U.S. Fish & Wildlife Service
Arlington, Texas, Ecological Services

FINAL REPORT
SURVEYS OF U.S. ARMY CORPS OF ENGINEERS LANDS AT WHITNEY LAKE FOR THE ENDANGERED GOLDEN-CHEEKED WARBLER - 2008

Photo: Gil Eckrich, Fort Hood

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1.0 INTRODUCTION

An investigation of the status of the endangered golden-cheeked warbler (*Dendroica chrysoparia* [GCWA]) was conducted by the U.S. Fish and Wildlife Service (Service) during its breeding season from March 20 until April 30 on U.S. Army Corps of Engineers (Corps) lands at Whitney Lake in Bosque, Hill, and Johnson Counties, Texas. The purpose of this investigation was to determine presence or absence of GCWAs at suspected locations which had not been previously surveyed for this purpose and to confirm continued presence at areas where prior detections had been recorded. Data resulting from this investigation would aid in the assessment of the Corps' inventory of protected resources and in their recovery efforts for the GCWA pursuant to section 7 (a) (1) of the Endangered Species Act of 1973, as amended. The Service would also benefit from these activities by furthering the recovery of the GCWA; recovery of federally listed species being one of the Service's highest priorities.

Upon completion of surveys and results analysis, the surveyors recorded a minimum of 61 GCWA detections. GCWA presence was confirmed at each of the four selected study areas.

2.0 BACKGROUND INFORMATION

Construction of Whitney Lake was authorized in the Flood Control Act of 1944. In addition to flood control, other purposes of the lake include water conservation, production of hydroelectric power, and public recreation. Construction began on the dam in May 1947 and was completed in December 1951. Construction of the powerhouse began in April 1951 and was completed in June 1953. Approximately 20,000-acre *in fee* property surrounding Whitney Lake is owned and managed by the Corps and spans portions of Bosque, Hill, and Johnson Counties in north central Texas.

Prior surveys for GCWA at Whitney Lake have been performed in 1996, 1997, and 1998 by private consulting firms revealing presence at several locations. Subsequently, a 2005 study

conducted by the U.S. Army Engineer Research and Development Center indicated continued presence at two previously surveyed locations (Appendix B).

The Corps property at Whitney Lake which functions as habitat for the GCWA is of unique importance to the Service regarding recovery efforts for this species. The Service's Recovery Plan (USFWS 1992) for the GCWA dictates that recovery efforts must include *protection of sufficient breeding habitat to ensure the continued existence of at least one viable, self-sustaining population in each of the eight recovery regions,* and *all existing GCWA populations on public lands are protected and managed to ensure their continued existence*. The habitat at Whitney Lake occurs within GCWA Recovery Region 2 in which our files indicate that less than 50 birds have been documented in recent years. Due to the limited amount of public land and GCWA breeding habitat in Recovery Region 2, Whiney Lake may represent the most realistic opportunity to pursue substantial GCWA recovery efforts within this region.

3.0 GOLDEN-CHEEKED WARBLER INFORMATION

The GCWA is a small, insectivorous songbird, 11.5 to 13 cm (4.5 to 5 in) long, with a wingspan of about 20 cm (7.9 in). The male has a black back, throat, and cap, and yellow cheeks with a black stripe through the eye. Females are similar, but less colorful. The lower breast and belly of both sexes are white with black streaks on the flanks (USFWS 1992).

The GCWA nests in the juniper-oak woodlands of the Texas Hill Country and winters in the pine-oak woodlands of southern Mexico, Guatemala, Honduras, and Nicaragua. Its entire nesting range is confined to 33 counties in central Texas. Typical nesting habitat is found in tall, dense, mature stands of Ashe juniper (*Juniperus ashei*) mixed with deciduous trees such as Texas red oak (*Quercus buckleyi*), Lacey oak (*Quercus glaucoides*), white shin oak (*Quercus sinuata* var. *breviloba*), plateau live oak (*Quercus fusiformis*), post oak (*Quercus stellata*), Texas ash (*Fraxinus texensis*), cedar elm (*Ulmus crassifolia*), netleaf hackberry (*Celtis reticulata*), bigtooth maple (*Acer grandidentatum*), American sycamore (*Platanus occidentalis*), Arizona walnut (*Juglans*

major), escarpment cherry (*Prunus serotina*), and pecan (*Carya illinoinensis*). This type of woodland is often found in relatively moist areas such as steep-sided canyons and slopes. GCWAs are also occasionally found in drier, upland juniper-oak, i.e., live oak, post oak, blackjack oak (*Quercus marilandica*) woodlands over flat topography. Although the composition of woody vegetation may vary from place to place, Ashe juniper, which is necessary for nest construction, is always present.

The males arrive in central Texas in early March and begin to establish breeding territories, which they defend against other males by singing from visible perches within their territories. The females arrive a few days later but are more difficult to detect in the dense woodland habitat. Usually three or four eggs are laid. The average nest height is 5 m (16.4 ft) above ground. Eggs are generally incubated in April and, unless there is a second nesting attempt, nestlings fledge in May to early June. By early August, GCWAs begin their migration south.

Most studies report GCWA territory sizes ranging from 0.09 to 0.21 pairs per acre (Ladd 1985). Wahl et al. (1990) reported that density estimates ranged from zero to 0.26 pairs per acre with a median of 0.06 pairs per acre among several sites throughout the GCWA's range. Pulich (1976) classified warbler habitat into excellent, average, and marginal corresponding to five, two, and one pair per 100 acres.

The primary threats to the GCWA are habitat loss and urban encroachment. Other factors include the loss of deciduous oaks (used for foraging) to oak wilt, nest parasitism by brown-headed cowbirds *(Molothrus ater)*, and predation and competition by blue jays (*Cyanocitta cristata*) and other urban-tolerant birds (USFWS 1992).

4.0 METHODOLOGY

Four study areas within Corps lands at Whitney Lake were surveyed for the presence or absence of the GCWA during the 2007 breeding season. Study areas were selected by the following process:

1. Remote sensing utilizing ESRI© ArcGIS was used to evaluate which areas within the Corps boundary likely contained the largest contiguous patches of forested habitat. Priority was then given to those areas contiguous with large patches of off-property forested habitat. The USGS's National Land Cover Dataset was utilized and the results are depicted in Figure 4-1.
2. Ten resulting focus areas where evaluated based upon their likelihood of supporting appropriate GCWA habitat. Predictive factors include vegetation, topography, patch size, and remoteness from human disturbance.
3. The importance of investigating areas without prior GCWA surveys lead to the decision to select an equal number of prior-surveyed and non-surveyed study areas. Prior-surveyed areas were included in order to investigate site-fidelity across multiple generations.
4. Further decisions were made based upon feasibility of completing the project within the limitations of time needed to survey given acreages.
5. Final decisions were made with input from Corps staff after two ground-truthing site visits to confirm suspected GCWA habitats.

The Service's Survey Protocol for the GCWA dictated the procedures followed throughout the remainder of this section. Surveys were conducted beginning March 20 and completed April 30. Each study area was visited a minimum of five times with visits to individual areas no fewer than five days apart. The surveys were performed by federally-permitted Service wildlife biologists by hiking slowly along roughly pre-determined routes, seeking potential habitat, and listening for GCWA vocalizations. Surveys began at or near sunrise when possible and lasted until 2 p.m. Several detections after 2 p.m. were also recorded while hiking back to the campsite or vehicle. Hand-held Trimble GeoXT units were carried by both surveyors allowing each to accurately track the route taken and to stay within Corps boundaries, and to record GPS coordinates of GCWA

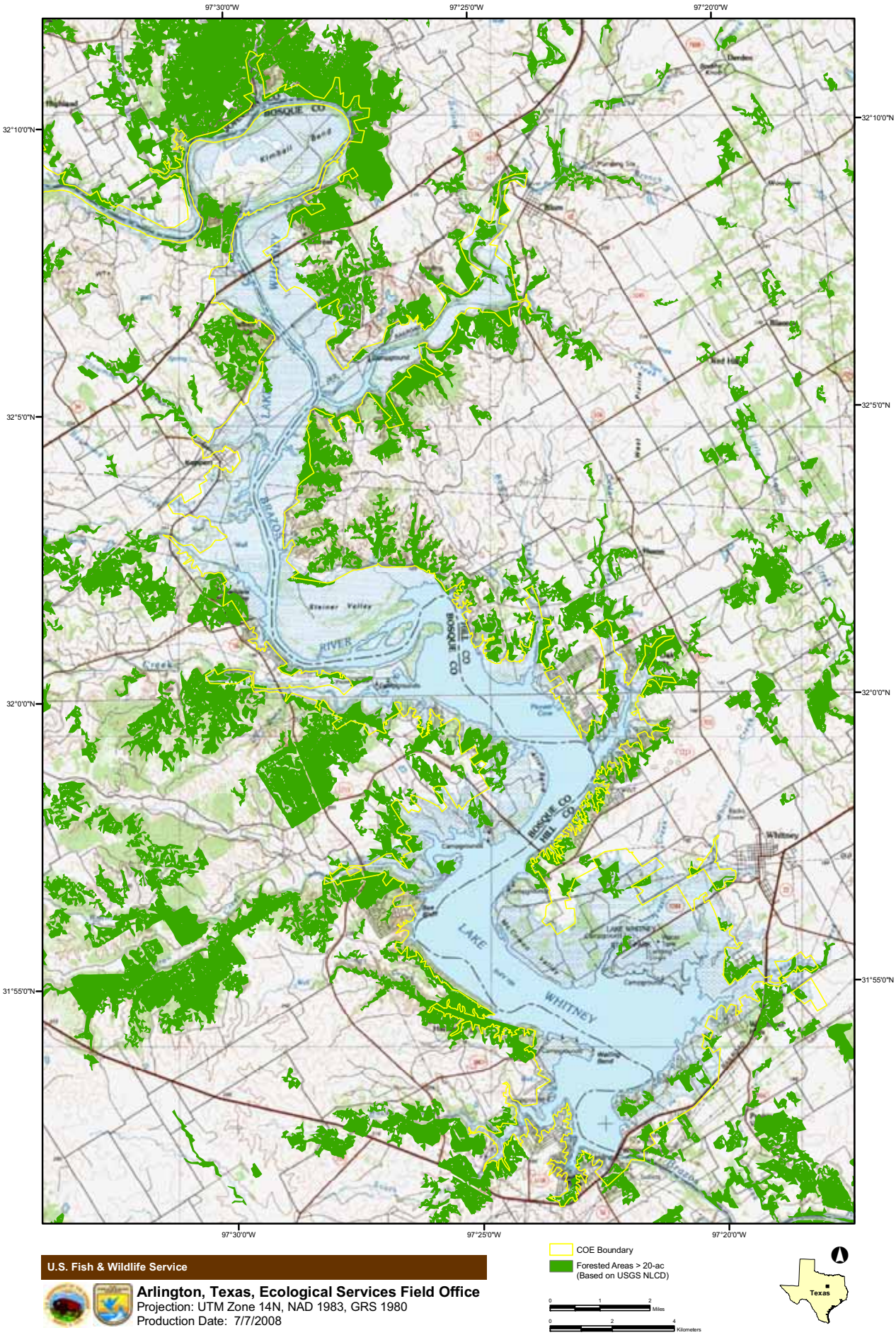

Figure 4-1: Forested areas (>20-acres) near Whitney Lake derived from the USGS National Land Cover Dataset.

detections and other notable observations. At all locations where GCWAs were detected, notes were recorded including the following:

1. approximate distance from detection point to actual GCWA location
2. vocalization specifics
3. vegetation types in order of abundance
4. percent tree canopy cover
5. percentage of mature Ashe juniper in tree canopy
6. percent cloud cover
7. wind speed and direction
8. GCWA movement and behavior
9. other related information

Summaries of these field notes are included in the Survey Data Tables for each study area located within the Results and Discussion section. Efforts were made to also make visual confirmation at each detection site. Photographs were taken at each survey site primarily at detection locations to demonstrate habitat type and quality. Taped playback of GCWA vocalizations to elicit detections in areas where none were heard was not necessary because GCWA presence was readily established in each study area.

Survey route directions (eastward and westward) were alternated in an attempt to avoid investigating each point at the same time of day throughout the survey season. Likewise, if two study areas were routinely surveyed on the same day, their order was also alternated. Access to each study area was obtained by vehicle and/or Service-owned boat when necessary and remoteness dictated the need to camp overnight within a study area. Otherwise, the surveyors lodged at McCowan Valley Park camping shelters prior to survey days.

Upon completion of surveys and data collection, all records were analyzed to verify detection accuracy. In situations where detections recorded less than 300 m apart on the same day, one was omitted. This conservative approach may inadvertently exclude legitimate detections but is

necessary to prevent potentially double-counting the same bird. However, multiple GCWAs detection points recorded less than 300 m apart were not omitted in the following instances:

1. Two or more were heard at the same time (countersinging).
2. Two detections were separated by a fragmentary obstacle such as a wide highway right-of-way.
3. Because GPS coordinates were taken at the point where the surveyors detected the bird, some points may appear to represent birds less than 300 m apart. For example, if the field notes for Point A indicate a GCWA heard approximately 100 m to the west and the notes for Point B indicate a GCWA heard approximately 50 m to the east, these would both be considered positive detections even if Point A and Point B were recorded as little as 150 m apart.

5.0 STUDY AREAS

5.1 UPPER BRAZOS RIVER STUDY AREA

This general area is located on the northern and eastern side of the Brazos River beginning at the western boundary of Ham Creek Park and extends downriver around Kimball Bend to the southern Corps boundary near the feature known as Broke Rock. The re-development of Ham Creek Park was the subject of a 2006 formal consultation with the Service and areas currently undergoing facility construction were excluded from this study area. Additional areas were excluded from consideration that did not likely meet GCWA nesting or foraging habitat resulting in a final study area encompassing approximately 260 acres. Elevations range widely and abruptly from approximately 160 m to approximately 215 m above mean sea level (msl). Much of the edges of the highest elevations consist of limestone bluffs three to eight meters high topped with mature Ashe juniper/oak woodlands as do the canyon slopes below representing ideal habitat for nesting GCWAs. Ashe Juniper is the most dominant overstory tree species within these areas. Hardwood overstory species in descending abundance include Texas red oak, white shin oak, cedar elm, Texas ash, netleaf hackberry, plateau live oak, mesquite (*Prosopis glandulosa*), and

bumelia (*Bumelia lanuginosa*). Slope bottoms contain a higher percentage of most of these hardwood tree species and also include pecan, boxelder (*Acer negundo*), and American elm (*Ulmus americana*) and represent suitable GCWA foraging habitat when in reasonably close proximity to nesting habitat. Woody shrub understory species include Mexican buckeye (*Ungnadia speciosa*), prairie flame-leaf sumac (*Rhus lanceolata*), Texas buckeye (*Aesculus glabra*), skunkbush sumac (*Rhus trilobata*), Texas mountain-laurel (*Sophora secundiflora*), and catclaw acacia (*Acacia greggii*).

At least 75% of this study area contains good to high quality GCWA nesting habitat with approximately 15% of the remaining area representative of foraging habitat. Approximately 10% of the study area would be considered temporarily unsuitable for GCWA due to large-scale unauthorized clear cutting of two areas previously containing old-growth Ashe juniper/oak woodland, very likely to have formerly been high quality habitat. Regeneration of these areas into suitable nesting habitat would likely take no less than 25 years while a return to their original state may take at least 50 years. Approximately 1500 off-property acres of potential GCWA habitat is relatively contiguous with this study area. The location of the Upper Brazos study area and each of the other study areas is represented in Figure 5-1.

5.2 CEDRON CREEK STUDY AREA

This approximately 180-acre study area is a relatively linear block of forested habitat located just south of, and running parallel to, Cedron Creek, its midpoint located near the intersection of FM 56 and CR 1500 (Figure 5-1). Elevation changes are typically gradual and range from approximately 170 to 215 m above msl. Much of the study area west of FM 56 is comprised of mature Ashe juniper/oak woodland typical of preferred GCWA nesting/foraging habitat. Ashe juniper is the most dominant overstory tree species in this area while the remaining hardwood overstory species in descending abundance include Texas red oak, white shin oak, Texas ash, cedar elm, and netleaf hackberry. At elevations above 200 m msl, white shin oak was the dominant hardwood species occasionally co-dominant with Ashe juniper. Woody shrub understory species include Texas redbud (*Cercis Canadensis* var. *texensis*), Texas buckeye, Mexican buckeye, and skunkbush sumac. The initial 1/3 of the study area moving eastward from FM 56 is very similar to the western portion in composition and habitat potential. Further eastward and downslope, an area within the

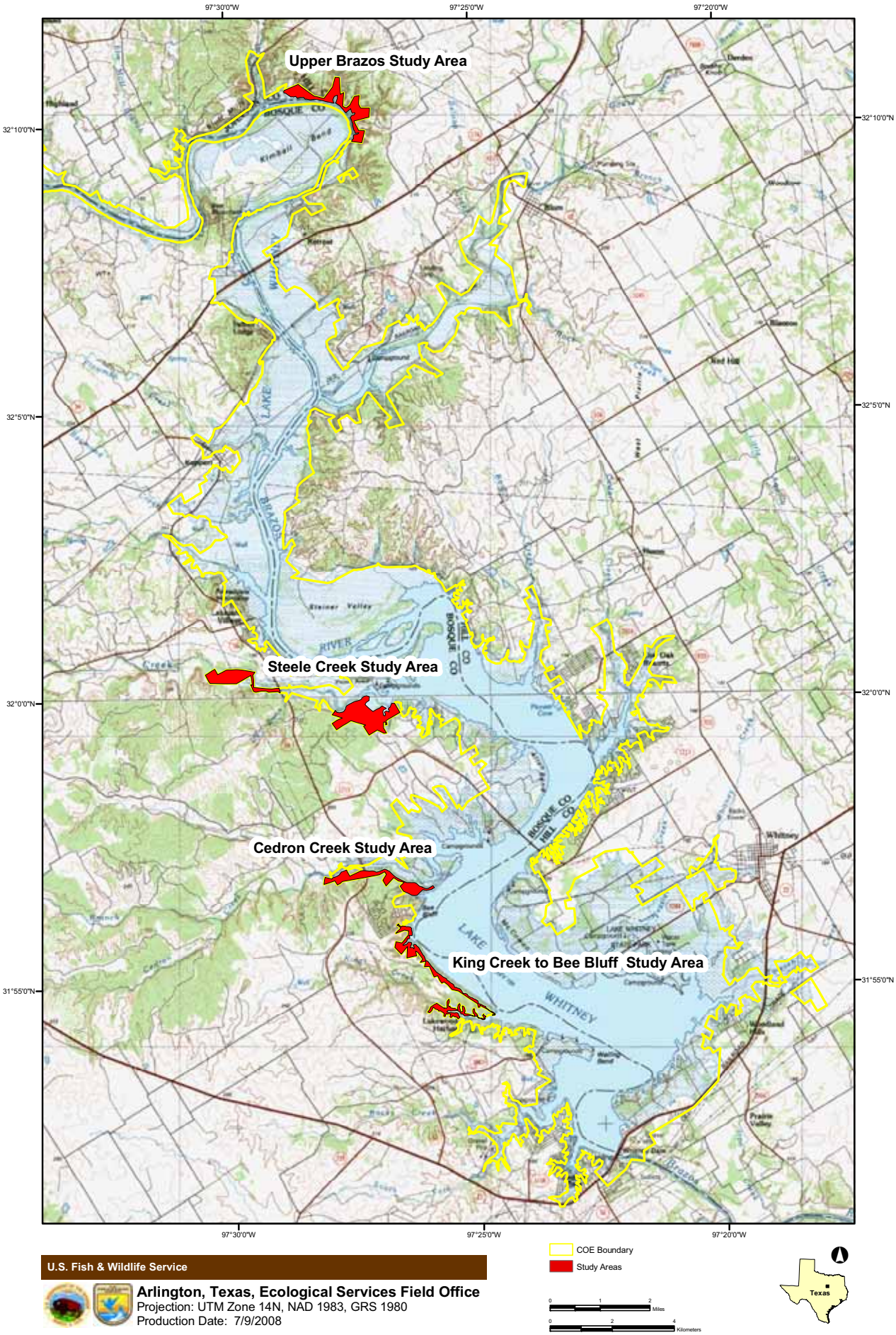

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Figure 5-1: Study area locations near Whitney Lake.

floodplain of the confluence of three unnamed tributaries is comprised almost entirely of riparian vegetation, while further eastward GCWA habitat was present but of variable quality.

The entire study area is suitable nesting and/or foraging habitat for GCWAs with approximately 55% characterized as good to high quality nesting habitat while the remaining 45% represents fair quality nesting habitat and/or foraging habitat. Approximately 270 off-property acres of potential GCWA habitat is relatively contiguous with this study area.

5.3 STEELE CREEK STUDY AREA

The portion of this study area west of FM 56 was groundtruthed on March 10, 2008, and was found to contain four fragmented patches of fair to good quality GCWA habitat ranging from two to fifteen acres. This portion of the study area was excluded from further survey due to the small size and fragmentation of potential GCWA habitat present. The remaining approximately 280-acre area consists of forested habitat located along the southern shore of Steele Creek near its confluence with Whitney Lake (figure 5-1). Elevation changes are minimal and gradual ranging from 165 to 185 m above msl. Mature Ashe juniper/oak woodland dominate the study area; Ashe juniper being the most abundant overstory tree. Hardwood overstory species in descending abundance include Texas red oak, shin oak, plateau live oak, Texas ash, and cedar elm. Woody shrub understory species include prairie flame-leaf sumac, and skunkbush sumac. There is a noticeable difference between the juniper/oak woodland habitats within the western and eastern halves of this study area. Those within the western portion are comprised of juniper of varying age and typically include a substantial understory made up of a variety of young hardwoods and shrub species (Appendix A, p. A-7). In contrast, those within the eastern portion typically contain a much higher percentage of very mature juniper, hardwoods are almost entirely plateau live oak, and a largely open understory (Appendix A, p. A-7). Aside from juniper/oak woodland, substantial variety of habitat/vegetation types exist throughout this study area including riparian deciduous species within floodplains, small open grassland areas, and occasional dense, young juniper monocultures.

When considered as a whole, the entire study area is suitable nesting and/or foraging habitat for GCWAs. Approximately 65% of the entire study area is characterized as good to high quality

nesting habitat while 35% represents fair quality nesting habitat and/or foraging habitat. Approximately 650 off-property acres of potential GCWA habitat is relatively contiguous with this study area.

5.4 KING CREEK TO BEE BLUFF STUDY AREA

This study area consists of a linear portion of Corps property beginning on the southern shore of King Creek just west of the private residences, extends around the shores of the creek, and thence northwestward along the lake shore to Bee Bluff (figure 5-1). The total area (excluding open water) within the Corps boundary encompassing this study area is approximately 200 acres. Almost all of the study area consists of sloping topography extending from the inland Corps boundary to the water's edge with the northwestern portion containing the highest degree of slope ranging from approximately 165 to 200 m above msl. GCWA habitat is present throughout the surveyed area consisting typically of mature Ashe juniper/oak woodland on the slope tops and canyon walls. Hardwood overstory species in descending abundance include cedar elm, hackberry, Texas red oak, Texas ash, and shin oak. Canyon bottoms and areas near the water's edge contain a higher percentage of most of these hardwood tree species and also include pecan, American elm, and chinaberry (*Melia azedarach*), and largely represent suitable GCWA foraging habitat. Woody shrub understory species include Mexican buckeye, Texas buckeye, prairie flame-leaf sumac, and skunkbush sumac.

When considered as a whole, the entire study area is suitable nesting and/or foraging habitat for GCWAs. Approximately 75% of the entire study area is characterized as good to high quality nesting habitat while 25% represents fair quality nesting habitat and/or foraging habitat. Approximately 750 off-property acres of potential GCWA habitat is relatively contiguous with this study area.

6.0 RESULTS AND DISCUSSION

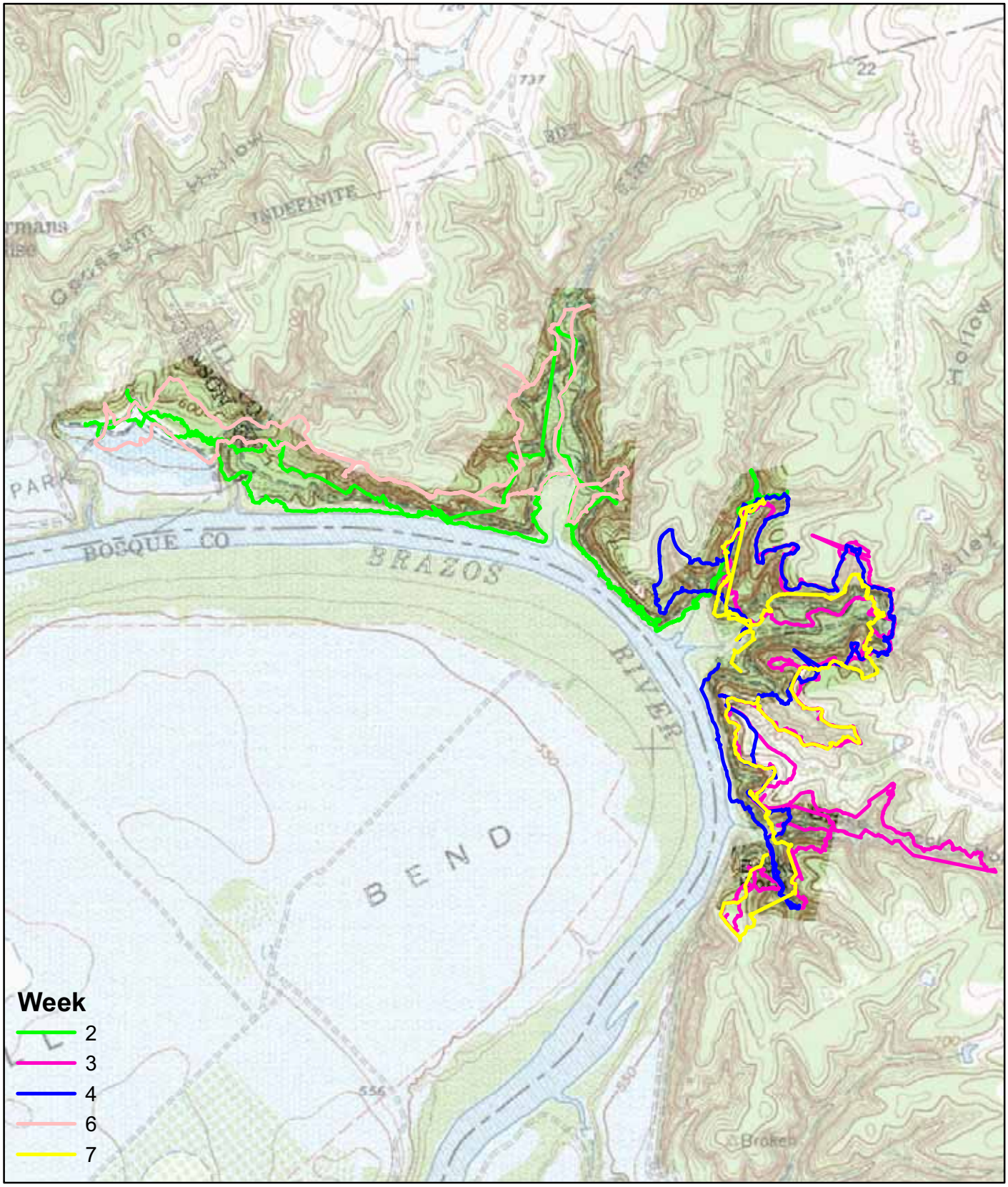
Distance traveled during daily survey periods totaled approximately 80 kilometers (50 miles), almost entirely on foot. Upon completion of results analysis, an original total of 67 detections were corrected as 61. Survey specifics for each study area are as follows:

6.1 UPPER BRAZOS RIVER STUDY AREA

Surveys were conducted during the period 25 March through 29 April, 2008. Because GCWAs were readily detected throughout this study area upon the first survey visit, it was determined to be unnecessary (and impractical) to survey this entire study area upon each visit. With GCWA presence confirmed, further survey routes were designed to cover approximately two-thirds of the study area per visit and alternate eastward and westward approaches. Permission to access the adjacent landowner's property allowed the surveyors to better assess adjacent, off-property habitat quality. Campsites were accessed by boat and alternated between the features known as Broke Rock, Bailey Hollow, Elm Hollow, and east of Ham Creek. Actual survey routes taken were recorded utilizing hand-held Trimble GeoXT units and are depicted in Figure 6-1.

Twenty-nine positive GCWA detections were confirmed after results analysis (Figure 6-2). The largest numbers in descending order were recorded within the canyons located at Bailey Hollow (15), Elm Hollow (7), and Broke Rock (4) and along sloping hillsides east of Ham Creek Park (2). These GCWA abundances correspond reasonably well with the presence of preferred suitable habitat within each of these locations, on and off-property. Bailey Hollow has the largest concentration of sloping topography vegetated with mature Ashe juniper/oak woodland composed of 70-100% closed tree canopy. In contrast, much of the area east of Ham Creek is relatively flat, containing many open grassy areas and dense juniper monocultures. GCWAs were only detected within this area along the sloping hillsides where the aforementioned clear-cutting operation had not removed mature Ashe junipers. Daily survey details and detection specifics are provided in Table 6-1.

Given what is known regarding average GCWA territory size, the clustering of detections across survey visits suggests the presence of approximately 10 individual GCWA territories within the



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Production Date: 7/11/2008

Feet: 0 500 1,000 2,000

Meters: 0 125 250 500

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Figure 6-1: Upper Brazos study area survey routes by week surveyed.

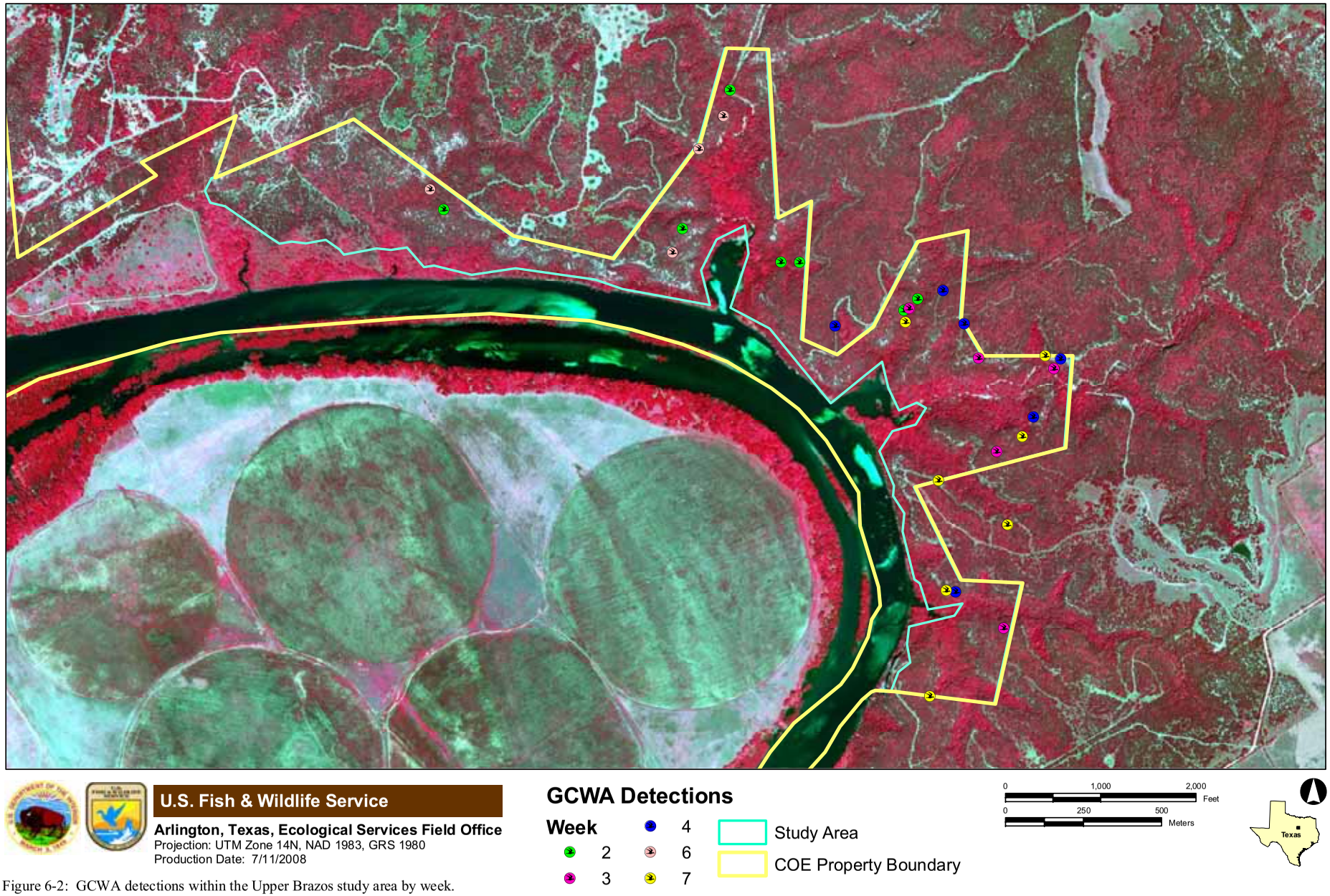


Figure 6-2: GCWA detections within the Upper Brazos study area by week.

Table 6-1. Golden-cheeked Warbler Survey Data - Upper Brazos Study Area

a. Survey visit details:

Date	Sunrise Time	Time			Temperature (degrees F.)		Wind Direction		Wind Speed (mph)		Cloud Cover (percent)		Surveyors/Observers	Comments
		Start	End	Total hrs	Start	End	Start	End	Start	End	Start	End		
03/25/2008	7:26	7:25	4:35	9:10	45	67	SE*	SE	0-5	0-5	0	0	SE, JL	E Ham Creek to Bailey Hollow & back, 8 GCWA detections
04/01/2008	7:17	7:15	5:33	10:18	69	82	SSE	SSE	0-3	0-3	100	2	SE, JL	Broke Rock to Bailey Hollow & back, 8 GCWA detections
04/08/2008	7:09	6:50	2:15	7:25	67	81	SSE	SSE	0-5	5-10	100	95	SE, JL	Bailey Hollow to Broke Rock & back, 7 GCWA detections
04/22/2008	6:52	6:45	1:39	6:54	68	85	SSE	SSE	0-3	0-3	60	40	SE, JL	Elm Hollow to E Ham Creek & back, 6 GCWA detections
04/29/2008	6:45	7:05	2:57	7:52	51	76	SE	SE	0-5	0-10	0	0	SE, JL	Broke Rock to Bailey Hollow & back, 7 GCWA detections

b. GCWA detections: Total after analysis: 29 positive detections

Date	GCWA			%Canopy/ %MAJ	Vegetation in descending abundance	Distance and Direction to GCWA Latitude	Time of Day Latitude	GPS Coordinates		Comments
	Heard/ Seen	Sex	Song A/B/C					Latitude	Longitude	
03/25/2008	H	M	A	50/50	MAJ,RO,SO,RB	≈75m W	8:16	32.17604	-97.47144	On east-facing slope above clear-cut area E of Ham Creek
03/25/2008	H	M	A	50/80	MAJ,RO,SO	≈20m NW	9:45	32.17539	-97.46335	Near edge of deep gorge
03/25/2008	H & S	M	A	75/50	MAJ,CE,TxBE,SO,RB,EB	seen overhead	10:38	32.17936	-97.46167	Creekside, sang then flew north
03/25/2008	H	M	A	65/10	CE,HB,BU,EB	≈25m NNW	11:18	32.17438	-97.46003	On south-facing slope
03/25/2008	H	M	A	65/60	MAJ,CE,HB	≈100m E	11:22	32.17438	-97.46003	Heard countersinging with 11:18 detection, detection point recorded as same coordinates
03/25/2008	H	M	A	85/75	MAJ,AJ,CE,HB,TxA,BE,BO	≈75m W	12:50	32.17199	-97.45608	**OMITTED** – possible duplicate of 1:10 detection
03/25/2008	H & S	M	A	60/60	MAJ,CE,YH,TxA,AJ	seen overhead	1:10	32.17327	-97.45542	Seen creekside in large CE
03/25/2008	H & S	F	None	60/60	MAJ,CE,YH,TxA,AJ	seen overhead	1:25	32.17327	-97.45542	Seen accompanying 1:10 male in large CE, detection point recorded as same coordinates
04/01/2008	H	M	A	70/55	MAJ,RO,TxA,SO,RB,HB	≈15m W	9:32	32.16374	-97.45265	On west-facing slope
04/01/2008	H	M	B	50/40	CE,AJ,SO,HB,BU	≈30 W	12:22	32.17120	-97.45083	First B-song heard in Upper Brazos Study Area
04/01/2008	H & S	M	A	50/20	CE,RO,AJ,HB,TxA	seen overhead	1:08	32.17300	-97.45570	Seen in CE near creekbed
04/01/2008	H	M	A	50/70	MAJ,SO,HB,MQ	≈20m NW	1:52	32.17153	-97.45339	Bluff top near cleared ROW
04/01/2008	H	M	A	50/70	MAJ,SO,HB,MQ	≈90m NE	1:52	32.17153	-97.45339	**OMITTED** – possible duplicate of 12:22 detection, heard countersinging with 1:52 male
04/01/2008	H	M	A	70/70	MAJ, SO,HB,MQ	≈150m E	2:17	32.17142	-97.45041	**OMITTED** – possible duplicate of 12:22 detection
04/01/2008	H	M	A & B	60/50	MAJ,AJ,RO,SO	≈5m S	2:49	32.16882	-97.45282	Sang A & B songs
04/01/2008	H	M	A	80/50	MAJ,CE,TxA,RO,HB	≈75m E	5:33	32.16445	-97.45405	**OMITTED** – possible duplicate of 9:32 detection
04/08/2008	H	M	A	85/70	MAJ,SO,LO,	≈10m W	8:17	32.17252	-97.45823	Heard at Corps boundary
04/08/2008	H	M	A	60/70	MAJ,SO,CCA,SBS	≈200m W	9:15	32.17355	-97.45451	On east-facing slope
04/08/2008	H & S	M	B	60/70	MAJ,SO	seen overhead	9:18	32.17349	-97.45456	**OMITTED** – possible duplicate of 9:15 detection although switched from A to B song
04/08/2008	H	M	A	70/50	MAJ,CE,HB,RO,TxA,SO	≈3m above	9:41	32.17253	-97.45384	Countersang with 9:15 detection
04/08/2008	H	M	B	60/50	MAJ,CE,HB,PC,RO	≈150m E	10:25	32.17147	-97.45061	Taken from bluff top, bird near canyon floor
04/08/2008	H	M	A & B	50/60	MAJ,CE,HB,LO,RO,SO	≈50m SW	11:02	32.16982	-97.45155	Taken from bluff top, bird on opposing bluff top
04/08/2008	H	M	A	70/50	MAJ,CE,TxA,RO,HB	≈100m S	12:40	32.16484	-97.45452	On north-facing slope
04/22/2008	H	M	B	75/40	MAJ,RO,SO	≈10m W	8:02	32.17861	-97.46190	On west-facing slope
04/22/2008	H & S	M	A	55/60	MAJ,RO,ML	seen overhead	8:25	32.17767	-97.46275	At edge of Corps boundary
04/22/2008	H	M	B	55/60	MAJ,RO,ML	≈75m SE	8:35	32.17767	-97.46275	**OMITTED** – possible duplicate of 8:02 detection, heard countersinging with 8:25 male
04/22/2008	H	M	A	70/70	MAJ,RO,HB	≈30m SSW	8:58	32.17614	-97.46313	**OMITTED** – possible duplicate of 8:25 detection
04/22/2008	H	M	A	60/70	MAJ,RO,SO	≈90m SSW	9:31	32.17470	-97.46371	On east-facing slope
04/22/2008	H	M	A	60/60	MAJ,RO,SO,CE,HB,TxA	≈25m W	10:33	32.17662	-97.47189	Heard again at 11:51 upon return trip
04/29/2008	H	M	A	75/20	AJ,SO,MAJ,TxA	≈10 m ESE	8:14	32.16180	-97.45521	Sang 5X at Corps boundary
04/29/2008	H	M	A	70/80	MAJ,TxA,MxBE,SBS,CCA	≈90m SSW	9:39	32.16484	-97.45454	On north-facing slope
04/29/2008	H	M	A	70/50	MAJ,RO,TxA,HB,FLS	≈50m ENE	10:46	32.16802	-97.45480	On northeast-facing slope
04/29/2008	H	M	A	60/70	MAJ,SO,TxA,RO,HB,CE	≈20m N	11:00	32.16672	-97.45248	In small canyon
04/29/2008	H	M	A	60/40	MAJ,TxA,RO,CE,AJ,AmE,RB	≈12m W	11:31	32.16926	-97.45194	At top of northwest-facing slope
02/29/2008	H	M	A	80/50	MAJ,RO,SO,CE,TxA,HB,ML,MxBE	≈75m W	12:40	32.17157	-97.45113	In small canyon
02/29/2008	H	M	B	70/60	MAJ,CE,HB,TxA,YH	≈30m ENE	1:45	32.17260	-97.45585	On west-facing slope

(*abbreviations for survey data tables found in Appendix C)

Upper Brazos study area. Considering the size of this study area and the abundance of suitable habitat, it is entirely possible that additional, undetected territories are present, and even more likely that off-property oriented territories overlap with Corps lands. In total, survey results imply that this study area is highly productive for GCWAs.

6.2 CEDRON CREEK STUDY AREA

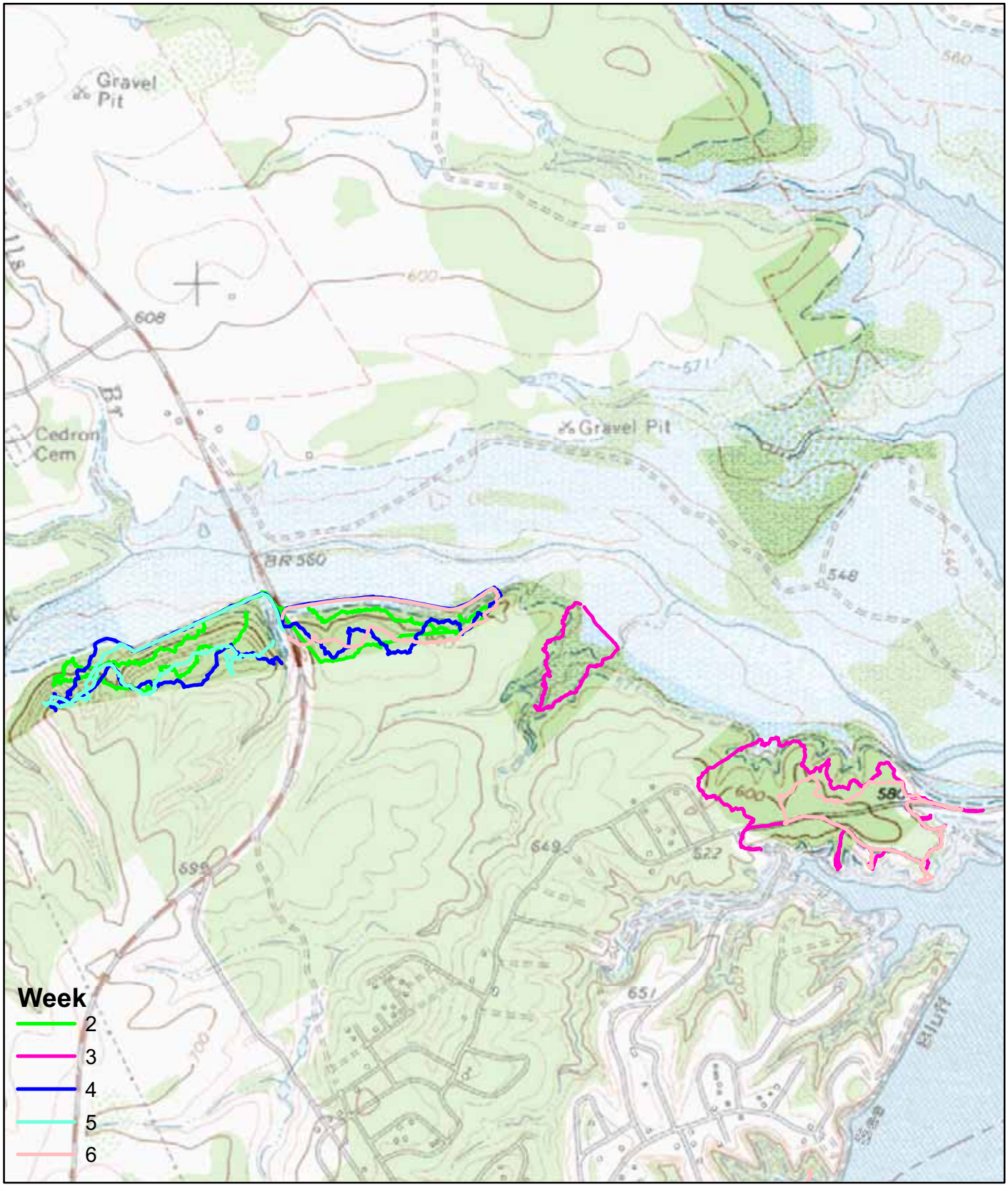
Surveys were conducted during the period 25 March through 29 April, 2008. Because GCWA presence was readily established throughout, survey routes were designed to focus on approximately two-thirds of the entire study area per visit. Access was gained by vehicle either from FM 56 or from CR 1500 near the lake shore and alternated eastward to westward in direction. The Cedron Creek and Steele Creek study areas were typically surveyed on the same day and therefore each was alternated in daily order. Actual survey routes taken are depicted in Figure 6-3.

Sixteen positive GCWA detections were confirmed after results analysis (Figure 6-4). The largest GCWA numbers were recorded within the area west of FM 56 corresponding with the largest presence of preferred suitable habitat, on and off-property. The area immediately east of FM 56 was very similar and survey results suggest a similar abundance of GCWAs per habitat patch size. A single GCWA was detected within the eastern third of the study area where habitat quality is much more variable. Daily survey details and detection specifics are provided in Table 6-2.

Given what is known regarding average GCWA territory size, the clustering of detections across survey visits suggests the presence of at least seven individual GCWA territories within the Cedron Creek study area. It is possible that additional, undetected territories are present considering that only half of our visits could begin at sunrise in order to survey the Steele Creek area on the same day and even more likely that off-property oriented territories overlap with Corps lands. In total, survey results imply that this study area is highly productive for GCWAs.

6.3 STEELE CREEK STUDY AREA

Surveys were conducted during the period 20 March through 23 April, 2008. Because GCWA presence was readily established, survey routes were designed to focus on approximately two-thirds of the entire study area per visit. Access was gained by boat launched from Steele



U.S. Fish & Wildlife Service

Arlington, Texas, Ecological Services Field Office

Projection: UTM Zone 14N, NAD 1983, GRS 1980

Production Date: 7/11/2008

0 500 1,000 2,000 Feet

0 125 250 500 Meters

Texas

Figure 6-3: Cedron Creek study area survey routes by week surveyed.

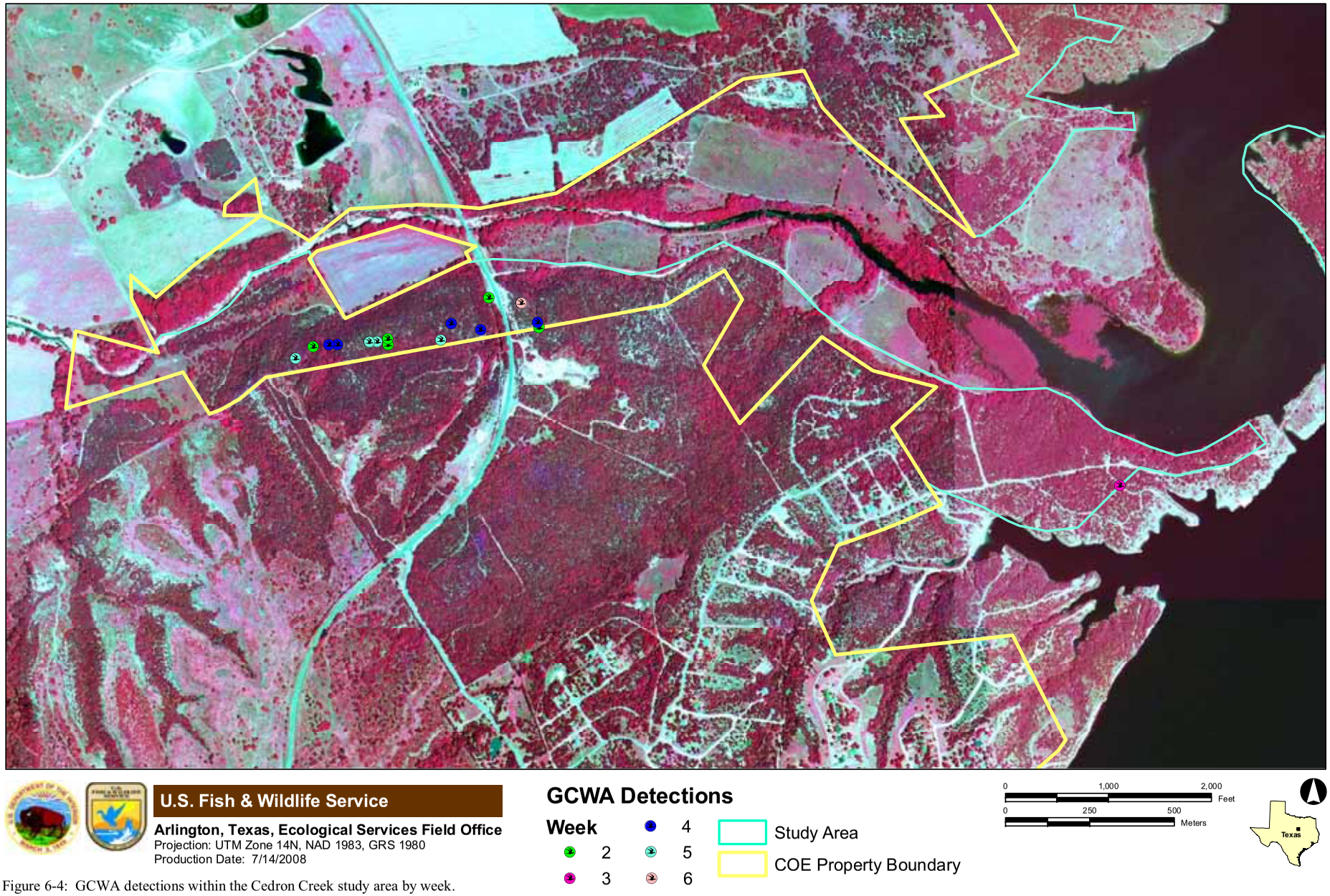


Figure 6-4: GCWA detections within the Cedron Creek study area by week.

Table 6-2. Golden-cheeked Warbler Survey Data - Cedron Creek Study Area

a. Survey visit details:

Date	Sunrise Time	Time			Temperature (degrees F.)		Wind Direction		Wind Speed (mph)		Cloud Cover (percent)		Surveyors/Observers	Comments
		Start	End	Total hrs	Start	End	Start	End	Start	End	Start	End		
03/26/2008	7:25	7:40	11:21	3:41	64	72	SSE	SSE	0-5	5-10	98	90	SE,JL/EA	Western ¾, west & east of FM 56, 5 GCWA detections
04/02/2008	7:16	12:07	3:05	2:58	68	72	SE	SE	0	0	100	100	SE,JL	Eastern ¾, from CR 1500, 1 GCWA detection
04/09/2008	7:07	8:10	11:55	3:45	59	69	SSE	SSE	0-5	0	100	100	SE,JL	Western ¾, early morning rain delay, 7 GCWA detections
04/17/2008	6:58	12:27	2:26	1:59	71	75	SSE	SSE	5-15	5-15	100	100	SE,JL,OB	Western ¾, west of FM 56, accompanied by Shannon Mansfield, (Student), 4 GCWA detections
04/23/2008	6:51	11:29	1:48	2:19	73	82	SSE	SSE	0-10	0-10	100	100	SE,JL	Eastern ¾, extending to FM 56, 1 GCWA detection

b. GCWA Detections:

Date	GCWA			%Canopy/ %MAJ	Vegetation in descending abundance	Distance and Direction to GCWA	Time of Day	GPS Coordinates		Comments
	Heard/ Seen	Sex	Song A/B/C					Latitude	Longitude	
03/26/2008	H	M	A	70/60	MAJ,SO,RO,TxA	≈20m SSW	8:11	31.94815	-97.45938	Small SO understory throughout this area
03/26/2008	H	M	A	70/60	MAJ,SO,RO,TxA	≈50m N	8:21	31.94815	-97.45938	Heard countersinging with 8:11 detection, detection point recorded as same coordinates
03/26/2008	H	M	A	70/80	MAJ,CE,TxA,TxBE	≈15m W	8:45	31.94813	-97.46172	Heard in huge, tall MAJ
03/26/2008	H	M	A	80/60	MAJ,RO,CE,SO	≈30m W	9:49	31.94937	-97.45621	Point taken from edge of FM 56
03/26/2008	H	M	A	50/60	MAJ,RO,SO	≈5m NE	10:05	31.94855	-97.45465	Moved to the east & continued singing
04/02/2008	H	M	A	70/40	MAJ,RO,HB,AJ,TxA,SO	≈50m N	12:40	31.94412	-97.43653	Heard on south-facing slope of small canyon
04/09/2008	H	M	A & B	75/80	MAJ,RO,SO,TxA	≈50m SE	8:20	31.94852	-97.45647	Heard near south Corps boundary near FM 56
04/09/2008	H	M	B	70/80	MAJ,SO,TxA	≈20m S	8:37	31.94869	-97.45740	Countersang with 8:20 detection
04/09/2008	H	M	A	50/50	MAJ,SO,RO,TxA	≈10m E	9:09	31.94789	-97.46012	**Omitted-** possible duplicate of bird later detected countersinging at 9:23 after having switched to B-song
04/09/2008	H & S	M	A & B	70/70	MAJ,RO,TxA,TxBE	≈3m overhead	9:23	31.94817	-97.46122	Countersang w/ 9:24 detection alternating A & B songs
04/09/2008	H	M	B	70/70	MAJ,RO,TxA,TxBE	≈20m S	9:24	31.94817	-97.46122	Countersang w/ 9:23 detection B song only, detection point recorded as same coordinates
04/09/2008	H	M	A	60/80	MAJ,SO,RO	≈5m SE	10:37	31.94869	-97.45469	Considered not a duplicate of 8:20 detection due to FM 56 fragmentary obstacle
04/09/2008	H	M	A	60/30	TxA,SO,MAJ,AJ	≈20m ESE	10:58	31.94875	-97.45288	**Omitted** – possible duplicate of 10:37 detection
04/17/2008	H	M	A	70/50	MAJ,RO,TxA,RB	≈200m ESE	12:40	31.94825	-97.45772	First recorded at this detection point and later heard countersinging w/ 12:55 & 12:56 detections
04/17/2008	H	M	A	80/70	MAJ,TxA,SO,RO	≈100m S	12:55	31.94823	-97.45996	Countersang w/ 12:40 & 12:56 detections
04/17/2008	H	M	A	80/70	MAJ,TxA,SO,RO	≈100m SE	12:56	31.94823	-97.45996	Countersang w/ 12:40 & 12:55 detections, 3 were heard simultaneously from this detection point recorded same as 12:55 bird
04/17/2008	H & S	M	A	80/70	MAJ,SO,TxA,MxBE,RO,RB	≈5m E	1:25	31.94782	-97.46228	Observed singing for 10+ minutes
04/23/2008	H & S	M	A & B	70/40	MAJ,RO,SO,TxA	≈10m E	12:46	31.94921	-97.45518	Observed singing at top of large MAJ at 12:52, switched between A & B-songs eventually moving ≈250 m eastward

Total after analysis: 16 positive detections

Creek Park (across the creek channel) and survey routes alternated eastward to westward in direction. The Cedron Creek and Steele Creek study areas were typically surveyed on the same day and therefore each was alternated in daily order. Actual survey routes taken are depicted in Figure 6-5.

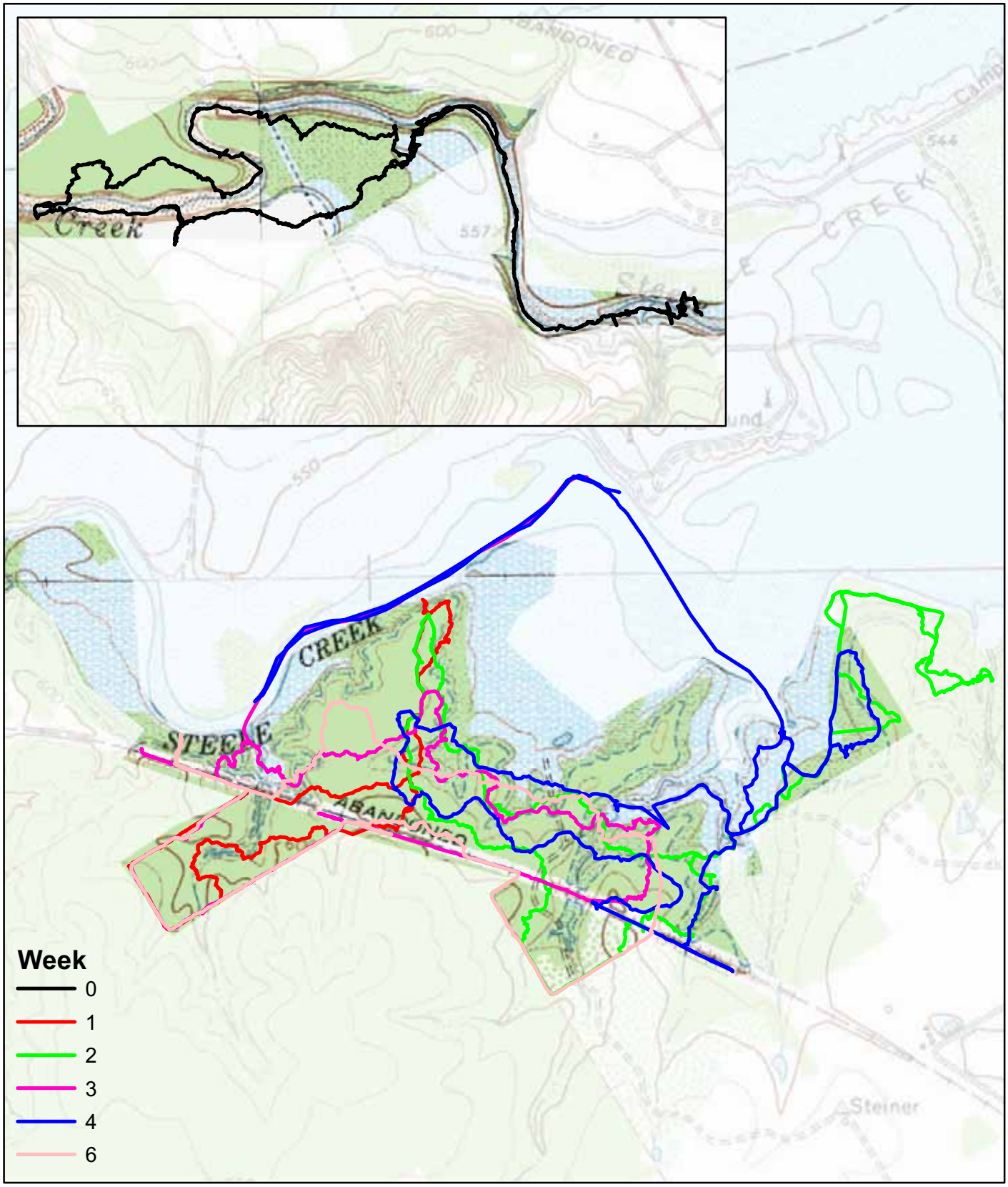
Seven positive GCWA detections were confirmed after results analysis (Figure 6-6). Detections were widespread with the only clustering occurring near the western-central portion of the study area. The eastern half appeared to contain an abundance of suitable habitat yet only one GCWA detection was recorded within an area of foraging (non-nesting) habitat. As indicated in the *Study Areas* section of this report, suitable habitat within the western and eastern portions of this study area differed substantially. Daily survey details and detection specifics are provided in Table 6-3.

Our results suggest the possible presence of four individual GCWA territories within the Steele Creek study area. It is possible that undetected territories are present given that only half of our survey visits could began at sunrise in order to survey Cedron Creek on the same day and the fact that apparent suitable habitat was abundant in a large area where only a single detection occurred. In total, survey results imply that this study area is moderately productive for GCWAs.

The portion of the original study area east of FM 56 excluded from surveys may also support nesting GCWAs. Although habitat present was small and fragmented, it is possible that nesting or foraging occurs in these areas, especially if off-property adjacent lands contain occupied, suitable habitat.

6.4 KING CREEK TO BEE BLUFF STUDY AREA

Surveys were conducted during the period 20 March through 30 April, 2008. Surveying this entire survey area on foot was abandoned after the second visit since the Corps boundary position along steep canyons often made it impossible to follow a route without being forced off-property. Because permission to cross private property could not be readily obtained, surveys continued by boat. Surveys began as early as possible; however, it was determined to be unsafe to cross one of the widest portions of the lake before sunrise in the Service's small Jon boat. Features such as canyons and coves were investigated upon each visit and an appropriate time was spent at each



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Projection: UTM Zone 14N, NAD 1983, GRS 1980

Production Date: 7/11/2008

Feet: 0 500 1,000 2,000

Meters: 0 125 250 500

Texas

Figure 6-5: Steele Creek study area survey routes by week surveyed (inset depicts omitted western portion).

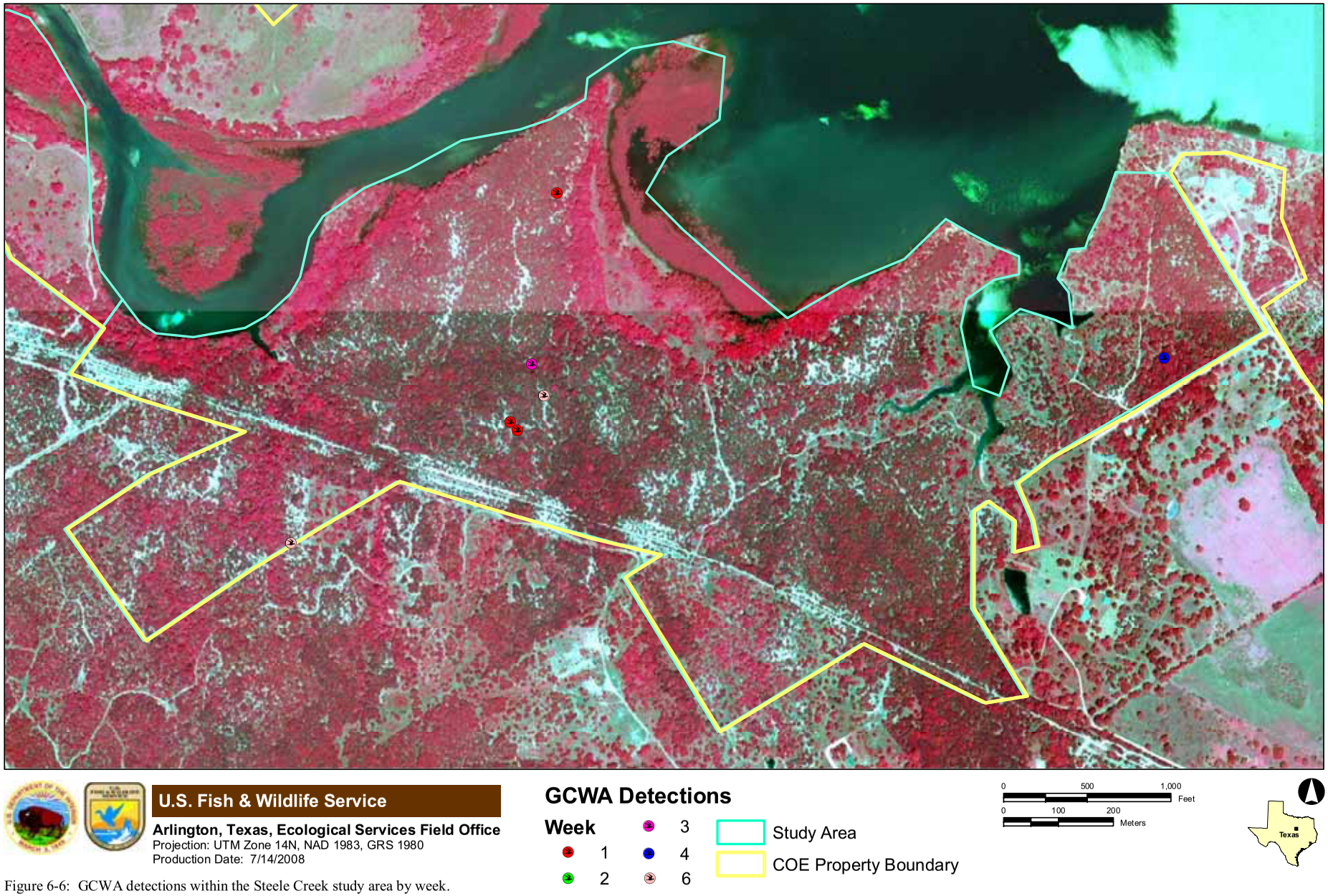


Figure 6-6: GCWA detections within the Steele Creek study area by week.

Table 6-3. Golden-cheeked Warbler Survey Data - Steele Creek Study Area

a. Survey visit details:

Date	Sunrise Time	Time			Temperature (degrees F.)		Wind Direction		Wind Speed (mph)		Cloud Cover (percent)		Surveyors/Observers	Comments
		Start	End	Total hrs	Start	End	Start	End	Start	End	Start	End		
03/10/2008	7:46	9:50	12:42	2:52	58	71	SE	SE	0	0-5	100	100	SE,JL,OB/BD	Non-survey groundtruthing exercise, no GCWA detections
03/20/2008	7:33	10:38	1:54	3:16	52	65	SSE	SSE	0-5	5-10	50	30	SE,JL/BD,SM	Western ¾ moving southwestward and back, 3 GCWA detections
03/26/2008	7:25	11:44	3:33	3:49	73	78	SSE	SSE	5-10	10-15	90	70	SE,JL	Eastern ¾ from CR 1410 and back, no GCWA detections
04/02/2008	7:16	8:00	11:19	3:19	58	66	SE	SE	0-5	0-5	100	100	SE,JL	Western ¾ moving eastward and back, 3 GCWA detections
04/09/2008	7:07	12:30	3:30	3:00	72	79	SSE	SSE	0	0	100	95	SE,JL	Eastern ¾ moving westward and back, 1 GCWA detection
04/23/2008	6:51	7:50	10:50	3:00	67	72	SSE	SSE	0-10	0-5	100	100	SE,JL	Western ¾ moving eastward and back, 2 GCWA detections

b. GCWA Detections:

Date	GCWA			%Canopy/ %MAJ	Vegetation in descending abundance	Distance and Direction to GCWA	Time of Day	GPS Coordinates		Comments
	Heard/ Seen	Sex	Song A/B/C					Latitude	Longitude	
03/20/2008	H	M	A	70/85	MAJ,SO,RO,AJ,TxA	≈10-15m E	11:40	31.99861	-97.45642	Heard initially from ≈100m southeast
03/20/2008	H & S	M	B	70/85	MAJ,SO,RO,AJ,TxA	≈15m NE	12:30	31.99487	-97.45739	Seen at top of large TxA
03/20/2008	H	M	B	70/85	MAJ,SO,RO,AJ,TxA	≈10m SE	12:35	31.99473	-97.45725	Seen countersinging briefly at top of MAJ
04/02/2008	H	M	A	80/80	MAJ,RO,SO	≈100m NNW	9:00	31.99431	-97.46000	**Omitted** – possible duplicate of bird later detected at 10:13
04/02/2008	H	M	A	60/60	MAJ,LO,AJ,TxA,RO	≈30m W	10:13	31.99581	-97.45696	Enormous MAJ seen at this point
04/02/2008	H	M	A	70/50	MAJ,AJ,SO,CE,RO,LO	≈10m W	10:51	31.99575	-97.45896	**Omitted** - possible duplicate of bird detected at 10:13
04/09/2008	H & S	M	C	70/5	CE,LO,MAJ	≈10m W	12:55	31.99577	-97.44479	Heard and seen singing unusual song in non-nesting habitat area
04/23/2008	H	M	A	55/40	MAJ,AJ,RO,SO,TxA,FLS,SBS	≈20m E	8:33	31.99294	-97.46164	Near Corps boundary, many cowbirds in area
04/23/2008	H	M	A	70/80	MAJ,LO,RO,TxA	≈10m W	10:10	31.99529	-97.45673	Sang continually while moving about the area

Total after analysis: 7 positive detections

location. The surveyors listened from the boat at numerous locations within each cove or canyon as well as on foot for up to an hour. Actual survey routes taken are depicted in Figure 6-7.

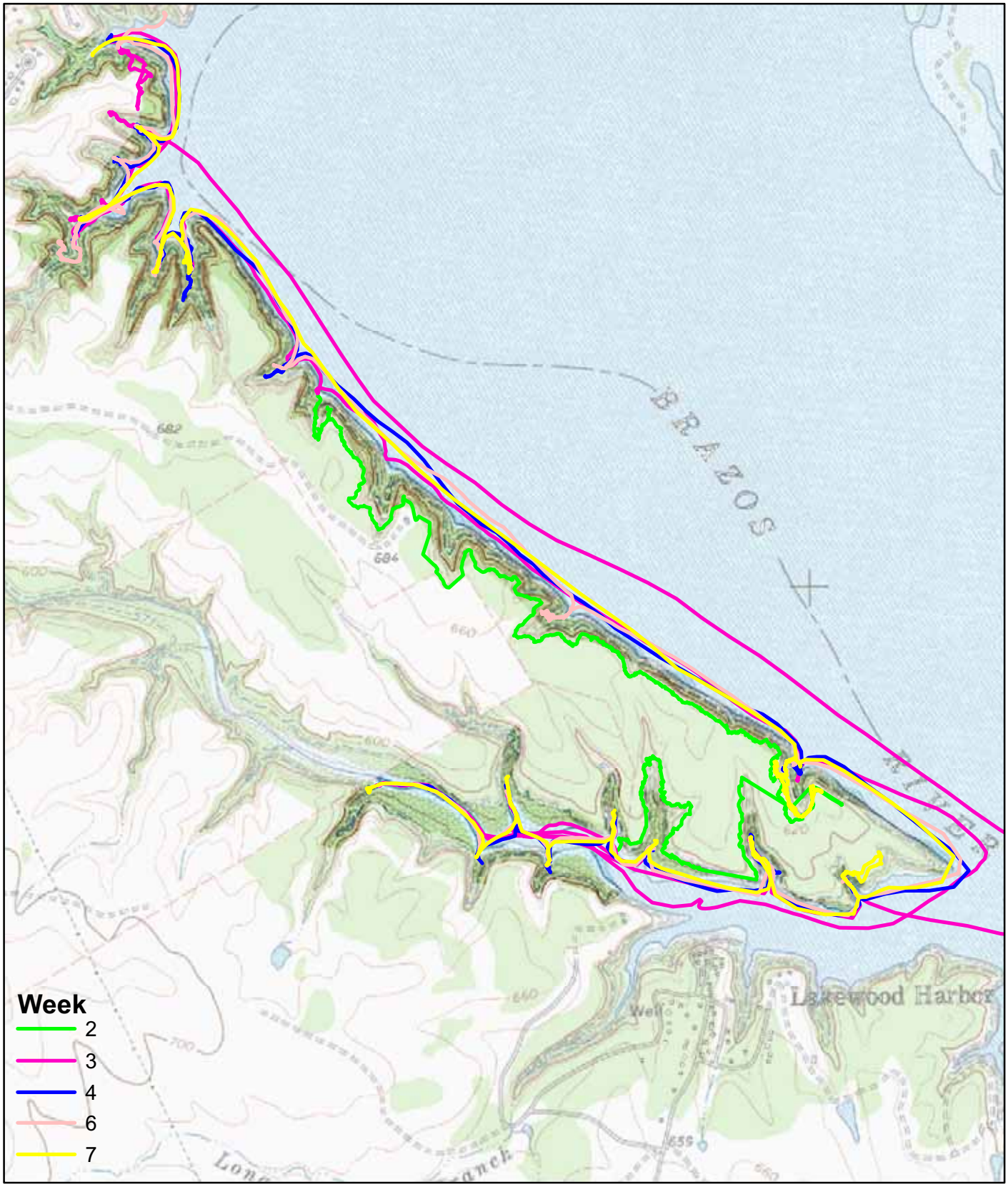
Nine positive GCWA detections were confirmed after results analysis (figure 6-8). Most all detections occurred within the canyons located near the northern portion of the study area just south of Bee Bluff. Two detections occurred on separate days within a smaller cove near the southern portion along the lakeshore. No detections occurred within the King Creek channel although substantial suitable habitat appeared available especially along the northern shore. Daily survey details and detection specifics are provided in Table 6-4.

Our results suggest the possible presence of five individual GCWA territories within the King Creek to Bee Bluff study area. It is very likely that undetected territories are present within the Corps property above the steeply sloping shoreline between King Creek and the northern canyons where abundant suitable habitat was fully investigated by foot only a single time. In total, survey results imply that this study area is at least moderately productive for GCWAs.

7.0 RECOMMENDATIONS

Based upon the results of this investigation, past coordination, the Service's knowledge of the local status of the GCWA, and potential threats within the foreseeable future, we offer the following recommendations:

1. We suggest that Corps staff amend the Whitney Lake Master Plan in order to designate areas in which GCWAs have been documented in this and prior (Appendix B) investigations as Environmentally Sensitive Areas. This designation should apply to all on-property area characterized as nesting/foraging habitat contiguous with the area in which GCWAs have been documented. This designation should not preclude these areas from public use such as hunting, hiking or camping, but might serve as a safeguard to ensure that future development proposals fully evaluate possible impacts to protected



U.S. Fish & Wildlife Service

Arlington, Texas, Ecological Services Field Office

Projection: UTM Zone 14N, NAD 1983, GRS 1980

Production Date: 7/11/2008

Feet: 0 500 1,000 2,000

Meters: 0 125 250 500

Texas

Figure 6-7: King Creek to Bee Bluff study area survey routes by week surveyed.

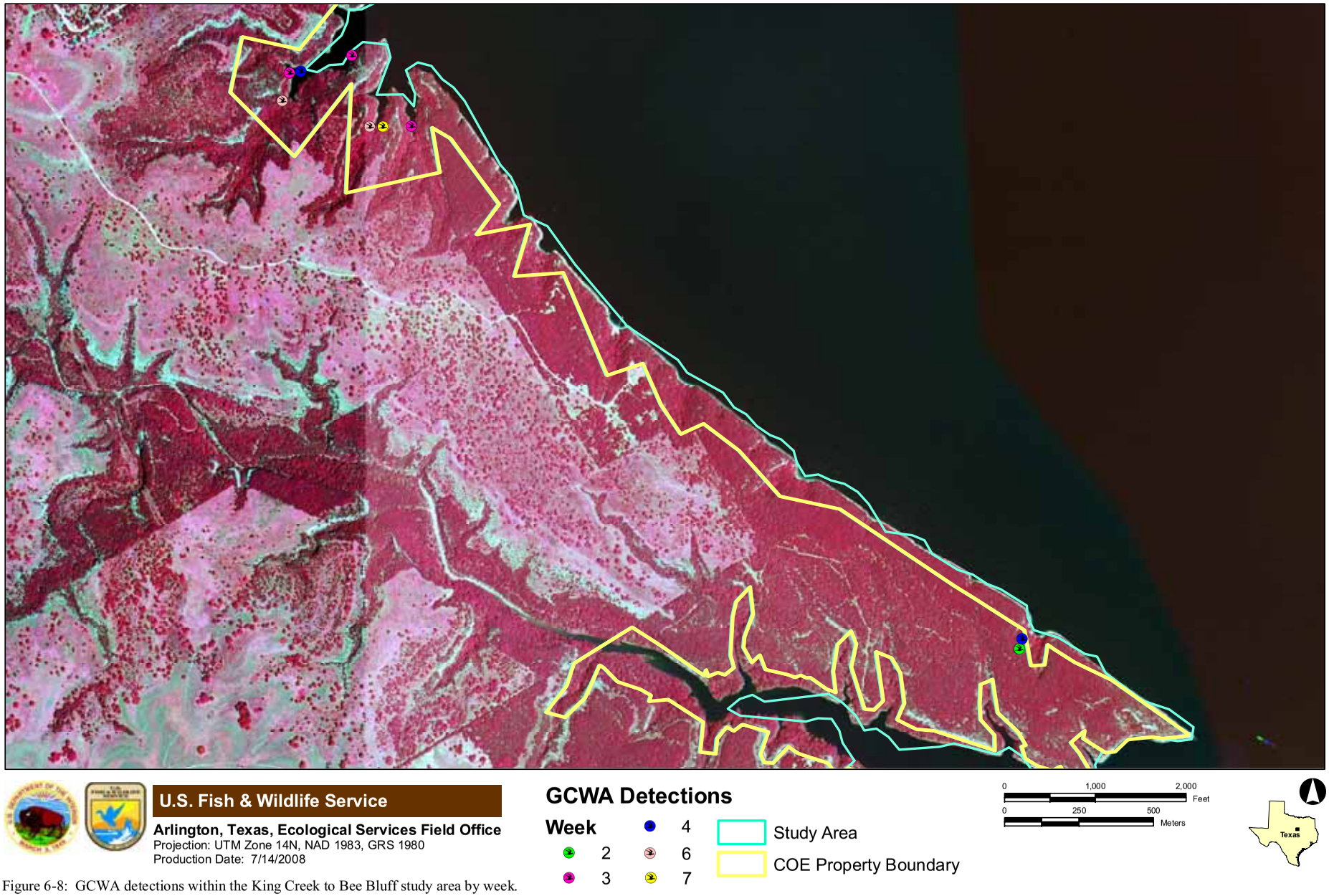


Figure 6-8: GCWA detections within the King Creek to Bee Bluff study area by week.

Table 6-4. Golden-cheeked Warbler Survey Data - King Creek to Bee Bluff Study Area

a. Survey visit details:

Date	Sunrise Time	Time			Temperature (degrees F.)		Wind Direction		Wind Speed (mph)		Cloud Cover (percent)		Surveyors/Observers	Comments
		Start	End	Total hrs	Start	End	Start	End	Start	End	Start	End		
03/20/2008	7:33	8:38	10:17	1:39	48	54	SSE	SSE	5-7	5-7	40	40	SE,JL/BD,SM	Partial survey/groundtruthing, no GCWAs detected
03/27/2008	7:24	9:12	2:20	5:08	69	84	S	S	5	5-10	95	10	SE,JL/EA	Surveyed on foot, 1 GCWA detection
04/03/2008	7:15	9:07	1:46	4:39	73	80	SSE	SSE	5-15	0-15	100	100	SE,JL	Surveyed by boat & on foot, 3 GCWA detections
04/10/2008	7:06	8:07	2:06	5:59	64	74	SSE	SSE	0-5	0-5	98	30	SE,JL	Surveyed by boat & on foot, 2 GCWA detections
04/24/2008	6:50	8:03	1:50	5:47	68	86	SSE	SSE	0-5	5-20	100	55	SE,JL	Surveyed by boat & on foot, gusty, 2 GCWA detections
04/30/2008	6:44	8:35	1:38	5:03	58	79	S	S	0-10	10-35	2	10	SE,JL	Ended early due to unsafe wind/waves. surveyed by boat & on foot, 1 GCWA detection

b. GCWA Detections:

Date	GCWA			%Canopy/ %MAJ	Vegetation in descending abundance	Distance and Direction to GCWA	Time of Day	GPS Coordinates		Comments
	Heard/ Seen	Sex	Song A/B/C					Latitude	Longitude	
03/27/2008	H	M	A	70/80	MAJ,RO,SO	≈5m E	10:05	31.90999	-97.41775	Sang 5-7 min. , Heard ≈50 min. later upon return trip
04/03/2008	H	M	B	50/60	MAJ,SO,RO	≈90m S	10:16	31.92904	-97.44139	Heard on N-facing bluff top from boat
04/03/2008	H	M	A	50/10	AJ,CE,HB,MAJ,MxBE	≈10m W	10:21	31.92854	-97.44361	At water's edge, better habitat upslope
04/03/2008	H	M	A	60/30	CE,MAJ,HB	≈15m W	11:12	31.92687	-97.43932	At water's edge, better habitat upslope
04/10/2008	H	M	A	70/10	AJ,RO,HB,TxA,MxBE,CE	≈5m WNW	11:31	31.91109	-97.41791	At transition of nesting/foraging habitats
04/10/2008	H	M	A	60/0	HB,CE,TxA,AJ	≈30m ENE	1:32	31.92858	-97.44321	At water's edge, better habitat upslope
04/24/2008	H	M	A	60/40	TxA,MAJ,HB,SO,CE,MxBE,RO	≈120m N	9:41	31.92770	-97.44388	In general area of prior detections
04/24/2008	H	M	B	60/0	CE,HB,CB	≈150m W	10:29	31.92688	-97.44079	Heard in better habitat upslope
04/30/2008	H	M	B	50/0	CE,TxA,PC,TxBE,HB,AmE	≈50m NNW	12:30	31.92692	-97.44053	Heard in better habitat upslope

Total after analysis: 9 positive detections

resources. The designation of Environmentally Sensitive Areas for this purpose should be ongoing if GCWA presence is discovered in additional areas.

2. We recommend that Corps staff develop a monitoring plan to assess the status of the GCWA on Whitney Corps lands over time. Those areas which contain suitable habitat but have not been surveyed should be investigated in order to fully inventory GCWA presence at Whitney Lake. Continual detailed surveys of areas where GCWAs have been detected would not be necessary; however, it would be beneficial to monitor GCWA persistence in these areas as well. Corps staff should be familiar with GCWA vocalizations in order to document presence when in the field. Monitoring should also include records of potential adverse impacts to habitat quality from encroachments, unauthorized timber harvests, or any other authorized or unauthorized activities. Our office would willingly participate in the development and implementation of a monitoring plan which would meet the needs of the GCWA and the Corps without being overly burdensome to the Corps' duties or finances.

3. The GCWA population at Whitney Lake might also benefit from a habitat management plan to maintain existing habitat and possibly increase habitat abundance long term. GCWA habitat typically needs no ongoing maintenance and is most productive when unaltered. However, certain areas indentified as currently unsuitable might be made suitable over time with appropriate enhancement efforts. For example, areas with dense Ashe juniper growth lacking enough hardwood species could be thinned and hardwoods planted. Although funding may not be available for enhancement projects, habitat restoration plans should be in place in the event that an illegal encroachment results in compensatory mitigation being obtained from a violator or any other funding source. Assistance from our office to develop a habitat management plan would be readily available.

4. Future activities conducted, funded, or authorized by the Corps occurring within GCWA habitat should be designed to avoid impacts to GCWAs. For example, fence-building around Corps property containing GCWA habitat could serve to benefit the species

long-term via habitat protection. However, rights-of-way widths should be 16 ft or less and should be constructed outside the breeding season (March 15 through June 1). Other activities might include rights-of-way construction for other purposes, tree removal practices, erosion control, or other projects which could adversely impact GCWAs or their habitat. If projects cannot be designed to avoid impacts to GCWAs with certainty, we recommend that the Service be contacted for assistance.

5. Larger patches of GCWA habitat generally are much more productive than smaller, fragmented patches and the protection of GCWA habitat adjacent to Corps property could be highly beneficial to GCWA conservation. For this reason, we recommend that the Corps and the Service develop a list of options to provide willing landowners interested in furthering the conservation of the GCWA on private lands. There are over forty land trust organizations operating in Texas which provide these types of opportunities, typically in the form of conservation easements. This would not result in the Corps assuming additional management responsibilities since conservation easement lands are typically enrolled and managed by the land trust organization and/or the landowner.

   Various future activities and developments within the area may possibly result in the need for project developers to mitigate impacts to GCWAs. Conservation easements on private lands may provide such an opportunity. Although the Corps and the Service should not solicit landowners for this purpose, it may be beneficial to identify areas near Corps boundaries which could potentially provide mitigation opportunities.

6. The Corps, in coordination with the Service, might develop a public relations plan to ensure that the public is aware of the GCWA at Whitney Lake but not fearful of federal regulation. Public perception of the GCWA is often tainted by misinformation; this was evident several times during our surveys. A public relations plan might include "talking points" to better explain the Federal Government's role in endangered species conservation. This information could possibly benefit the Corps' efforts at Whitney Lake as well as GCWA recovery efforts by decreasing negative perceptions.

8.0 LITERATURE CITED

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APPENDIX A

PHOTOS: HABITAT WITHIN STUDY AREAS

Upper Brazos – west-facing bluff overlooking Bailey Hollow, 04/08/2008

Upper Brazos – west-facing slope of Bailey Hollow, 04/08/2008

Upper Brazos – Elm Hollow SSW toward 9:31 GCWA detection, 04/01/2008

Upper Brazos – Elm Hollow SSW toward 8:58 detection, 04/01/2008

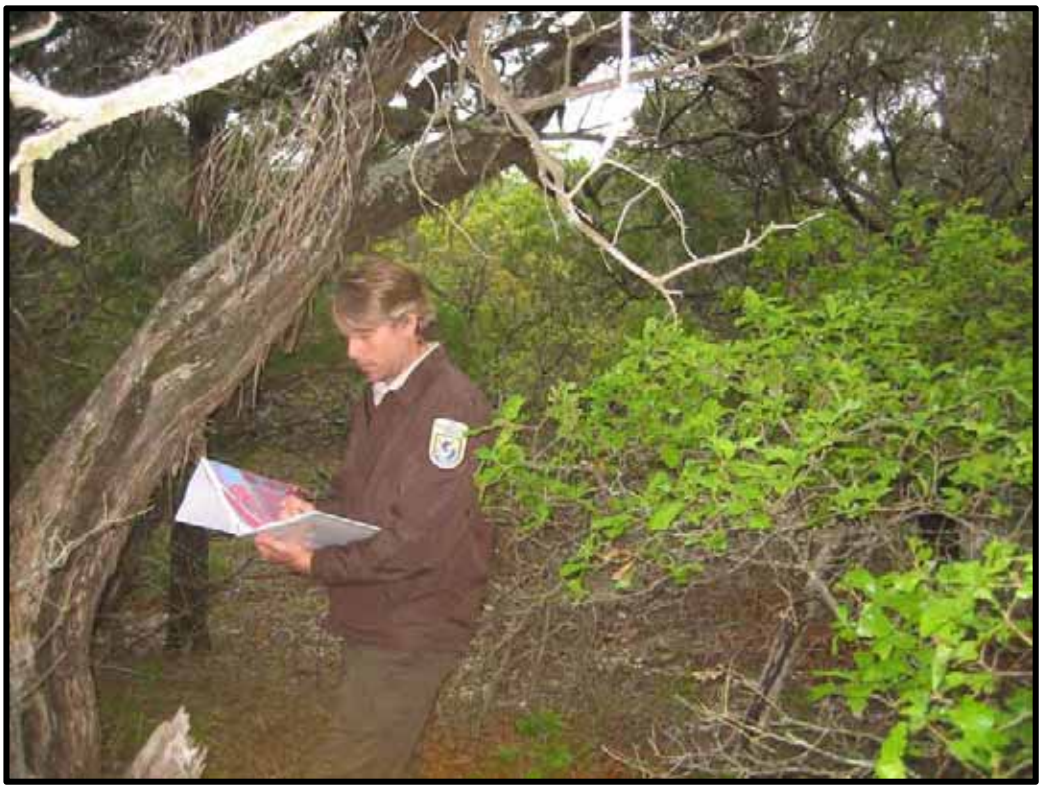
Upper Brazos – east of Ham Creek SW toward 10:33 GCWA detection, 04/22/2008

Upper Brazos – east of Ham Creek clear-cutting near 10:33 detection, 04/22/2008

Upper Brazos – Broke Rock north-facing slope toward 12:40 detection, 04/08/2008

Upper Brazos – bluff above Broke Rock facing SW, 04/08/2008

Cedron Creek – south-facing toward 10:58 detection, 04/09/2008



Cedron Creek – west-facing toward 9:09 detection, 04/09/2008

Steele Creek – western portion displaying open grassy understory, 04/23/2008

Steele Creek – eastern portion displaying dense understory, 04/23/2008

King Creek to Bee Bluff – near 11:32 detection facing downslope, 04/10/2008

King Creek to Bee Bluff – west-facing toward 1:32 detection, 04/10/2008

APPENDIX B

PRIOR GCWA SURVEYS AT WHITNEY LAKE
SURVEY ACCOUNTS AND MAP

Prior GCWA Surveys on Whitney Lake Corps Property

2006 – May 16 Site Visit by Service Staff

Girl Scout Island – single-day site visit by Arlington ES staff and Sam Masters (Corps) – one, possibly two GCWAs detected

2005 - Golden-Cheeked Warbler Surveys on U.S. Army Corps of Engineers Reservoirs in the Fort Worth District (Guilfoyle & Fischer)

Powelldale Mountains (AKA "**The Mountain**") - one point count station – one GCWA detected

Ham Creek – four point count stations – one GCWA detected

Loafers Bend Park – two point count stations – no GCWA detections

Cedar Creek Park – one point count station – no GCWA detections

Panther Boys Tract- two point count stations – no GCWA detections

Cedron Creek Park South of 1713 Bridge (Bosque County Side) - two point count stations – no GCWA detections

Cedron Creek (near Girl Scout Island Corridor)- two point count stations – no GCWA detections

McCowan Valley Park - one point count station – no GCWA detections

North of Katy Bridge (Hill County Side) - one point count station – no GCWA detections

1998 - Final Report – Mid-Brazos Project – Lake Whitney 1998 Endangered Species Investigations (Espy, Houston & Associates, Inc.)

Upper Brazos incl. Ham Creek – nine pres. /abs. survey visits – 24 GCWA detections

Nolan River area – six pres. /abs. survey visits – two GCWA detections

Powelldale Mountains (AKA "**The Mountain**") – two pres. /abs. survey visits – two GCWA detections

<u>1997</u> - Final Report – Mid-Brazos Project – Lake Whitney 1997 Endangered Species Investigations (Espy, Houston & Associates, Inc.)

Powelldale Mountains (AKA "**The Mountain**") – two pres. /abs. survey visits – two GCWA detections

Nolan River - eight pres. /abs. survey visits - two GCWA detections

Cedron Creek North (note: this is not Cedron Creek Park, this area is slightly north of the Park) - eight pres. /abs. survey visits – no GCWA detections (one BCVI sighting in non-habitat)

Panther Boys Camp - seven pres. /abs. survey visits – no GCWA detections (two BCVI detections)

<u>1996</u> - Endangered Species Investigations Mid Brazos Project – Lake Whitney Hill and Bosque Counties, Texas (DLS Associates)

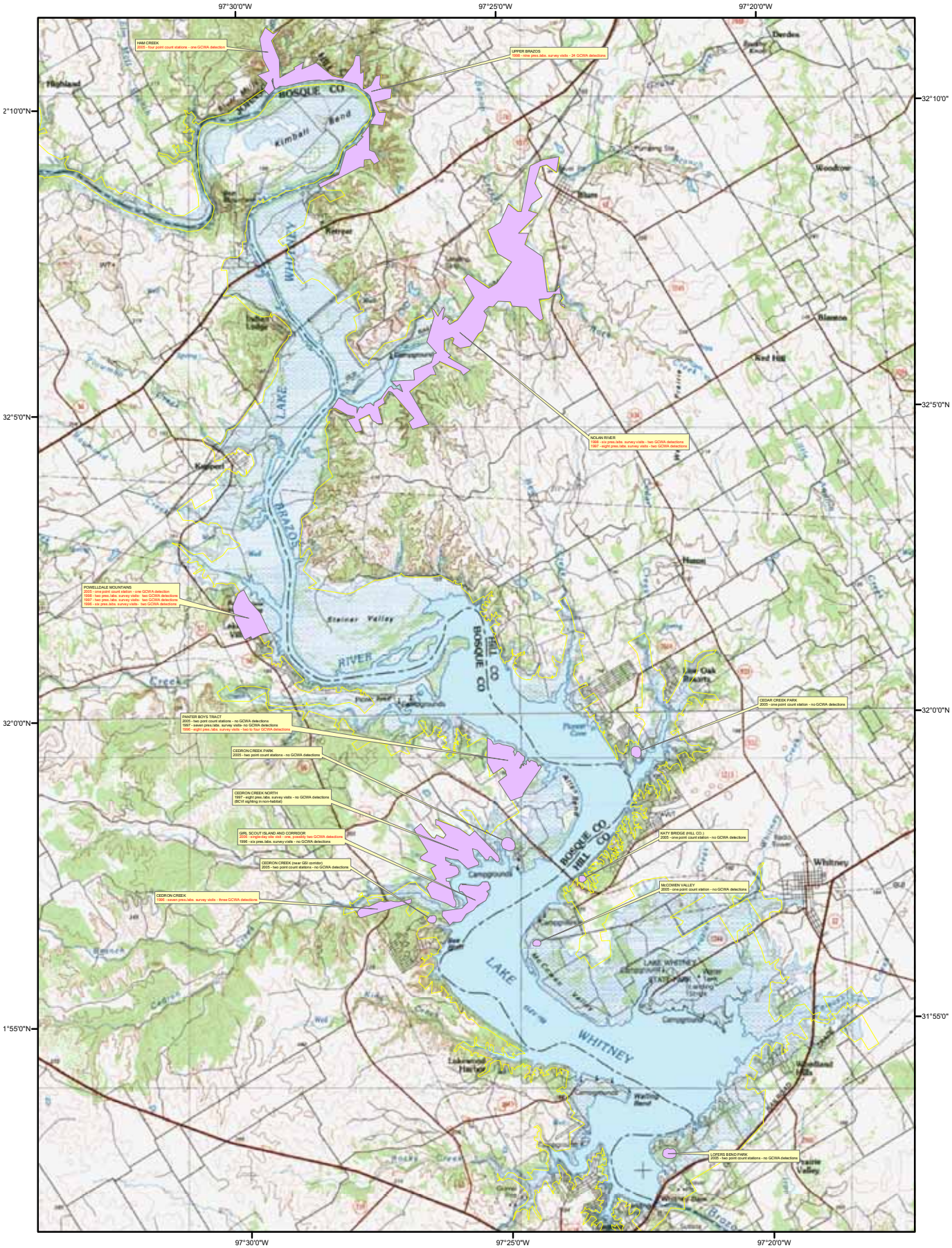
Powelldale Mountains (AKA "**The Mountain**") – six pres. /abs. survey visits – two GCWA detections

Cedron Creek (not Cedron Creek "North" or "Park," this area is on the south shore of Cedron Creek approx. ¼ mile west of FM 56) – seven pres. /abs. survey visits – three GCWA detections

Girl Scout Island and Girl Scout Corridor - six pres. /abs. survey visits – no GCWA detections

Panther Boys Tract – 8 pres. /abs. survey visits - two (possibly four) GCWA detections

Prior Golden-cheeked Warbler Surveys on Whitney Lake Corps Property - Johnson, Bosque, and Hill Counties, Texas


97°30'0"W
97°25'0"W
97°20'0"W
32°10'0"N
32°5'0"N
32°0'0"N
31°55'0"N
HAM CREEK
2005 - four point count stations - one GCWA detection
UPPER BRAZOS
1996 - nine pres./abs. survey visits - 24 GCWA detections
NOLAN RIVER
1996 - six pres./abs. survey visits - two GCWA detections
1997 - eight pres./abs. survey visits - two GCWA detections
POWELLDALE MOUNTAINS
2005 - one point count station - one GCWA detection
1996 - two pres./abs. survey visits - two GCWA detections
1997 - two pres./abs. survey visits - two GCWA detections
1998 - six pres./abs. survey visits - two GCWA detections
PANTER BOYS TRACT
2005 - two point count stations - no GCWA detections
1997 - seven pres./abs. survey visits- no GCWA detections
1996 - eight pres./abs. survey visits - two to four GCWA detections
CEDRON CREEK PARK
2005 - two point count stations - no GCWA detections
CEDRON CREEK NORTH
1997 - eight pres./abs. survey visits - no GCWA detections
(BCVI sighting in non-habitat)
GIRL SCOUT ISLAND AND CORRIDOR
2005 - single-day site visit - one, possibly two GCWA detections
1996 - six pres./abs. survey visits - no GCWA detections
CEDRON CREEK (near GSI corridor)
2005 - two point count stations - no GCWA detections
CEDRON CREEK
1996 - seven pres./abs. survey visits - three GCWA detections
CEDAR CREEK PARK
2005 - one point count station - no GCWA detections
KATY BRIDGE (HILL CO.)
2005 - one point count station - no GCWA detections
McCOWEN VALLEY
2005 - one point count station - no GCWA detections
LOFERS BEND PARK
2005 - two point count stations - no GCWA detections
BOSQUE CO
HILL CO
LAKE WHITNEY
BRAZOS RIVER
Whitney
Kimball Bend
Steiner Valley
Low Oak Bluffs
Woodrow
Blanton
Red Hill
Hasse
Highland
Kerrville
Lakewood Harbor
Waterfall Bend
Prairie Valley
Whitney Dam
Campground
Lake Whitney State Park
Boat Ramp
Camp Ground
Pecan Cove
Alvin Bend
Lake Whitney Campground
Lake Whitney State Park
Camp Ground
Boat Ramp
Lake Whitney Campground
Boat Ramp
Camp Ground
Boat Ramp
Camp Ground
Boat Ramp
Camp

APPENDIX C

SURVEY DATA TABLE ABBREVIATIONS

Survey Data Table Abbreviations

Surveyors / Observers

SE – Sean Edwards (USFWS)
JL – Jacob Lewis (USFWS)
OB – Omar Bocanegra (USFWS)
BD – Brady Dempsey (Corps)
SM – Sam Masters (Corps)
EA – Elizabeth Anderson (Corps)

Vegetation

AmE – American elm
AJ – Ashe juniper
BE – boxelder
BO – bur oak
BU – bumelia
CB – chinaberry
CCA – catclaw acacia
CE – cedar elm
DH – deciduous holly
EB – elbowbush
FLS – prairie flame-leaf sumac
HB – hackberry
LO – plateau live oak
MAJ – mature Ashe juniper
ML – Texas mountain laurel
MQ – mesquite
MxBE – Mexican buckeye
PC – pecan
RO – Texas red oak
SBS – skunkbush sumac
SO – white shin oak
TxA – Texas ash
TxBE – Texas buckeye

Miscellaneous

GCWA – golden-cheeked warbler
CR – County Road
FM – Farm to Market Road
N – North
S – South
E – East
W – West