FY 2023 Report on Monitoring

Golden-cheeked Warblers (*Setophaga chrysoparia*) on

Travis County-managed Tracts of the Balcones Canyonlands Preserve



Photo: Male golden-cheeked warbler. Courtesy of S. Ellwood.

Travis County

Department of Transportation and Natural Resources

Natural Resources and Environmental Quality Division

October 1, 2022 – September 30, 2023

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Introduction

As specified in the Balcones Canyonlands Conservation Plan (USFWS 1996; hereafter BCCP), the City of Austin and Travis County developed and implemented a Land Management Plan (LMP) to provide guidelines for managing the Balcones Canyonlands Preserve (BCP). The LMP Tier IIA-7 chapter (BCP 2007) describes the current management and monitoring goals for golden-cheeked warbler (*Setophaga chrysoparia*; hereafter GCWA) populations on the BCP. It states, "The GCWA population within the BCP will be monitored through a regional program to determine population size, territory density and trends, distribution, productivity, use of marginal habitat, and to determine the effects of habitat manipulation, urbanization, and recreation..." Guidelines are provided in the LMP for various levels of monitoring including presence/absence, territory mapping, pair detection and productivity.

In fiscal year 2023 (FY23), Travis County Natural Resources staff (Staff) and volunteers conducted various GCWA surveys and monitoring efforts on approximately 914.4 hectares (ha) of Travis County-managed BCP properties (Table 1; Figure 1). This report summarizes the results of the Travis County Natural Resources GCWA monitoring program in FY23.

Table 1. GCWA Survey and Monitoring Effort Summary, FY23, Travis County BCP, Texas.

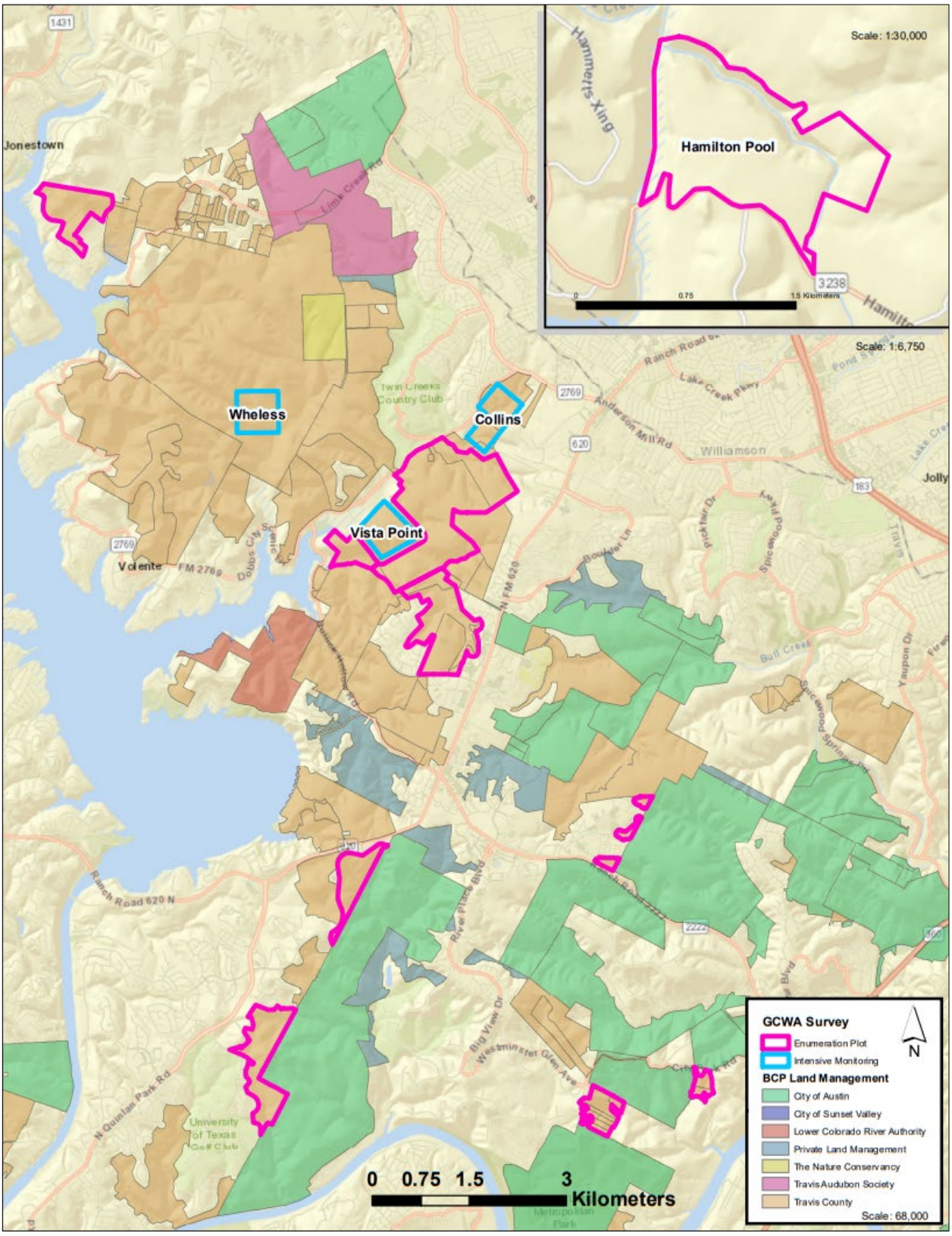
Survey Area[1]	Survey Type	Macrosite	Hectares Surveyed	Total Survey Hours
Bunten/Vireo Ridge	Enumeration	Cypress Creek	244.10	199.58
Coldwater Canyon/Gray Mountain	Enumeration	North Lake Austin	10.6	17.5
Colina Vista/Ribelin Mitigation Tract	Enumeration	Bull Creek	13	14.5
Grandview Hills/SAS	Enumeration	Cypress Creek	113.2	77.75
Hamilton Pool	Enumeration	Pedernales River	95	30.5
City Park Road	Enumeration	North Lake Austin	29.9	16.25
Steiner Ranch #2	Enumeration	North Lake Austin	79.3	19.25
Steiner Ranch #5	Enumeration	North Lake Austin	41.3	20.75
Trails End West	Enumeration	Cypress Creek	60.5	32.67
Vista Point	Enumeration	Cypress Creek	25.4	32.25
Collins[2,3]	Intensive Monitoring	Cypress Creek	56	199.08
Vista Point[2,3]	Intensive Monitoring	Cypress Creek	70	387.49
Wheless[2,3]	Intensive Monitoring	Cypress Creek	70	59
Total			**908.3**	**1106.57**

[1] Survey Areas may contain multiple BCP tracts.

[2] The City of Austin staff analyzed these data, see Appendix F of the FY23 BCCP Annual Report for additional information.

[3] Area surveyed includes 100-meter survey buffer.

Figure 1. GCWA Survey Area Overview on the BCP, FY23, Travis County, Texas.



Methods

Enumeration Surveys

Enumeration surveys, or territory mapping, may provide an estimate of GCWA abundance, occupancy, distribution, and territory density in selected study areas (or plots). Enumeration surveys on Travis County-managed properties are typically carried out every five years or on an "as needed" basis should new or future potential disturbance activities occur on or adjacent to the BCP.

Enumeration plots are typically surveyed from 15 March to 25 May with a minimum of eight visits in each plot to ensure adequate plot coverage. Additional surveys may occur between 25 May - 15 June to determine late-season nesting or territorial behavior. Surveys may begin 30 minutes before sunrise, and typically proceed for three to six hours depending on survey area size. Surveys are canceled or postponed if weather conditions produce a steady rain or if wind inhibits surveyor's ability to hear birds (approximately >12 miles/hour).

During each visit, surveyors attempted to audibly locate and follow male GCWAs and obtain several spatial and behavioral observations, while also recording male counter-singing to assist with the identification and delineation of male territory boundaries. GCWA locations are recorded using Garmin handheld global positioning units (GPS), ArcGIS Field Maps phone app (ESRI, Inc., Redlands, California), and/or on paper maps with an aerial imagery background using topographic lines and 100-meter Universal Transverse Mercator (UTM) grid. Data were recorded and analyzed in an ArcGIS 10.7 (ESRI, Inc., Redlands, California) geodatabase using a spatial reference of NAD 1983/UTM 14N. Data recorded for each GCWA observation included date, spatial coordinates, individual male observation ID, sex, song type, band information, counter-singing presence/directions, presence of a female/nest, and presence/number of fledglings.

Males are considered to have an established territory and are assigned a unique Territory ID post-hoc if any of the following occurred: 1) a male is observed on at least three occasions each separated by at least six days; 2) a male is with a female (appearing to be paired); 3) a male is observed attending a nest or feeding hatch-year fledglings.

After all field surveys are complete, territories are differentiated as either "Full", "Edge", or "Off-plot". A territory is designated as "Full" when the male is observed outside of the

designated survey plot on no more than one visit. An “Edge” territory is designated when a male is regularly observed inside the plot but is also observed outside on more than one visit. An “Off-Plot” territory is designated when a male is observed inside the plot on no more than one visit. “Off-plot” territories are not given a unique territory ID and are not included in further data analysis. A designation of “Unknown” is given, and no Territory ID is assigned to GCWA observations that do not meet the minimum requirements of a territory or when survey uncertainty cannot designate a Territory ID. After Territory IDs are assigned, minimum convex polygons (MCP) are subsequently created using ArcGIS, around each set of unique Territory ID observations to delineate projected GCWA male territory outer boundaries.

Staff used Verner’s (1985) method to calculate GCWA territory density within survey plots, where “Full” territories were counted as 1.0 territory and “Edge” territories counted as 0.5 territories. Staff then divided the modified average of “Full” and “Edge” territories by the number of hectares in the survey plot to give an estimate of territory density (territories per hectares). Staff then calculated a GCWA abundance estimate by adding together the total number of “Full”, “Edge”, and other individual “Unknown” male observations within the survey plot. “Off-plot” males are not included in abundance calculations.

Observations of GCWA females and fledglings are recorded during enumeration surveys and assigned the Territory ID of an assumed associated male, post-hoc. If surveyors cannot determine if they are associated with an identified male territory, those females and fledglings are also designated as “Unknown”. GCWA female and fledgling observations are used to aid in male territory determinations and may also be used to assess mating pair status and nesting productivity; however, nesting productivity and mating behavior observations are not the focus of territory enumeration surveys and due to limitations inherent to territory mapping methods (i.e. differences in observer ability, observer bias, and mobility of the target species, etc.), results of all surveys should be interpreted as approximations.

Intensive Monitoring Plots and Nest Monitoring

In coordination with the City of Austin, Staff participates in a BCP-wide monitoring program of established intensive monitoring plots. These previously established “100-acre plots” are arranged across a spectrum of GCWA habitats based on canopy height. The objective of these plots is to document and estimate long-term GCWA trends using data collected from color-banded male GCWAs. The goal is to attempt to estimate return

rates, dispersal, territory density/size, habitat use, territory age structure, pairing success, breeding success, and nest survival. For a more detailed description of survey methods and results of the intensive monitoring program, see the City of Austin's "Appendix F" of the 2023 BCCP Annual Report.

The Collins intensive plot was established after Staff discovered a colony of invasive tawny crazy ants (*Nylanderia fulva*; hereafter TCA) on an adjacent property in 2017. TCAs are arboreal foragers and there are concerns of negative impacts to the GCWA prey-base. In response, Staff began a pilot study to examine the composition of the canopy arthropod community within affected and adjacent areas, along with an intensive monitoring plot for GCWAs within the Collins tract. Additional information on the on-going TCA project is detailed in "Appendix V1" of the 2023 BCCP Annual Report.

Banding and Band Resighting

In coordination with the City of Austin, Staff also assists with banding GCWAs on Travis County BCP intensive monitoring plots. GCWAs are manually captured using mist-nets set up in known non-banded male GCWA territories. Staff lure GCWAs to the mist-nets by playing audible recordings of other GCWA calls and songs. An imitation GCWA decoy may also be attached to nearby vegetation to assist in luring males into the net. Once a GCWA is captured, it is banded with a single silver aluminum USFWS band with a unique serial number and up to three additional colored plastic bands, giving it a unique color band combination. Additional information collected while banding includes date of capture, sex, age, and spatial coordinates. The GCWA is captured, banded, and released as quickly as possible to minimize stress on the bird.

Previously established intensive plots, not intensively monitored in the current survey year, are treated as band resighting plots. Resight plots are also established in areas surrounding active intensive monitoring plots to identify additional GCWA dispersal and movement. These resight plots are systematically surveyed for returning color- banded GCWAs. This will continue until no banded GCWAs are observed within these plots for one full survey season. Resight plots are surveyed four times between 20 March and 15 April, with one additional survey between 15 May and 25 May to detect dispersing GCWAs. For a more detailed description of survey methods and results of the intensive monitoring program, banding, and band resighting effort, see the City of Austin's "Appendix F" of the 2023 BCCP Annual Report.

Results

Enumeration Surveys Results

In FY23, Staff and volunteers conducted GCWA enumeration surveys within 11 survey plots on the Travis County-managed tracts of the BCP, covering approximately 718.4 ha and contributing approximately 449 hours of survey effort (Table 1). Estimated GCWA abundance, territories, and territory density based on enumeration survey results are presented in Table 2.

Table 2. GCWA Abundance and Territory Density Estimates Based on Enumeration Survey Results, FY23, Travis County BCP, Texas.

GCWA Enumeration Survey Plots	Hectares (ha)	Estimated Abundance	No. of Full Territories	No. of Edge Territories	No. of Modified* Territories	Territory Density (Terr. per ha)
Bull Creek Macrosite						
Colina Vista/Ribelin Mitigation Tract	13	2	1	1	1.5	0.12
Cypress Creek Macrosite						
Bunten/Vireo Ridge	244.1	64	43	14	50	0.20
Grandview Hills/SAS	113.2	23	18	3	19.5	0.17
Trails End West	60.5	6	4	1	4.5	0.07
Vista Point	25.4	10	7	1	7.5	0.30
North Lake Macrosite						
Coldwater Canyon/Gray Mountain	10.6	4	1	2	2	0.19
City Park Road	29.9	5	2	1	2.5	0.08
Steiner Ranch #2	79.3	4	2	0	2	0.03
Steiner Ranch #5	41.3	6	5	0	5	0.12
Pedernales River Macrosite						
Hamilton Pool	95	8	7	0	7	0.07
All Survey Plots Combined	**712.3**	**132**	**90**	**23**	**101.5**	**0.14**

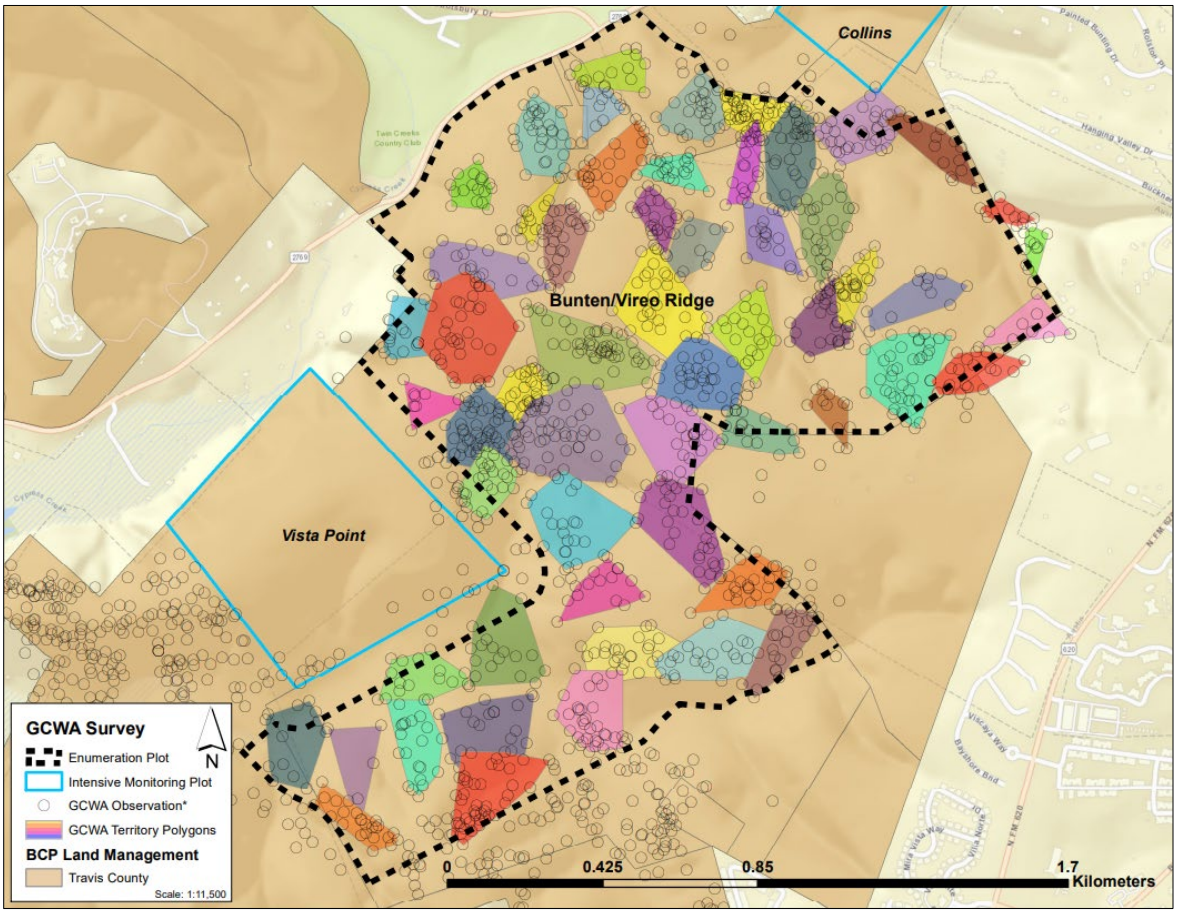
*Modified territories are the number of full territories plus one-half of the number of edge territories (Verner 1985).

Bunten/Vireo Ridge Enumeration Surveys Results

The Bunten/Vireo Ridge GCWA enumeration survey plot included approximately 51.2 ha of the Bunten tract, 189.3 ha of the Vireo Ridge tract, 2.3 ha of the Vista Point tract, and the 1.3-ha Mirtsching tract, totaling approximately 244.1 ha within the Cypress Creek macrosite. The Bunten/Vireo Ridge survey plot was bordered by both the Collins and Vista Point intensive monitoring plot buffers and is located east of FM 2769 and west of North FM 620, on the northwest edge of the City of Austin, Texas.

Fifty-seven GCWA territories (full or edge) were delineated on the Bunten/Vireo Ridge survey plot. The overall density of GCWAs for this survey plot was approximately 0.20 GCWA territories per ha. Female GCWAs were detected within 43.86% (n=25) of male territories and GCWA fledglings were detected in 15.79% (n=9) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 2.

Figure 2. GCWA observations and estimated territory delineations based on the Bunten/Vireo Ridge enumeration surveys from FY23, Travis County BCP, Texas.



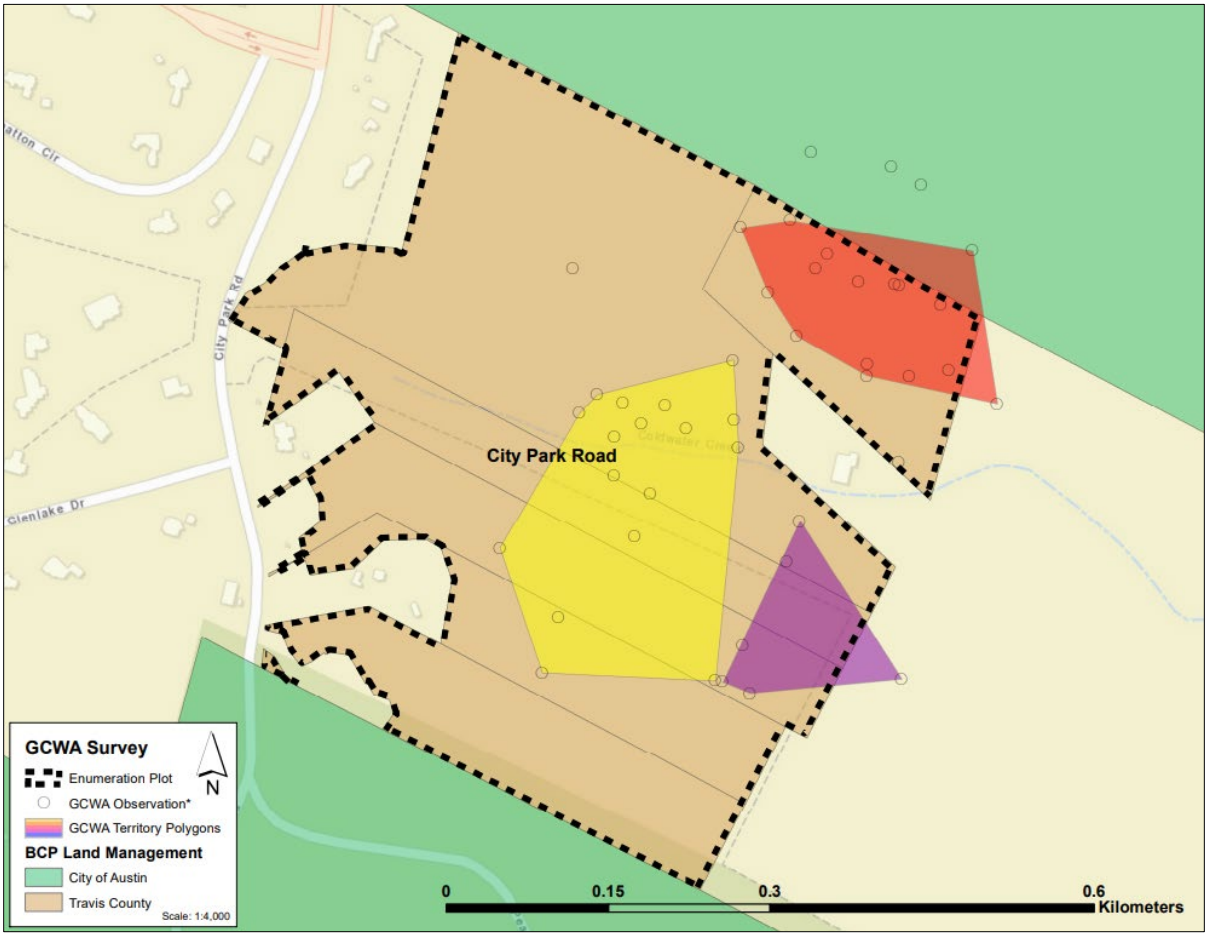
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

City Park Road GCWA Enumeration Surveys Results

The City Park Road GCWA enumeration survey plot included approximately 29.9 ha across the Lemens, Hereford, Brown, Ross, Hunt, and Martin conservation easement tracts. The City Park Road survey plot is located east of City Park Road and directly north of the City of Austin Emma Long Metropolitan Park in the North Lake Austin macrosite.

Three GCWA territories (full or edge) were delineated on the City Park Road survey plot. The overall density of GCWAs for this survey plot was approximately 0.08 GCWA territories per ha. Female GCWAs were detected within 100% (n=3) of male territories and GCWA fledglings were detected in 100% (n=3) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 3.

Figure 3. GCWA observations and estimated territory delineations based on the City Park Road enumeration surveys from FY23, Travis County BCP, Texas.



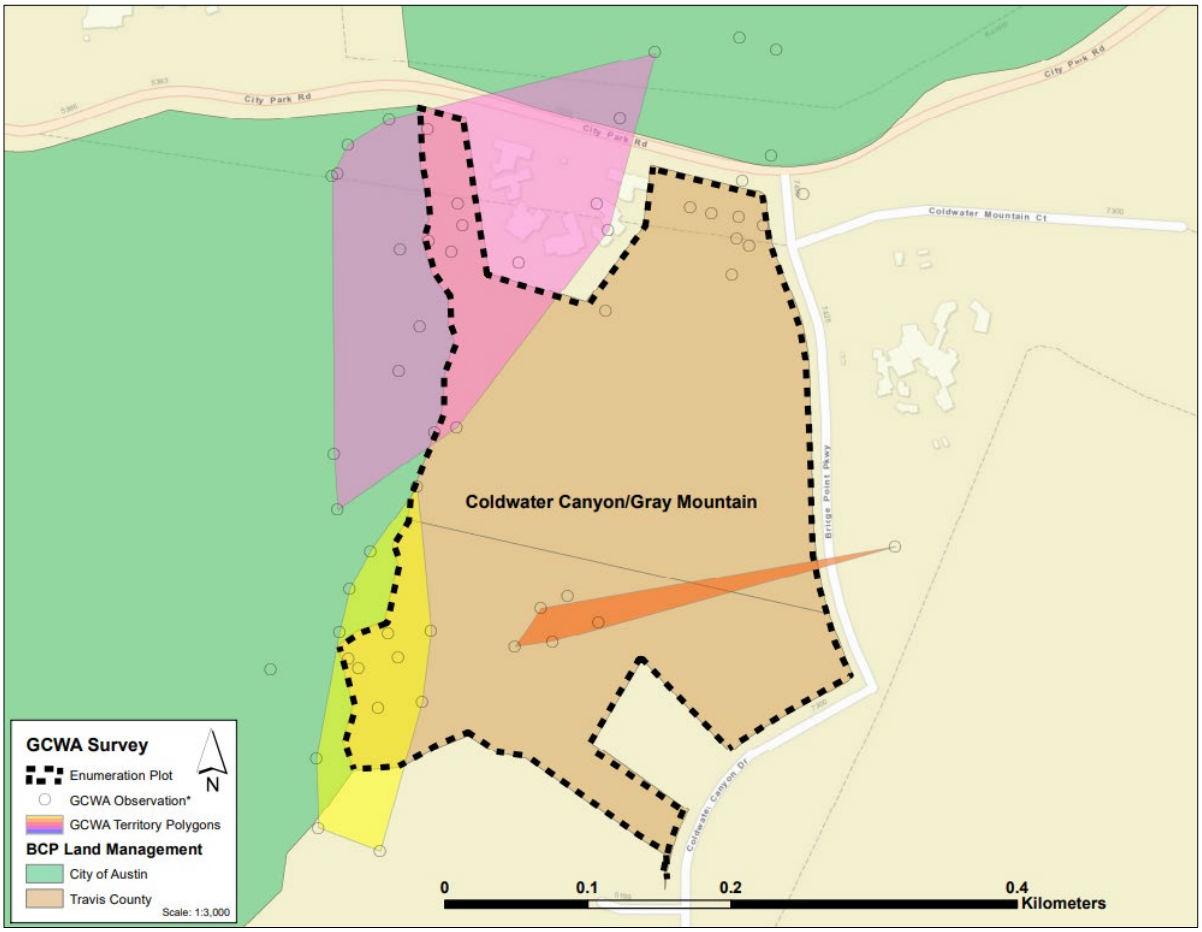
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Coldwater Canyon/Gray Mountain GCWA Enumeration Surveys Results

The Coldwater Canyon/Gray Mountain enumeration survey plot included the 6.3-ha Coldwater Canyon and 4.2-ha Gray Mountain conservation easements, totaling approximately 10.5 ha within the North Lake Austin macrosite. The Coldwater Canyon/Gray Mountain survey plot is located at the intersection of City Park Road and Bridge Point Parkway in Austin, TX.

Three GCWA territories (full or edge) were delineated on the Coldwater Canyon/Gray Mountain survey plot. The overall density of GCWAs for this survey plot was approximately 0.19 GCWA territories per ha. Female GCWAs were detected within 100% (n=3) of male territories and GCWA fledglings were detected in 33.33% (n=1) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 4.

Figure 4. GCWA observations and estimated territory delineations based on the Coldwater Canyon/Gray Mountain enumeration surveys from FY23, Travis County BCP, Texas.



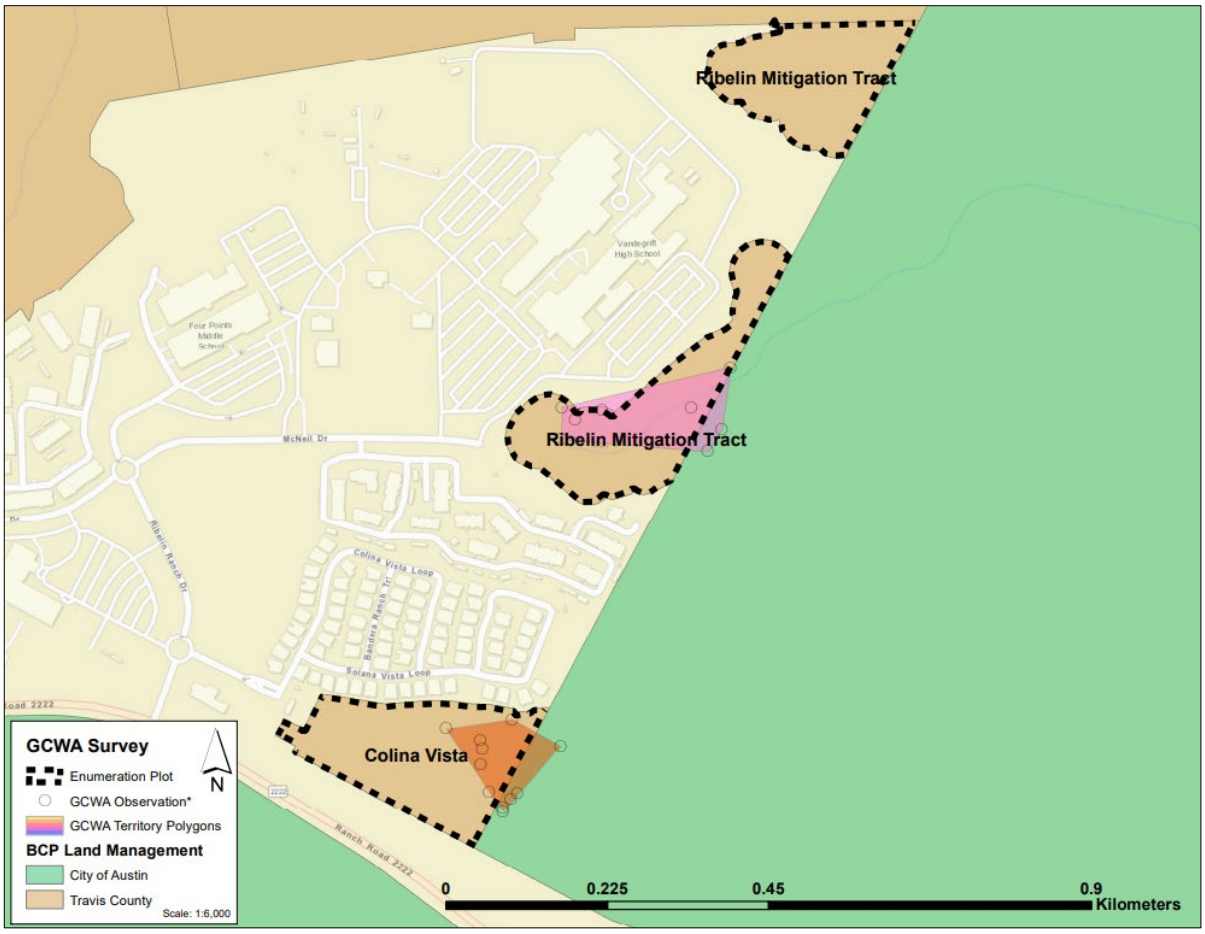
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Colina Vista/Ribelin Mitigation Tract Enumeration Surveys Results

The Colina Vista/Ribelin Mitigation Tract GCWA enumeration survey plots included the 4.6-ha Colina Vista tract and the 8.4-ha Ribelin Mitigation tract, totaling approximately 13 ha within the Bull Creek macrosite. The Colina Vista/Ribelin Mitigation Tract survey plots are located near Vandegrift High School in Austin, TX.

Two GCWA territories (full or edge) were delineated on the Colina Vista/Ribelin Mitigation Tract survey plots. The overall density of GCWAs for these survey plots was approximately 0.12 GCWA territories per ha. Female GCWAs were detected within 50% (n=1) of male territories and GCWA fledglings were detected in 50% (n=1) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 5.

Figure 3. GCWA observations and estimated territory delineations based on the Colina Vista/Ribelin Mitigation Tract enumeration surveys from FY23, Travis County BCP, Texas.



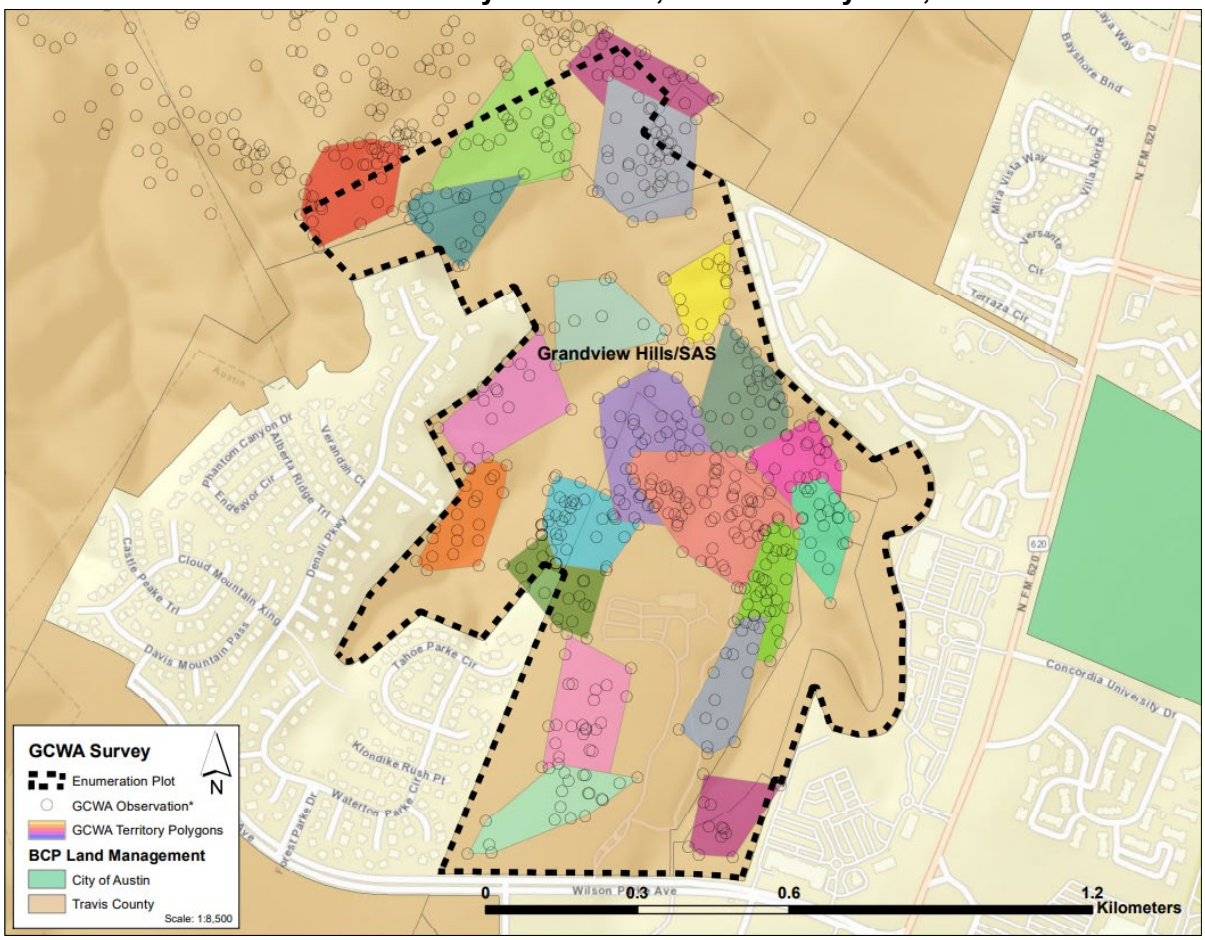
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Grandview Hills/SAS GCWA Enumeration Surveys Results

The Grandview Hills/SAS GCWA enumeration survey plot included approximately 59.7 ha of the Grandview Hills tract, the 38.2-ha SAS tract, the 2.8-ha Grandview 69 tracts, and a 12.5 ha portion of the Vireo Ridge tract, totaling approximately 113.20 ha within the Cypress Creek macrosite. The Grandview Hills/SAS survey plot is located northwest of the intersection of Wilson Park Avenue and North FM 620, on the northwest edge of Austin, Texas.

Twenty-one GCWA territories (full or edge) were delineated on the Grandview Hills/SAS survey plot. The overall density of GCWAs for these survey plots was approximately 0.17 GCWA territories per ha. Female GCWAs were detected within 33.33% (n=7) of male territories and GCWA fledglings were detected in 9.52% (n=2) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 6.

Figure 4. GCWA observations and estimated territory delineations based on the Grandview Hills/SAS enumeration surveys from FY23, Travis County BCP, Texas.



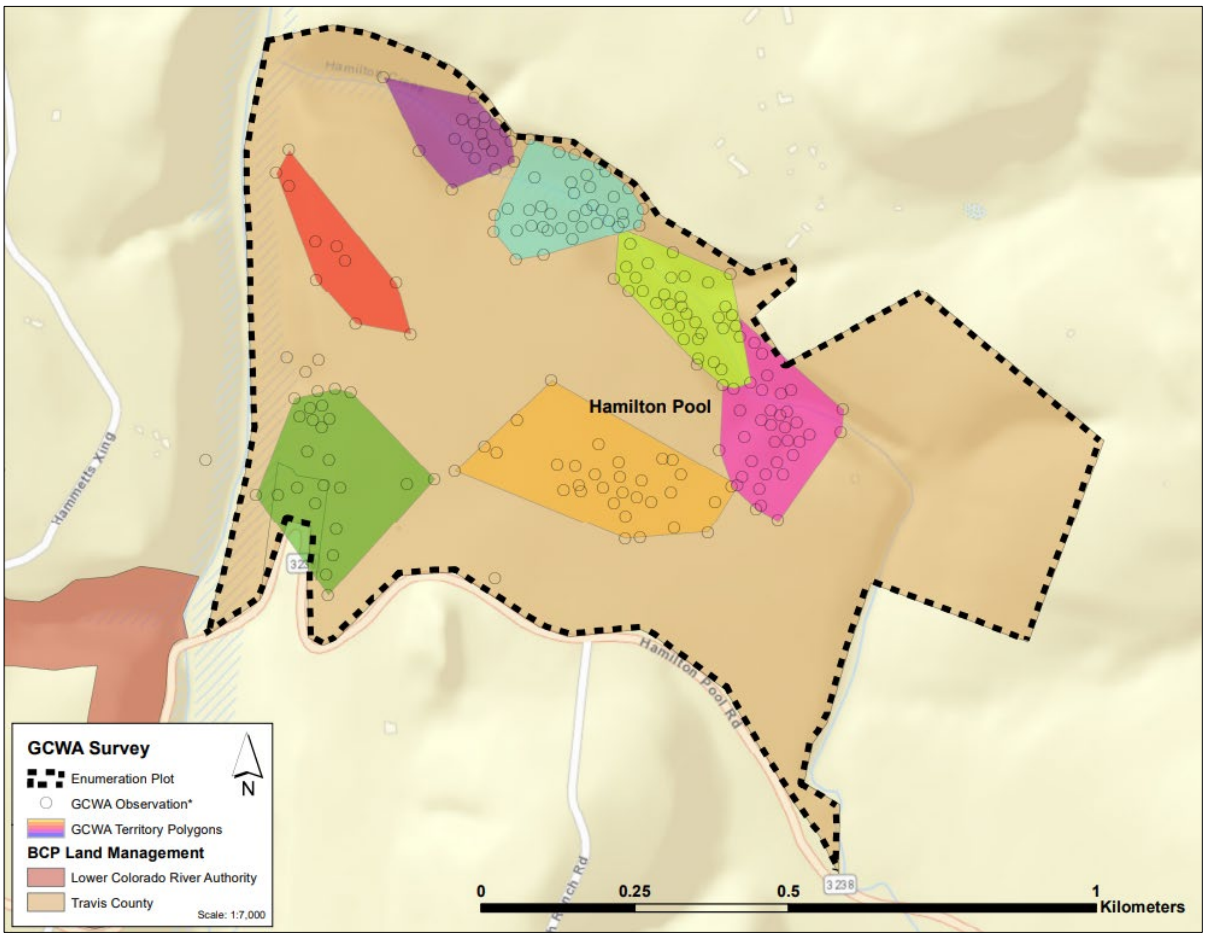
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Hamilton Pool GCWA Enumeration Surveys Results

The 95-ha Hamilton Pool GCWA enumeration survey plot included the Martin tract and the Hamilton Pool Preserve, a Travis County Park that is included in the BCP. Hamilton Pool Preserve is located north of Hamilton Pool Road in southwest Travis County, within the Pedernales River macrosite.

Seven GCWA territories (full or edge) were delineated on the Hamilton Pool survey plot. The overall density of GCWAs for this survey plot was approximately 0.07 GCWA territories per ha. Female GCWAs were detected within 57.14% (n=4) of male territories and GCWA fledglings were detected in 28.57% (n=2) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 7.

Figure 7. GCWA observations and estimated territory delineations based on the Hamilton Pool enumeration surveys from FY23, Travis County BCP, Texas.



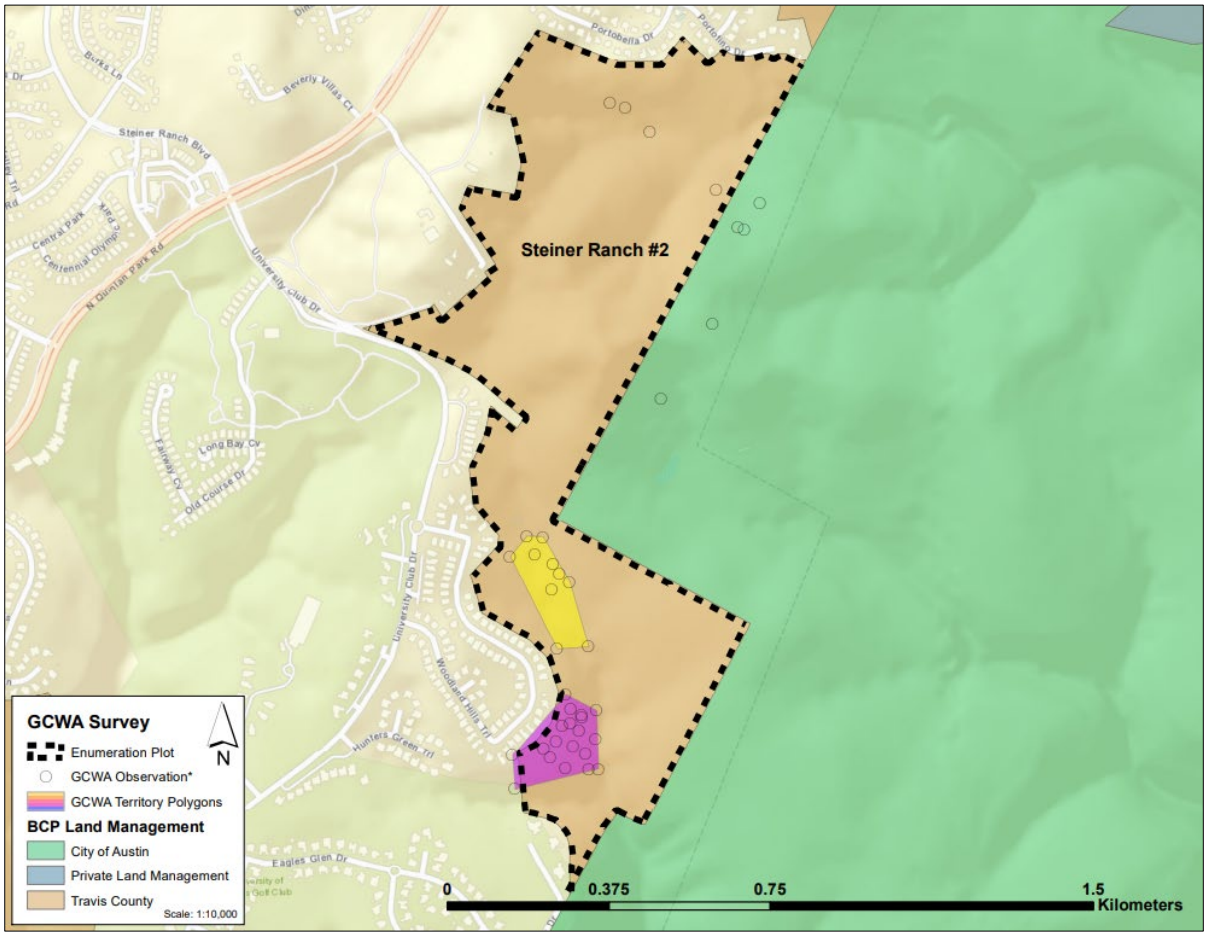
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Steiner Ranch #2 GCWA Enumeration Surveys Results

The Steiner Ranch #2 enumeration survey plot included approximately 79.3 ha of the Steiner Ranch conservation easement. This survey plot is located north of Lake Austin and east of Quinlan Park Road, within the North Lake Austin macrosite.

Two GCWA territories (full or edge) were delineated on the Steiner Ranch #2 survey plot. The overall density of GCWAs for this survey plot was approximately 0.03 GCWA territories per ha. No female or fledgling GCWAs were detected within the survey plot. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 8.

Figure 8. GCWA observations and estimated territory delineations based on the Steiner #2 enumeration surveys from FY23, Travis County BCP, Texas.



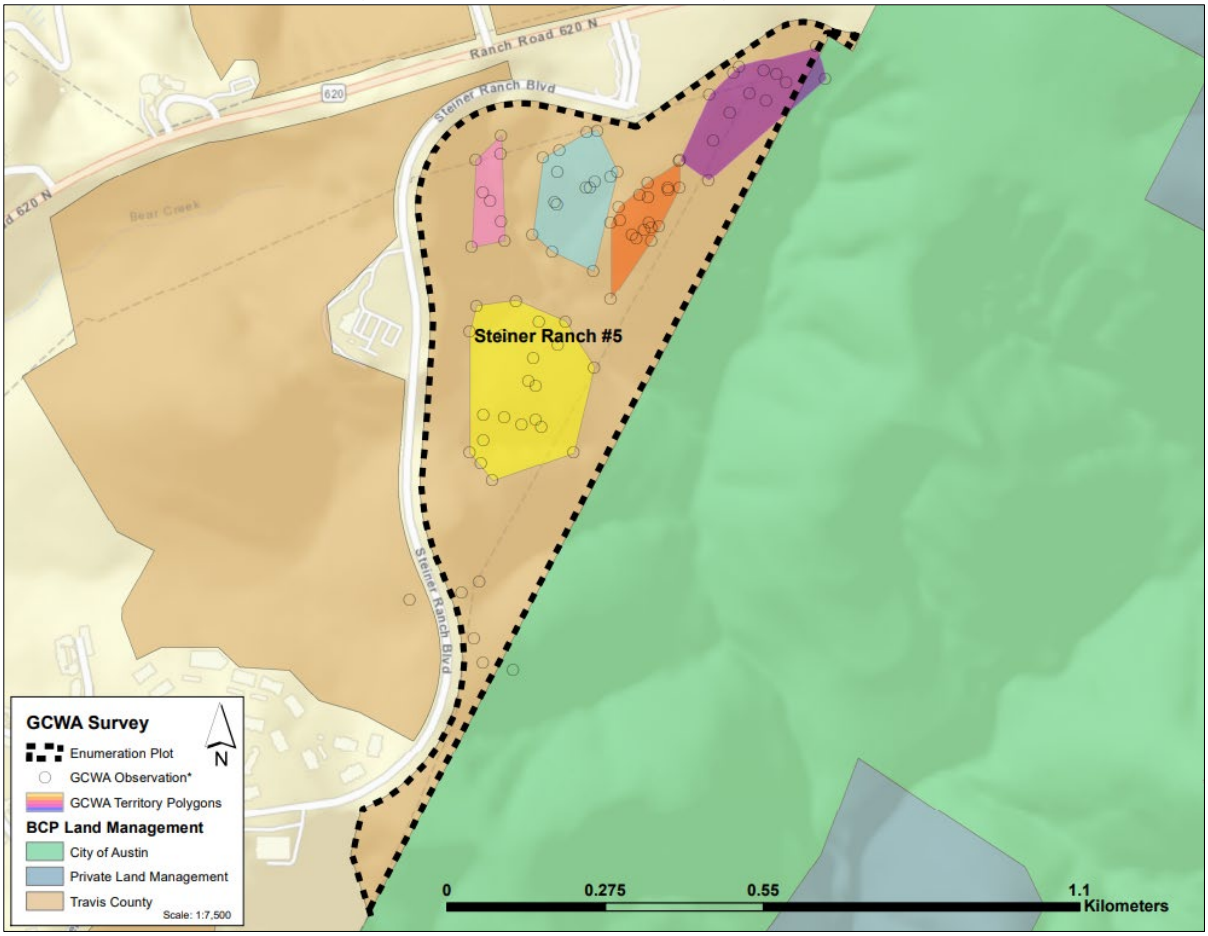
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Steiner Ranch #5 GCWA Enumeration Surveys Results

The Steiner Ranch #5 GCWA enumeration survey plot included approximately 41.3 ha of the Steiner Ranch conservation easement. Steiner Ranch #5 is located near the intersection of North FM 620 and Steiner Ranch Boulevard, within the North Lake Austin macrosite.

Five GCWA territories (full or edge) were delineated on the Steiner Ranch #5 survey plot. The overall density of GCWAs for this survey plot was approximately 0.12 GCWA territories per ha. Female GCWAs were detected within 20% (n=1) of male territories and GCWA fledglings were detected in 20% (n=1) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 9.

Figure 9. GCWA observations and estimated territory delineations based on the Steiner Ranch #5 enumeration surveys from FY23, Travis County BCP, Texas.



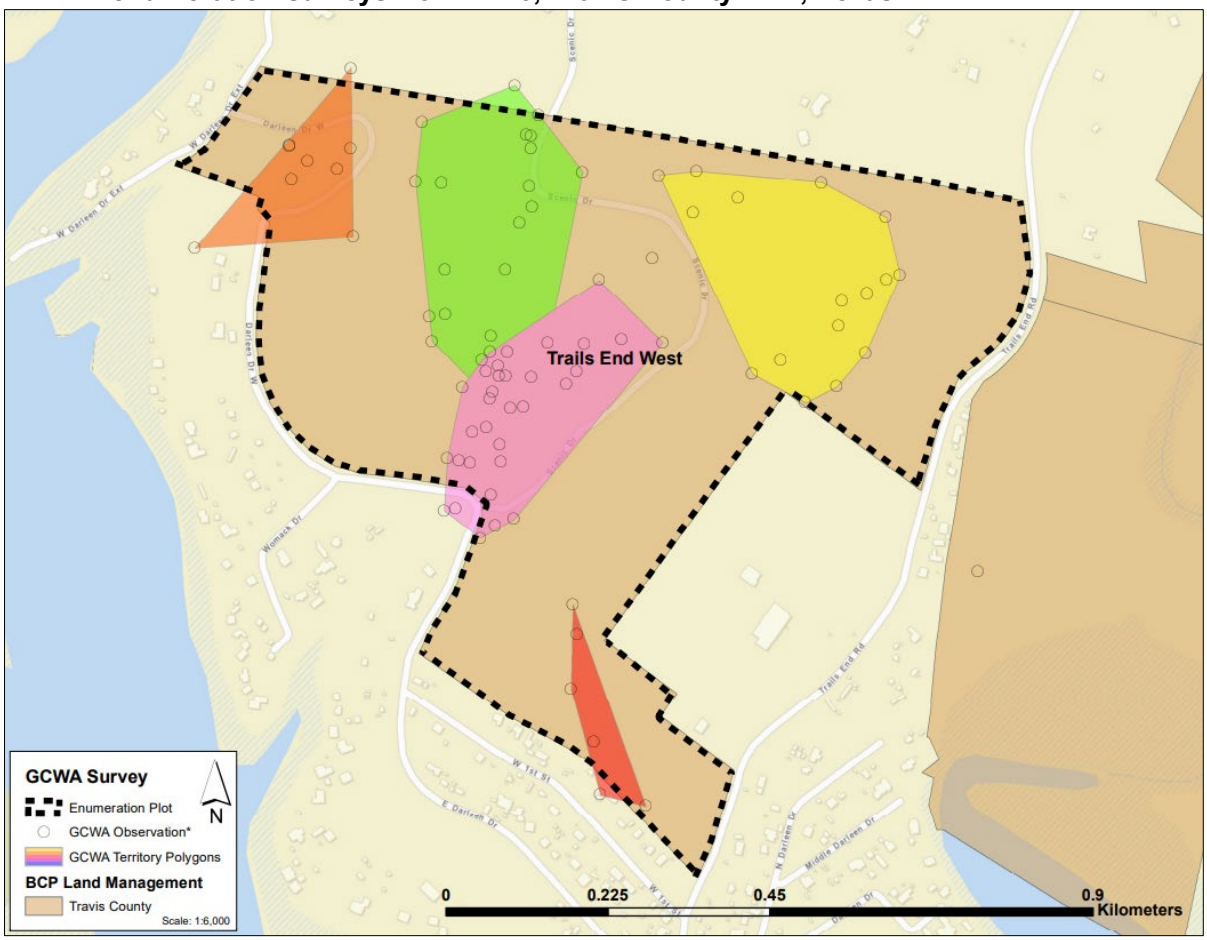
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Trails End West GCWA Enumeration Surveys Results

The Trails End West GCWA enumeration survey plot included the western portion of the Trails End tract, totaling approximately 60.50 ha within the Cypress Creek macrosite. The Trails End West survey plot is located between the cities of Jonestown and Cedar Park, west of Trails End Road.

Five GCWA territories (full or edge) were delineated on the Trails End West survey plot. The overall density of GCWAs for these survey plots was approximately 0.07 GCWA territories per ha. Female GCWAs were detected within 20% (n=1) of male territories and GCWA fledglings were detected in 40% (n=2) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 10.

Figure 10. GCWA observations and estimated territory delineations based on the Trails End West enumeration surveys from FY23, Travis County BCP, Texas.



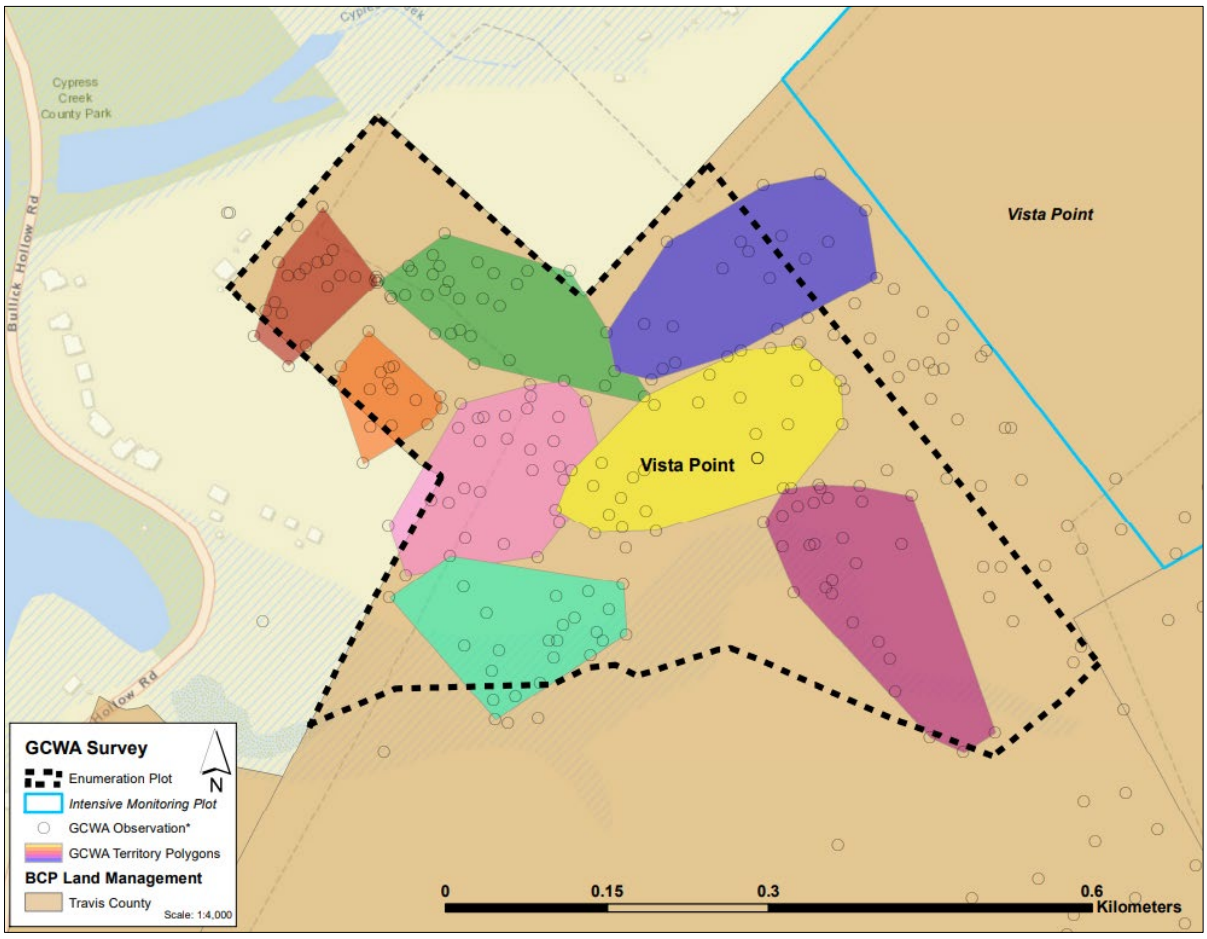
*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Vista Point GCWA Enumeration Surveys Results

The Vista Point GCWA enumeration survey plot included approximately 25.4 ha of the Vista Point tract, within the Cypress Creek macrosite. The Vista Point survey plot is located just east of Bullick Hollow Road and shares an eastern border with the Vista Point intensive monitoring plot buffer.

Eight GCWA territories (full or edge) were delineated on the Vista Point survey plot. The overall density of GCWAs for these survey plots were approximately 0.30 GCWA territories per ha. Female GCWAs were detected within 62.5% (n=5) of male territories and GCWA fledglings were detected in 37.5% (n=3) of territories. GCWA observation locations and delineated territories from FY23 enumeration surveys are presented in Figure 11.

Figure 11. GCWA observations and estimated territory delineations based on the Vista Point enumeration surveys from FY23, Travis County BCP, Texas.



*GCWA Observations outside of designated survey boundaries are estimated locations, based on audible male detections.

Intensive Monitoring Plot and Nest Monitoring Results

In FY23, Staff conducted GCWA intensive plot monitoring at the Collins, Vista Point, and Wheless plots (Figure 1). Staff surveyed intensive monitoring plots weekly from 15 March 2023 to 25 May 2023 to delineate territory boundaries and to monitor nesting activity. Additional weekly visits to the plots occurred between 25 May 2023 and 15 June 2023 to continue monitoring nesting activity, obtain hatch-year bird observations, and gain additional band resight information. Staff contributed approximately 199.08, 387.49, and 59 hours of survey time to the Collins, Vista Point, and Wheless intensive monitoring plots, respectively.

In FY23, Staff located 38 GCWA nests while conducting intensive plot surveys: 12 on Collins, 25 on Vista Point, and one on Wheless. Of the 38 nests, 29 nests were observed in Ashe Juniper (*Juniperus ashei*), five in live oak (*Quercus fusiformis*), three in white shin oak (*Quercus sinuata* var. *breviloba*), and one in a cedar elm (*Ulmus crassifolia*) tree. Of these 38 nests, 15 (~39.5%) successfully fledged young, 14 (~36.8%) failed due to presumed depredation or weather, seven (18.4%) were abandoned, and the remaining two (5.3%) had an unknown fate. No nests were observed to have been parasitized by brown-headed cowbirds (*Molothrus ater*).

Travis County shared intensive plot monitoring and nest data collected in FY23 with the City of Austin staff for further analysis and publication. For a more detailed summary of the results and discussion of the intensive monitoring program and nest monitoring effort, see the City of Austin's "Appendix F" of the 2023 BCCP Annual Report.

Banding and Band Resighting Results

In FY23, Staff assisted the City of Austin with banding GCWAs on Travis County BCP intensive monitoring plots. Staff contributed approximately 12 hours to GCWA banding effort on the Collins, Vista Point, and Wheless plots, collectively. A summary of Staff FY23 banding effort is shown in Table 3.

Table 3. GCWA Banding Results, FY23, Travis County BCP, Texas.

Banding Area	Date Banded	Sex	Age*	Color-Band Combination
Collins	4/18/2023	Male	SY	RD/MV:WH/SI
Collins	4/20/2023	Male	SY	MV/SI:WH/OR
Collins	4/20/2023	Male	SY	DG/YE:BK/SI
Collins	4/21/2023	Male	SY	BK/SI:DB/RD
Vista Point	4/2/2023	Male	SY	OR/YE:WH/SI
Vista Point	5/2/2023	Male	SY	BK/BL:DG/SI
Vista Point	5/2/2023	Male	SY	BL/DG:YE/SI
Vista Point	5/2/2023	Male	SY	DG/SI:YE/MV
Vista Point	5/4/2023	Male	SY	DB/SI:RD/YE
Vista Point	5/4/2023	Male	SY	OR/SI:YE/MV
Wheless	4/24/2023	Male	SY	OR/SI:OR/RD
Wheless	4/24/2023	Male	SY	YE/DG:DG/SI
Wheless	5/11/2023	Male	ASY	DG/SI:WH/OR

* SY = Second Year; ASY = After Second Year; AHY = After Hatch Year

In FY23, volunteers assisted with band resighting efforts surrounding the Vista Point, Collins, and Hamilton SE (City of Austin plot) intensive monitoring plots (Figure 1). Travis County shared banding and band resighting data collected in FY23 with the City of Austin staff for further analysis and publication. For a more detailed summary of the results and discussion of the band resighting effort, see the City of Austin's "Appendix F" of the 2023 BCCP Annual Report.

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