

Final Report
Wheless Preserve
Golden-cheeked Warbler Territory Mapping
Spring 2015

Prepared for



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1.0 INTRODUCTION

The Lower Colorado River Authority (LCRA) owns and manages the 2,317-acre Wheless Preserve, which is part of the larger Balcones Canyonlands Preserve (BCP) system. The BCP is a system of preserves associated with the Balcones Canyonlands Conservation Plan (BCCP), a regional habitat conservation plan in which LCRA is a Managing Partner. The Wheless Preserve is bordered on the west side by Lime Creek Road, north of the Village of Volente, in northwestern Travis County, Texas (see **Figure 1.0** in **Appendix A**). Around the remainder of the Wheless Preserve boundary are additional preserve lands owned and/or managed by Travis Audubon Society, Travis County, City of Austin and The Nature Conservancy, and private landowners. The Wheless Preserve contains approximately 1,715 acres of suitable habitat for the endangered golden-cheeked warbler (GCWA, *Setophaga chrysoparia*), of which 1,400 acres are considered high-quality habitat.

The purpose of this report is to present the results of 2015 GCWA territory mapping within a portion of the Wheless Preserve. The survey methods followed the U.S. Fish and Wildlife Service's (USFWS) recommended minimum procedures for determining the presence/absence of GCWAs (USFWS 2010), as outlined in LCRA's Federal Fish and Wildlife Permit (Permit No. TE800900-0), unless otherwise stated. In addition, GCWA territory-level mapping was conducted according to the *Land Management Plan Protocol for Conducting Territory Mapping on BCP Lands (Appendix A – 100-acre Plot Protocol for Field Season 2002 and Beyond)* (BCCP 2007).

Section 2.0 of this report describes the survey plot. Section 3.0 describes the methods used to perform the 2015 surveys and territory mapping, and Section 4.0 presents the results of the territory mapping.

2.0 DESCRIPTION OF SURVEY AREAS

2.1 Prime Plot

The Prime Plot is approximately 93.2 acres (per ArcGIS estimate of boundary shapefile provided to Blanton & Associates, Inc. (B&A) by LCRA). Topography of the Prime Plot is highly variable due to a portion of the plot being bisected by Long Hollow Creek, a spring-fed stream that flows north to south along the west side of the Prime Plot. An unnamed tributary to Long Hollow Creek also flows north to south through the center of the Prime Plot, intersecting Long Hollow Creek near the southern end of the plot. These two streams have created small canyons that are separated by a narrow ridge. East of the unnamed tributary, the Prime Plot extends to the western edge of a relatively flat plateau that separates the Long Hollow Creek watershed from the Cypress Creek watershed. Multiple ephemeral streams contribute to the Long Hollow Creek watershed, creating numerous smaller draws and drainages. Elevations within the Prime Plot range from approximately 780 feet above mean sea level (msl) to approximately 950 feet above msl. Representative photographs of the Prime Plot are found in **Appendix B**.

Vegetation/habitat within the Prime Plot largely conforms to a mature forest community structure (Diamond et al. 1987), with a relatively open understory, a high degree of species overlap (interspersion), and canopy cover ranging from 50 to 90 percent. The groundcover is largely exposed rock and leaf litter, with a low-diversity of sparse herbaceous plants. However, some portions of the Prime Plot support less-

mature woodlands, largely on southwest-facing slopes, that are dominated primarily by shorter-statured Ashe juniper (*Juniperus ashei*), Texas red oak (*Quercus buckleyi*), and plateau live oak (*Quercus fusiformis*). These areas are characteristically more open (greater interstitial space between plants), thereby creating less interspersed plants or plant species.

Dominant canopy species within suitable GCWA habitat of the Prime Plot include Ashe juniper, Texas red oak, plateau live oak, Durand oak (*Quercus sinuata*), cedar elm (*Ulmus crassifolia*), Arizona walnut (*Juglans major*), Escarpment black cherry (*Prunus serotina* var. *eximia*), Texas ash (*Fraxinus texensis*), sycamore (*Platanus occidentalis*), and sugarberry (*Celtis laevigata*). Common midstory and understory species include Ashe juniper, plateau live oak, Texas red oak, Texas mountain laurel (*Sophora secundiflora*), Texas redbud (*Cercis canadensis* var. *texensis*), evergreen sumac (*Rhus virens*), Lindheimer's silktassel (*Garrya ovata* ssp. *lindheimeri*), Texas persimmon (*Diospyros texana*), agarito (*Berberis trifoliolata*), Texas kidneywood (*Eysenhardtia texana*), Roosevelt weed (*Baccharis neglecta*), elbow-bush (*Forestiera angustifolia*), and Mexican buckeye (*Ungnadia speciosa*). Other common understory species include cedar sage (*Salvia roemeriana*), frostweed (*Verbesina virginica*), greenbriar (*Smilax bona-nox*), mustang grape (*Vitis mustangensis*), and other various grasses and forbs.

3.0 METHODS

Surveys began on March 31, 2015 and were completed on May 25, 2015 (**Table 1**). Observations began no earlier than one-half hour after official sunrise, when temperatures were above 55 degrees Fahrenheit, wind speeds were below 15 miles per hour, and with no or light precipitation. The Prime Plot was surveyed 10 times. Two biologists surveyed the plot for at least three hours on nine of the surveys and one biologist surveyed for at least six hours on one survey. Surveyors used spot-mapping techniques consistent with the USFWS protocol for GCWA presence/absence (USFWS 2010), International Bird Census Committee (IBCC 1970), and Bibby et al. (2003).

During each visit, surveyors walked slowly through the survey area and listened for GCWAs. If a GCWA was observed, surveyors recorded the location of the bird on a paper field map and with an Ashtech or Spectra 10 Global Positioning System (GPS) receiver. The GPS location recorded was the actual or estimated location of the bird. Locations of birds observed more than 30 feet from the observer were moved to the estimated location of the bird, and the accuracy of the location was estimated. Observers also noted other observations, including vocalization (call or song type), time of observation, sex, presence of bands, and presence of juveniles. Contemporary contacts of multiple birds (counter-singing) were noted on the field maps and notebooks. No audio tapes were used during these surveys.

After completion of the field surveys, all GCWA locations were mapped using ArcGIS 10.2.1 in NAD 1983 Texas State Plan Coordinate System. An area was considered a potential territory if a male and female were present, if a male or female and juveniles were present, if counter-singing was observed from a neighboring male, if there were repeated observations in the same area, if there were sequential movements of an individual male, or if one male was observed singing in an area where no other birds were observed (Bibby et al. 2003). Some areas identified as a territory met multiple criteria.

Table 1. Survey Dates, Times, and Weather Conditions for GCWA Surveys

Date	Time				Temperature (°F)		Wind Direction		Wind Speed (mph)		Cloud Cover (%)		Surveyor	Comments
	Sunrise	Start	End	Total Time	Start	End	Start	End	Start	End	Start	End		
03/31/2015	7:28	08:21	12:10	3:49	72	84	SSW	SW	0-5	5-10	100	30	J. Schindler	north half of Prime Plot
03/31/2015	7:28	08:21	12:09	3:48	72	84	SSW	S	0-5	5-10	60	20	B. Doggett	south half of Prime Plot
04/06/2015	7:20	08:06	11:50	3:44	69	75	SE	SE	0-5	0-5	60	40	G. Casares	north half of Prime Plot
04/06/2015	7:20	08:06	11:50	3:44	69	75	SE	SE	0-5	0-5	60	40	B. Doggett	south half of Prime Plot
04/15/2015	7:10	08:20	14:30	6:10	65	82	SE	SE	0-5	0-5	<5	<5	J. Schindler	both halves of Prime Plot
04/20/2015	7:04	07:48	11:00	3:12	56	63	SE	SE	7	9	10	50	C. Ladd	north half of Prime Plot
04/20/2015	7:04	07:50	11:00	3:10	56	63	SE	SE	7	9	10	50	G. Casares	south half of Prime Plot
05/05/2015	6:49	08:45	12:20	3:35	74	80	SE	SE	2	2	100	100	G. Casares	north half of Prime Plot
05/05/2015	6:49	08:43	12:21	3:38	75	80	SE	SE	2	2	100	100	B. Doggett	south half of Prime Plot
05/07/2015	6:48	07:50	11:22	3:32	71	75	SE	SE	0-5	0-5	100	100	J. Schindler	north half of Prime Plot: light sprinkle (precipitation) twice
05/07/2015	6:48	07:50	11:22	3:32	71	75	SE	SSE	0-5	0-5	100	100	B. Doggett	south half of Prime Plot; light sprinkle (precipitation) twice
05/12/2015	6:44	08:10	11:15	3:05	67	67	NE	NE	0-2	0-2	100	100	G. Casares	north half of Prime Plot: light rain 11:00-11:10
05/12/2015	6:44	08:10	11:15	3:05	67	67	NNE	NNE	0-2	0-3	100	100	B. Doggett	south half of Prime Plot
05/22/2015	6:38	07:40	11:00	3:20	65	68	E	E	0-5	0-5	100	100	J. Schindler	north half of Prime Plot: light fog and mist 2-3 times during survey
05/22/2015	6:38	07:40	11:00	3:20	65	68	E	E	1	1	100	100	C. Ladd	south half of Prime Plot: 08:45 fine mist, 09:30 light rain, 09:40 fine mist
05/23/2015	6:37	07:15	10:20	3:05	0-5	0-5	E	SE	0-5	0-5	100	100	J. Schindler	north half of Prime Plot: light rain for 5-10 min at the beginning of survey
05/23/2015	6:37	07:20	10:15	2:55	73	75	E	SE	1	1	100	100	C. Ladd	south half of Prime Plot: light rain to start.
05/25/2015	6:37	08:02	11:32	3:30	75	77	SSE	SSE	0-3	0-3	100	100	G. Casares	north half of Prime Plot: light rain at 10:45-10:50
05/25/2015	6:37	08:02	11:23	3:21	75	77	SSE	SSE	0-3	0-3	100	100	B. Doggett	south half of Prime Plot: very light sprinkle at the end of survey
Total Time: 67:35														

Reproductive success metrics were determined as follows:

1. Territory density: number of territories per 100 acres (edge territories counting as 0.5 territory);
2. Calculation of edge territories: each territory that straddles plot boundary counted as a half territory (i.e., 0.5 territory) (Verner 1985); and
3. Productivity measures (Anders 2000) - calculated for full territories ONLY, as follows:
 - a. Pairing success: pairing success of male GCWA determined by observing one or more of the following conditions: a territorial male associating with a female, the nest of a territorial male, and/or a male tending ≥ 1 fledgling. Pairing success rate = number of territories determined to have pairing success / total number of full territories;
 - b. Breeding success: breeding success rate = number of territories that successfully fledged at least one young / total number of full territories;
 - c. Estimated brood size: average brood size per successful pair (based on “breeding success”); and
 - d. Productivity = sum of the highest number of fledglings recorded at any one time for each full territory / total number of full territories.

4.0 RESULTS

4.1 Prime Plot

GCWA were observed at 139 points in the Prime Plot, including 131 observations of a male and eight observations of females (**Figures 2.0** through **2.10**). No banded birds were observed during the surveys; birds could be seen clearly enough in eight of the 139 observations to see that they were not banded. All observation data are included in **Table 2**. Other bird species were recorded and noted in **Appendix C**.

Figure 2.0 shows the survey results of the Prime Plot survey for the entire season (10 visits), **Figures 2.1** through **2.10** show the results by day (March 31 through May 25, 2015). Six full territories (labeled C, D, E, F, G, and H) were observed (**Figure 2.0**). Females were observed in B, C, F, and G territories. Juveniles were observed with the male in territory C.

Three edge territories were also identified (A, B, and I) (**Figure 2.0**). A female was seen in territory B. No juveniles were noted in any of the edge territories.

Territory density in the Prime Plot was estimated at 8.0 GCWA per 100 acres. This calculation was based on six full territories and three edge territories in 93.2 acres. The pairing success rate in the Prime Plot was 50 percent (three out of the six full territories). The breeding success rate was estimated at 20 percent, based on one of the six full territories in which juveniles were detected (territory C). The maximum brood size was four, again based on the observations on territory C. The productivity was estimated at 0.8, based on the four juveniles and six full territories.

B&A conducted an identical survey of the Prime Plot in 2014 (B&A 2014). Overall, more GCWA (males, females, and juveniles) were observed in 2015 over the previous year. This resulted in more territories and a higher GCWA density.

Table 2. Survey Observation Data: Prime Plot

MAP #	Latitude	Longitude	Y_PROJ	X_PROJ	Date	Observer	Banded	Vocalization	Sex	Precision (Feet)	Movement/Counter-singing
1	-97.87454	30.45811	608049.064	3370087.3274	3/31/2015	J. Schindler	Unknown	A	M	90	01-06 same bird
2	-97.87375	30.45838	608125.306	3370118.4453	3/31/2015	J. Schindler	Unknown	A	M	30	01-06 same bird moved from 01 to 02 to 03
3	-97.87386	30.45809	608115.1724	3370085.5852	3/31/2015	J. Schindler	Unknown	A	M	90	01-06 same bird
4	-97.87353	30.45819	608146.5634	3370097.5616	3/31/2015	J. Schindler	Unknown	A	M	60	01-06 same bird moved from 03 to 04 then to 05
5	-97.87403	30.45838	608098.1004	3370117.3097	3/31/2015	J. Schindler	Unknown	A	M	30	01-06 same bird moved from 04 to 05 then back to 02
6	-97.87407	30.45860	608093.6566	3370142.1761	3/31/2015	J. Schindler	Unknown	A	M	30	01-06 same bird moved from 02
7	-97.86942	30.45827	608541.0393	3370109.6509	3/31/2015	J. Schindler	Unknown	A	M	60	07-11 same bird moved from 07 to 08
8	-97.86924	30.45820	608557.718	3370102.1114	3/31/2015	J. Schindler	Unknown	A	M	90	07-11 same bird moved from 07 then to 08 then to 09
9	-97.86965	30.45852	608518.259	3370137.6007	3/31/2015	J. Schindler	Unknown	A	M	60	07-11 same bird moved from 08 to 09 to 10
10	-97.86895	30.45844	608585.577	3370129.8300	3/31/2015	J. Schindler	Unknown	A	M	60	07-11 same bird moved from 09 to 10
11	-97.86916	30.45812	608566.1279	3370094.0440	3/31/2015	J. Schindler	Unknown	A	M	90	07-11 same bird moved from 10 to 11
12	-97.86867	30.46136	608609.0795	3370453.1575	3/31/2015	J. Schindler	Unknown	A/B	M	30	12-14 same bird moved to 13
13	-97.86831	30.46132	608643.7454	3370449.0109	3/31/2015	J. Schindler	Unknown	A	M	30	12-14 same bird moved from 12 to 13
14	-97.86878	30.46142	608598.5664	3370459.3090	3/31/2015	J. Schindler	Unknown	A	M	30	12-14 same bird moved from 13 to 14
15	-97.87130	30.46196	608356.3518	3370517.4948	3/31/2015	J. Schindler	Unknown	A	M	90	counter singing with 16/17
16	-97.87090	30.46296	608393.5316	3370628.8994	3/31/2015	J. Schindler	Unknown	A	M	90	different and separate individual from 01-15
17	-97.87050	30.46264	608431.8578	3370593.6161	3/31/2015	J. Schindler	Unknown	A	M	90	different and separate individual from 01-15
18	-97.87122	30.46153	608364.0517	3370469.6493	3/31/2015	J. Schindler	Unknown	A	M	30	moved from 15 and later from 19
19	-97.87160	30.46143	608328.1239	3370458.0746	3/31/2015	J. Schindler	Unknown	A	M	60	moved back to 18
20	-97.87148	30.46126	608339.375	3370439.3226	3/31/2015	J. Schindler	Unknown	A	M	60	moved from 18 and then to 21 after
21	-97.87129	30.46092	608358.2051	3370402.2793	3/31/2015	J. Schindler	Unknown	A	M	60	moved from 20
22	-97.87062	30.45883	608424.6635	3370170.5313	3/31/2015	B. Doggett	Unknown	A	M	150	
23	-97.87047	30.45860	608439.5628	3370145.7605	3/31/2015	B. Doggett	Unknown	A	M	120	same bird as 22
24	-97.87091	30.45847	608397.6108	3370130.3009	3/31/2015	B. Doggett	Unknown	A	M	90	moved from 22 to 23 then to 24
25	-97.87091	30.45873	608397.169	3370160.1007	3/31/2015	B. Doggett	Unknown	A	M	30	moved from 24 to 25 then to 26
26	-97.87067	30.45868	608420.5743	3370154.7705	3/31/2015	B. Doggett	Unknown	A	M	60	moved from 25 to 26 then back to 25
27	-97.87428	30.46056	608071.728	3370359.3152	4/6/2015	G. Casares	Unknown	A	M	30	counter singing with 28
28	-97.87377	30.45951	608122.0831	3370243.1413	4/6/2015	G. Casares	Unknown	A	M	150	counter singing with 27
29	-97.86795	30.46196	608677.4094	3370520.3222	4/6/2015	G. Casares	Unknown	A/B	M	30	counter singing with 30
30	-97.86809	30.45969	608667.3756	3370268.6979	4/6/2015	G. Casares	No	A	M	30	flew to 31
31	-97.86833	30.45898	608644.5336	3370189.5029	4/6/2015	G. Casares	No	A	M	30	same bird from 30 counter singing and aggressive interaction with bird from 33
32	-97.86838	30.45896	608639.8227	3370186.9919	4/6/2015	G. Casares	No	Chipping	F	30	paired with male from 30/31
33	-97.86848	30.45895	608630.2504	3370186.4817	4/6/2015	G. Casares	No		M	30	aggressive interaction with male from 31
34	-97.86845	30.45893	608632.7756	3370183.8138	4/6/2015	G. Casares	No		F	30	paired with male from 33
35	-97.87362	30.45720	608138.4619	3369987.2378	4/6/2015	B. Doggett	Unknown	A	M	30	moved to 36
36	-97.87369	30.45839	608130.9467	3370118.9213	4/6/2015	B. Doggett	No	A	M	30	moved from 35
37	-97.87398	30.45845	608103.2588	3370125.2747	4/6/2015	B. Doggett	Unknown	A	M	30	moved from 35 to 36 then to 37
38	-97.87033	30.45822	608453.2772	3370103.0871	4/6/2015	B. Doggett	Unknown	A	M	190	moved to 35
39	-97.87095	30.45810	608394.285	3370089.2387	4/6/2015	B. Doggett	Unknown	A	M	30	moved from 34 to 35 then to 36
40	-97.87071	30.45774	608417.1664	3370049.6908	4/6/2015	B. Doggett	Unknown	A	M	60	moved from 38
41	-97.87425	30.45606	608079.571	3369860.6489	4/6/2015	B. Doggett	Unknown	A	M	300	maybe same bird as 38
42	-97.87081	30.45758	608407.9862	3370031.7537	4/15/2015	J. Schindler	Unknown	B	M	30	moved to 43
43	-97.87097	30.45780	608392.1281	3370056.9223	4/15/2015	J. Schindler	Unknown	B	M	60	
44	-97.87152	30.45597	608342.1441	3369853.4351	4/15/2015	J. Schindler	Unknown	B	M	45	
45	-97.87156	30.45595	608337.9334	3369850.6942	4/15/2015	J. Schindler	Unknown	Chipping	F	30	
46	-97.87199	30.45523	608297.7407	3369770.9386	4/15/2015	J. Schindler	Unknown	B	M	60	same male as 44
47	-97.87108	30.46066	608378.5845	3370373.4767	4/15/2015	J. Schindler	Unknown	B	M	30	
48	-97.86768	30.45951	608706.2704	3370249.5698	4/15/2015	J. Schindler	Unknown	B	M	60	
49	-97.86814	30.46123	608660.109	3370439.6198	4/15/2015	J. Schindler	Unknown	A	M	30	

Table 2. Survey Observation Data: Prime Plot

MAP #	Latitude	Longitude	Y_PROJ	X_PROJ	Date	Observer	Banded	Vocalization	Sex	Precision (Feet)	Movement/Counter-singing
50	-97.86788	30.46184	608684.9208	3370506.6203	4/15/2015	J. Schindler	Unknown	A	M	30	moved from 49
51	-97.86796	30.46234	608676.5996	3370562.8203	4/15/2015	J. Schindler	Unknown	A	M	30	moved from 50
52	-97.86804	30.46207	608669.2276	3370532.9619	4/15/2015	J. Schindler	Unknown	A	M	60	moved from 51
53	-97.86776	30.46214	608695.4987	3370541.0342	4/15/2015	J. Schindler	Unknown	A	M	60	moved from 52
54	-97.86783	30.46188	608689.071	3370511.6607	4/15/2015	J. Schindler	Unknown	A	M	30	moved from 53
55	-97.86764	30.46216	608707.4575	3370543.0069	4/15/2015	J. Schindler	Unknown	A	M	30	moved from 54
56	-97.86955	30.46094	608525.375	3370405.3081	4/15/2015	J. Schindler	Unknown	A	M	30	
57	-97.86981	30.46024	608501.337	3370327.5423	4/15/2015	J. Schindler	Unknown	A	M	30	moved from 56
58	-97.87112	30.46042	608375.1812	3370346.7237	4/15/2015	J. Schindler	Unknown	B	M	30	maybe same bird as 47, counter singing with 57
59	-97.87390	30.46093	608108.0933	3370400.0317	4/15/2015	J. Schindler	Unknown	A	M	120	
60	-97.86968	30.46077	608513.0656	3370387.2127	4/20/2015	C. Ladd	No	A	M	30	
61	-97.86808	30.46046	608666.8453	3370353.7363	4/20/2015	C. Ladd	Unknown	A	M	30	counter singing with 62
62	-97.86757	30.46056	608715.8581	3370365.6999	4/20/2015	C. Ladd	Unknown	B	M	90	counter singing with 61
63	-97.86833	30.46023	608643.0595	3370327.7694	4/20/2015	C. Ladd	Unknown	A	M	30	same bird as 61
64	-97.86809	30.46200	608664.3583	3370524.9788	4/20/2015	C. Ladd	Unknown	A	M	30	possibly same bird as 61 and 63
65	-97.87271	30.45800	608225.0905	3370076.6020	4/20/2015	G. Casares	Unknown	A	M	30	moved to 66
66	-97.87196	30.45843	608297.1766	3370125.8278	4/20/2015	G. Casares	No	A/C	M	30	moved from 65
67	-97.87186	30.45845	608306.37	3370127.1178	4/20/2015	G. Casares	Unknown	Chipping	F	30	paired with male from 66
68	-97.87068	30.45897	608418.9339	3370186.3277	4/20/2015	G. Casares	Unknown	A	M	300	moved to 69
69	-97.87097	30.45741	608392.7447	3370012.7384	4/20/2015	G. Casares	Unknown	A/B	M	30	moved from 68
70	-97.87150	30.45618	608343.5927	3369875.8923	4/20/2015	G. Casares	Unknown	A	M	30	
71	-97.87435	30.46167	608063.309	3370482.6543	5/5/2015	G. Casares	Unknown	Chipping	M	30	
72	-97.87426	30.46174	608072.2169	3370490.3057	5/5/2015	G. Casares	Unknown	Chipping	F	30	
73	-97.87186	30.46239	608302.3698	3370564.0554	5/5/2015	G. Casares	Unknown	A	M	150	counter singing with male from 74
74	-97.87014	30.46089	608468.3152	3370400.1180	5/5/2015	G. Casares	Unknown	A/B	M	30	counter singing with male from 73
75	-97.87336	30.45815	608163.0212	3370093.1519	5/5/2015	B. Doggett	Unknown	A	M	180	counter singing with male from 76
76	-97.87360	30.45737	608140.7584	3370006.7859	5/5/2015	B. Doggett	Unknown	A	M	90	counter singing with male from 75
77	-97.87281	30.45640	608217.3658	3369899.3132	5/5/2015	B. Doggett	Unknown	A	M	30	moved to 78
78	-97.87337	30.45629	608163.5548	3369887.1754	5/5/2015	B. Doggett	Unknown	A	M	90	moved from 77
79	-97.87185	30.45547	608310.2867	3369797.4709	5/5/2015	B. Doggett	Unknown	A	M	90	moved to 80
80	-97.87215	30.45493	608282.6016	3369736.8476	5/5/2015	B. Doggett	Unknown	A	M	120	moved from 79
81	-97.87295	30.45980	608200.5503	3370275.8784	5/7/2015	J. Schindler	Unknown	A	M	90	moved to 82
82	-97.87327	30.45959	608170.0498	3370252.7369	5/7/2015	J. Schindler	Unknown	A	M	60	moved from 81 to 82 then 83
83	-97.87328	30.45953	608168.3955	3370245.5241	5/7/2015	J. Schindler	Unknown	A	M	60	moved from 82 to 83 then to 84
84	-97.87384	30.45871	608116.1694	3370154.9180	5/7/2015	J. Schindler	Unknown	A	M	30	moved from 83
85	-97.87061	30.46044	608424.2957	3370349.3588	5/7/2015	J. Schindler	Unknown	A	M	90	moved to 86
86	-97.87085	30.46032	608401.4845	3370336.4069	5/7/2015	J. Schindler	Unknown	B	M	60	moved from 85 to 86 then to 87
87	-97.87110	30.46055	608377.115	3370360.8014	5/7/2015	J. Schindler	Unknown	B	M	30	moved from 86 to 87 then to 88
88	-97.87126	30.46050	608361.6809	3370355.1738	5/7/2015	J. Schindler	Unknown	B	M	30	moved from 87 to 88 then to 89
89	-97.87146	30.46039	608342.2924	3370343.2748	5/7/2015	J. Schindler	Unknown	B	M	30	moved from 88 to 89
90	-97.86919	30.46272	608557.5717	3370603.1640	5/7/2015	J. Schindler	Unknown	B	M	60	
91	-97.86844	30.45953	608633.4432	3370250.2900	5/7/2015	J. Schindler	Unknown	B	M	90	moved to 92
92	-97.86880	30.45953	608598.075	608598.0750	5/7/2015	J. Schindler	Unknown	B	M	30	moved from 91 to 92 then to 93 then to 94 possible nest nearby
93	-97.86873	30.45955	608606.0651	3370252.0366	5/7/2015	J. Schindler	Unknown	Chipping	F	30	paired with male from 92
94	-97.86880	30.45941	608599.2462	3370237.1857	5/7/2015	J. Schindler	Unknown	B	M	30	moved from 92 to 94
95	-97.86873	30.45938	608605.6821	3370233.2987	5/7/2015	J. Schindler	Unknown	Chipping	F	30	same female from 93
96	-97.86769	30.46076	608704.5695	3370387.7383	5/7/2015	J. Schindler	Unknown	A	M	30	
97	-97.87295	30.45910	608200.6135	3370198.3646	5/7/2015	B. Doggett	Unknown	A	M	30	
98	-97.87339	30.45856	608159.1289	3370138.0566	5/7/2015	B. Doggett	Unknown	A	M	120	

Table 2. Survey Observation Data: Prime Plot

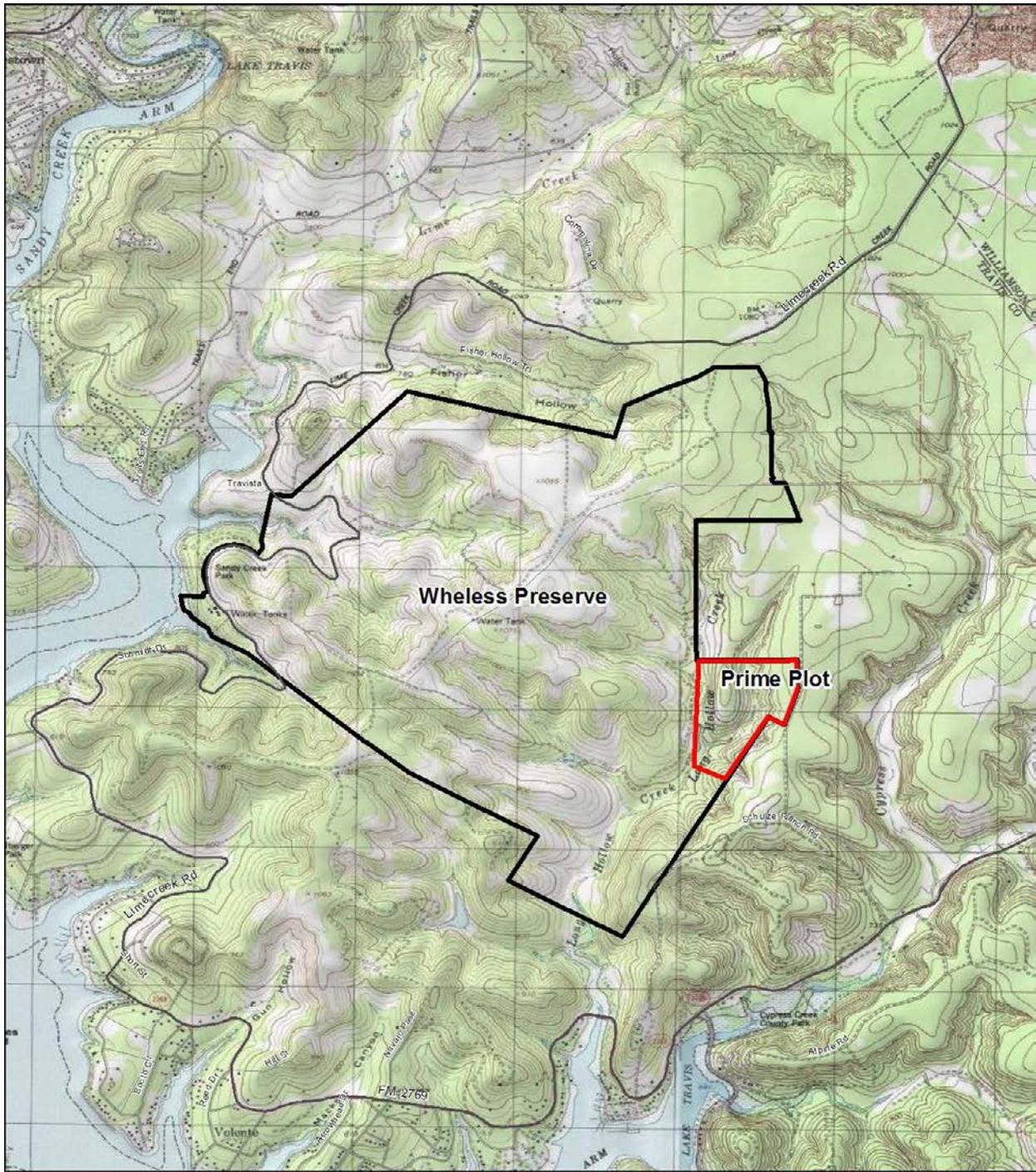
MAP #	Latitude	Longitude	Y_PROJ	X_PROJ	Date	Observer	Banded	Vocalization	Sex	Precision (Feet)	Movement/Counter-singing
99	-97.87310	30.45882	608187.2768	3370167.9603	5/7/2015	B. Doggett	Unknown	A	M	120	
100	-97.87378	30.46065	608119.806	3370369.1585	5/12/2015	G. Casares	Unknown	Chipping	M	30	
101	-97.87109	30.46017	608378.0694	3370319.0101	5/12/2015	G. Casares	Unknown	B	M	30	
102	-97.86923	30.46240	608554.3999	3370568.1695	5/12/2015	G. Casares	Unknown	A	M	30	
103	-97.87104	30.46057	608382.724	3370363.0066	5/22/2015	J. Schindler	Unknown	B	M	90	moved to 104
104	-97.87131	30.46045	608357.2995	3370350.1484	5/22/2015	J. Schindler	Unknown	B	M	30	moved from 103 to 104 then to 105
105	-97.87155	30.46021	608333.9863	3370322.9579	5/22/2015	J. Schindler	Unknown	B	M	30	moved from 104 to 105 then to 106
106	-97.87152	30.45998	608337.1872	3370297.2665	5/22/2015	J. Schindler	Unknown	B	M	60	moved from 105 to 106 then to 107
107	-97.87139	30.46029	608349.0528	3370331.8363	5/22/2015	J. Schindler	Unknown	B	M	30	moved from 106 to 107 then to 108
108	-97.87093	30.46052	608393.2891	3370358.2434	5/22/2015	J. Schindler	Unknown	B	M	30	moved from 107 to 108
109	-97.87038	30.46053	608445.8277	3370359.2702	5/22/2015	J. Schindler	Unknown	B	M	30	moved to 110
110	-97.87036	30.46030	608448.2246	3370334.0364	5/22/2015	J. Schindler	Unknown	B	M	30	moved from 110 to 111; same male as 103-108
111	-97.87047	30.46049	608437.709	3370355.4186	5/22/2015	J. Schindler	Unknown	B	M	30	moved to 110 to 111 then to 112; same male as 103-108
112	-97.87102	30.46035	608384.7156	3370339.0997	5/22/2015	J. Schindler	Unknown	B	M	30	moved from 111 to 112 then to 113; same male as 103-108
113	-97.87118	30.46029	608369.2086	3370332.2069	5/22/2015	J. Schindler	Unknown	B	M	30	moved from 112 to 113; same male as 103-108
114	-97.86871	30.45931	608608.2187	3370226.3752	5/22/2015	J. Schindler	Unknown	B	M	30	male with four fledges, no female seen
115	-97.87109	30.45942	608379.1059	3370235.4221	5/22/2015	C. Ladd	Unknown	C	M	30	
116	-97.86988	30.45747	608497.1054	3370020.4435	5/22/2015	C. Ladd	Unknown	A	M	120	
117	-97.87070	30.45800	608417.9452	3370079.1262	5/22/2015	C. Ladd	Unknown	A	M	150	
118	-97.87094	30.45837	608394.9249	3370119.7224	5/22/2015	C. Ladd	Unknown	A	M	90	
119	-97.87021	30.46089	608461.5768	3370399.2780	5/23/2015	C. Ladd	Unknown	A	M	30	moved to 120; later counter singing with male from 123
120	-97.87046	30.46110	608437.9582	3370422.9213	5/23/2015	C. Ladd	Unknown	A	M	30	moved from 119
121	-97.86879	30.46018	608599.3814	3370321.8906	5/23/2015	C. Ladd	Unknown	Chipping	M	30	moved to 122; family group with 4 juveniles
122	-97.86885	30.46041	608593.1408	3370347.5527	5/23/2015	C. Ladd	Unknown	Chipping	M	30	moved from 121 to 122 then to 123; family group with 4 juveniles
123	-97.86918	30.46040	608561.5059	3370346.1994	5/23/2015	C. Ladd	Unknown	A	M	30	counter singing with male from 119
124	-97.86860	30.46093	608616.845	3370406.1809	5/23/2015	C. Ladd	Unknown	A	M	30	family group nearby
125	-97.87157	30.45855	608333.9454	3370138.6285	5/23/2015	C. Ladd	Unknown	A	M	30	
126	-97.87140	30.45591	608353.172	3369846.5773	5/23/2015	J. Schindler	Unknown	B	M	30	moved to 127
127	-97.87189	30.45571	608306.8669	3369824.2723	5/23/2015	J. Schindler	Unknown	B	M	90	moved from 126
128	-97.87049	30.45801	608437.9773	3370080.1967	5/23/2015	J. Schindler	Unknown	A	M	30	moved to 129
129	-97.87045	30.45742	608442.5512	3370015.2286	5/23/2015	J. Schindler	Unknown	B	M	60	moved from 128 to 129 then to 130
130	-97.87084	30.45747	608404.9315	3370020.4634	5/23/2015	J. Schindler	Unknown	B	M	90	moved from 129 to 130
131	-97.87186	30.45755	608306.9801	3370027.4698	5/23/2015	J. Schindler	Unknown	A	M	30	moved to 132
132	-97.87170	30.45838	608321.3416	3370120.0440	5/23/2015	J. Schindler	Unknown	A	M	60	moved from 131
133	-97.86830	30.46202	608644.4686	3370527.0242	5/25/2015	G. Casares	Unknown	B	M	30	moved to 134
134	-97.86894	30.46131	608583.5829	3370447.3030	5/25/2015	G. Casares	Unknown	B	M	300	moved from 133; counter singing with male from 135
135	-97.86890	30.45972	608588.6282	3370271.3922	5/25/2015	G. Casares	Unknown	B	M	300	moved to 136
136	-97.87035	30.46015	608449.6157	3370317.0777	5/25/2015	G. Casares	Unknown	B	M	30	moved from 135
137	-97.87032	30.46013	608452.3206	3370314.8692	5/25/2015	G. Casares	Unknown	Chipping	F	30	paired with male from 136
138	-97.87172	30.45775	608320.1417	3370050.5774	5/25/2015	B. Doggett	Unknown	A	M	120	
139	-97.87176	30.45772	608317.0545	3370046.7331	5/25/2015	B. Doggett	Unknown	A	M	30	

5.0 REFERENCES

- American Ornithologists' Union (AOU). 1998. Check-list of North American birds, 7th ed. (as currently supplemented through 2014).
- Anders, A. D, J. S. Horne, and L. L. Sanchez. 2000. Relationship between habitat characteristics and demography of golden-cheeked warblers on Ft. Hood, Texas. In Endangered species monitoring and management at Ft. Hood, Texas: 2000 annual report. Fort Hood Project, The Nature Conservancy of Texas, Ft. Hood, Texas, USA.
- Balcones Canyonlands Conservation Plan (BCCP). 2007. Balcones Canyonlands Preserve land management plan, Tier II: golden-cheeked warbler.
- Bibby, C. J., N. D. Burgess, D. A. Hill, and S. Mustoe. 2003. Bird census techniques; chapter 3: territory mapping methods. Academic Press, London.
- Blanton and Associates, Inc. (B&A) 2014. Final Report: Wheless Preserve Golden-cheeked Warbler Territory Mapping (Spring 2014). Prepared for the Lower Colorado River Authority (LCRA).
- Diamond, D., D. Riskind, and S. Orzell. 1987. A framework for plant community classification and conservation in Texas. *Texas Journal of Science* 39(3): 203-221.
- International Bird Census Committee (IBCC). 1970. Recommendations for an international standard for a mapping method in bird census work. *Audubon Field Notes* 24(6): 722-726.
- U.S. Fish and Wildlife Service (USFWS). 2010. USFWS Section 10(a)(1)(A) scientific permit requirements for conducting presence/absence surveys and habitat assessments for endangered golden-cheeked warblers. USFWS Ecological Services Field Office, Austin, Texas. 10 pp.
- Verner, J. 1985. Assessment of counting techniques. *Current Ornithology* 2:247-302.

Appendix A

Figures



 Survey Area



1:45,000

Feet

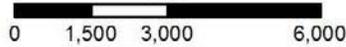


Figure 1.0
 Wheless Preserve
 GCWA Territory Mapping
 Spring 2015
 Location Map

Figure 2.0
 Wheless Preserve
 GCWA Territory Mapping
 Spring 2015
 Survey and Territory Mapping Results
 Prime Plot

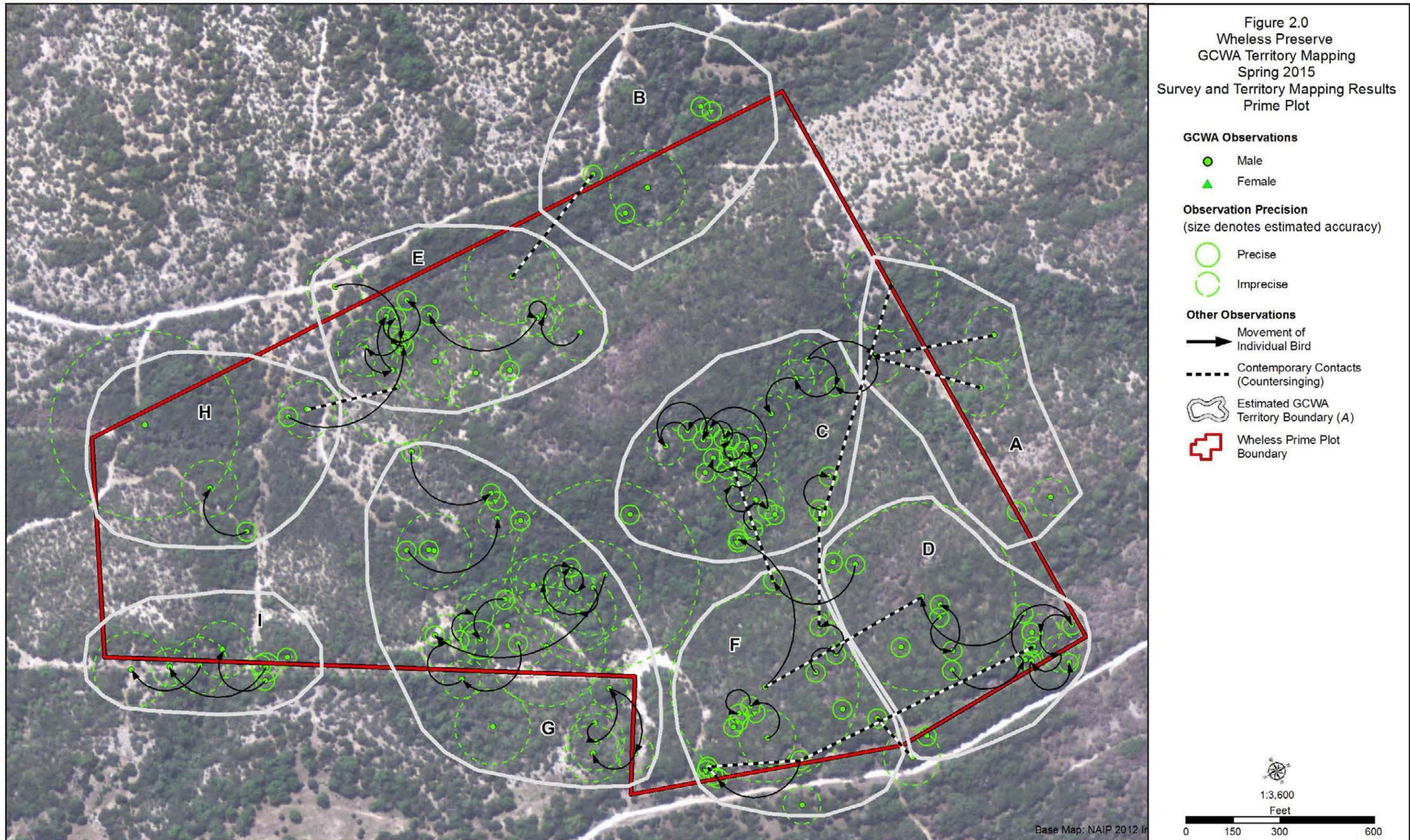


Figure 2.1
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 March 31, 2014 Survey Results
 Prime Plot



GCWA Observations

- Male
- ▲ Female

Observation Precision

(size denotes estimated accuracy)

- Precise
- Imprecise

Other Observations

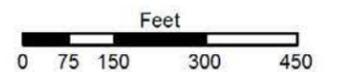
- Movement of Individual Bird
- Contemporary Contacts (Countersinging)

Map ID

▬ Wheless Prime Plot Boundary



1:3,600



Base Map: 2012 NAIP Imagery

Figure 2.2
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 April 6, 2015 Survey Results
 Prime Plot



Figure 2.3
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 April 15, 2015 Survey Results
 Prime Plot



GCWA Observations

- Male
- ▲ Female

Observation Precision

(size denotes estimated accuracy)

- Precise
- Imprecise

Other Observations

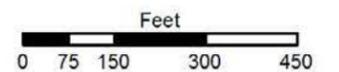
- Movement of Individual Bird
- Contemporary Contacts (Countersinging)

Map ID

▬ Wheless Prime Plot Boundary



1:3,600



Base Map: 2012 NAIP Imagery

Figure 2.4
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 April 20, 2015 Survey Results
 Prime Plot



GCWA Observations

- Male
- ▲ Female

Observation Precision

(size denotes estimated accuracy)

- Precise
- Imprecise

Other Observations

- Movement of Individual Bird
- Contemporary Contacts (Countersinging)

Map ID

☒ Wheless Prime Plot Boundary



1:3,600



Base Map: 2012 NAIP Imagery

Figure 2.5
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 May 5, 2015 Survey Results
 Prime Plot



GCWA Observations

- Male
- ▲ Female

Observation Precision

(size denotes estimated accuracy)

- Precise
- Imprecise

Other Observations

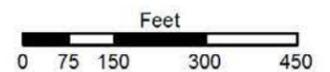
- Movement of Individual Bird
- Contemporary Contacts (Countersinging)

Map ID

▭ Wheless Prime Plot Boundary



1:3,600



Base Map: 2012 NAIP Imagery

Figure 2.6
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 May 7, 2015 Survey Results
 Prime Plot



GCWA Observations

- Male
- ▲ Female

Observation Precision

(size denotes estimated accuracy)

- Precise
- Imprecise

Other Observations

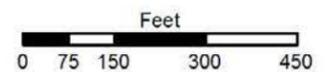
- Movement of Individual Bird
- - - Contemporary Contacts (Countersinging)

Map ID

▭ Wheless Prime Plot Boundary



1:3,600



Base Map: 2012 NAIP Imagery

Figure 2.7
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 May 12, 2015 Survey Results
 Prime Plot



- GCWA Observations**
- Male
 - ▲ Female
- Observation Precision**
 (size denotes estimated accuracy)
- Precise
 - Imprecise
- Other Observations**
- Movement of Individual Bird
 - Contemporary Contacts (Countersinging)
 - # Map ID
 - ⊕ Wheless Prime Plot Boundary

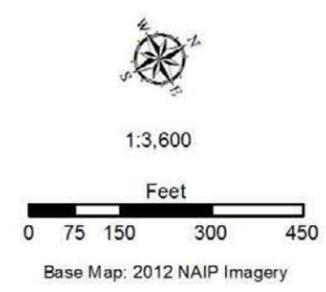


Figure 2.8
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 May 22, 2015 Survey Results
 Prime Plot



- GCWA Observations**
- Male
 - ▲ Female
- Observation Precision**
 (size denotes estimated accuracy)
- Precise
 - Imprecise
- Other Observations**
- Movement of Individual Bird
 - Contemporary Contacts (Countersinging)
 - # Map ID
 - ⬜ Wheless Prime Plot Boundary

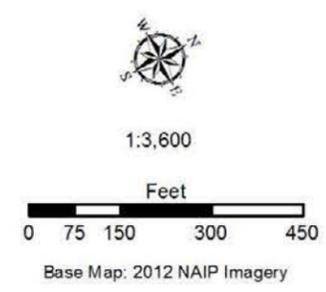


Figure 2.9
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 May 25, 2015 Survey Results
 Prime Plot



GCWA Observations

- Male
- ▲ Female

Observation Precision

(size denotes estimated accuracy)

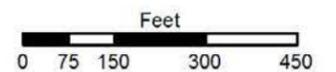
- Precise
- Imprecise

Other Observations

- Movement of Individual Bird
- - - Contemporary Contacts (Countersinging)
- # Map ID
- ▭ Wheless Prime Plot Boundary



1:3,600



Base Map: 2012 NAIP Imagery

Figure 2.10
 Wheless Preserve GCWA Territory Mapping
 Spring 2015
 May 25, 2015 Survey Results
 Prime Plot



Appendix B
Representative Photographs



Photo 1. Overview of habitat



Photo 2. Overview of habitat



Photo 3. Typical habitat



Photo 4. Typical habitat

Appendix C

Birds Observed During the Wheless 2015 Survey of the Prime Plot

Appendix C. Birds Observed During the Wheless Territory Mapping of the Prime Plot

Common name	Scientific name
Northern Bobwhite	<i>Colinus virginianus</i>
Wild Turkey	<i>Meleagris gallopavo</i>
Black Vulture	<i>Coragyps atratus</i>
Turkey Vulture	<i>Cathartes aura</i>
Cooper's Hawk	<i>Accipiter cooperii</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Mourning Dove	<i>Zenaida macroura</i>
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
Greater Roadrunner	<i>Geococcyx californianus</i>
Eastern Screech-Owl	<i>Megascops asio</i>
Common Nighthawk	<i>Chordeiles minor</i>
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>
Chimney Swift	<i>Chaetura pelagica</i>
Black-chinned Hummingbird	<i>Archilochus alexandri</i>
Golden-fronted Woodpecker	<i>Melanerpes aurifrons</i>
Ladder-backed Woodpecker	<i>Picoides scalaris</i>
Eastern Phoebe	<i>Sayornis phoebe</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Great Crested Flycatcher	<i>Myiarchus crinitus</i>
White-eyed Vireo	<i>Vireo griseus</i>
Blue Jay	<i>Cyanocitta cristata</i>
Western Scrub-Jay	<i>Aphelocoma californica</i>
American Crow	<i>Corvus brachyrhynchos</i>
Purple Martin	<i>Progne subis</i>
Barn Swallow	<i>Hirundo rustica</i>
Carolina Chickadee	<i>Poecile carolinensis</i>
Black-crested Titmouse	<i>Baeolophus atricristatus</i>
Carolina Wren	<i>Thryothorus ludovicianus</i>
Bewick's Wren	<i>Thryomanes bewickii</i>
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>
Ruby-crowned Kinglet	<i>Regulus calendula</i>
Northern Mockingbird	<i>Mimus polyglottos</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Louisiana Waterthrush	<i>Parkesia motacilla</i>
Black-and-white Warbler	<i>Mniotilta varia</i>
Nashville Warbler	<i>Oreothlypis ruficapilla</i>

Appendix C. Birds Observed During the Wheless Territory Mapping of the Prime Plot

Common name	<i>Scientific name</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Yellow-rumped Warbler	<i>Setophaga coronata</i>
Golden-cheeked Warbler	<i>Setophaga chrysoparia</i>
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>
Chipping Sparrow	<i>Spizella passerina</i>
Field Sparrow	<i>Spizella pusilla</i>
Lark Sparrow	<i>Chondestes grammacus</i>
Summer Tanager	<i>Piranga rubra</i>
Northern Cardinal	<i>Cardinalis cardinalis</i>
Painted Bunting	<i>Passerina ciris</i>
Brown-headed Cowbird	<i>Molothrus ater</i>
Bullock's Oriole	<i>Icterus bullockii</i>
House Finch	<i>Haemorhous mexicanus</i>
Lesser Goldfinch	<i>Spinus psaltria</i>
American Goldfinch	<i>Spinus tristis</i>

Avian nomenclature and taxonomy follows the American Ornithologists' Union (AOU 1998), as currently supplemented through 2014.