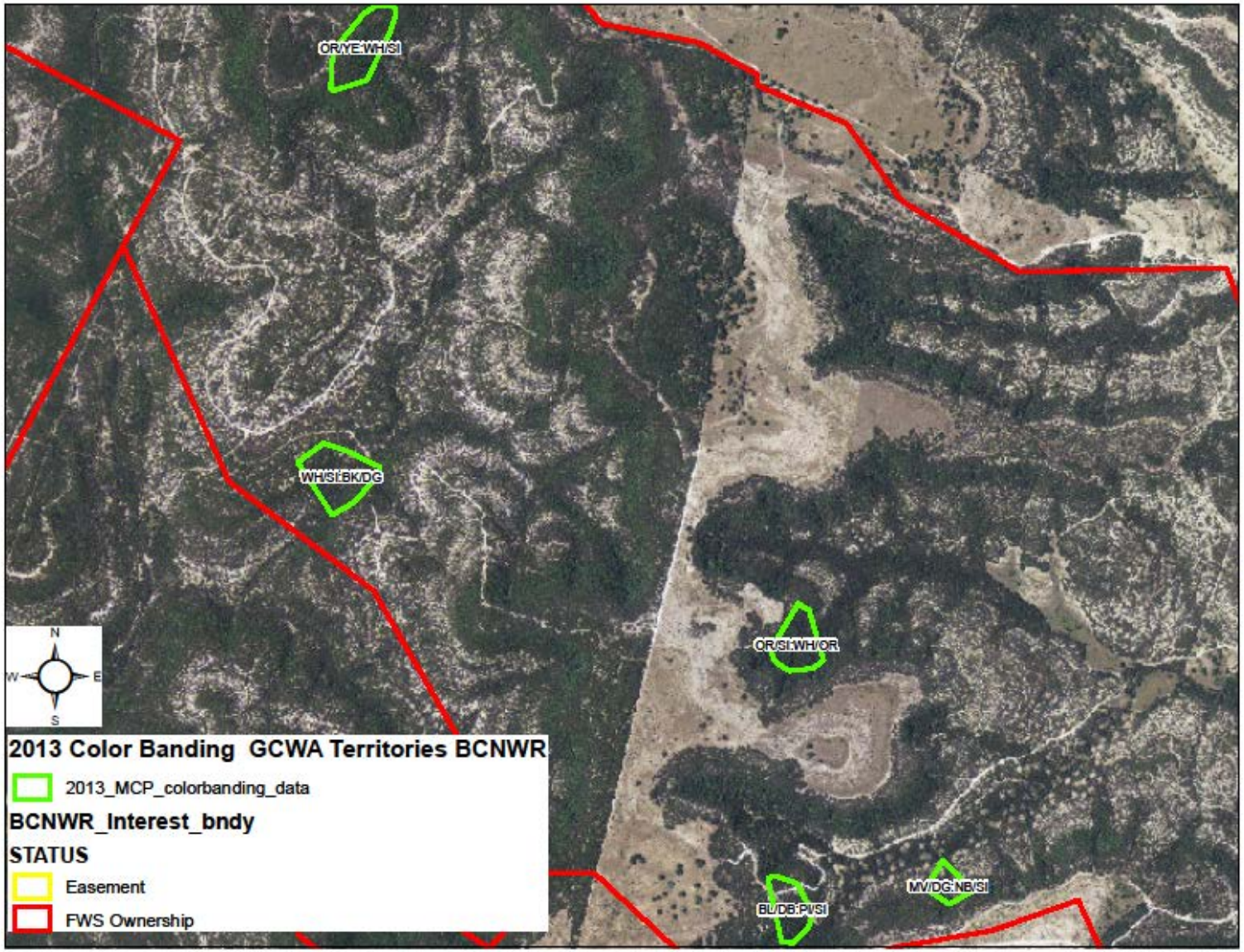

Figure 8: 2013 minimum convex polygons for golden-cheeked warbler Territories on Webster, BCNWR.

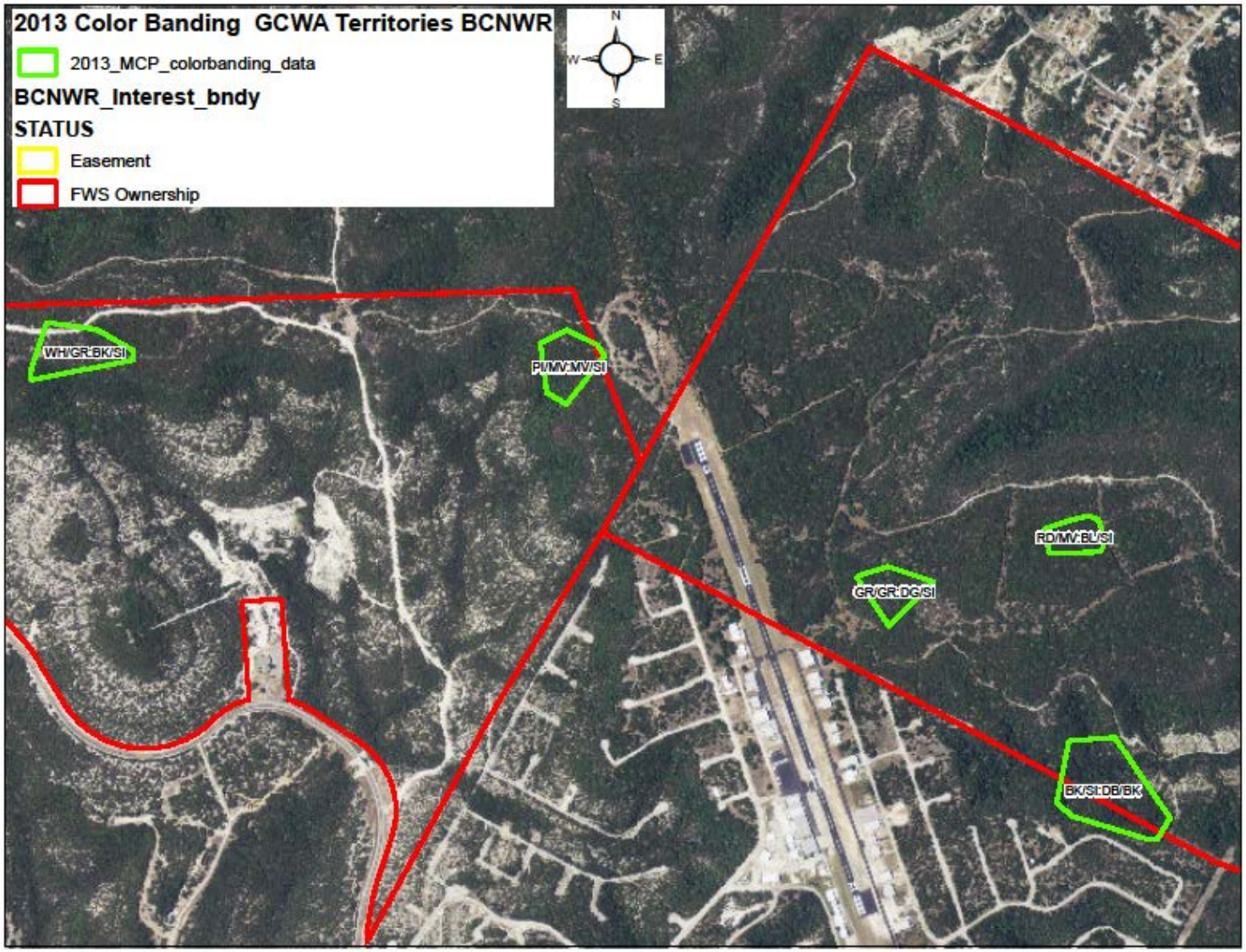

Figure 9: 2013 minimum convex polygons for golden-cheeked warbler Territories on Front Range, and Victoria, BCNWR.

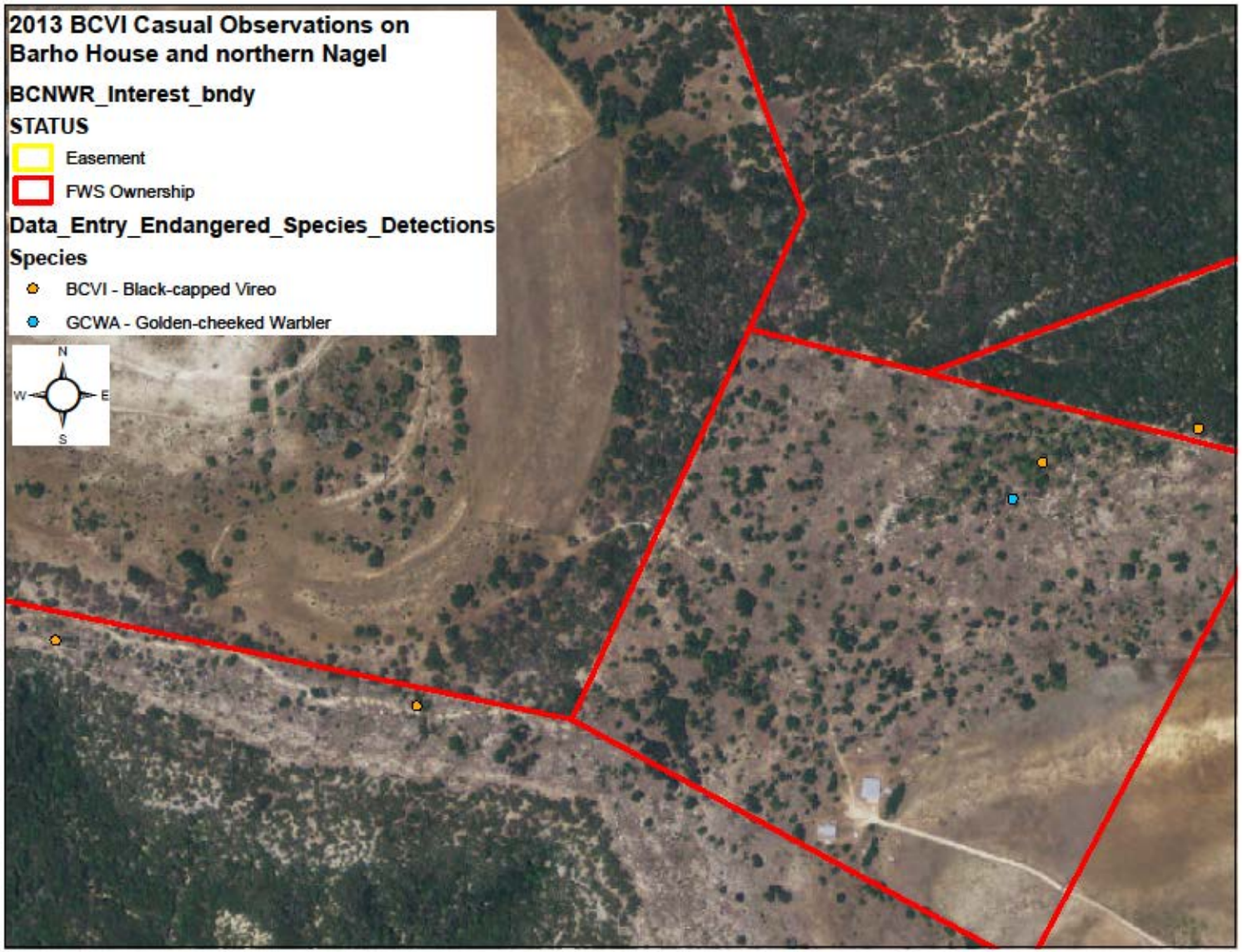

Figure 10: 2013 black-capped vireo casual observation surveys on Barho House and northern Nagel, BCNWR.

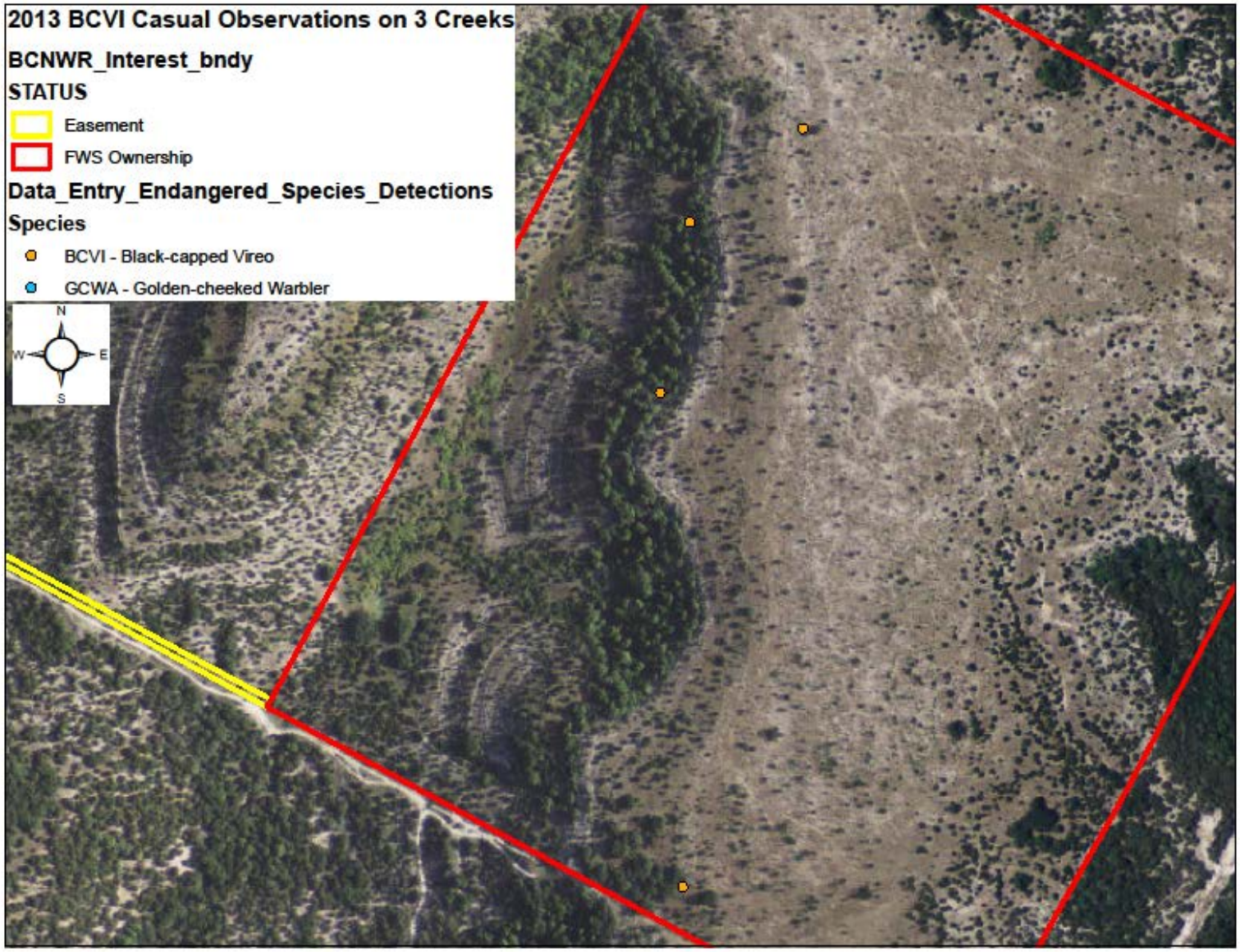

Figure 11: 2013 black-capped vireo casual observation surveys on 3 Creeks, BCNWR.

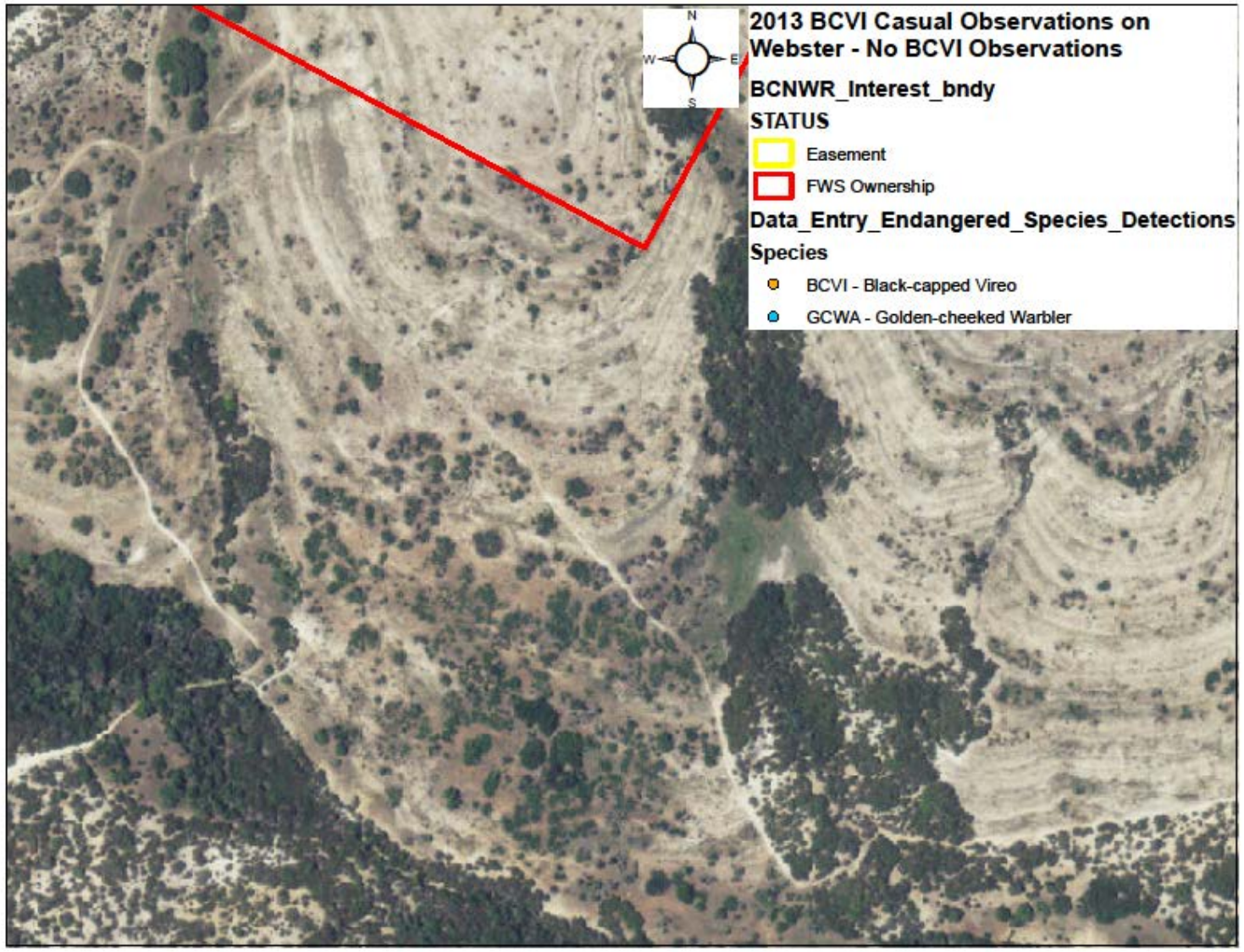

Figure 12: 2013 black-capped vireo casual observation surveys on Webster, BCNWR. No black-capped vireo seen/heard.

2013 Balcones Canyonlands National Wildlife Refuge
STANDARDS FOR CONDUCTING AND DOCUMENTING GOLDEN-CHEEKED WARBLER SURVEYS

The following standards have been developed to ensure that all individuals conducting golden-cheeked warbler (golden-cheeked warbler) territory-mapping surveys for the Refuge collect appropriate information during their surveys, and that the information is documented in a clear and consistent manner. These standards are organized in 4 main sections:

- **GETTING STARTED**
- **WHAT INFORMATION TO DOCUMENT AND HOW**
- **POST SURVEY PROCESSING**
- **ATTACHMENTS**

Additional standards may apply to different types of surveys (e.g. point counts) but the following is applicable to all surveys involving documentation of golden-cheeked warbler presence, territory boundaries, and/or breeding success.

GETTING STARTED

Materials to Take With You during your Surveys

- Field maps (black-and-white topographic maps for mapping observations, plus optional aerial maps)
- Notebook (Note: a notebook is for your own personal use. You must provide field notes on the back of your maps).
- Pens/pencils
- Binoculars
- GPS
- Compass
- Thermometer
- Flagging (orange)
- Permanent marker (Sharpie)
- Cell phone
- Extra batteries for electronics
- Note, if you are working alone you must have a second form of communication (hand-held radio) and must have a point of contact to check in with every two hours.

You may want to attach flagging to your GPS unit and other field equipment to make them easier to find if dropped.

General Standards for Conducting Surveys

- Do not survey in a steady rain or thunderstorm (light drizzle is OK.)
- Do not survey if sustained winds interfere with your ability to hear singing birds (approximately 12 miles/hour or greater.)
- Do not use playback of songs or calls to elicit a response. Exceptions to this may occur during your first few surveys after the warbler has been banded to obtain an initial detection. Doing so may help narrow your area of focus, but should be used sparingly, and should only be used to draw a bird less than 10 meters from your location (i.e. from the top of a tree to a lower branch). Once identified, playback songs should no longer be used.

- For each site visit, record on the field map: observer name (**first and last name**), date, and starting and stopping times. At the end of the visit, record the total survey time for that visit. Record time to the nearest ¼ hour (i.e. 1.75 hours)
- Record beginning and ending weather conditions – temperature, wind speed, cloud cover (%), and precipitation – on the map.
- Record observations of Brown-headed Cowbirds and any sightings of golden-cheeked warblers feeding fledgling cowbirds. You may also want to note presence of potential predators such as jays, hawks, owls, grackles, snakes, Eastern Fox Squirrels, crows, ravens, and fire ants.
- Describe and record GPS coordinates for vandalism, trespassing (camp sites, new trails, tree cutting, dumping, etc.), or other damage you find on Refuge tracts. Report these situations as soon as possible to Scott or Jim.

WHAT INFORMATION TO DOCUMENT AND HOW

Minimum documentation will include both a field map showing locations of all golden-cheeked warbler observations, using appropriate symbology; GPS coordinates for each observation (whenever possible); and notes containing additional information on each observation. These should be recorded on the back of the field map. After each survey is completed, both the field map and associated notes will be filed in a central repository that can be accessed by Refuge staff for analysis and data entry.

Documenting golden-cheeked warbler Observations

- Observations include all golden-cheeked warblers seen and heard, as well as any nests that are found. As much as reasonably possible, you should limit your observations to golden-cheeked warblers with a known status (i.e. banded or unbanded) and each observation should be collected with your GPS unit. Avoid having observations of "unknown" golden-cheeked warblers. An exception to this may be a golden-cheeked warbler countersinging at a distance away from the color banded golden-cheeked warbler you are observing.
- Record the location of each observation on a black-and-white topographic field map.
- The primary purpose of this survey is to map the territory and productivity of the color banded warbler. During the course of your survey you should identify each unbanded warbler, as this will help later in better understanding territory delineations and will increase your level of confidence for correctly identifying females and fledglings for the color banded male and adjacent territories. However, very little effort should be spent on unbanded warblers. Once you have identified the status (unbanded) of that bird, you should immediately discontinue surveying that bird and begin searching for the color banded warbler. The unbanded warbler should be noted on your datasheet and you should change the default name to "UB and the associated point number" (i.e. UB145). Similarly, if the warbler is unknown you should record it as "UK with the associated point number". As much as possible, you should avoid marking points as "unknown". Most of your observations will be of the color banded male singing. These observations should be recorded by creating a waypoint with the GPS unit. To expedite processing, you should accept the default waypoint number. When time allows you must transcribe these observations on your field map. An appropriately located point on the map with the associated waypoint number is what should be included. On the back of the map you should include more detailed notes on what the waypoint numbers represent. Any unusual observations (i.e. female or fledglings) should also be recorded as a waypoint, but greater detail in the field notes should be provided.
- Use symbols described in **ATTACHMENT 1. However**, instead of using letter symbols to identify species, use the methodology described above to identify **each individual** golden-cheeked warbler (i.e., use "UB145", "UK145", etc. for **each** bird in place of the "**W**" that is used for **all** birds of the same species in **ATTACHMENT 1**) . Since we are not focusing on territory mapping the unbanded or unknown warblers, it is permissible to use the same name for each unbanded and unknown warbler at each point.

  - Use the female symbol " ♀" on the front of the map and on the notes on the back to denote a female golden-cheeked warbler. If a female golden-cheeked warbler is in close proximity (10 meters) to a male (e.g. both are foraging in a tree, tending a nest, or feeding fledglings), there is no need to give her a separate identification number. You can utilize a single standardized waypoint, as identified above. Your notes on the back should clearly describe if the observation is of a male, female, or both. If she is alone or it is unclear if she is with a mate, assign her a separate identification number utilizing the "UK145♀" example as identified above.
  - Use a lowercase " **f** " to identify each fledgling golden-cheeked warbler observed (e.g. write " **fff** " on the map for 3 fledglings found together). Again, no need to give fledglings separate identification numbers if found with a parent. One or more fledglings found on their own or not clearly associated with a nearby adult golden-cheeked warbler should be given a separate identification number (one per group if the fledglings appear to be siblings.) You should note which territory you believe the fledglings are associated with on the back of your map.
  - Correctly associating the total number of fledglings related to the color banded male is the most important aspect of this survey. This can also be the most difficult aspect of the survey. Typically, the male and female will split the brood, taking 1-3 fledglings each to feed, and each parent may be 50+ meters from each other. To help increase your level of confidence you are identifying the correct female, you may want to consider describing on your datasheet what the female looks like (i.e. amount of black on chest and neck) each time you visually see a female closely (within 10 meters) associated with the color banded male. It is not uncommon for males and females with fledglings to move outside of their respective territories.
- When possible, mark a GPS waypoint for the **actual** (< 10 meters away) location of each golden-cheeked warbler observation shown on your map. If a golden-cheeked warbler observation is distant from your location, note the estimated location on your map with a dashed line circle around the identification number. These would all be recorded as unknowns (UK). The size of the circle can represent the level of confidence in the estimated location.
- The primary focus of this survey effort is to monitor only color banded golden-cheeked warblers associated with established occupancy survey points. For all adult golden-cheeked warblers, observe and record whether banded, and if so, record the band combinations (see **Observing and Documenting Band Combinations** below) on the back of your datasheet with the associated waypoint numbers. The color banded golden-cheeked warbler is the individual you should focus your time and efforts on. However, it is important to note all other golden-cheeked warbler observations.
- Use a solid line with arrow to indicate direction of movement of observed golden-cheeked warblers.
- Use a dotted line between 2 (or more) males to indicate counter-singing or other contemporary contact between males. This information is very important in helping to distinguish separate males and their territory boundaries.
- Document aggressive encounters between 2 (or more) golden-cheeked warblers using radiating lines surrounding the numbers identifying both birds (see **ATTACHMENT 1** for example.)
- Record any details of the observation (e.g. plumage characteristics, song type, behavior, etc.) on the back of the field map. Describe nestlings and fledglings as thoroughly as possible. It is especially important to document males or females carrying food or nesting materials and the direction they move with these materials. If possible, follow such birds as unobtrusively as possible. If you find a nest, follow instructions in **Marking and Documenting golden-cheeked warbler Nests** below.
- It is very important to estimate and record ages of <u>all</u> nestlings and fledglings based on nest observations and/or **ATTACHMENT 3, NEST, NESTLING, AND FLEDGLING AGEING.**

- Once three or more fledglings associated with the color banded golden-cheeked warblers territory have been identified, you should consider reducing the level of effort at that site and use that additional time at other sites.

Important dates to remember are:

- Nest building occurs last week of March and first week of April
- Nest feeding occurs around mid-April to mid-May
- Fledging begins around late April
- If a nest fails nesting activity can occur through early June

Observing and Documenting Band Combos

- Observers must attempt to see all detected golden-cheeked warblers and confirm whether the bird is banded.
- Record the following for each detected bird (male and female):
  - If you are unable to see the bird well enough to determine if it is banded, record as " **UK** ".
  - If you definitely see that there are no bands, record as " **UB** ".
  - If you determine the bird is banded but are unable to discern any of the colors, record as " **?/?:?/? B** ". Keep in mind it is likely there are no other color banded individuals within the area and as such this is likely the golden-cheeked warbler you should be monitoring.
  - Record the color of observed bands in the following order:
    upper left leg/lower left leg: upper right leg/lower right leg.
    (Remember when a bird is facing you, the 'left' leg is to your right)
  - Use the 2-letter codes for the bands as given below. Aluminum (**SI**) bands are **always** on the lower leg; "No band" (**NB**) is **always** recorded as being on the upper leg (e.g. **RD/SI:NB/BL**).
  - Always put a "?" after the whole or any part of the combo of which you are uncertain. For example, if you know the left leg is red and aluminum but you are unsure of the blue and dark blue on the right, this would be recorded as " **RD/SI:BL?/DB? "** If you believe the blue in the example above was blue or dark blue, record it as " **RD/SI:BL or DB?/DB**? ".

Color band abbreviations:

Red	**RD**
Orange	**OR**
Yellow	**YE**
Green	**GR** (lighter shade)
Dark Green	**DG** (darker shade)
Blue	**BL** (lighter shade)
Dark Blue	**DB** (darker shade)
Mauve	**MV**
Pink	**PI**
Black	**BK**
White	**WH**
Silver	**SI** (aluminum band)
No Band	**NB**

Samples of color bands: YE-OR-OR-RD-PI-MV-BL-BL-WH-GR-GR-DG-DB-BK

Marking and Documenting golden-cheeked warbler Nests

- Locations of nests for the color banded golden-cheeked warbler are important information, but do not warrant disturbance of the nesting pair. If the parents appear agitated, move away to watch from a respectful distance.
- If you locate a nest for the color banded golden-cheeked warbler:
  - Mark the nest location as a waypoint in your GPS (and record the coordinates on the back of your map in case something should happen to the waypoint).
  - Determine and record the nest ID as follows: the survey point number, plus the word "nest", plus the 4 digit year, plus 2 digit number of golden-cheeked warbler nests (needed for renesting attempts) you have located at that point this year. For example, the ID for your first nest in 2013 at point 17 will be: **17_nest_2013_01**.
  - Use an asterisk " ✱" to indicate the nest location on your field map.
  - Use orange flagging to mark the nest site ≥ 3 meters from the nest, preferably at a location from which the nest is visible. On the flag write with a Sharpie the nest ID, date, distance and bearing from the flag to the nest, nest height and species of tree nest is in as: **nest ID, date, # meters → degrees °, # meters ↑**. For example, on March 31 you find a nest 5 meters above ground and 3 meters from the flag at a bearing of 240 degrees from point 17 in an Ashe juniper tree, you would write on the flag: **01_nest_2013_17, 3/31, 3m → 240°, 5m ↑ Ashe juniper**. This information, and any other relevant information should be included on your datasheet and on the golden-cheeked warbler Nest Monitoring Form. You may also draw a diagram of the nest location on your datasheets and/or on the flag as necessary. (**Rule of thumb:** You should only have to find the nest **ONCE!**).
  - From as far away as possible, monitor the nest long enough (up to 30 minutes) to determine status (inactive, active) and stage (building, incubating, hatching, nestlings, or fledging). Record the status, stage, and any other observations (e.g. parental visits, number of nestlings, etc.) on the back of the map.
  - Ideally, nests should be monitored every 2-4 days after activity is confirmed (more often close to fledging). At a minimum, monitor after each survey and stay up to 30 minutes to confirm status (active nests will almost always be visited within this time frame). After monitoring the nest, you should fill out the nest monitoring form.
  - Nest for unbanded golden-cheeked warblers should only be monitored if time allows.

ATTACHMENT 2 is a sample field map showing appropriate use of symbology for typical observations during a golden-cheeked warbler field survey.

POST-SURVEY PROCESSING

Following each completed survey, the surveyor is expected to place the following documentation in the designated central location:

- **Original field survey map** showing location and movement of all detected golden-cheeked warblers and nests. The observer's name, date of survey, and start, stop, and total survey times should also be noted on the front of the map. Before placing in the folder you should make sure all data is legible and complete.
- **All Field notes** that contain any additional relevant/important information.

After each survey, download your GPS survey points to the designated GPS file on the Refuge's server (see **ATTACHMENT 4, DOWNLOADING COORDINATES**). This will ensure that the data is secure in the event of loss or malfunction of your GPS unit.

New and revisited nests: Complete a **golden-cheeked warbler Nest Monitoring Form** (**ATTACHMENT 5**) for each nest found and file it in the central file. Also enter the nest ID, territory ID (if known), location and status of the nest into the nest summary spreadsheet. Surveyors must update the nest monitoring form after each monitoring visit until the nest's fate is finalized.

ATTACHMENTS:

1 MAPPING SYMBOLS
2 SAMPLE SURVEY MAP
3 NEST, NESTLING, AND FLEDGLING AGEING
4 DOWNLOADING COORDINATES
5 golden-cheeked warbler NEST MONITORING FORM

An aggressive encounter between two birds of species W.*

W

A simple contact with a bird of species W. This includes sight or sound contact. In the case of a sound contact, this symbol is used when the sound cannot be classified as belonging to any category below or when the sound is not believed to have a high territorial significance, or when activities not covered by the standard symbols should be registered. The sex symbol may be added where appropriate.*

W——W

Two contacts with the same bird of species W. The addition of an arrow can be used to indicate observed movement.*

W

A contact with a bird of species W, giving any vocal utterance (except song) thought to have territorial significance.*

W-------W

Contemporary contact of two different birds of species W. This is used to indicate separate singing males or separate pairs rather than members of the same pair or same family group. In the last two cases, the symbols may be ringed or underlined, or any non-standard symbol may be added.*

A contact with a singing bird of species W which has been seen or previously located by song.*

W*

A nest of species W. The number of eggs or young or other information on the nest may be added.*

A song contact with a bird of species W not precisely located (useful only in the case of birds with large territories or birds heard at a distance).*

From Bibby, et al. 1992

See Example Survey Map and Field Notes

ATTACHMENT 2: SAMPLE SURVEY MAP

NEST, NESTLING, AND FLEDGLING AGE INFORMATION FOR golden-cheeked warbler

NEST BUILDING	**2 -3 days**
REST PERIOD	**1 – 4 days**
LAYING: 3 – 5 eggs, one per day on consecutive days	**1 – 5 days**
INCUBATION: Begins day before last egg laid Performed by female only	**11 -12 days**
HATCHING: Asynchronous, usually over two days Young naked; mouse gray down on coronal and dorsal pterylae Bill pale whitish-yellow, red mouth lining	**DAY 1**
Feather tracts evident over eyes, occiput, flanks, and margin & bases of wings Primaries visible; rectrices faintly visible	**DAY 2**
Eyes barely open; gape deep yellow; quills of wing feathers evident	**DAY 3**
Active and strong	**DAY 4**
Crouching behavior	**DAY 5**
Primaries unsheath	**DAY 6**
Young feathered; tail approx. 4 mm	**DAY 7**
White wing bars become apparent	**DAY 8**
FLEDGING: Rectrices unsheath; tail approx. 9 mm Throat pale gray, breast whitish with black streaks, lower belly white Superciliary & auricular regions distinct from blackish-gray head Broad pink bill *From Pulich (1976)*	**DAY 9**
FLEDGLING: Dark grey feathers above; light breast and belly with grey streaks at edges Downy body; tail very short (almost non-existent); broad pink beak	**DAY 2***
Downy body; tail – 1.5. cm; tan beak	**DAY 5**
Tail ~2 cm; light brown beak	**DAY 8**
Adult length tail; adult width beak	**DAY 12**
Yellow appears on face and under wings	**DAY 19**
Front ½ of face yellow; breast beginning to look mottled	**DAY 24**
Yellow extends to behind eye *From Gass (1996)*	**DAY 28** ** days since fledging*

Entering Territory Mapping Data into ArcGIS

Setting up Folder Connections (to make later steps quicker)

In ArcCatalog click the connect to folder icon in the toolbar (folder with a plus sign)

Connect to:

> *I:\Biology Program New2\Inventory and Monitoring\Golden_Cheeked_Warbler\Color Banding\2013 banding\GPS downloads*
>
> *I:\GIS\Biology_Program\Endangered_Species*
>
> *C:\Users\xxxxxx\Documents\ArcGIS* (This should be automatically connected)

Entering Data Stored as Waypoints into GIS

Step 1: Create a shapefile from you GPS

> Open GPX file in DNRGPS (from your GPS or a folder) and select waypoints to be transferred using the grey boxes on the left side of the window. Use shift to select consecutive waypoints and control to select disconnected waypoints.
>
> File->Save to->File, navigate to your named folder in GPS downloads, name file as *DateNamePC# (April19Joey177 or April19Joey177_179_180)* chose ESRI shapefile as file type, click save

Step 2: Load your created Shapefile into *Data_Entry_Endangered_Species_Detections*

> In your ArcCatalog catalog tree, expand *Z:\GIS\Biology_Program\Endangered_Species* then *Data_Entry_Endangered_Species_Surveys.gdb*
>
> Right click *Data_Entry_Endangered_Species_Detections.* Navigate to *Load*, click *Load Data.* Input your shapefile from the location it was saved in step 1. It should be: *I:\BiologyProgramNew2\InventoryandMonitoring\Golden_Cheeked_Warbler\Color Banding\2013 banding\GPS downloads*
>
> Click *add* to populate the list of files to be loaded. Multiple shapefiles can be added. Click *next* twice.
>
> Next to *Observation Date*, select the box and choose *time*.
> Next to *UTM_X* select the box and choose *x_proj*
> Next to *UTM_Y* select the box and choose *y_proj*
> Click *next* twice, and then click *finish*

Step 3: Edit the Attribute Table in *Data_Entry_Endangered_Species_Detections*

In ArcMap, open a blank map, click add data (yellow box with plus sign over it in the toolbar), under your folder connections navigate to *I:\GIS\Biology_Program\Endangered_Species,* double click on *Data_Entry_Endangered_Species_Surveys.gdb,* select *Data_Entry_Endangered_Species_Detections,* click *Add*

Click *Editor* in the editor toolbar, click start editing. (If this toolbar does not appear click *Customize*, navigate to *Toolbars*, click *Editor*)

In the table of contents on the left side of the window, right click on *Data_Entry_Endangered_Species_Detections* then click *Open Attribute Table*, the points you just added should appear at the bottom of this table.

Fill in the appropriate fields for your points, the waypoint name shows up under *Ident*.

Multiple points can be selected at once by using the grey boxes on the left side of the window to highlight your points. Use shift to select consecutive waypoints and control to select disconnected waypoints.

To edit multiple points at once: highlight the points to be edited, right click on the heading for the field to be edited, click field calculator, click in the lower white box, then enter desired text and put quotations around it. Click Ok. (If you don't put quotations around your text, it won't work!)

Once you are done editing, click *Editor* then click *stop editing*. Click *yes* when you are prompted to save your edits.

Adding points from only UTMS to GIS

In ArcMap click the *Go to XY* button on the toolbar

Choose meters in the drop down menu

Enter the easting (starts with 5) in X and the northing (starts with 3)in Y, click add point, If converting multiple points repeat this step, and select all of your points before continuing

In the drawing toolbar choose *Convert Graphics to Features* in the drop down menu

Choose to use the same coordinate system as the *Data_Entry* source layer

Click *automatically delete graphics after conversion*

To name your file and choose which folder it will go to: click the folder icon, navigate to *C:\Users\xxxxxx\Documents\ArcGIS,* double click *default.gdb*, name your file, click save.

Click OK. This will create a layer in your default geodatabase that can be added to the *Data_Entry_Endangered_Species_Detections* attribute table like a shapefile created in DNRGPS

Follow steps 2 and 3 above, except after clicking load data, you will find your shapefile under C:\Users\xxxxx\Documents\ArcGIS in the default gdb and you do not match data fields (time, x_proj, and y_proj)

2011 GCWA NEST MONITORING FORM

SITE _____ NEST ID _____ FATE _____

UTM(easting) _____ UTM(northing) _____

MALE ID _____ FEMALE ID _____

DATE FOUND _____ DATE FINAL _____

Observer	Date	Start Time	End time	Stage	♀ on nest	♂ at nest	Egg	Nstl	Cowbird egg	Cowbird nstl	Fate	Comments