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Golden-cheeked Warbler Annual Report – 2020



Photo: R. Rylander

Report Overview

In order to better understand the status of the federally endangered Golden-cheeked Warbler in southeastern Hays County, a project was assembled by Texas State University. Groups of undergraduate field technicians performed transect and territory mapping surveys to determine the warbler's abundance and habitat use. Due to the COVID-19 pandemic, the university made the decision to cancel research efforts, only allowing for an abbreviated field season. Over the first (and only) month of survey effort, seven male warblers were located which provided researchers with a decent amount of data considering the interruption.

Brief Species Introduction

The Golden-cheeked Warbler (*Setophaga chrysoparia*, hereafter GCWA) is a small neotropical passerine that selectively breeds only within the Edwards Plateau Region of central Texas. It is dependent upon large stands of mature juniper-oak woodlands that are typically located near or along canyon slopes. The birds use this habitat for nesting, breeding, and carrying out most foraging behaviors during the months of March - July (Pulich 1976). Due to habitat loss

and fragmentation over the past 50 years, the GCWA was emergency listed as endangered in 1990 by the U.S. Fish and Wildlife Service (USFWS 1990). Since then, multiple conservation-based institutions, organizations, military bases and independent biologists have dedicated their time, finances, and effort into studying and preserving this species. Even though research efforts have been fruitful and current GCWA population numbers appear stable, the warbler continues to suffer from (first and foremost) habitat loss and fragmentation, followed by other factors such as brood parasitism and predation, anthropogenic activities and noise, among other things (Groce et al. 2010, Duarte et al. 2016).

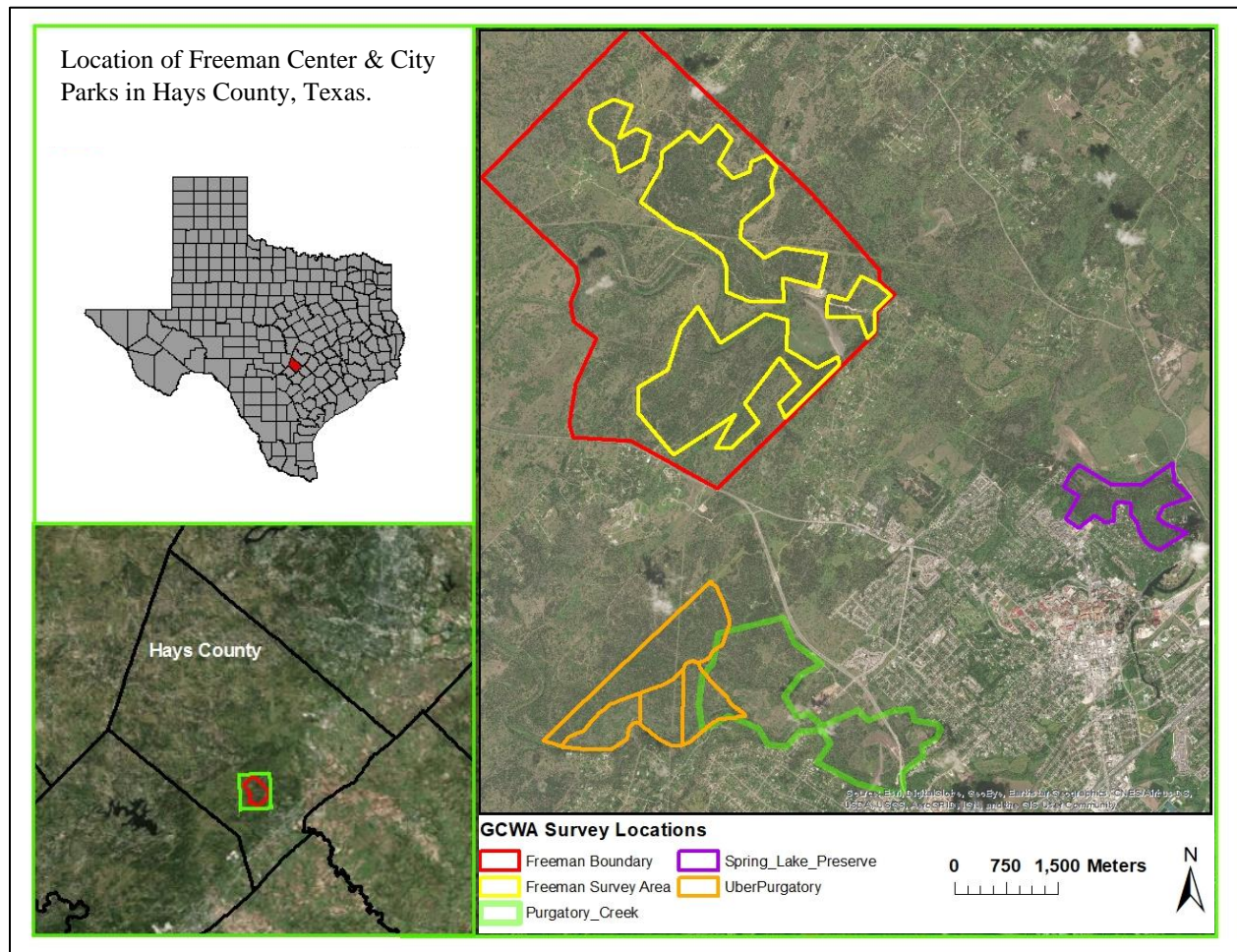
GCWA Survey Sites

The City of San Marcos is located near the southeastern tip of Hays County, which is an area that has been under constant growth and construction over the past decade. According to the U.S. Census Bureau, San Marcos and the surrounding areas near the Interstate 35 (I-35) corridor are part of the fastest growing population centers, not only in the state, but in the nation. With rapid population growth comes building human infrastructures, roads, and landscape change in order to support the increasing number of people. Therefore, natural habitat such as woodlands and grasslands are fragmented and converted at an alarming rate.

Among the increasing human populations in central Texas, small areas of “suitable” GCWA habitat still exist in patches within SE Hays County. Therefore, the following survey locations were chosen mostly due to availability of access, but also because they still contained decent stands of mature juniper-oak woodlands that the GCWA needs to successfully breed.

Texas State University and the Parks and Recreation division of the City of San Marcos both gave permission to have certain properties surveyed for GCWAs during the months of March-June in 2020 (Figure 1). The Freeman Center, a Texas State University owned property, is located roughly 5 miles NW of downtown San Marcos, Texas, and contains over 4,000 acres of mixed habitat types. Large sections of oak-juniper woodlands (*Juniperus ashei*, *Quercus fusiformis*, *Quercus buckleyi*, *Ulmus crassifolia*) are scattered throughout, with the main contiguous patch of potential GCWA habitat measuring around 700 acres (as noted from arials in ArcGIS 10.2). The Freeman Center also is an operating cattle ranch and site for multiple wildlife graduate student research projects (rodents, birds, vegetation analyses, habitat management, etc.). The properties surveyed on city-owned land included areas of Spring Lake Preserve, Upper Purgatory Creek, and Uber Purgatory, all of which are selectively (or permanently) closed to the public during the nesting season of the GCWA. These city parks contain habitat made up of mature juniper-oak woodlands, but in comparison to the Freeman Center, these properties are located closer to urban centers and neighborhoods. The areas surrounding the city parks have undergone more development and fragmentation than that of the properties surrounding the Freeman Center.

Figure 1.



Survey Methodology

PLEASE NOTE: NOT ALL METHODOLOGIES WERE UTILIZED THIS SEASON DUE TO COVID-19. WE WERE ONLY ABLE TO PERFORM TRANSECTS FROM MID-MARCH TO EARLY APRIL BEFORE THE PROJECT WAS SHUT DOWN.

We used the following methods to survey and monitor GCWAs on university property. Even though there are many different ways to perform these surveys, we choose to use protocol similar to those used on Fort Hood Military Reserve, the Balcones Canyonlands Preserve (BCP), and Camp Bullis Military Base in San Antonio, Texas.

Transects

At the beginning of the season when GCWAs first arrive (late February and early March), we conducted transects across suspected GCWA habitat at the Freeman Center and city parks. We plotted transects using the “Fishnet” tool on ArcGIS 10.2 (ESRI, Inc., Redlands, California), using aerial imagery to identify suspected warbler habitat. Each transect consisted of

a series of points located every 200 m, where the observer paused for 5 minutes to listen for singing males. Observers began these transects no later than 30 minutes after daybreak, and direction in which transect plots were walked were altered on each visit. We covered each transect point ≥ 2 times on visits separated by ≥ 5 days. If any singing males were detected at a point, we estimated and recorded a distance and bearing for each individual, as well as marked a GPS point as close to the singing individual as possible. Transects were primarily done to locate GCWAs on property so that territory mapping could be done for the remainder of the season.

Territory mapping

If GCWAs were located via transects, we territory mapped males using similar methods to those utilized by the City of Austin, Travis County Balcones Canyonlands Preserve, and Fort Hood Military Reserve (Reidy and Thompson 2010, Peak 2011, Balcones Canyonlands Preserve Land Managers Handbook, Tier IIA, Chapter VII: Monitoring the Golden-cheeked Warbler 2007 (hereafter BCP 2007), International Bird Census Committee IBCC Guidelines 1970, Verner 1985, Bibby et al. 1992). Between March 15 and June 1, we visited each GCWA territory once a week (>5 days between visits for official territory distinction), and we recorded GPS locations of the bird roughly every 5-10 minutes (or during every 'large' flight movement (>30 m)) for ≥ 45 minutes per territory. We began surveys roughly 30 minutes before sunrise and completed surveys within 6 hours. Temperatures needed to be ≥ 12 degrees Celsius and consistent wind patterns < 25 kph for detectability purposes. We also made observations on GCWA age (if visible through binoculars), if counter-singing males were in the vicinity, if females were present, and if we suspected nesting behavior. If males or females were suspected of nesting, then we spent extra time to locate the nest. Search time was not excessive as to keep disturbance within breeding GCWA habitat down to a minimum (BCP 2007, Reidy and Thompson 2010).

We considered GCWA territories official if a) the male was observed in the same location on at least three different visits with 5+ days between visits, b) the male was seen with a female (courtship behavior, nest building, etc.), or c) was observed feeding fledglings (BCP 2007). All GPS coordinates were uploaded into ArcGIS 10.6 and plotted against an aerial imagery for that particular location. Once all points were assigned to distinctive male GCWAs, we calculated territories using minimum convex polygons (MCPs).

Thirty-four separate surveyors were trained to perform transect and territory mapping surveys for GCWAs in 2020; undergraduate students Aja Martin, Alexa Higginbotham, Alexis Commiskey, Amber Dabbs, Annelisa Martinez, Celeste Palmquest, Cezanne Lossing-Cann, Chase Coulters, Chloe Hernandez, Claudia Smith, Daniela Dominguez, Dylan Lugo, Elisabeth Harper, Emily Blumentritt, Hanna Wright, Hannah Brown, Jacob Olsen, Joshua Robledo, Kailey Contreras, Kaitlyn Patterson, Kate Underwood, Kelsey Otsby, Kevin Legrow, Kianna Burtle, Lluvia De La Rosa, Matthew Johnson, Meredith Dalton, Natasha Malone, Nathan Derr, Ryan Kridler, Thomas Norris, Trey Mays, Xavier Leszczynski, and graduate student Jenni Vanhoye, all under the management of PhD Candidate Rebekah Rylander. Though all volunteers listed were not able to get out into the field to physically survey due to the pandemic, all surveyors were trained to identify GCWAs by sight and by sound (USFWS permit TE168189-1 (Rebekah Rylander)), and were familiar with transect and spot mapping techniques before official data was

collected. GPS points were taken using Garmin eTrex 10, Garmin eTrex 20 units, or the Avenza and Backcountry Navigator phone apps, all of which are capable of 5-meter accuracy in the field. IACUC permits were obtained for this research on university property.

Capture and banding

In addition to transect and territory mapping, we subjected male GCWAs to mist-netting for capture under federal banding permit #24108 (Rebekah Rylander). In order to capture warblers, we used playback of aggressive male GCWA calls in early daylight hours, not to exceed 20 minutes of playback, following the protocol suggested by USFWS and Fort Hood Military Reserve. Once warblers were caught, we ceased playback, extracted birds from the net quickly, and banded each with a unique color-combination. We were given unique color combinations through Fort Hood Military Base in order to prevent repeated combinations across the state. Once age and sex of the individual was determined, we released it immediately back into its territory. By color banding male GCWAs, it provided an opportunity for surveyors to accurately identify the individual they were following, leading to territory mapping with less error. This equated to clearer results as to where specific GCWAs were located and what habitat they were utilizing.

Survey Results

Due to limitations, we only performed ~ 200 hours of volunteer survey efforts in 2020. Even with a shortened season, we detected a total of seven unique GCWA males – 6 at Freeman and 1 at Upper Purgatory (Figures 2&3). We unfortunately did not get to survey Upper Purgatory early in the season, and a brief hike through the property in mid-May resulted in no positive detections. We only surveyed Spring Lake Preserve on April 6th which also resulted in no positive detections. We assigned all detected male GCWAs a unique number, and those numbers are used in preceding paragraphs and tables in reference to the individual warblers (Table 1).

Table 1. GCWA Detection Summary Data		
Male GCWA #	# of Detection Days	“Territory” Size (ha)
1	2	2.7
2	2	5.1
3	3	2.1
4	3	6.0
5	2	<1.0
6	3	2.5
7	1	<1.0

Please note: We use the term “territory” loosely this season because we technically did not have enough detections with 5+ day time separation to officially designate territories. Thus, “territories” for 2020 GCWAs is referring to the area used by the singing males during our shortened season.

Our first detection in 2020 for GCWAs was March 14th (male #3), and our last detection was April 7th (male #4). No additional surveys were performed on Freeman or City Parks after April 7th, with the exception of the walk-through on Uber Purgatory on May 14th. For full details on warbler detections during the 2020 season, see Table 2. Maps at the end of this report show warbler “territories” in greater detail (Figures 6-8).

Figure 2. Mapped territories for GCWAs at the Freeman Center. The following numbers have been assigned to each territorial GCWA male. These will be referred to in the rest of the report:

Yellow = male #1, green = male #2, blue = male #3, orange = male #4, gray = male #5, pink = male #6

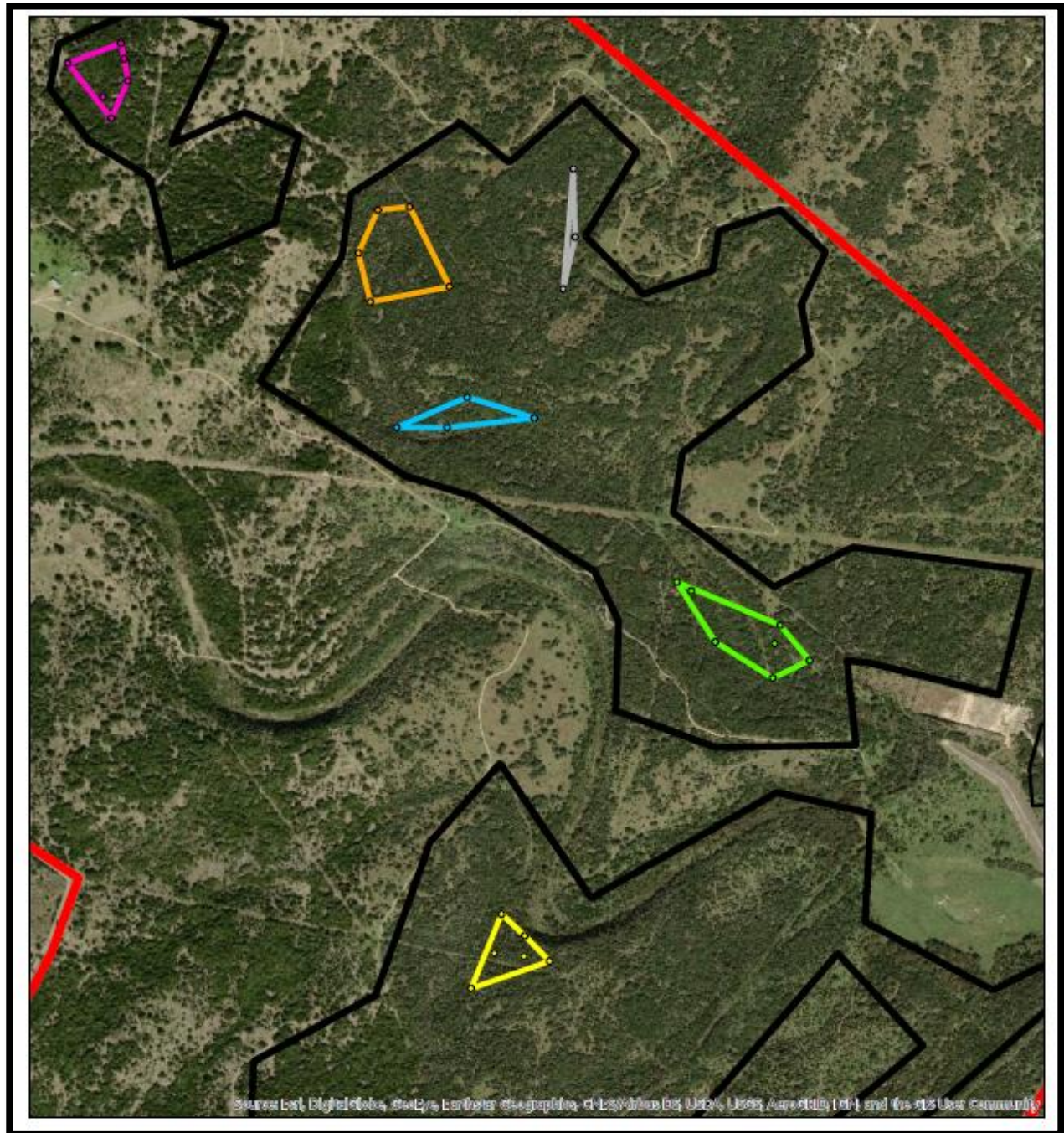


Figure 3. 2020 Upper Purgatory Creek GCWA detections.

Blue = male #7

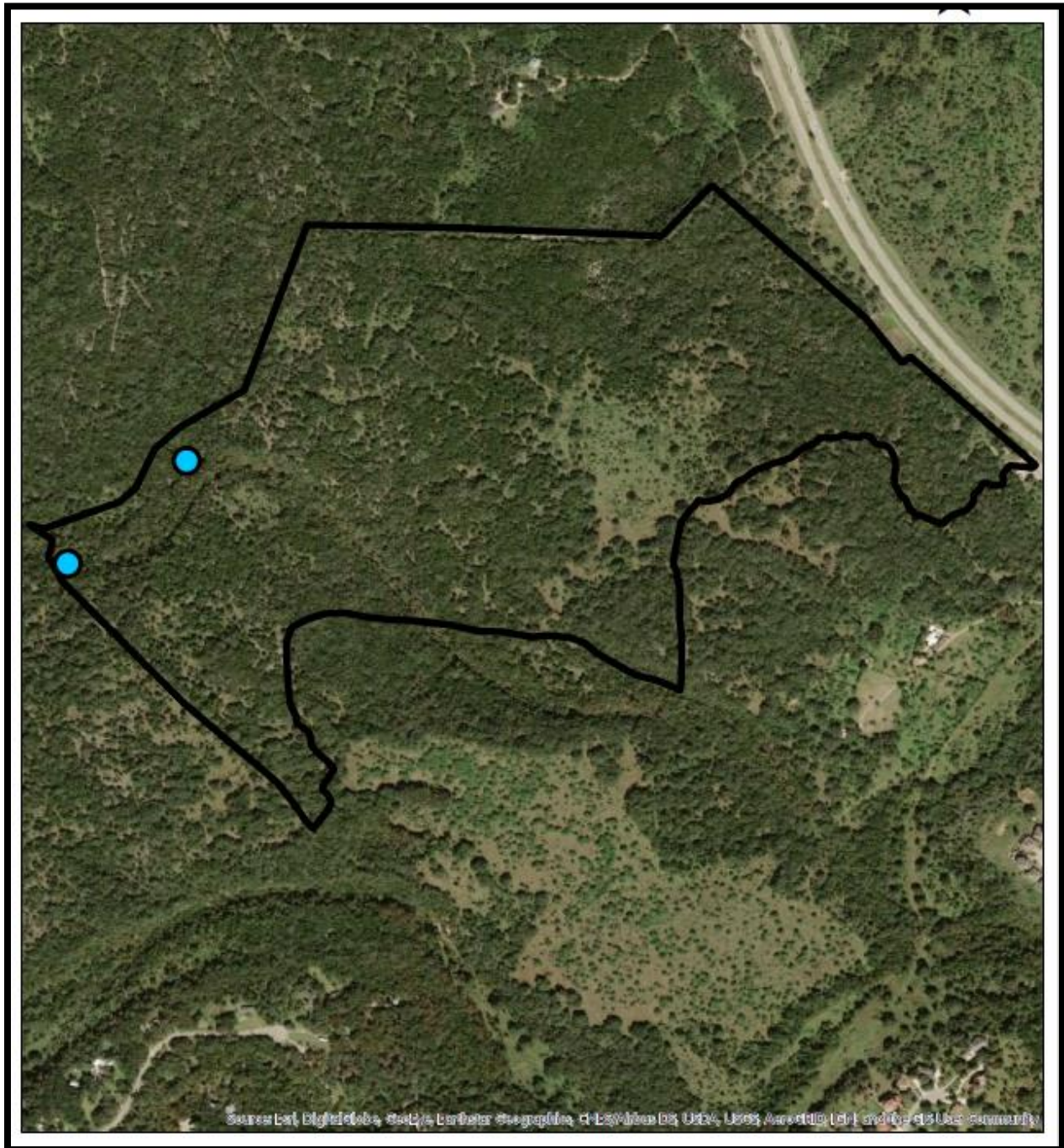


Table 2. GCWA Detection Dates		
Male #	Date	Comments
1	3/31/2020	Successful banding attempt
	4/1/2020	
2	4/1/2020	Successful banding attempt
	4/2/2020	
3	3/14/2020	Detected during first official survey of 2020
	3/15/2020	Failed banding attempt – warbler super quiet and unresponsive to playback
	4/2/2020	
4	3/14/2020	Detected during first official survey of 2020
	4/2/2020	
	4/7/2020	
5	4/1/2020	Very quiet individual – not much data recorded
	4/7/2020	
6	3/30/2020	
	4/1/2020	Failed banding attempt – warbler unresponsive to playback
	4/2/2020	
7	4/6/2019	Was only detected on this date, not allowed to follow up if it remained

At the Freeman Center, six “territories” were delineated, however the size of the territory depended upon how many days we were able to detect the individual. These territories are not truly representative of how much the individuals moved during the season, but instead is a measurement of how much they moved during our random survey days. Typically male GCWAs have an average territory size of 10 acres (or roughly 4 hectares), so it could be that some of these “territories” were decent representatives of the habitat and area that the individuals used (male #2 and #4), but not so much for the other identified males. Large “territories” can also be an indicator of wandering behavior which is observed in males that have not located a female or settled upon a territory yet.

Banding Results

Two males were successfully captured and banded during the 2020 season (Table 3).

Table 3. Banding Data				
Male GCWA #	USGS Band	Color-bands (left leg : right leg)	Date Captured	Age
1	2830-66009	dark blue/yellow : black/silver	3/31/2020	SY
2	2830-66010	dark blue/silver : white/dark blue	4/1/2020	SY

Both captured warblers were aged as second year (SY) birds, meaning they hatched during 2019 and returned to central Texas for their first breeding season in 2020. Once males had been banded and aged, we immediately released them where they safely flew to a nearby perch

and returned to singing and scouting their territories. Several photos at the end of this report are included, demonstrating warbler banding/aging.

We attempted capturing males #3 & 6, but neither individual responded aggressively to playback. Instead of singing back to the playback warbler calls, these males became quiet and retreated, which is not the usual response. If we had more time during this field season, additional banding attempts would have been made towards capturing these (and other) individuals.

Discussion

Even though the 2020 GCWA survey season was cut short due to the COVID-19 pandemic, we were still able to retrieve important and insightful information on warbler whereabouts on the Freeman Center and City of San Marcos properties. We were able to positively detect warblers in most of the same locations that we have detected warblers during previous seasons at Freeman (Figure 4), further demonstrating the need to preserve the vegetation in these locations. However, on City property, we have yet to find a consistent pattern of warbler detections over the years (Figure 5). Though no specific habitat or vegetative structure analyses have been conducted within and around Freeman or City of San Marcos parks in regard to this particular warbler project, we are likely safe assuming that warblers are seeking suitable areas of dense oak/juniper canopy that can be located in predictable pockets throughout SE Hays County.

It is unfortunate that we will never know if any of the 7 detected male GCWA remained in their “territories” throughout the duration of the GCWA breeding season or if any males paired up and successfully fledged young. Based on data from previous seasons, it is likely that several males remained on property until mid to late April, whereas other males possibly moved on to different areas of central Texas. We can only speculate the outcome and hope that these warblers were reproductively successful, one way or another.

We did not observe any GCWAs on Spring Lake Preserve for a fourth year in a row. We were only able to perform one survey, which means there is a possibility that a warbler was present but just not detected. Current eBird data also does not produce solid positive detections for any GCWAs at this preserve. Because of this, we recommend that trails that have been previously closed for GCWA nesting season should be re-opened to the public for recreational use during the months of March-June. The eBird accounts of GCWAs on Spring Lake are from May and June (2018 and 2019), which is usually associated with post-breeding movements.

Uber Purgatory produced no positive warbler detections during the May 14th hike, but just as for Spring Lake Preserve, we cannot be certain that warblers were not actually utilizing the property due to the single survey. We feel that it is likely that GCWAs are utilizing Uber Purgatory, and we recommend surveying this area again in 2021 before trails are cut. Uber Purgatory contains suitable habitat that needs more attention in years to come.

Figure 4. Overlap of GCWA territories on the Freeman Center

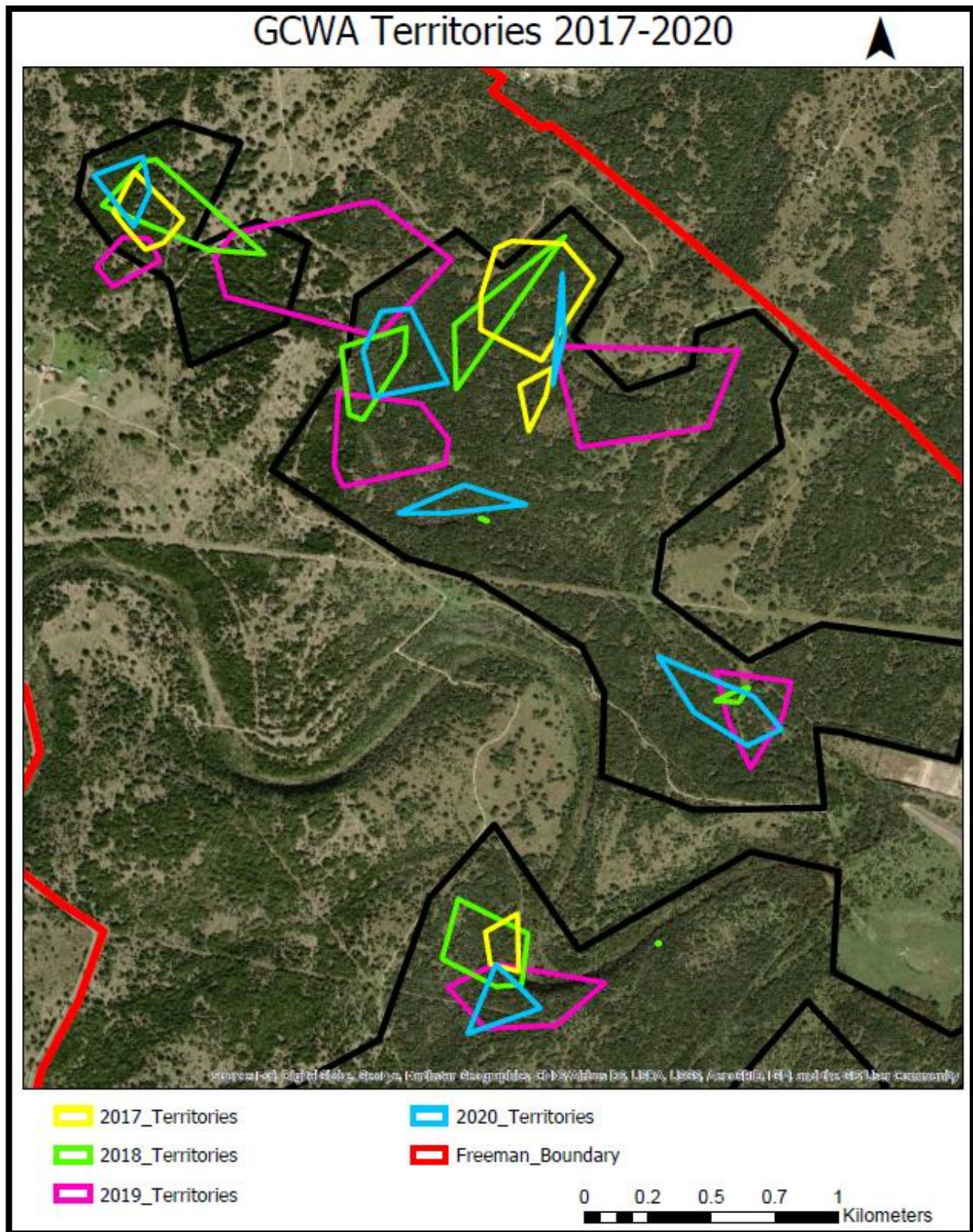
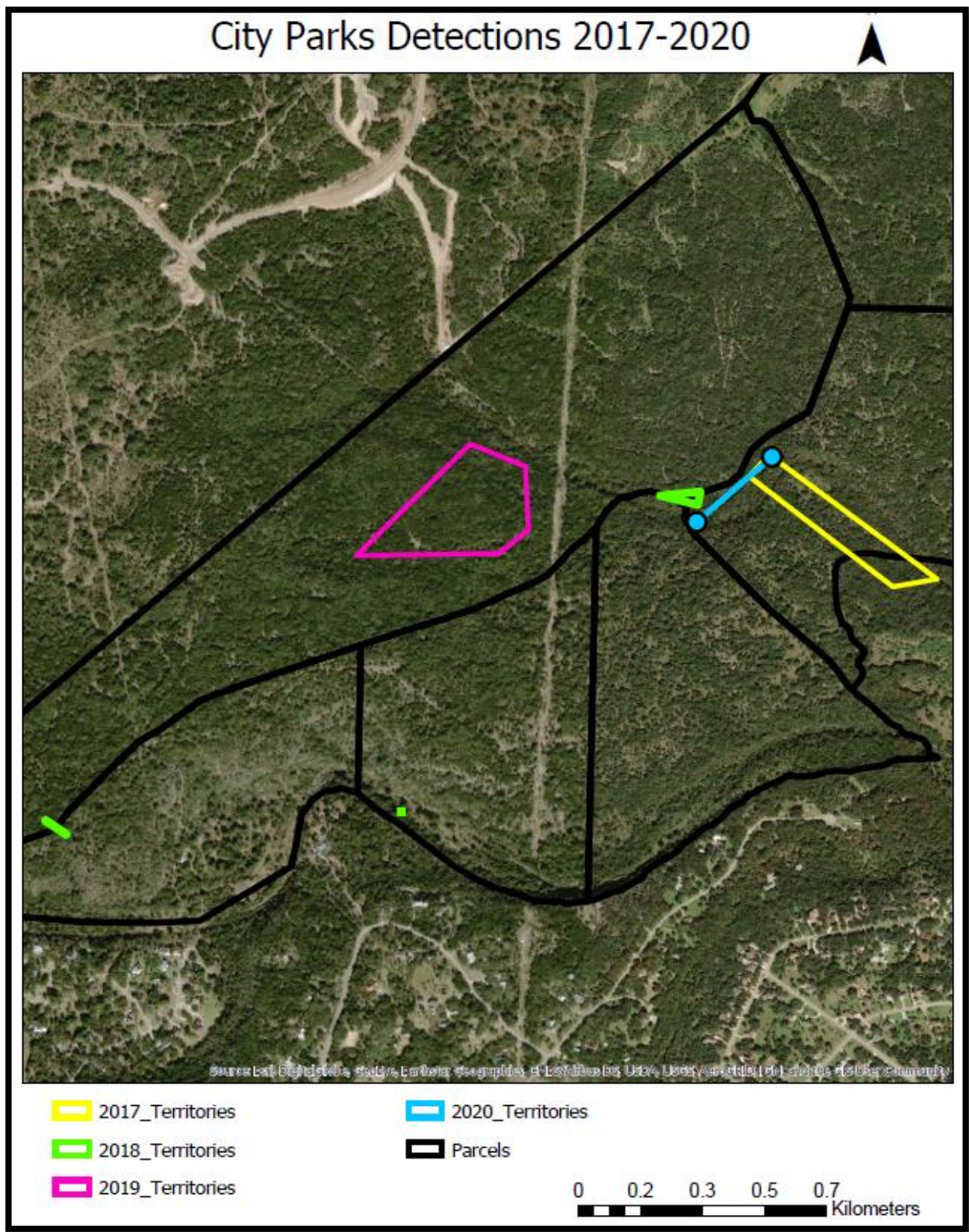


Figure 5. Disjointed pattern of GCWA distribution on Upper and Uber Purgatory Creek



We did not successfully resight any of the banded warblers from our 2018 or 2019 season during 2020. Though this is not entirely surprising, it is interesting that male warblers continue to use the same habitat patches each year, though they are not the same individuals. We are interested to see if any of the banded males from this season return in 2021.

Although survey efforts were significantly reduced this 2020 season, we still feel accomplished for detecting seven male GCWA in less than a month. Many entities across the globe were unable to perform avian field work this year due to COVID-19, and even though we were eventually cut off from being in the field, we were able to collect valuable data on warbler whereabouts. We strongly recommend performing another year of surveys during the 2021 season, particularly spending more time out at Uber Purgatory. We also highly recommend more time following male warblers in 2021 with hopes of detecting females and potentially nests/fledglings, just like those detected in 2020. By gaining more insight into the GCWAs behaviors and reproductive success in SE Hays County, we can better provide management recommendations to both university and park staff.

Acknowledgements

This ongoing GCWA research has been possible because of the generous financial contributions from the Freeman Center at Texas State University and the San Marcos Greenbelt Alliance. We also appreciate their support of undergraduate participation in this project, as it allows students to experience and directly engage in endangered species conservation efforts.

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Figure 6.

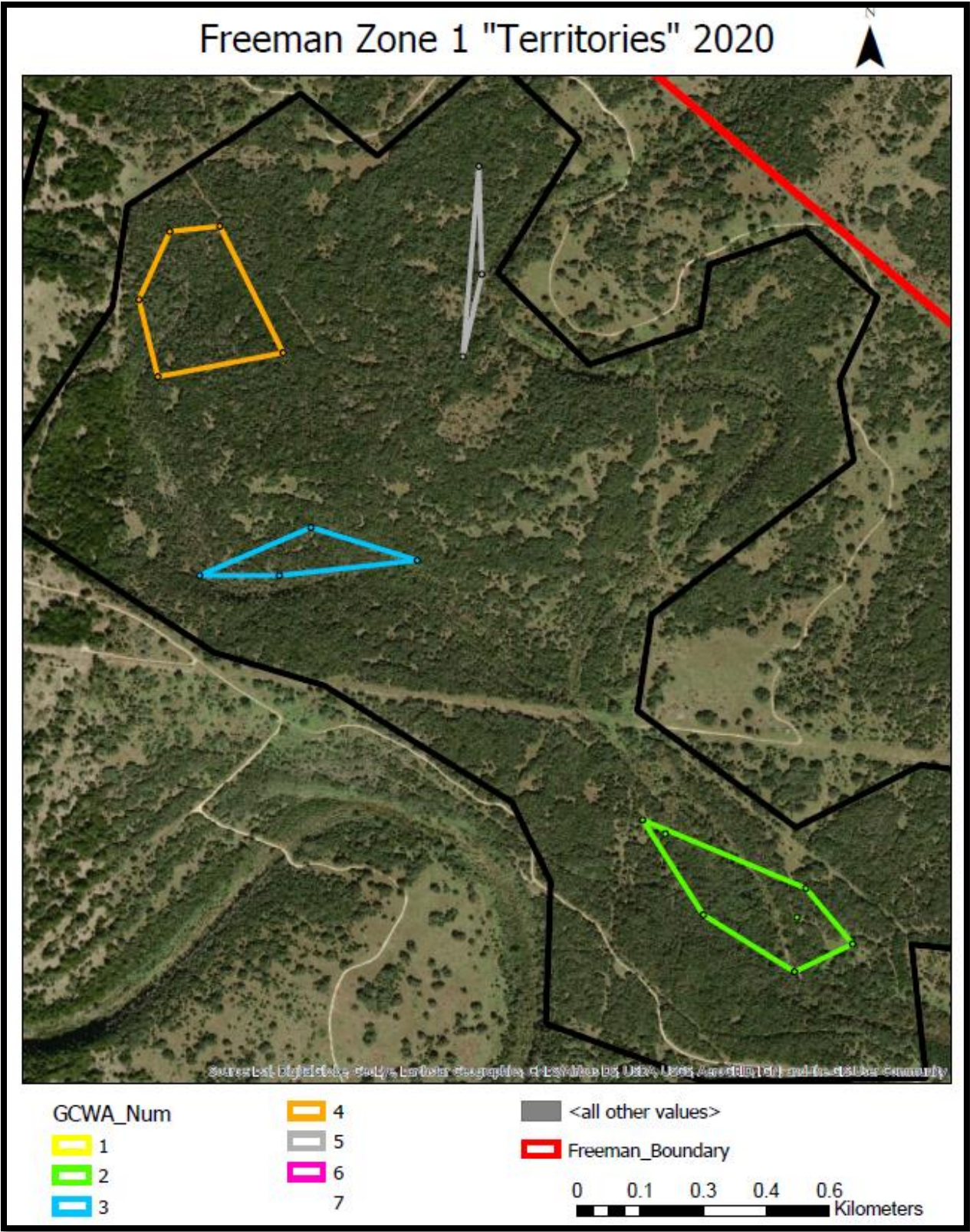


Figure 7.

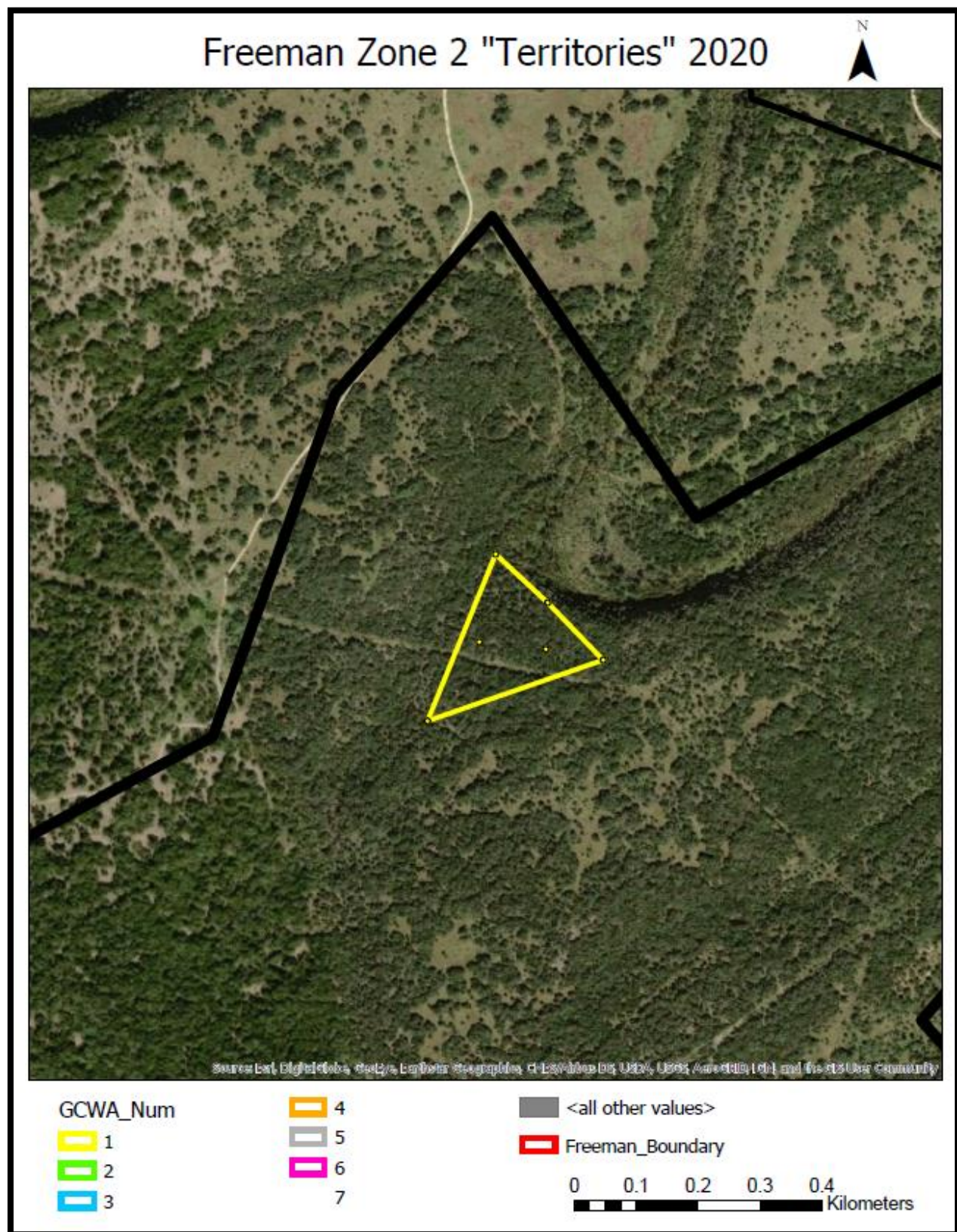
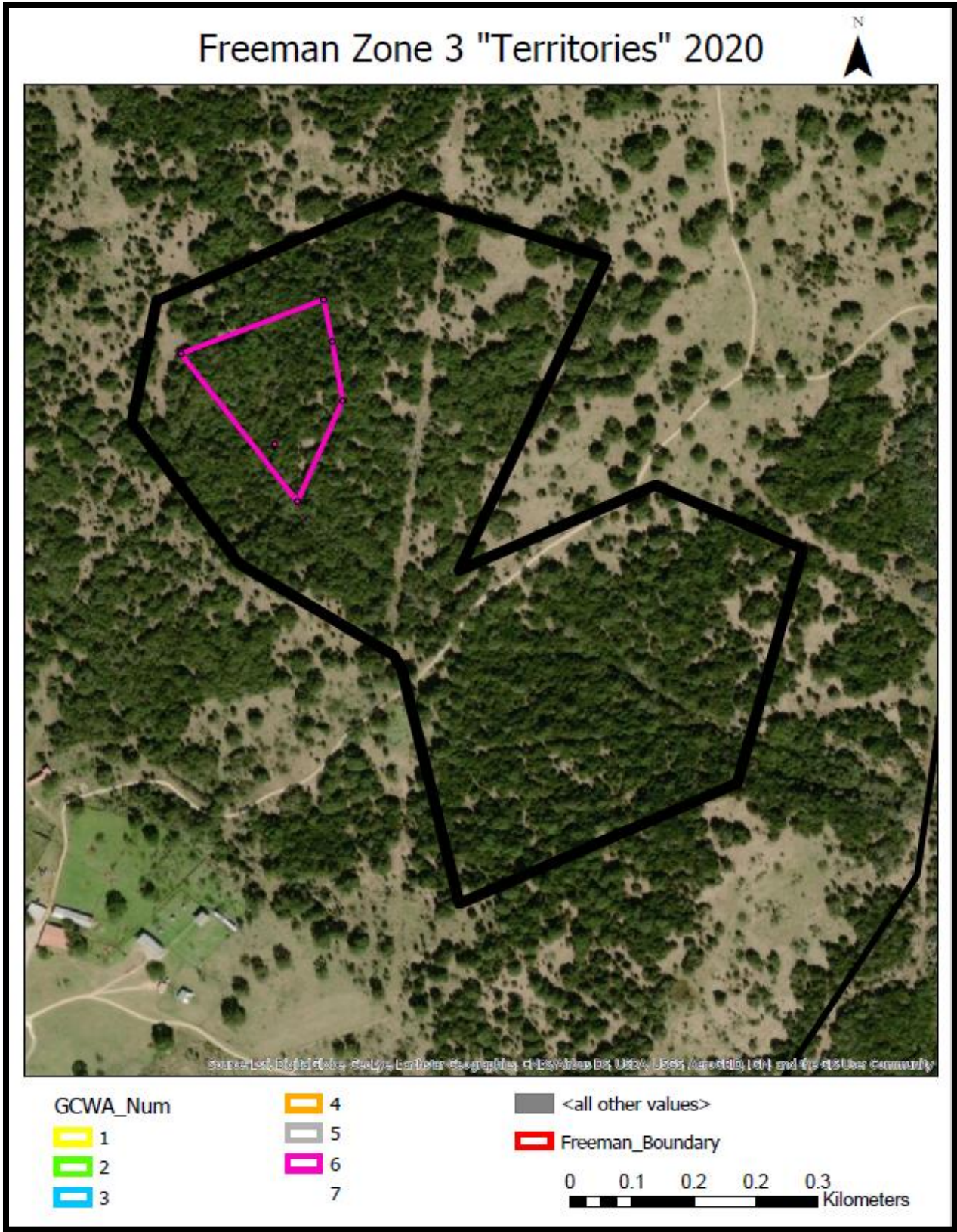


Figure 8.



Photos of GCWAs that were successfully captured at Freeman in 2020.



Top left: Male #2, singing from a juniper while surveying his territory. (M. Johnson)

Top right: Captured male from territory #1. (R. Rylander)

Bottom left: Male #1 is a second year (SY) as seen by the black feather shafts in the median coverts and brown alula. (R. Rylander)

Bottom right: Side-by-side comparisons of the banding combinations for males 1&2. Both males were aggressive and came into playback song, making them catchable in a mist net. (R. Rylander)

