National Park Service
U.S. Department of the Interior

Natural Resource Program Center

Landbird Monitoring in the Chihuahuan Desert Network

Annual Report, 2010

Natural Resource Technical Report NPS/CHDN/NRTR—2011/429

ON THE COVER

Cliff swallow (*Petrochelidon pyrrhonota*). Photo © Robert Shantz.

Landbird Monitoring in the Chihuahuan Desert Network

Annual Report, 2010

Natural Resource Technical Report NPS/CHDN/NRTR—2011/429

Authors

Chris White
Rocky Mountain Bird Observatory
230 Cherry Street, Suite 150
Fort Collins, Colorado 80521

Contact

Robert E. Bennetts
National Park Service
Southern Plains Network
Capulin Volcano National Monument
PO Box 40
Des Moines, New Mexico 88418

Editor

Emily Yost
Utah State University
Department of Environment and Society
5215 Old Main Hill
Logan, Utah 84322-5215

February 2011

U.S. Department of the Interior
National Park Service
Natural Resource Program Center
Fort Collins, Colorado

The National Park Service, Natural Resource Program Center publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Technical Report Series is used to disseminate results of scientific studies in the physical, biological, and social sciences for both the advancement of science and the achievement of the National Park Service mission. The series provides contributors with a forum for displaying comprehensive data that are often deleted from journals because of page limitations.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available from the Chihuahuan Desert Network website, http://www.nature.nps.gov/im/units/CHDN, as well as at the Natural Resource Publications Management web site, http://www.nature.nps.gov/publications/NRPM.

Please cite this publication as:

White, C. 2011. Landbird monitoring in the Chihuahuan Desert Network: annual report, 2010. Natural Resource Technical Report NPS/CHDN/NRTR—2011/429. National Park Service, Fort Collins, Colorado.

NPS 960/106748, February 2011

Contents

Figures

Tables

Photos

Acronyms

AMIS	Amistad National Recreation Area
BIBE	Big Bend National Park
CAVE	Carlsbad Caverns National Park
CHDN	Chihuahuan Desert Inventory & Monitoring Network
FODA	Fort Davis National Historic Site
GUMO	Guadalupe Mountains National Park
NHS	national historic site
NM	national monument
NP	national park
NPS	National Park Service
NRA	national recreation area
RMBO	Rocky Mountain Bird Observatory
WHSA	White Sands National Monument

Executive Summary

In 2010, landbirds were surveyed within six of seven Chihuahuan Desert Inventory & Monitoring Network (CHDN) parks. Sample points were located along a transect for linear features (e.g., most riparian habitats) or a grid for areal features. A total of 66 transects or grids were surveyed in 2010. Survey efforts were focused on the breeding season, when increased territorial behavior by songbirds results in higher detection rates and greater sampling efficiency. The window of primary breeding and, therefore, sampling was from April through June, with adjustments made for individual park visits based on latitude and elevation. We used point-transect surveys to estimate and monitor landbird population parameters. Surveys were generally conducted once for each transect or grid to facilitate estimates of occupancy, which rely on an encounter-history matrix derived from repeated visits, rather than a detection function to account for detectability.

We sampled a total of 713 points on 66 transects or grids. Of these, 541 points were sampled in grassland habitat and 172 in riparian habitat. We recorded a total of 7,626 birds of 107 species on our survey points. Amistad National Recreation Area had the highest number of birds counted (n = 2,908). White Sands National Monument had the lowest number of birds detected (n = 102), though only two transects were surveyed and technicians were unable to access much of the area. We observed the greatest number of species at Big Bend National Park (n = 69) and the fewest at White Sands (n = 14). Species richness and community composition varied widely among the parks surveyed. The number of individuals or species detected is influenced not only by the number of survey points, but also by the size and diversity of available habitats. Cliff swallow was the most commonly detected species within the CHDN (n = 954). Nine species were detected only once during surveys. Six species (black-throated sparrow, blue grosbeak, northern mockingbird, mourning dove, ash-throated flycatcher, Scott's oriole) were detected at all six parks, whereas numerous species were detected at one or very few parks.

The Rocky Mountain Bird Observatory (RMBO), our primary cooperator for this project, manages the network's bird monitoring data. Other networks using RMBO also use this service and have found it to be efficient and effective. This enables CHDN data to be in the same database as those of several other networks and organizations, which in turn allows for a more comprehensive regional assessment.

1 Introduction

1.1 Background

The mission of the National Park Service (NPS) is to manage park resources "unimpaired for future generations." Protecting and managing some of our nation's most significant natural resources requires basic knowledge of the condition of ecosystems and species that occur in national parks. In order to better meet this mission, the Inventory & Monitoring (I&M) Program was established to determine status and trends in ecological resources (NPS 1992). Established in 2001, the Chihuahuan Desert Inventory & Monitoring Network (CHDN) includes seven parks in the northern Chihuahuan Desert in southern New Mexico and west Texas. Six of the seven parks are representative of the Northern Chihuahuan Subregion of the Chihuahuan Desert Ecoregion. Amistad National Recreation Area, the exception, is situated primarily within the Tamaulipan Thornscrub (Mezquital) Ecoregion of southern Texas and northeastern Mexico, but it is also influenced by both the Chihuahuan Desert and Edwards Plateau ecoregions (NPS, CHDN 2010).

Monitoring changes in landbird population and community parameters can be an important element of a comprehensive, long-term monitoring program, such as that being implemented for the CHDN parks. Landbirds are a conspicuous component of many ecosystems and have high body temperatures, rapid metabolisms, and occupy high trophic levels. As such, changes in landbird populations may be indicators of changes in the biotic or abiotic components of the environment upon which they depend (Canterbury et al. 2000; Bryce et al. 2002). Relative to other vertebrates, landbirds are also highly detectable and can be efficiently surveyed with the use of numerous standardized methods (Bibby et al. 2000; Buckland et al. 2001).

Birds select habitat based on the presence of behavioral cues triggered by the environment (Hutto 1985; Alcock 2005). In some environments, however, especially those that vary unpredictably, habitat may not be saturated and changes in resources may not always be tracked by changes in animal populations (Wiens 1985). In these situations, relating changes in bird populations to environmental features can be complex, especially when confounded by time lags that are characteristic of site-tenacious bird species. Additional complications occur if birds respond more sensitively to environmental change than we can detect and when cyclical environmental changes result in erratic changes in population size that are ultimately inconsequential. However, the utility of monitoring landbirds is strengthened by concurrent monitoring of a broad suite of environmental parameters (Dale and Beyeler 2001) that may assist with elucidating changes in the bird community to other environmental factors. Such a broad-based approach is now being undertaken by the CHDN (NPS 2008) and other broad-based monitoring approaches (e.g., Ringold et al. 1996; Stevens and Gold 2003; Barrows et al. 2005).

Perhaps the most compelling reason to monitor landbird communities is that birds themselves are inherently valuable. The high aesthetic and spiritual values that humans place on native wildlife is acknowledged in the agency's Organic Act: "to conserve . . . the wild life therein . . . unimpaired for the enjoyment of future generations." Birdwatching, in particular, is a popular, longstanding recreational pastime in the U.S., and forms the basis of a large and sustainable industry (Sekercioglu 2002).

The CHDN began monitoring birds in spring 2010 following a pilot season in 2009; this effort is now part of a collaboration among the Southern Plains, Sonoran Desert, and Chihuahuan Desert networks.

1.2 Program Goals and Objectives

The overall goal of the CHDN landbird monitoring program is to detect biologically significant changes in population parameters over time. This collaborative program is intended to maximize the strength of inferences within the context of finite resources. The monitoring design is a multitiered, flexible framework that will enable efficient estimation and monitoring of population parameters, periodic evaluation of assumptions, and the opportunity for adaptation to meet additional needs.

We have selected three primary monitoring objectives that are complementary and together provide a comprehensive assessment of changing bird populations and communities.

1.2.1 Objective 1: Occupancy

We will estimate the proportion of points occupied for most species in most parks. Occupancy is a measure of presence or absence of a species in space that indicates changes in the distribution of a species when evaluated across time. Recent advancements in occupancy theory and modeling have provided sound justification of its application in monitoring programs (MacKenzie et al. 2003; Field et al. 2005; MacKenzie et al. 2006).

1.2.2 Objective 2: Bird species richness and composition

We will estimate parameters related to community dynamics, particularly species richness and species composition. Monitoring the richness and composition of native communities of concern, and the changes occurring within and among these communities, provides a valuable complement to population-based parameters. Species richness data are essential to understanding the effects of changing landscapes on native biodiversity. Species composition helps us to understand the effects of management and other changes by assessing which species are or are not responding to changes in the environment.

1.2.3 Objective 3: Density (when feasible)

We will estimate density of the most-common species using the point-transect distance-sampling method at fixed points and subsequent analyses using the Distance program (Thomas et al. 2005). Provided that assumptions are reasonably met, distance-sampling methods allow researchers to model a detection function that adjusts for imperfect detectability and is a robust, widely accepted method for estimating landbird abundance (Buckland et al. 2001). With reasonable effort, we will likely only be able to estimate density annually for the most-common species in larger parks.

2 Methods

2.1 Methods

2.1.1 Sampling design

The details of our sampling design and field methods are presented in Powell et al. (in review). Our intention for monitoring landbirds extends beyond the birds themselves, and includes a broader vision of landbirds as indicators of the ecosystems they inhabit. This dual purpose influences our sampling design, especially in light of our funding and logistical limitations. In some cases, trade-offs have been made to accommodate particular habitat types or park resources that are considered particularly important to a given park.

We stratified most parks by grassland and riparian habitat classes, although CHDN parks contain a wide range of grassland vegetation (and, by extension, bird) communities.

In 2010, we surveyed landbirds within six of the seven CHDN parks. Sample points were located along a transect for linear features (e.g., most riparian habitats) or a grid for area features. A total of 66 transects or grids were surveyed in 2010 (Table 2.1.1-1). In most parks, we used sites selected with methodology outlined in Powell et al. (2007).

Table 2.1.1-1. Number of transects of each habitat class surveyed in each CHDN park unit, 2010

Park unit	Grassland	Riparian
AMIS	8	9
BIBE	20	8
CAVE	8	1
FODA	1	--
GUMO	8	1
WHSA	2	--

2.1.2 Seasonal timing of surveys

During the breeding season, increased territorial behavior by songbirds results in higher detection rates and greater sampling efficiency. Additionally, occupancy estimates assume that a bird detected is present for the entire period being surveyed (in this case, both survey periods). Thus, our surveys were focused on the primary breeding season in order to account for the greatest number of species in each park, recognizing that some species (e.g., migrants) may not have been adequately surveyed because of this restricted window. Although migrants are certainly an important component of bird communities, their presence can be highly variable and substantially

Cactus wren (*Campylorhynchus brunneicapillus*) was one of the most commonly counted species in the Chihuahuan Desert Inventory & Monitoring Network in 2010.

influenced by external factors. Focusing on the breeding population is expected to provide the most reliable information about changes in bird populations related to changes in condition of CHDN parks.

The timing of breeding varies among species and depends on a number of factors, including latitude and elevation. The window of primary breeding and sampling was from April through June, with adjustments, as described above, for individual park visits based on latitude and elevation (Figure 2.1.2).

2.2 Bird Surveys

We used point-transect surveys to estimate and monitor landbird population parameters (Buckland et al. 2001). The point-transect approach evolved from the variable circular plot approach (Reynolds et al. 1980) and distance sampling of line transects (Burnham et al. 1980), where points are considered as a transect with zero distance (Buckland et al. 2001). For density estimates, the method involves estimating the linear distance to individual birds while standing for a predetermined period of time at a fixed point in space (Figure 2.2). For groups of birds, we estimated the distance to the group and the number of birds in the group. Estimating the distance to each bird allows the observer to approximate density via a species-specific detection function that accounts for variation in detectability due to surveyor, environmental, or weather-related factors (Buckland et al. 2001; Diefenbach et al. 2003).

All birds detected at a given point were recorded. After counts were completed, observers used a

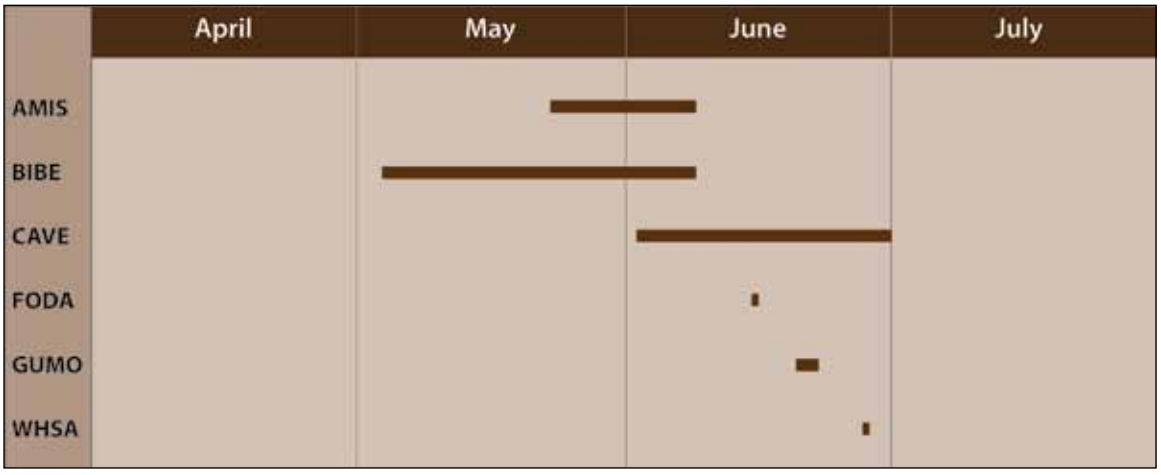

Figure 2.1.2. Dates when sampling was conducted in CHDN parks, 2010.

handheld GPS (Global Positioning System) unit to locate successive survey points. While walking between points, observers searched for species not recorded during the count period.

Most CHDN transects were surveyed once, with the exception of the grassland transect at Fort Davis National Historic Site and the riparian transects at Carlsbad Caverns and Guadalupe Mountains national parks, which were visited twice.

We conducted six-minute point-counts at each point along the transect or grid and used a rangefinder to estimate the linear distance to each bird or group detected. Our current protocol of spending six minutes per site is consistent with other efforts being conducted by Rocky Mountain Bird Observatory (RMBO) and to increases efficiency by allowing more points to be surveyed.

2.3 Additional Monitoring to Augment Bird Sampling

It is well known that landbird populations are particularly influenced by changes in vegetation structure and composition (Holmes and Sherry 2001; Krueper et al. 2003). Considering environmental data, such as vegetation, will allow us to aggregate (i.e., to stratify, post-hoc) survey sites that share similar characteristics. For this purpose, we will use data collected through the network's vegetation monitoring efforts. We will also use other data (e.g., climate) collected by CHDN and other organizations as covariates when assessing population trends for birds. Finally, landbird population parameters, coupled with detailed environmental information, can be used to build habitat-association models (e.g., Manley et al. 2004) that can inform conservation efforts and scientific inquiry throughout the region.

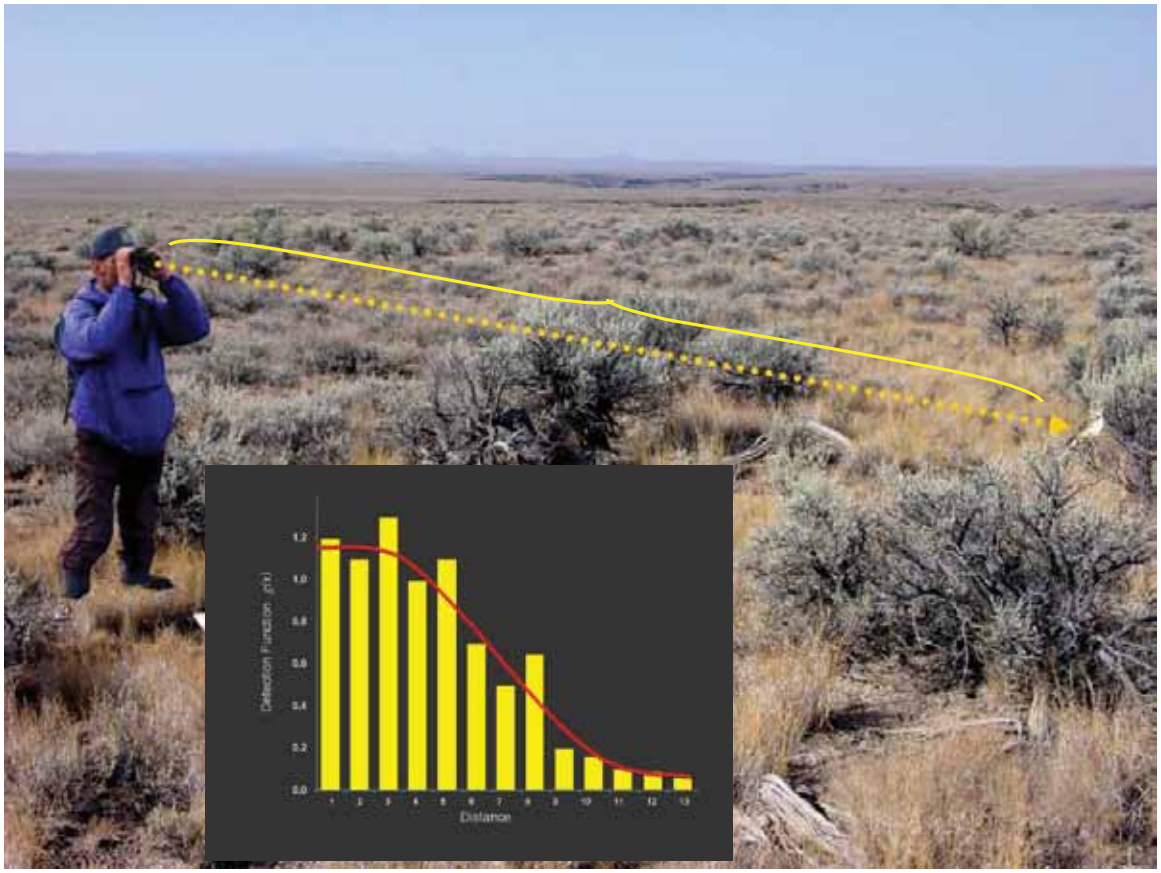

Figure 2.2. Distance sampling works by estimating a detection profile (graph) as a function of distance from which either individual or groups of birds are observed from the transect.

2.4 Reporting

The primary monitoring objectives focus on long-term changes and trends, and monitoring must be conducted for a number of years before meaningful estimates related to trends are feasible. Consequently, it is neither practical nor useful to conduct comprehensive analyses for each objective on an annual basis. Instead, we will provide annual basic data summaries and, once every five years, a comprehensive synthesis report that will go into much greater depth, including analyses for all objectives and interpretations in broader ecological context.

Field methods for estimating all three primary objectives are essentially the same; analyses and evaluation procedures used to estimate trends will differ.

It is neither practical nor useful to conduct comprehensive analyses for each objective on an annual basis. Instead, we will provide annual basic data summaries and, once every five years, a comprehensive synthesis report that will go into much greater depth, including analyses for all objectives and interpretations in broader ecological context.

2.5 Accessing the Data

The Rocky Mountain Bird Observatory (RMBO), our primary cooperator for this project, manages the bird monitoring data associated with it. Other networks using RMBO also use this service and have found it to be efficient and effective. This enables CHDN data to be stored in the same database as that of several other networks and organizations, which in turn allows for a more comprehensive regional assessment. CHDN and its parks have easy access to the data through the RMBO Avian Data Center, http://www.rmbo.org/public/monitoring/CountsEffort.aspx (see Figure 2.4).

To access the data,

1. Visit http://www.rmbo.org/public/monitoring/
2. Click on the "Data Queries" tab
3. Click on "Species Counts (total individuals detected with effort)"
4. For a basic query about a park's bird data, make the following selections:
   Program: Chihuahuan Desert Network
   ManagementEntity: Chihuahuan Desert Network
   Management Unit: select desired park unit
   Habitat: select desired habitat
5. Click "Show All Available Species" for park list of species with data
6. Click "Submit Query" for query results.

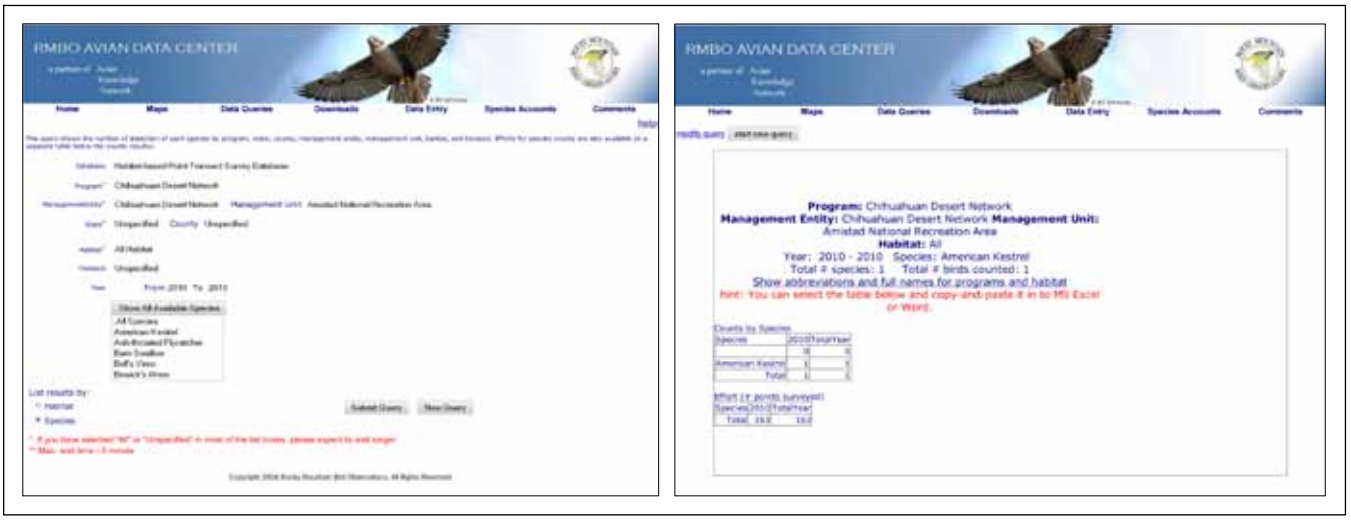

Figure 2.5. Screen shot of data query on Rocky Mountain Bird Observatory website (left) and results (right).

3 Results and Discussion

We sampled a total of 713 points on 66 transects or grids (Table 3-1). Of these, 541 points were sampled in grassland habitat and 172 in riparian habitat. We recorded a total of 7,626 birds of 107 species on our survey points.

Amistad National Recreation Area (NRA) had the highest number of birds counted (n = 2,908). White Sands National Monument (NM) had the lowest number of birds detected (n = 102), though only two transects were surveyed and technicians were unable to access much of the area. We observed the greatest number of species at Big Bend National Park (NP) (n = 69) and the fewest at White Sands (n = 14) (Table 3-2). Species richness and community composition varied widely among the parks surveyed. The number of individuals or species detected is influenced not only by the number of survey points and visits, but also by the size and diversity of available habitats.

Cliff swallow was the most commonly detected species within the CHDN (n = 954) (see Table 3-3). Nine species were detected only once during surveys.

Table 3-2. Number of species observed in each habitat class at each park, 2010

Park	Species detected		
	Grassland	Riparian	Total[1]
Amistad NRA	41	51	62
Big Bend NP	55	44	69
Carlsbad Caverns NP	34	26	46
Fort Davis NHS	34	--	34
Guadalupe Mountains NP	34	33	56
White Sands NM	14	--	14
Total[1]	**84**	**82**	**107**

[1] Totals do not necessarily equal the sum of the numbers shown for parks or habitat classes, as a single species may have been observed in more than one park or habitat class, and do not include incidental observations.

Six species (ash-throated flycatcher, black-throated sparrow, blue grosbeak, mourning dove, northern mockingbird, Scott's oriole) were detected at all six parks, whereas numerous species were detected at one or very few parks.

Table 3-1. Numbers of survey points and individual birds counted in each habitat class at each CHDN park, 2010

Park	Grassland		Riparian		Total birds detected
	Survey points	Birds counted	Survey points	Birds counted	
Amistad NRA	95	1,516	68	1,392	2,908
Big Bend NP	251	1,825	58	690	2,515
Carlsbad Caverns NP	71	591	14	236	827
Fort Davis NHS	48	533	--	--	533
Guadalupe Mountains NP	61	363	32	378	741
White Sands NM	15	102	--	--	102
Total	**541**	**4,930**	**172**	**2,696**	**7,626**

Note: Survey points represent the sum of all visits, rather than independent visits. The riparian habitats in Carlsbad Caverns NP and Guadalupe Mountains NP were sampled twice and all other transects or grids were sampled once.

Table 3-3. Total number of birds observed of each species during surveys in all CHDN parks, 2010

Common name	# of birds
Cliff swallow	954
Black-throated sparrow	768
Northern mockingbird	436
Cactus wren	348
Turkey vulture	300
Pyrrhuloxia	281
Cassin's sparrow	278
Blue grosbeak	248
Rufous-crowned sparrow	238
White-winged dove	224
Mourning dove	217
Bell's vireo	195
Yellow-breasted chat	174
Painted bunting	158
Scaled quail	146
Ash-throated flycatcher	135
Canyon wren	133
Northern cardinal	125
Brown-headed cowbird	120
Lesser nighthawk	103
White-throated swift	96
Scott's oriole	91
Black-tailed gnatcatcher	85
Red-winged blackbird	76
Verdin	63
House finch	60
Rock wren	58
Common yellowthroat	55
Great-tailed grackle	53
Bewick's wren	52
Canyon towhee	48
Cassin's kingbird	48
Spotted towhee	46
Summer tanager	41
Lesser goldfinch	40
Western kingbird	38
Northern bobwhite	36
Barn swallow	35
Black vulture	31
Western wood-pewee	31
Great blue heron	30
Violet-green swallow	29
Plumbeous vireo	28

Common name	# of birds
Blue-gray gnatcatcher	27
Chihuahuan raven	26
Western tanager	24
Black-headed grosbeak	23
Say's phoebe	22
Ladder-backed woodpecker	21
Lark sparrow	21
Common ground-dove	20
Phainopepla	16
Black-crested titmouse	15
Carolina wren	15
Hooded oriole	15
Loggerhead shrike	15
Orchard oriole	15
Black-chinned hummingbird	13
Vermilion flycatcher	11
Black phoebe	10
Black-chinned sparrow	10
Brown-crested flycatcher	10
Golden-fronted woodpecker	10
Yellow-billed cuckoo	10
Broad-tailed hummingbird	9
Cave swallow	9
Eurasian collared-dove	9
Acorn woodpecker	8
Greater roadrunner	8
Indigo bunting	8
Curve-billed thrasher	7
Double-crested cormorant	7
Red-tailed hawk	6
Warbling vireo	6
Brewer's sparrow	5
Common nighthawk	5
Crissal thrasher	5
Green-tailed towhee	5
Hepatic tanager	5
Swainson's hawk	5
Chipping sparrow	4
Gray vireo	4
House sparrow	4
Northern rough-winged swallow	4
Scissor-tailed flycatcher	4
Wild turkey	4

Table 3-3. Total number of birds observed of each species during surveys in all CHDN parks, 2010, cont.

Common name	# of birds
Killdeer	3
Lucy's warbler	3
Mallard	3
Burrowing owl	2
Common poorwill	2
Great egret	2
Great horned owl	2
Groove-billed ani	2
Peregrine falcon	2
Varied bunting	2
White-breasted nuthatch	2
Yellow-rumped warbler	2
American kestrel	1
Cordilleran flycatcher	1
Golden eagle	1
Gray hawk	1
Green heron	1
Horned lark	1
Northern harrier	1
Snowy egret	1
Western scrub-jay	1
Unidentified birds	*359*
Total	**7,626**

Note: Species are listed in rank order from most to least commonly detected. Number of birds is the total number of individuals counted. Unidentified birds were included in the total number of birds recorded during surveys, but these birds were not included in counts of the number of species detected per park. Incidental sightings (i.e., species noted as incidental were identified by our birding team, but not as part of our regular survey) are not included in this table, but are included in individual park species tables.

Table 3-4. Parks where each species was detected through May–June, 2010

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Acorn woodpecker	*Melanerpes formicivorus*		o	o	●	o	o
American avocet	*Recurvirostra americana*	o	o	o			o
American bittern	*Botaurus lentiginosus*	o	o	o			
American coot	*Fulica americana*	o	o	o		o	o
American crow	*Corvus brachyrhynchos*			o			o
American dipper	*Cinclus mexicanus*		o	o		o	
American goldfinch	*Spinus tristis*	o	o	o	o	o	o
American kestrel	*Falco sparverius*	●	o	o	o	o	o
American pipit	*Anthus rubescens*	o	o	o		o	o
American redstart	*Setophaga ruticilla*	o	o	o		o	o
American robin	*Turdus migratorius*	o	o	o	o	o	o
American tree sparrow	*Spizella arborea*			o		o	o
American white pelican	*Pelecanus erythrorhynchos*	o	o	o			o
American wigeon	*Anas americana*	o	o	o		o	o
American woodcock	*Scolopax minor*		o	o			
Anhinga	*Anhinga anhinga*	o	o				
Anna's hummingbird	*Calypte anna*		o	o			
Aplomado falcon	*Falco femoralis*		o				
Ash-throated flycatcher	*Myiarchus cinerascens*	●	●	●	●	●	●
Aztec thrush	*Ridgwayia pinicola*		o				
Baird's sandpiper	*Calidris bairdii*	o	o	o			o
Baird's sparrow	*Ammodramus bairdii*		o	o			o
Bald eagle	*Haliaeetus leucocephalus*	o	o	o		o	
Baltimore oriole	*Icterus galbula*	o	o	o		o	
Band-tailed pigeon	*Patagioenas fasciata*		o	o		o	
Bank swallow	*Riparia riparia*	o	o	o			o
Barn owl	*Tyto alba*	o	o	o		o[1]	o
Barn swallow	*Hirundo rustica*	●	●	●	●	o	o
Bay-breasted warbler	*Dendroica castanea*		o	o			
Bell's vireo	*Vireo bellii*	●	●	●			
Belted kingfisher	*Megaceryle alcyon*	o	o	o		o	o
Berylline hummingbird	*Amazilia beryllina*		o				
Bewick's wren	*Thryomanes bewickii*	●	●	●	●	●	o
Black phoebe	*Sayornis nigricans*	●	●	o	o	o	o

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Black tern	*Chlidonias niger*	o	o	o			o
Black vulture	*Coragyps atratus*	●	o	o[1]			
Black-and-white warbler	*Mniotilta varia*	o	o	o		o	o
Black-bellied plover	*Pluvialis squatarola*	o					o
Black-bellied whistling-duck	*Dendrocygna autumnalis*	o	o	o			
Black-billed cuckoo	*Coccyzus erythropthalmus*		o	o			
Black-billed magpie	*Pica hudsonia*			o		o	
Blackburnian warbler	*Dendroica fusca*		o	o			
Black-capped vireo	*Vireo atricapilla*		o	o			
Black-chinned hummingbird	*Archilochus alexandri*	o	●	●	●	●	o
Black-chinned sparrow	*Spizella atrogularis*		o	●	o	●	o
Black-crested titmouse	*Baeolophus atricristatus*	o	o		●	o[1]	
Black-crowned night-heron	*Nycticorax nycticorax*	o	o	o			o
Black-headed grosbeak	*Pheucticus melanocephalus*		o	o	●	●	o
Black-legged kittiwake	*Rissa tridactyla*		o				
Black-necked stilt	*Himantopus mexicanus*	o	o	o			o
Blackpoll warbler	*Dendroica striata*		o	o			
Black-tailed gnatcatcher	*Polioptila melanura*	●	●	●		●	●
Black-throated blue warbler	*Dendroica caerulescens*	o	o	o		o	o
Black-throated gray warbler	*Dendroica nigrescens*		o	o		o	o
Black-throated green warbler	*Dendroica virens*		o	o		o[1]	
Black-throated sparrow	*Amphispiza bilineata*	●	●	●	●	●	●
Black-vented oriole	*Icterus wagleri*		o				
Blue grosbeak	*Passerina caerulea*	●	●	●	●	●	●
Blue jay	*Cyanocitta cristata*		o	o		o	
Blue-gray gnatcatcher	*Polioptila caerulea*	o	●	o	o	●	o
Blue-headed vireo	*Vireo solitarius*		o	o		o	
Blue-throated hummingbird	*Lampornis clemenciae*	o[1]	o	o		o	
Blue-winged teal	*Anas discors*	o	o	o		o[1]	o
Blue-winged warbler	*Vermivora cyanoptera*		o	o			

● = species detected in 2010 survey

o = species not detected in 2010 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] = species is probably present in the park

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Bobolink	*Dolichonyx oryzivorus*			o			
Bonaparte's gull	*Chroicocephalus philadelphia*	o	o				o
Brewer's blackbird	*Euphagus cyanocephalus*	o	o	o	o	o	o
Brewer's sparrow	*Spizella breweri*	o	●	o	o	o	●
Broad-billed hummingbird	*Cynanthus latirostris*		o	o		o	
Broad-tailed hummingbird	*Selasphorus platycercus*		●	o	o	●	o
Broad-winged hawk	*Buteo platypterus*		o	o			
Bronzed cowbird	*Molothrus aeneus*	o	o	o	o	o	o
Brown creeper	*Certhia americana*		o	o		o	o
Brown pelican	*Pelecanus occidentalis*	o	o				o
Brown thrasher	*Toxostoma rufum*	o[1]	o	o	o[1]	o	o
Brown-crested flycatcher	*Myiarchus tyrannulus*	●	●				
Brown-headed cowbird	*Molothrus ater*	●	●	●	●	●	o
Bufflehead	*Bucephala albeola*	o	o	o			o
Bullock's oriole	*Icterus bullockii*	o	o	o	o		o
Burrowing owl	*Athene cunicularia*	o	o	o		●	o
Bushtit	*Psaltriparus minimus*	o	o	o	o	o	
Cactus wren	*Campylorhynchus brunneicapillus*	●	●	●	●	●	o
Calliope hummingbird	*Stellula calliope*		o	o		o	
Canada goose	*Branta canadensis*		o	o		o[1]	o
Canada warbler	*Wilsonia canadensis*		o	o			
Canvasback	*Aythya valisineria*	o	o	o			o
Canyon towhee	*Melozone fusca*	●	●	●	●	●	o
Canyon wren	*Catherpes mexicanus*	●	●	●	●	●	
Cape May warbler	*Dendroica tigrina*		o	o			
Carolina wren	*Thryothorus ludovicianus*	●	●	o		o	
Caspian tern	*Hydroprogne caspia*	o					
Cassin's finch	*Carpodacus cassinii*		o	o	o	o	o
Cassin's kingbird	*Tyrannus vociferans*		o	●	●	●	o
Cassin's sparrow	*Peucaea cassinii*	●	●	●	o	●	●
Cassin's vireo	*Vireo cassinii*		o	o		o	
Cattle egret	*Bubulcus ibis*	o	o	o		o	o
Cave swallow	*Petrochelidon fulva*		o	●			
Cedar waxwing	*Bombycilla cedrorum*	o	o	o	o	o	o

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Cerulean warbler	*Dendroica cerulea*		o	o			
Chestnut-collared longspur	*Calcarius ornatus*	o	o	o		o	o
Chestnut-sided warbler	*Dendroica pensylvanica*		o	o		o	o
Chihuahuan raven	*Corvus cryptoleucus*	●	●	●	●	o	●
Chimney swift	*Chaetura pelagica*	o	o	o			
Chipping sparrow	*Spizella passerina*	o	●	o	o	o	o
Cinnamon teal	*Anas cyanoptera*	o	o	o		o[1]	o
Clark's grebe	*Aechmophorus clarkii*	o					
Clark's nutcracker	*Nucifraga columbiana*		o	o		o	
Clay-colored sparrow	*Spizella pallida*	o	o	o	o	o	o
Clay-colored thrush	*Turdus grayi*		o				
Cliff swallow	*Petrochelidon pyrrhonota*	●	●	●	●	o	o
Colima warbler	*Oreothlypis crissalis*		o			o	
Common black-hawk	*Buteogallus anthracinus*	o[1]	o	o	o	o	
Common goldeneye	*Bucephala clangula*		o	o			
Common grackle	*Quiscalus quiscula*	o[1]	o	o		o	o
Common ground-dove	*Columbina passerina*	●	●	o			
Common loon	*Gavia immer*	o	o				o
Common merganser	*Mergus merganser*	o[1]	o	o		o[1]	o
Common moorhen	*Gallinula chloropus*		o	o			
Common nighthawk	*Chordeiles minor*	●	●	●	o	●	o
Common poorwill	*Phalaenoptilus nuttallii*	o	o	o		●	o
Common raven	*Corvus corax*	o	o	o	o	o	o
Common yellowthroat	*Geothlypis trichas*	●	●	o		o	o
Connecticut warbler	*Oporornis agilis*			o			
Cooper's hawk	*Accipiter cooperii*	o	o	o	o	o	o
Cordilleran flycatcher	*Empidonax occidentalis*		o	o	o	●	o
Costa's hummingbird	*Calypte costae*		o	o[1]			
Couch's kingbird	*Tyrannus couchii*	o	o				
Crescent-chested warbler	*Oreothlypis superciliosa*		o				

● = species detected in 2010 survey

o = species not detected in 2010 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] = species is probably present in the park

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Crested caracara	*Caracara cheriway*	o	o				
Crissal thrasher	*Toxostoma crissale*		●	o		●	o
Curve-billed thrasher	*Toxostoma curvirostre*	o	●	o	o	●	o
Dark-eyed junco	*Junco hyemalis*		o	o	o	o	o
Dickcissel	*Spiza americana*	o	o	o			o
Double-crested cormorant	*Phalacrocorax auritus*	●	o	o			
Downy woodpecker	*Picoides pubescens*			o		o	
Dunlin	*Calidris alpina*		o				
Dusky flycatcher	*Empidonax oberholseri*		o	o	o	o	o
Dusky-capped flycatcher	*Myiarchus tuberculifer*		o	o			
Eared grebe	*Podiceps nigricollis*	o	o	o			o
Eastern bluebird	*Sialia sialis*		o	o		o	
Eastern kingbird	*Tyrannus tyrannus*		o	o	o[1]		
Eastern meadowlark	*Sturnella magna*	o	o	o	o	o	o
Eastern phoebe	*Sayornis phoebe*	o	o	o			
Eastern screech-owl	Megascops asio	o	o	o[1]			
Eastern towhee	*Pipilo erythrophthalmus*			o		o	
Eastern wood-pewee	*Contopus virens*	o	o	o			
Elegant trogon	*Trogon elegans*		o				
Elf owl	*Micrathene whitneyi*	o	o	o		o	
Eurasian collared-dove	*Streptopelia decaocto*	●	o	o	o		o
Eurasian wigeon	*Anas penelope*	o					
European starling	*Sturnus vulgaris*		o	o	o	o	o
Evening grosbeak	*Coccothraustes vespertinus*		o	o		o	o
Fan-tailed warbler	*Euthlypis lachrymosa*		o				
Ferruginous hawk	*Buteo regalis*	o	o	o		o	o
Ferruginous pygmy-owl	*Glaucidium brasilianum*		o				
Field sparrow	*Spizella pusilla*	o	o	o		o	
Flame-colored tanager	*Piranga bidentata*		o				
Flammulated owl	*Otus flammeolus*		o	o		o	
Forster's tern	*Sterna forsteri*	o	o				o
Fox sparrow	*Passerella iliaca*	o	o	o		o[1]	
Franklin's gull	*Leucophaeus pipixcan*	o	o				o
Gadwall	*Anas strepera*	o	o	o		o[1]	o

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Gambel's quail	*Callipepla gambelii*		o			o	o
Golden eagle	*Aquila chrysaetos*	o	o	o	o	●	o
Golden-cheeked warbler	*Dendroica chrysoparia*		o				
Golden-crowned kinglet	*Regulus satrapa*	o	o	o		o	
Golden-crowned sparrow	*Zonotrichia atricapilla*		o	o		o	
Golden-fronted woodpecker	*Melanerpes aurifrons*	●	●				
Golden-winged warbler	*Vermivora chrysoptera*		o	o			
Grace's warbler	*Dendroica graciae*		o	o		o	
Grasshopper sparrow	*Ammodramus savannarum*	o	o	o	o	o	
Gray catbird	*Dumetella carolinensis*		o	o		o	o
Gray flycatcher	*Empidonax wrightii*		o	o	o	o	o
Gray hawk	*Buteo nitidus*		o	●	o	o[1]	
Gray vireo	*Vireo vicinior*		●	o		o	o
Gray-cheeked thrush	*Catharus minimus*		o	o			o
Great blue heron	*Ardea herodias*	●	o	o	o	o	o
Great crested flycatcher	*Myiarchus crinitus*		o	o			
Great egret	*Ardea alba*	●	o	o		o	o
Great horned owl	*Bubo virginianus*	o	●	o	o	o	o
Great kiskadee	*Pitangus sulphuratus*	o	o	o			
Greater pewee	*Contopus pertinax*		o	o		o	
Greater roadrunner	*Geococcyx californianus*	o	●	o	o	●	o
Greater white-fronted goose	*Anser albifrons*	o	o				
Greater yellowlegs	*Tringa melanoleuca*	o	o	o			o
Great-tailed grackle	*Quiscalus mexicanus*	●	o	o		o	o
Green heron	*Butorides virescens*	●	o	o			o
Green kingfisher	*Chloroceryle americana*	o	o				
Green-tailed towhee	*Pipilo chlorurus*	o	●	o	o	o	o
Green-winged teal	*Anas crecca*	o	o	o		o	o
Groove-billed ani	*Crotophaga sulcirostris*	●	o	o			
Gull-billed tern	*Gelochelidon nilotica*	o					

● = species detected in 2010 survey

o = species not detected in 2010 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] = species is probably present in the park

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Hairy woodpecker	*Picoides villosus*			o		o	
Hammond's flycatcher	*Empidonax hammondii*		o	o		o	
Harris's hawk	*Parabuteo unicinctus*	o	o	o		o	
Harris's sparrow	*Zonotrichia querula*		o	o			o
Hepatic tanager	*Piranga flava*		o	o	o	●	o
Hermit thrush	*Catharus guttatus*	o	o	o	o	o	o
Hermit warbler	*Dendroica occidentalis*		o	o		o	
Herring gull	*Larus argentatus*	o				o	
Hooded merganser	*Lophodytes cucullatus*	o	o	o			
Hooded oriole	*Icterus cucullatus*	●	●	o		o	o
Hooded warbler	*Wilsonia citrina*		o	o		o	o
Horned grebe	*Podiceps auritus*	o					o
Horned lark	*Eremophila alpestris*	o	o	o	o	●	o
House finch	*Carpodacus mexicanus*	●	●	●	●	●	o
House sparrow	*Passer domesticus*	o	●	o	●	o	o
House wren	*Troglodytes aedon*	o	o	o	o	o	o
Hutton's vireo	*Vireo huttoni*		o	o		o	
Inca dove	*Columbina inca*	o	o	o		o[1]	o
Indigo bunting	*Passerina cyanea*	o	●	●	o	o	o
Interior least tern	*Sterna antillarum athalassos*	o					
Juniper titmouse	*Baeolophus ridgwayi*			o		o	
Kentucky warbler	*Oporornis formosus*		o	o		o	o
Killdeer	*Charadrius vociferus*	●		●	o		
King rail	*Rallus elegans*		o				
Ladder-backed woodpecker	*Picoides scalaris*	●	●	●	●	●	o
Lark bunting	*Calamospiza melanocorys*	o	o	o	o	o	o
Lark sparrow	*Chondestes grammacus*	●	o	o	●	o	o
Laughing gull	*Leucophaeus atricilla*	o	o				
Lawrence's goldfinch	*Spinus lawrencei*					o	
Lazuli bunting	*Passerina amoena*		o	o		o	o
Le Conte's sparrow	*Ammodramus leconteii*	o	o	o			
Least bittern	*Ixobrychus exilis*		o	o			
Least flycatcher	*Empidonax minimus*	o	o	o			
Least grebe	*Tachybaptus dominicus*		o				

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Least sandpiper	*Calidris minutilla*	o	o	o			o
Least tern	*Sterna antillarum*		o				o
Lesser goldfinch	*Spinus psaltria*	o	●	●	●	●	o
Lesser nighthawk	*Chordeiles acutipennis*	●	●	●		●	●
Lesser prairie-chicken	*Tympanuchus pallidicinctus*			o			
Lesser scaup	*Aythya affinis*	o	o	o			o
Lesser yellowlegs	*Tringa flavipes*	o	o	o			o
Lewis's woodpecker	*Melanerpes lewis*		o	o		o	
Lincoln's sparrow	*Melospiza lincolnii*	o	o	o	o	o	o
Little blue heron	*Egretta caerulea*	o	o				
Loggerhead shrike	*Lanius ludovicianus*	o	●	o	o	●	o
Long-billed curlew	*Numenius americanus*	o	o	o		o[1]	o
Long-billed dowitcher	*Limnodromus scolopaceus*	o	o	o			o
Long-billed thrasher	*Toxostoma longirostre*	o	o	o			
Long-eared owl	*Asio otus*		o	o		o[1]	
Louisiana waterthrush	*Parkesia motacilla*	o[1]	o	o			
Lucifer hummingbird	*Calothorax lucifer*		o	o			
Lucy's warbler	*Oreothlypis luciae*		●	o			o
MacGillivray's warbler	*Oporornis tolmiei*	o	o	o	o	o	o
Magnificent hummingbird	*Eugenes fulgens*		o	o		o	
Magnolia warbler	*Dendroica magnolia*		o	o			
Mallard	*Anas platyrhynchos*	●	●	o		o	o
Marbled godwit	*Limosa fedoa*						o
Marsh wren	*Cistothorus palustris*	o	o	o		o	o
Mccown's longspur	*Rhynchophanes mccownii*	o		o		o[1]	
Merlin	*Falco columbarius*	o	o	o		o	o
Mexican jay	*Aphelocoma ultramarina*		o				
Mexican spotted owl	*Strix occidentalis lucida*					o	
Mississippi kite	*Ictinia mississippiensis*	o[1]	o	o			
Montezuma quail	*Cyrtonyx montezumae*		o	o	o	o	

● = species detected in 2010 survey

o = species not detected in 2010 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] = species is probably present in the park

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Mountain bluebird	*Sialia currucoides*	o	o	o	o	o	o
Mountain chickadee	*Poecile gambeli*		o	o		o	o
Mourning dove	*Zenaida macroura*	●	●	●	●	●	●
Mourning warbler	*Oporornis philadelphia*		o				
Nashville warbler	*Oreothlypis ruficapilla*	o	o	o	o[1]	o	o
Neotropic cormorant	*Phalacrocorax brasilianus*	o	o	o			
Northern beardless-tyrannulet	*Camptostoma imberbe*			o			
Northern bobwhite	*Colinus virginianus*	●		o		o	
Northern cardinal	*Cardinalis cardinalis*	●	●	●	●	●	
Northern flicker	*Colaptes auratus*	o	o	o	o	o	o
Northern goshawk	*Accipiter gentilis*		o	o		o	
Northern harrier	*Circus cyaneus*	o	●	o	o	o	o
Northern mockingbird	*Mimus polyglottos*	●	●	●	●	●	●
Northern parula	*Parula americana*		o	o		o	o
Northern pintail	*Anas acuta*	o	o	o			o
Northern pygmy-owl	*Glaucidium gnoma*		o			o	
Northern rough-winged swallow	*Stelgidopteryx serripennis*	o	●	o		o	o
Northern saw-whet owl	*Aegolius acadicus*		o			o	
Northern shoveler	*Anas clypeata*	o	o	o		o[1]	o
Northern shrike	Lanius excubitor					o	
Northern waterthrush	*Parkesia noveboracensis*		o	o		o	o
Olive sparrow	*Arremonops rufivirgatus*	o					
Olive warbler	*Peucedramus taeniatus*		o				
Olive-sided flycatcher	*Contopus cooperi*		o	o	o	o	o
Orange-crowned warbler	*Oreothlypis celata*	o	o	o	o	o	o
Orchard oriole	*Icterus spurius*	●	●	●	o	o[1]	o
Osprey	*Pandion haliaetus*	o	o	o		o	
Ovenbird	*Seiurus aurocapilla*		o	o		o[1]	o
Pacific loon	*Gavia pacifica*	o					
Pacific-slope flycatcher	*Empidonax difficilis*			o[1]		o	
Painted bunting	*Passerina ciris*	●	●	●	o		o
Painted redstart	*Myioborus pictus*		o	o		o	
Palm warbler	*Dendroica palmarum*		o	o			o
Pectoral sandpiper	*Calidris melanotos*		o				

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Peregrine falcon	*Falco peregrinus*	o	●	o		●	o
Phainopepla	*Phainopepla nitens*		o	o	●	o	o
Philadelphia vireo	*Vireo philadelphicus*		o	o			
Pied-billed grebe	*Podilymbus podiceps*	o	o	o		o[1]	o
Pine grosbeak	*Pinicola enucleator*					o	
Pine siskin	*Spinus pinus*		o	o	o	o	o
Pine warbler	*Dendroica pinus*		o	o		o[1]	
Pinyon jay	*Gymnorhinus cyanocephalus*		o	o		o	
Piratic flycatcher	*Legatus leucophaius*		o	o			
Plumbeous vireo	Vireo plumbeus		o	o		●	o
Prairie falcon	*Falco mexicanus*		o	o	o[1]	o	o
Prairie warbler	*Dendroica discolor*		o	o			
Prothonotary warbler	*Protonotaria citrea*		o	o			
Purple finch	*Carpodacus purpureus*		o	o		o	
Purple gallinule	*Porphyrio martinica*		o				
Purple martin	*Progne subis*	o	o	o		o	o
Pygmy nuthatch	*Sitta pygmaea*		o	o		o	
Pyrrhuloxia	*Cardinalis sinuatus*	●	●	●	o	●	●
Red crossbill	*Loxia curvirostra*		o	o		o	
Red-bellied woodpecker	*Melanerpes carolinus*			o			
Red-breasted merganser	*Mergus serrator*	o	o				
Red-breasted nuthatch	*Sitta canadensis*		o	o	o	o	o
Reddish egret	*Egretta rufescens*	o	o				
Red-eyed vireo	*Vireo olivaceus*		o	o		o	o
Red-faced warbler	*Cardellina rubrifrons*		o	o		o	
Redhead	*Aythya americana*	o	o	o			o
Red-headed woodpecker	*Melanerpes erythrocephalus*		o	o		o[1]	o
Red-naped sapsucker	*Sphyrapicus nuchalis*		o	o		o	o
Red-necked phalarope	*Phalaropus lobatus*			o			o
Red-shouldered hawk	*Buteo lineatus*	o	o	o			

● = species detected in 2010 survey

o = species not detected in 2010 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] = species is probably present in the park

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Red-tailed hawk	*Buteo jamaicensis*	●	●	o	●	●	o
Red-throated loon	*Gavia stellata*	o[1]					
Red-winged blackbird	*Agelaius phoeniceus*	●	o	o		o	o
Ring-billed gull	*Larus delawarensis*	o	o	o		o	o
Ringed kingfisher	*Megaceryle torquata*	o					
Ringed turtle-dove	*Streptopelia risoria*			o[1]			
Ring-necked duck	*Aythya collaris*	o	o	o		o	o
Ring-necked pheasant	*Phasianus colchicus*			o		o	
Rock pigeon	*Columba livia*	o	o	o		o	o
Rock wren	*Salpinctes obsoletus*	●	●	●	●	●	o
Roseate spoonbill	*Platalea ajaja*	o	o				
Rose-breasted grosbeak	*Pheucticus ludovicianus*		o	o		o	o
Rose-throated becard	*Pachyramphus aglaiae*		o				
Ross's goose	*Chen rossii*		o				
Rough-legged hawk	*Buteo lagopus*		o	o	o[1]	o	o
Royal tern	*Thalasseus maximus*	o					
Ruby-crowned kinglet	*Regulus calendula*	o	o	o	o	o	o
Ruby-throated hummingbird	*Archilochus colubris*	o	o			o	
Ruddy duck	*Oxyura jamaicensis*	o	o	o			o
Ruddy ground-dove	*Columbina talpacoti*		o	o			
Rufous hummingbird	*Selasphorus rufus*	o[1]	o	o	o	o	o
Rufous-backed robin	*Turdus rufopalliatus*		o				
Rufous-capped warbler	*Basileuterus rufifrons*	o	o				
Rufous-crowned sparrow	*Aimophila ruficeps*	●	●	●	●	●	o
Rusty blackbird	*Euphagus carolinus*		o	o			
Sage sparrow	*Amphispiza belli*		o	o		o	o
Sage thrasher	*Oreoscoptes montanus*	o	o	o		o	o
Sanderling	*Calidris alba*						o
Sandhill crane	*Grus canadensis*	o	o	o		o	o
Savannah sparrow	*Passerculus sandwichensis*	o	o	o	o	o	o
Say's phoebe	*Sayornis saya*	●	●	●	●	●	o
Scaled quail	*Callipepla squamata*	●	●	●	o	●	●
Scarlet tanager	*Piranga olivacea*		o	o		o	o
Scissor-tailed flycatcher	*Tyrannus forficatus*	●	●	o	o[1]	o[1]	o

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Scott's oriole	*Icterus parisorum*	●	●	●	●	●	●
Sedge wren	*Cistothorus platensis*	o	o	o			
Semipalmated plover	*Charadrius semipalmatus*	o					o
Semipalmated sandpiper	*Calidris pusilla*	o		o			o
Sharp-shinned hawk	*Accipiter striatus*	o	o	o	o	o	o
Short-billed dowitcher	*Limnodromus griseus*	o[1]					
Short-eared owl	*Asio flammeus*		o	o			o
Short-tailed hawk	*Buteo brachyurus*		o	o			
Slate-throated redstart	*Myioborus miniatus*		o				
Smith's longspur	*Calcarius pictus*		o				
Snow bunting	*Plectrophenax nivalis*		o				
Snow goose	*Chen caerulescens*	o	o	o		o[1]	o
Snowy egret	*Egretta thula*	●	o	o		o	o
Snowy plover	*Charadrius alexandrinus*	o					o
Solitary sandpiper	*Tringa solitaria*	o	o	o			o
Song sparrow	*Melospiza melodia*	o	o	o	o	o	o
Sora	*Porzana carolina*	o	o	o			o
Spotted owl	*Strix occidentalis*			o			
Spotted sandpiper	*Actitis macularius*	o	o	o		o	o
Spotted towhee	*Pipilo maculatus*	o	o	o	o	●	o
Sprague's pipit	*Anthus spragueii*	o	o	o			
Steller's jay	*Cyanocitta stelleri*		o	o	o	o	
Stilt sandpiper	*Calidris himantopus*						o
Sulphur-bellied flycatcher	*Myiodynastes luteiventris*		o				
Summer tanager	*Piranga rubra*	●	●	●	●	o	o
Swainson's thrush	*Catharus ustulatus*	o	o	o		o	o
Swainson's hawk	*Buteo swainsoni*	o	●	o	o	o	o
Swainson's warbler	*Limnothlypis swainsonii*		o	o			
Swallow-tailed kite	*Elanoides forficatus*		o				
Swamp sparrow	*Melospiza georgiana*	o	o	o		o	
Tennessee warbler	*Oreothlypis peregrina*		o	o			

● = species detected in 2010 survey

o = species not detected in 2010 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] = species is probably present in the park

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Thick-billed kingbird	*Tyrannus crassirostris*		o	o			
Townsend's solitaire	*Myadestes townsendi*		o	o	o	o	o
Townsend's warbler	*Dendroica townsendi*		o	o	o	o	o
Tree swallow	*Tachycineta bicolor*	o	o	o			o
Tricolored heron	*Egretta tricolor*	o	o	o		o[1]	
Tropical kingbird	*Tyrannus melancholicus*		o				
Tropical parula	*Parula pitiayumi*		o	o			
Tufted flycatcher	*Mitrephanes phaeocercus*		o				
Tundra swan	*Cygnus columbianus*		o	o			
Turkey vulture	*Cathartes aura*	●	●	●	●	●	o
Upland sandpiper	*Bartramia longicauda*	o	o	o			
Varied bunting	*Passerina versicolor*	o	●	o		o[1]	
Varied thrush	*Ixoreus naevius*		o	o		o	
Veery	*Catharus fuscescens*		o				
Verdin	*Auriparus flaviceps*	o	●	●	●	●	●
Vermilion flycatcher	*Pyrocephalus rubinus*	●	o	●	o	o	o
Vesper sparrow	*Pooecetes gramineus*	o	o	o	o	o	o
Violet-crowned hummingbird	*Amazilia violiceps*	o	o				
Violet-green swallow	*Tachycineta thalassina*		o	●	o	●	o
Virginia rail	*Rallus limicola*	o	o	o			o
Virginia's warbler	*Oreothlypis virginiae*		o	o		o	o
Warbling vireo	*Vireo gilvus*		o	o		●	o
Western bluebird	*Sialia mexicana*		o	o	o	o	o
Western grebe	*Aechmophorus occidentalis*	o		o			o
Western kingbird	*Tyrannus verticalis*	●	●	●	o	●	o
Western meadowlark	*Sturnella neglecta*	o	o	o	o	o	o
Western sandpiper	*Calidris mauri*	o	o	o			o
Western screech-owl	*Megascops kennicottii*	o	o	o		o	o
Western scrub-jay	*Aphelocoma californica*		o	o	o	●	o
Western tanager	*Piranga ludoviciana*	o	o	o	o	●	o
Western wood-pewee	*Contopus sordidulus*	o[1]	●	o	o	●	o
Whimbrel	*Numenius phaeopus*		o				
Whip-poor-will	*Caprimulgus vociferus*		o	o		o	
White ibis	*Eudocimus albus*		o	o		o[1]	

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
White-breasted nuthatch	*Sitta carolinensis*		o	o		●	
White-crowned sparrow	*Zonotrichia leucophrys*	o	o	o	o	o	o
White-eared hummingbird	*Hylocharis leucotis*		o			o	
White-eyed vireo	*Vireo griseus*	o	o	o		o[1]	
White-faced ibis	*Plegadis chihi*	o	o	o			o
White-rumped sandpiper	*Calidris fuscicollis*						o
White-tailed hawk	*Buteo albicaudatus*		o				
White-tailed kite	*Elanus leucurus*		o	o			
White-throated sparrow	*Zonotrichia albicollis*		o	o	o	o	o
White-throated swift	*Aeronautes saxatalis*	●	o	o	o	●	o
White-tipped dove	*Leptotila verreauxi*		o				
White-winged dove	*Zenaida asiatica*	●	●	●	●	●	o
Wild turkey	*Meleagris gallopavo*	●	o	●		o	
Willet	*Tringa semipalmata*	o	o	o			o
Williamson's sapsucker	*Sphyrapicus thyroideus*		o	o		o	o
Willow flycatcher	*Empidonax traillii*		o	o			o
Wilson's phalarope	*Phalaropus tricolor*	o	o	o			o
Wilson's snipe	*Gallinago delicata*	o	o	o		o	o
Wilson's warbler	*Wilsonia pusilla*	o	o	o	o	o	o
Winter wren	*Troglodytes hiemalis*	o	o	o		o	
Wood duck	*Aix sponsa*	o	o	o		o	
Wood thrush	*Hylocichla mustelina*		o				o
Worm-eating warbler	*Helmitheros vermivorum*	o	o	o		o	o
Yellow rail	*Coturnicops noveboracensis*		o				
Yellow warbler	*Dendroica petechia*	o	o	o	o	o	o
Yellow-bellied flycatcher	*Empidonax flaviventris*		o				
Yellow-bellied sapsucker	*Sphyrapicus varius*		o	o		o	
Yellow-billed cuckoo	*Coccyzus americanus*	●	●	o	o	o[1]	
Yellow-breasted chat	*Icteria virens*	●	●	●		●	o
Yellow-crowned night-heron	*Nyctanassa violacea*	o	o	o			

● = species detected in 2010 survey

o = species not detected in 2010 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] = species is probably present in the park

Table 3-4. Parks where each species was detected through May–June 2010, cont.

Common name	Scientific name	AMIS	BIBE	CAVE	FODA	GUMO	WHSA
Yellow-eyed junco	*Junco phaeonotus*		o			o	
Yellow-green vireo	*Vireo flavoviridis*		o	o			
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	o	o	o	o	o	o
Yellow-rumped warbler	*Dendroica coronata*	o	●	o	o	o	o
Yellow-throated vireo	*Vireo flavifrons*	o	o	o		o	
Yellow-throated warbler	*Dendroica dominica*		o	o			o
Zone-tailed hawk	*Buteo albonotatus*	o	o	o	o	o	

● = species detected in 2010 survey

o = species not detected in 2010 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] = species is probably present in the park

3.1 Amistad National Recreation Area

3.1.1 2010 sampling

During May and June of 2010, we sampled 17 transects/grids at Amistad NRA (Figure 3.1.1-1, -2). Eight transects/grids were in the grassland habitat with 6 to 16 survey points each. Nine were in riparian habitat with 6 to 10 survey points each (Table 3.1.1). A total sample of 163 survey points was taken at Amistad NRA.

3.1.2 Results and discussion

During 2010, 2,908 birds of 62 species were counted at Amistad NRA (Table 3.1.2). Cliff swallow was the most commonly counted species (31%), followed by Cassin's sparrow (6%), turkey vulture (6%), and northern mockingbird (5%).

Desert scrub birds along with a host of birds associated with the dense riparian vegetation surrounding the lake were detected in Amistad NRA grassland transects. A typical transect included black-throated sparrow, cactus wren, Cassin's sparrow, northern bobwhite, and pyrrhuloxia. In close proximity were Bell's vireo, great-tailed grackle, northern cardinal, painted bunting, red-winged blackbird, and yellow-breasted chat. We detected abundant Cassin's and rufous-crowned sparrows in the desert scrub surrounding the lake.

Cassin's sparrow (*Aimophila cassinii*) was the second-most counted species at Amistad NRA in 2010.

We observed common and lesser nighthawks alongside each other on multiple transects. The riparian corridors were narrow to non-existent along the Rio Grande, but supported a good mix of birds including black vulture, brown-crested flycatcher, canyon wren, hooded oriole, orchard oriole, rock wren, scissor-tailed flycatcher, summer tanager, and white-throated swift. We detected a single peregrine falcon and common moorhen outside of a survey period along the Rio Grande.

Table 3.1.1. Habitat class, number of survey points, and sampling dates for each transect or grid at Amistad NRA, 2010

Transect/Grid	Habitat class	Survey points	# visits	Visit 1	Visit 2
CH-AM2	Grassland	10	1	6/5/2010	--
CH-AM3	Grassland	8	1	5/31/2010	--
CH-AM4	Grassland	6	1	5/24/2010	--
CH-AM5	Grassland	11	1	5/26/2010	--
CH-AM6	Grassland	14	1	5/29/2010	--
CH-AM7	Grassland	15	1	5/30/2010	--
CH-AM8	Grassland	15	1	6/6/2010	--
CH-AM9	Grassland	16	1	6/3/2010	--
CH-AMRI1	Riparian	8	1	5/28/2010	--
CH-AMRI3	Riparian	9	1	5/27/2010	--
CH-AMRI5	Riparian	6	1	6/1/2010	--
CH-AMRI7	Riparian	8	1	6/8/2010	--
CH-AMRI9	Riparian	6	1	6/11/2010	--
CH-AMRI13	Riparian	9	1	6/2/2010	--
CH-AMRI14	Riparian	6	1	6/10/2010	--
CH-AMRI18	Riparian	6	1	6/9/2010	--
CH-AMRI23	Riparian	10	1	6/4/2010	--

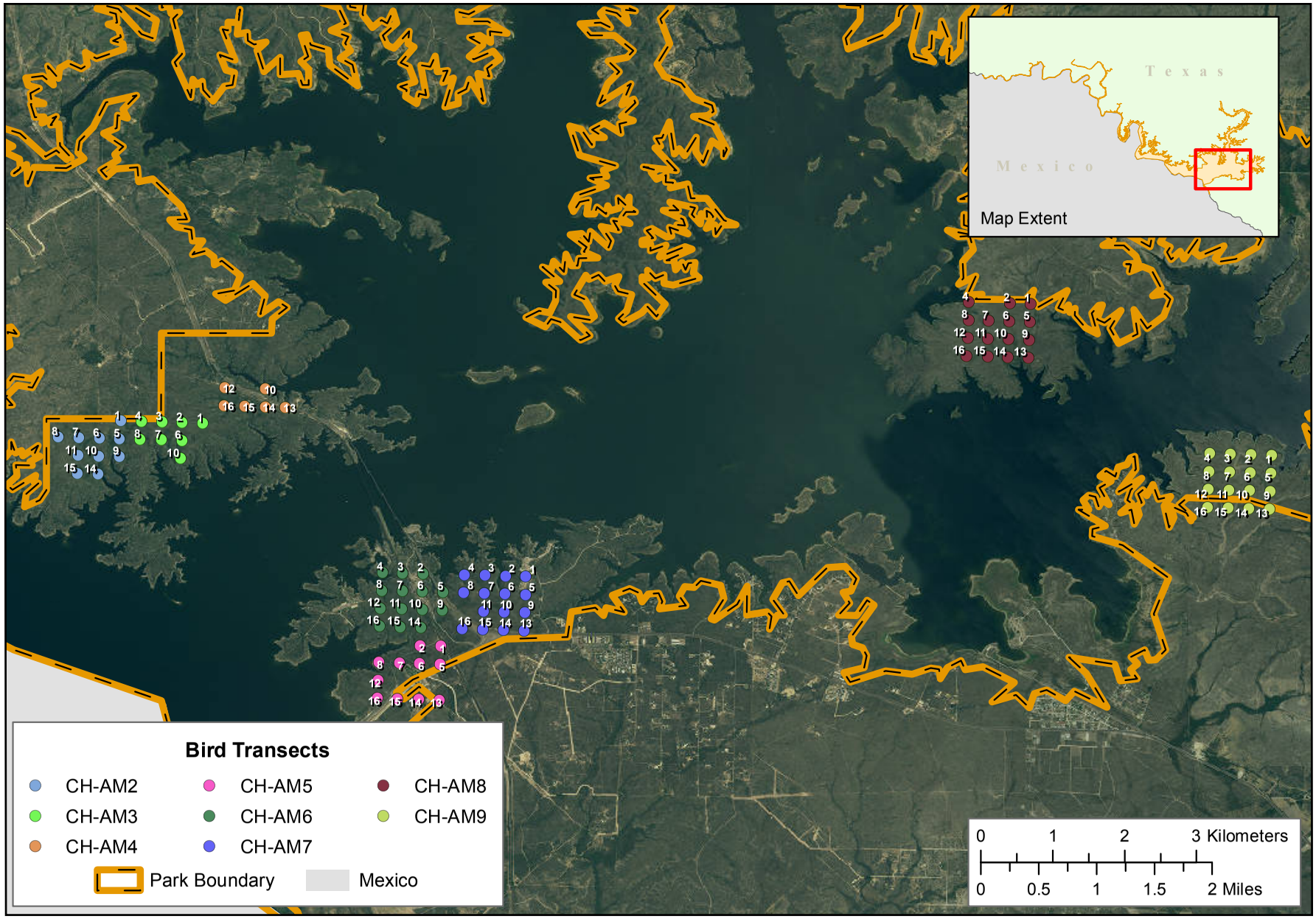

Figure 3.1.1-1. Point locations sampled at Amistad NRA, East, 2010.

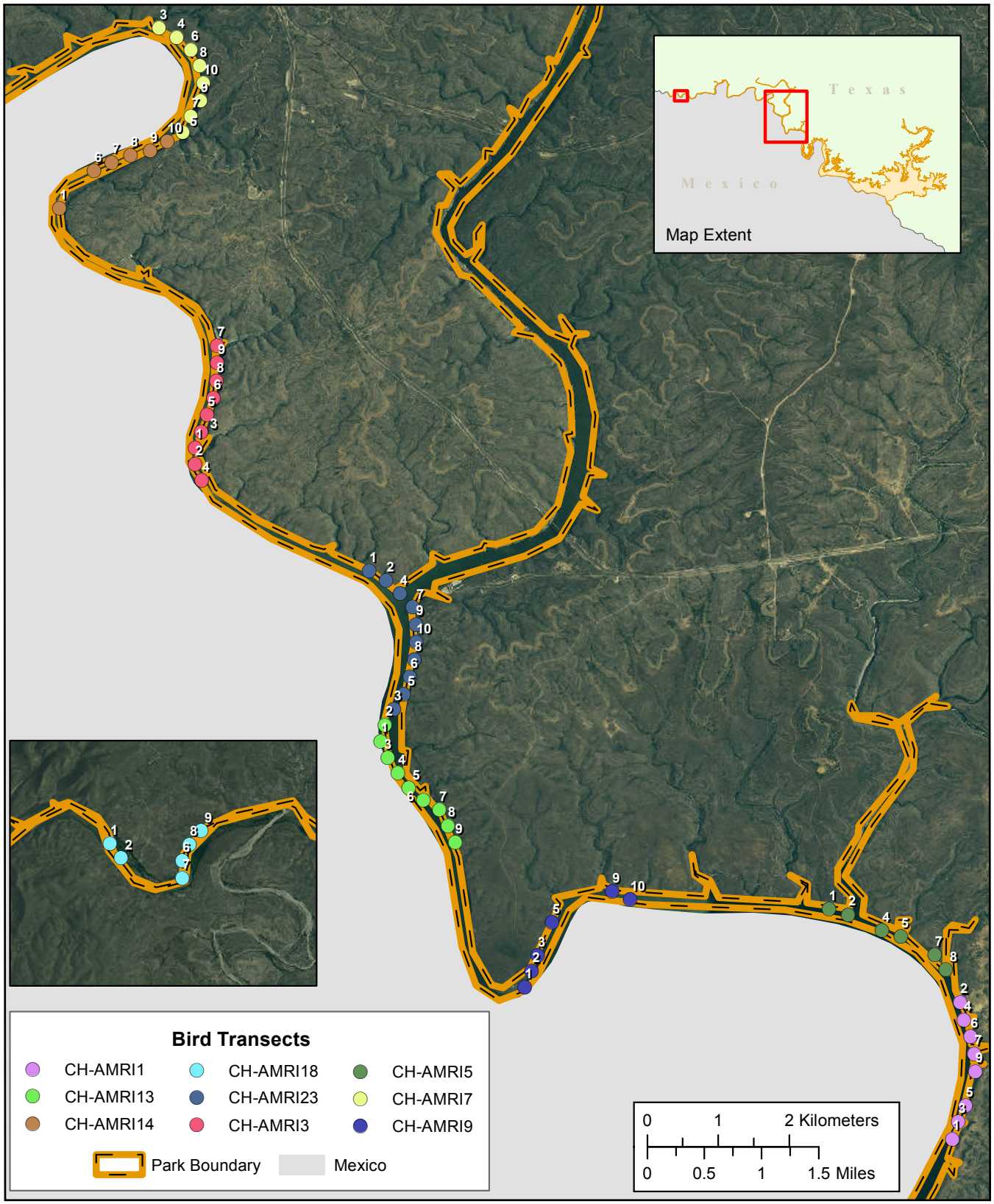

Figure 3.1.1-2. Point locations sampled at Amistad NRA, West, 2010.

Table 3.1.2 Number of birds detected of each species counted in each habitat class, Amistad NRA, 2010

Species	Habitat class		# of birds detected	
	Grassland	Riparian	Total	% of total
Cliff swallow	428	466	894	31%
Cassin's sparrow	151	29	180	6%
Turkey vulture	39	131	170	6%
Northern mockingbird	120	11	131	5%
Painted bunting	65	27	92	3%
White-throated swift	--	84	84	3%
Rufous-crowned sparrow	56	24	80	3%
Red-winged blackbird	14	62	76	3%
Cactus wren	53	20	73	3%
White-winged dove	28	43	71	2%
Canyon wren	--	70	70	2%
Black-throated sparrow	59	6	65	2%
Mourning dove	39	22	61	2%
Northern cardinal	47	11	58	2%
Great-tailed grackle	21	32	53	2%
Bell's vireo	31	14	45	2%
Scaled quail	45	--	45	2%
Northern bobwhite	35	1	36	1%
Brown-headed cowbird	31	2	33	1%
Pyrrhuloxia	31	1	32	1%
Yellow-breasted chat	6	26	32	1%
Black vulture	--	31	31	1%
Great blue heron	3	27	30	1%
Rock wren	--	30	30	1%
Blue grosbeak	16	6	22	1%
Barn swallow	19	--	19	1%
Common yellowthroat	--	19	19	1%
Ash-throated flycatcher	10	7	17	1%
Common ground-dove	10	4	14	0%
Summer tanager	--	14	14	0%
Hooded oriole	1	12	13	0%
Bewick's wren	12	--	12	0%
House finch	1	10	11	0%
Lesser nighthawk	11	--	11	0%
Eurasian collared-dove	9	--	9	0%
Golden-fronted woodpecker	2	6	8	0%
Yellow-billed cuckoo	5	3	8	0%
Black-tailed gnatcatcher	7	--	7	0%
Double-crested cormorant	--	7	7	0%
Vermilion flycatcher	3	2	5	0%
Black phoebe	--	4	4	0%

Table 3.1.2. Number of birds detected of each species in each habitat class, Amistad NRA, 2010, cont.

Species	Habitat class		# of birds detected	
	Grassland	Riparian	Total	% of total
Brown-crested flycatcher	--	4	4	0%
Lark sparrow	4	--	4	0%
Orchard oriole	--	4	4	0%
Canyon towhee	2	1	3	0%
Carolina wren	--	3	3	0%
Red-tailed hawk	--	3	3	0%
Scissor-tailed flycatcher	--	3	3	0%
Chihuahuan raven	1	1	2	0%
Great egret	1	1	2	0%
Groove-billed ani	--	2	2	0%
Killdeer	2	--	2	0%
Mallard	--	2	2	0%
Western kingbird	2	--	2	0%
American kestrel	--	1	1	0%
Common nighthawk	1	--	1	0%
Green heron	--	1	1	0%
Ladder-backed woodpecker	--	1	1	0%
Say's phoebe	--	1	1	0%
Scott's oriole	--	1	1	0%
Snowy egret	1	--	1	0%
Wild turkey	--	1	1	0%
Unidentified swallow	*33*	*65*	*98*	*3%*
Unidentified bird	*44*	*25*	*69*	*2%*
Unidentified dove	*6*	*1*	*7*	*0%*
Unidentified sparrow	*7*	*--*	*7*	*0%*
Unidentified hummingbird	*1*	*4*	*5*	*0%*
Unidentified duck	*3*	*1*	*4*	*0%*
Unidentified thrasher	*--*	*1*	*1*	*0%*
Unidentified woodpecker	*--*	*1*	*1*	*0%*
Total	**1,516**	**1,392**	**2,908**	**100%**

Note: Species are listed in rank order of detection, from the most to least commonly observed. Relative detectability among species has not been taken into account; thus, rank order provides only a general indication of relative abundance. Detectability will be explicitly accounted for in periodic synthesis reports.

3.2 Big Bend National Park

3.2.1 2010 sampling

During May and June of 2010, we sampled 28 transects/grids at Big Bend NP (Figure 3.2.1). Twenty transects/grids were in grassland habitat with 6 to 16 survey points each and eight were in riparian habitat with 6 to 8 points each, for a total sample of 309 points (Table 3.2.1).

3.2.2 Results and discussion

During 2010, 2,515 birds of 69 species were counted at Big Bend NP (Table 3.2.2). Black-throated sparrow was the most commonly counted species (15%). Also common were cactus wren (9%), northern mockingbird (8%), pyrrhuloxia (8%), and Bell's vireo (6%). Other prominent species were yellow-breasted chat (4%) and blue grosbeak (4%).

Pyrrhuloxia (*Cardinalis sinuatus*) was a commonly counted species at Big Bend NP in 2010.

This was the first park we visited in the CHDN. For the first two weeks of sampling, bird activity on the grassland transects was quite high. Black-throated sparrow, cactus wren, northern mockingbird, and pyrrhuloxia made up the vast majority of breeding birds detected on these transects. We also observed ash-throated flycatcher, black-tailed gnatcatcher, blue grosbeak, lesser nighthawk, and Scott's oriole on almost all of the grassland transects. A few late migrants were detected during this early period on the grassland transects including Brewer's sparrow, chipping sparrow, lark bunting, northern harrier, and yellow-rumped warbler. Highlights for these grassland areas include two varied buntings, a pair of scissor-tailed flycatchers at the western fringes of their breeding range and an unexpected abundance of birds usually associated with riparian areas found in the vast arroyo systems that covered the flatter parts of the park. These species include Bell's vireo, orchard oriole, painted bunting, and yellow-breasted chat. After the first two weeks of surveying temperatures began to reach into the 90s shortly after sunrise, and close to 115 degrees by midday almost every day. We noted a significant drop in bird activity on the grassland transects at this time.

The riparian areas along the Rio Grande were characterized by large thickets of mesquite and tamarisk alternating with sandy washes and patches of tall, impenetrable phragmites. Bird activity in these areas was quite high for most of our time at Big Bend NP despite the extreme heat. Common species included ash-throated flycatcher, Bell's vireo, blue grosbeak, brown-crested flycatcher, brown-headed cowbird, Carolina wren, common yellowthroat, northern cardinal, painted bunting, white-winged dove, and yellow-breasted chat. Highlights included a peregrine falcon near Mariscal Canyon, indigo bunting, vermillion flycatcher, and several singing male Lucy's warblers. Other interesting species found in the two riparian campgrounds but not on surveys include black vulture, common ground-dove, elf owl, golden-fronted woodpecker, gray hawk, Inca dove, orchard oriole, and western wood-pewee. Many of the riparian transects were very hard to access and we rarely were able to survey every point.

Table 3.2.1. Habitat class, number of survey points, and sampling dates for each transect or grid at Big Bend NP, 2010

Transect/Grid	Habitat class	Survey points	# visits	Visit 1	Visit 2
CH-BB1	Grassland	10	1	6/9/2010	--
CH-BB2	Grassland	16	1	5/12/2010	--
CH-BB3	Grassland	6	1	5/21/2010	--
CH-BB4	Grassland	16	1	6/3/2010	--
CH-BB5	Grassland	16	1	5/5/2010	--
CH-BB6	Grassland	16	1	5/12/2010	--
CH-BB7	Grassland	10	1	6/5/2010	--
CH-BB8	Grassland	13	1	5/13/2010	--
CH-BB9	Grassland	13	1	6/2/2010	--
CH-BB10	Grassland	16	1	5/29/2010	--
CH-BB11	Grassland	14	1	5/11/2010	--
CH-BB12	Grassland	13	1	5/15/2010	--
CH-BB13	Grassland	12	1	5/10/2010	--
CH-BB14	Grassland	10	1	6/4/2010	--
CH-BB15	Grassland	10	1	5/9/2010	--
CH-BB16	Grassland	6	1	6/6/2010	--
CH-BB17	Grassland	16	1	5/5/2010	--
CH-BB18	Grassland	10	1	5/10/2010	--
CH-BB19	Grassland	16	1	5/11/2010	--
CH-BB20	Grassland	12	1	5/13/2010	--
CH-BIRI1	Riparian	8	1	5/26/2010	--
CH-BIRI2	Riparian	8	1	5/17/2010	--
CH-BIRI3	Riparian	6	1	6/11/2010	--
CH-BIRI5	Riparian	8	1	5/19/2010	--
CH-BIRI6	Riparian	6	1	5/27/2010	--
CH-BIRI8	Riparian	6	1	6/1/2010	--
CH-BIRI9	Riparian	8	1	5/25/2010	--
CH-BIRI14	Riparian	8	1	6/10/2010	--

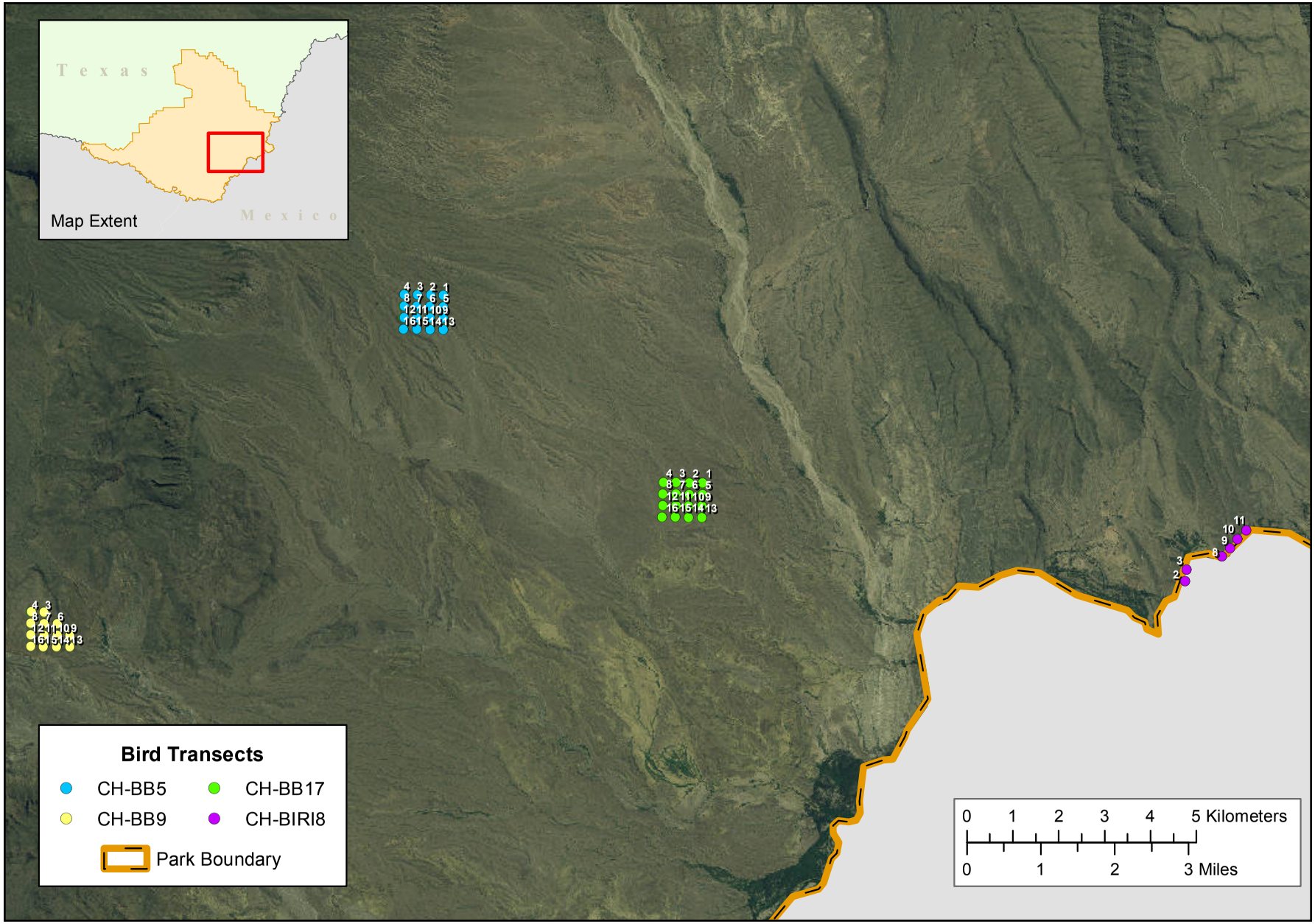

Figure 3.2.1-1. Point locations sampled at Big Bend NP, East, 2010.

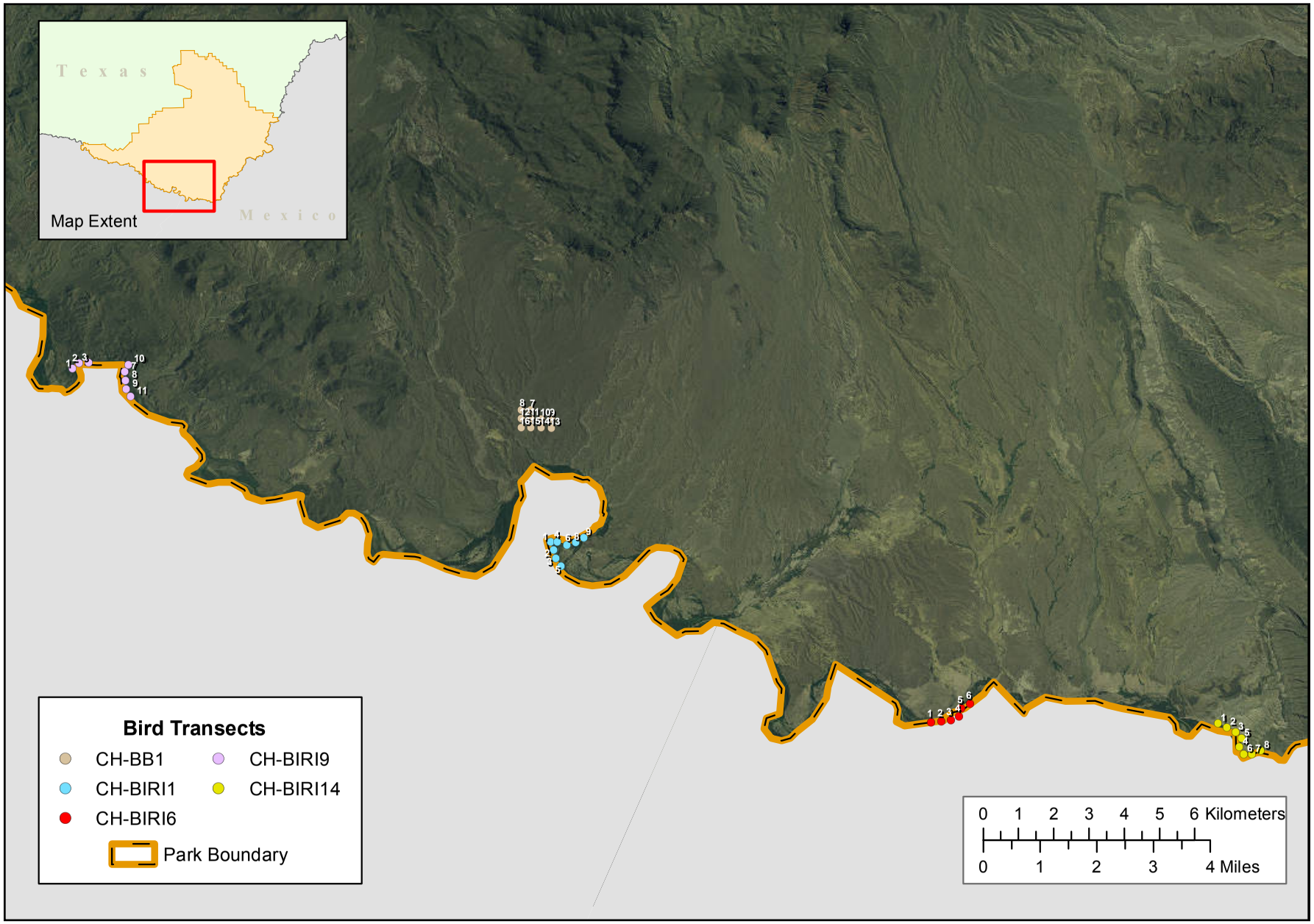

Figure 3.2.1-2. Point locations sampled at Big Bend NP, South, 2010.

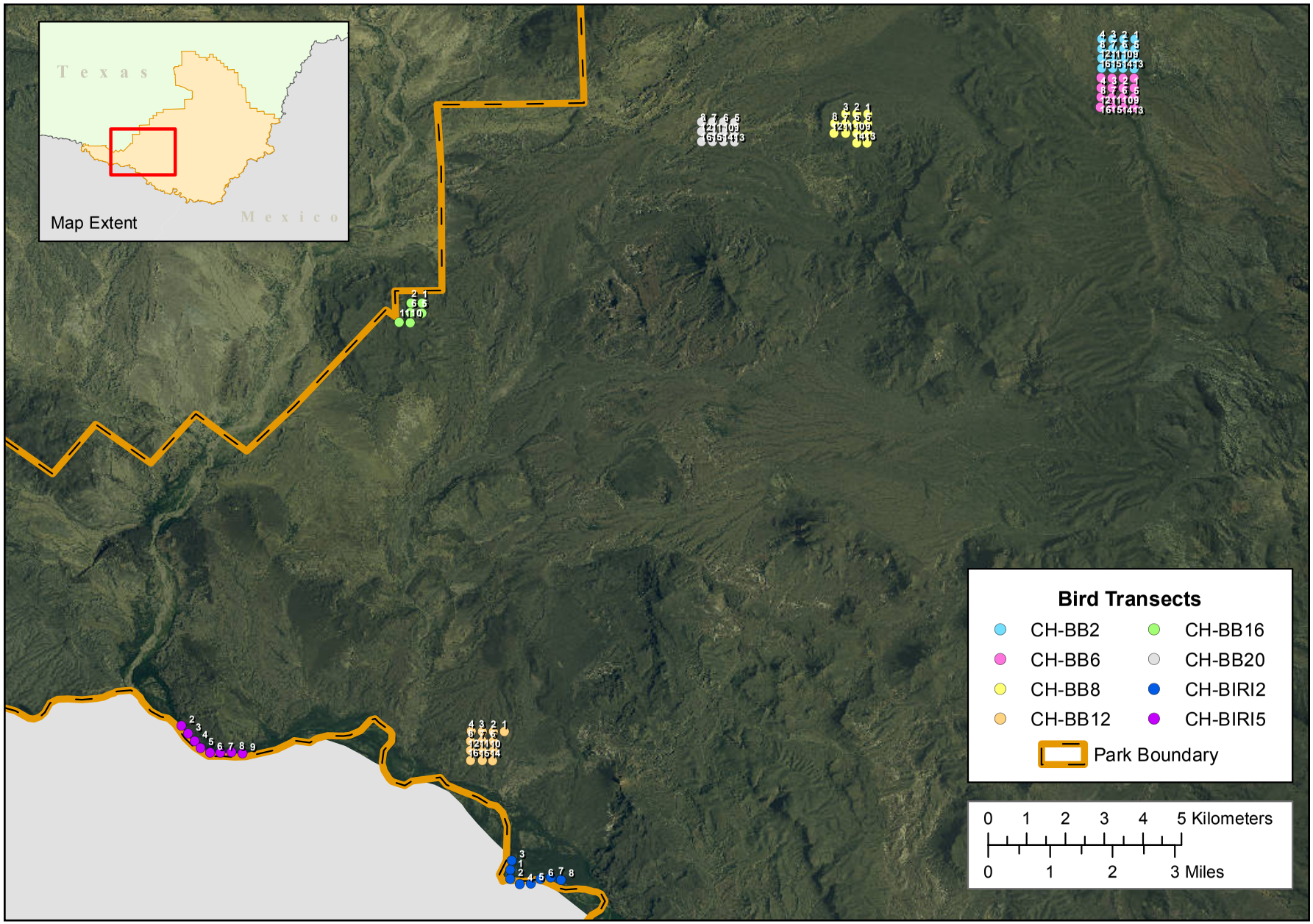

Figure 3.2.1-3. Point locations sampled at Big Bend NP, West, 2010.

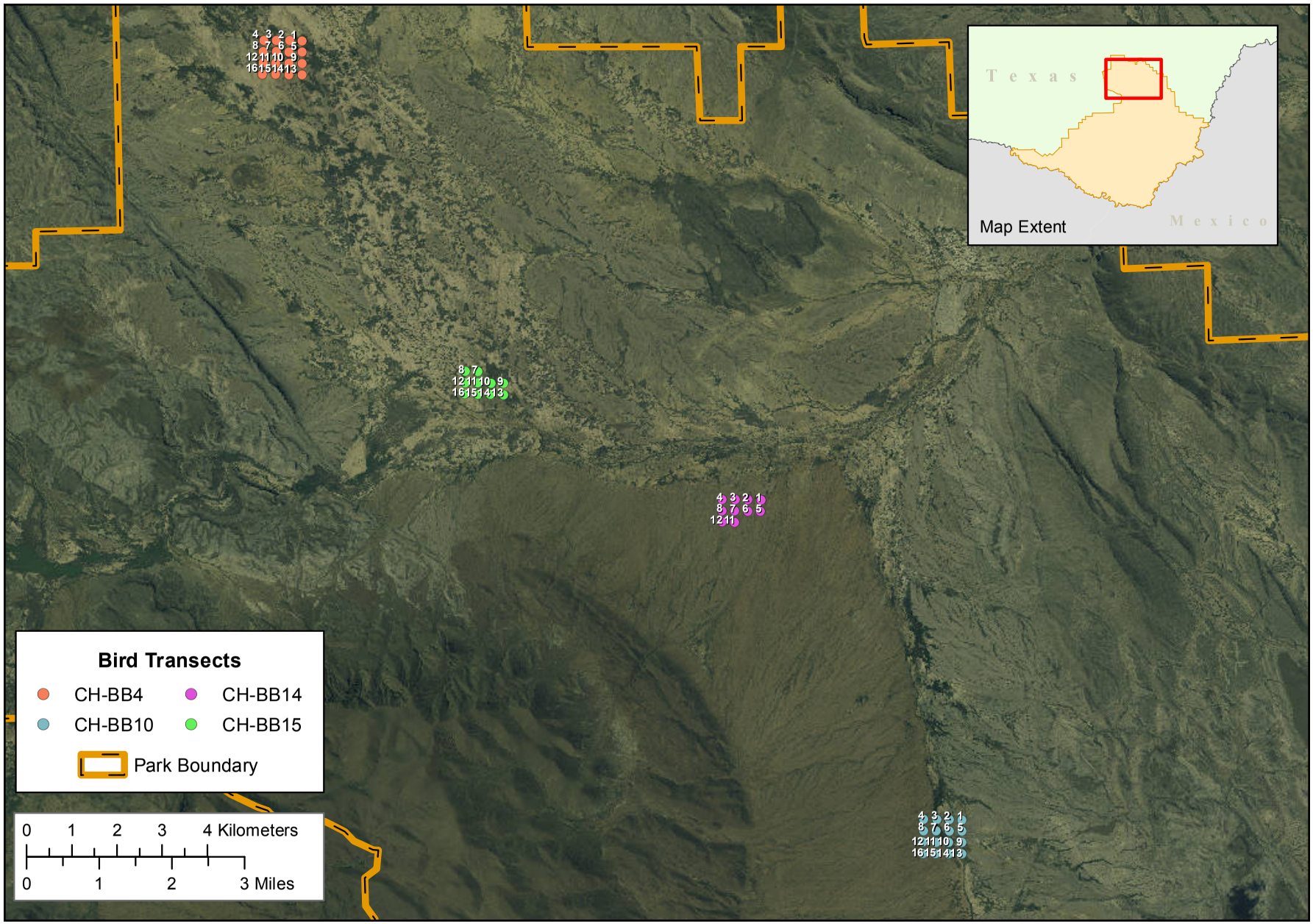

Figure 3.2.1-4. Point locations sampled at Big Bend NP, North, 2010.

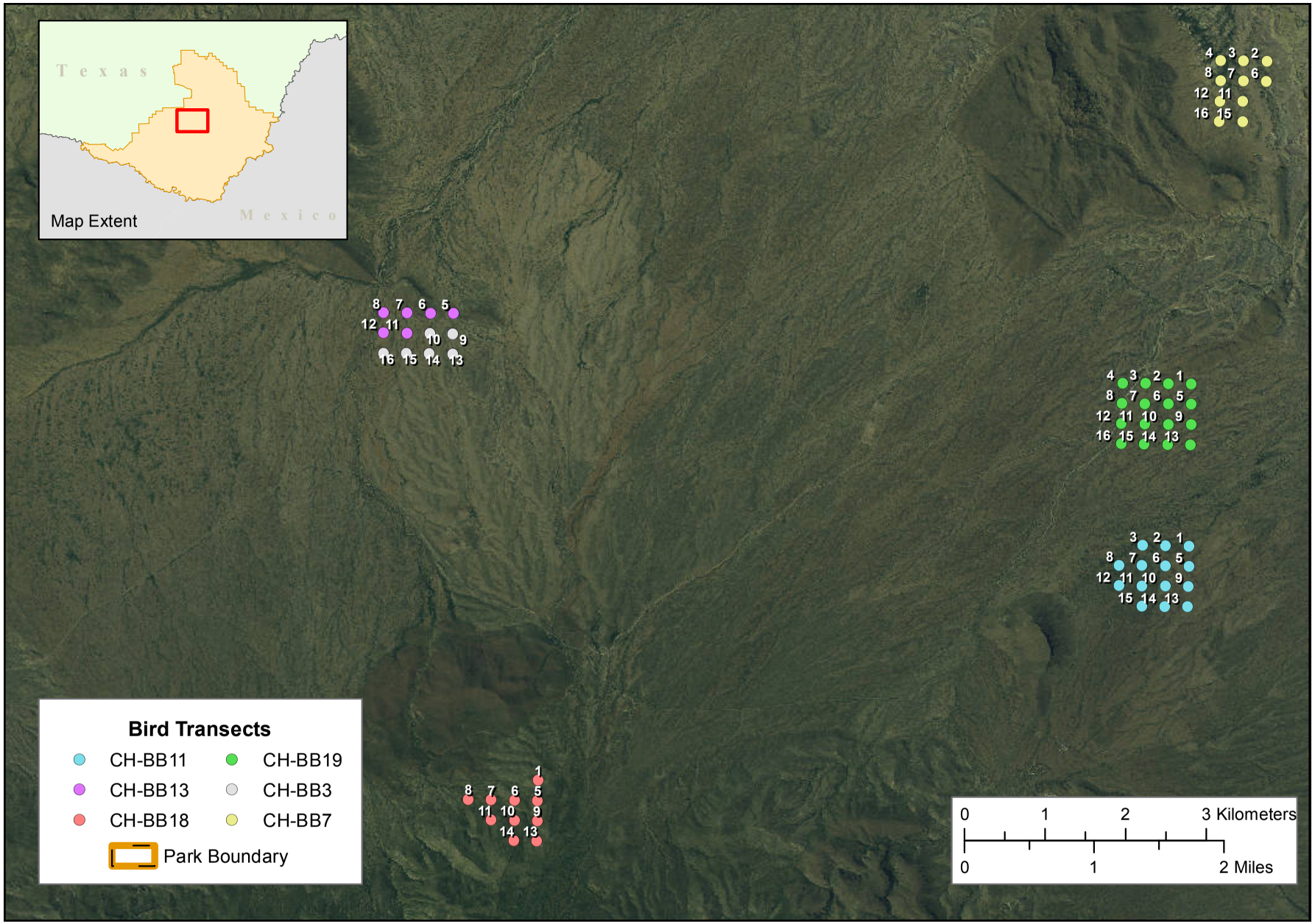

Figure 3.2.1-5. Point locations sampled at Big Bend NP, Center, 2010.

Table 3.2.2. Number of birds detected of each species in each habitat class, Big Bend NP, 2010

Species	Habitat class		# of birds detected	
	Grassland	Riparian	Total	% of total
Black-throated sparrow	368	21	389	15%
Cactus wren	231	1	232	9%
Northern mockingbird	191	10	201	8%
Pyrrhuloxia	199	2	201	8%
Bell's vireo	51	92	143	6%
Yellow-breasted chat	26	86	112	4%
Blue grosbeak	39	63	102	4%
Mourning dove	51	32	83	3%
Lesser nighthawk	68	6	74	3%
White-winged dove	1	68	69	3%
Black-tailed gnatcatcher	59	8	67	3%
Ash-throated flycatcher	47	10	57	2%
Scaled quail	54	1	55	2%
Brown-headed cowbird	25	29	54	2%
Painted bunting	23	30	53	2%
Rufous-crowned sparrow	50	1	51	2%
Verdin	43	7	50	2%
Northern cardinal	1	48	49	2%
Turkey vulture	38	11	49	2%
Scott's oriole	38	--	38	2%
Common yellowthroat	--	36	36	1%
House finch	22	7	29	1%
Summer tanager	--	21	21	1%
Cassin's sparrow	19	--	19	1%
Chihuahuan raven	15	4	19	1%
Carolina wren	--	12	12	0%
Canyon towhee	8	--	8	0%
Canyon wren	1	7	8	0%
Loggerhead shrike	8	--	8	0%
Blue-gray gnatcatcher	6	1	7	0%
Cliff swallow	3	4	7	0%
Greater roadrunner	6	1	7	0%
Ladder-backed woodpecker	2	5	7	0%
Lesser goldfinch	--	7	7	0%
Orchard oriole	7	--	7	0%
Black phoebe	--	6	6	0%
Brown-crested flycatcher	1	5	6	0%
Common ground-dove	--	6	6	0%
Green-tailed towhee	5	--	5	0%
Say's phoebe	4	1	5	0%
Swainson's hawk	5	--	5	0%
Brewer's sparrow	4	--	4	0%

Table 3.2.2. Number of birds detected of each species in each habitat class, Big Bend NP, 2010, cont.

Species	Habitat class		# of birds detected	
	Grassland	Riparian	Total	% of total
Chipping sparrow	4	--	4	0%
Crissal thrasher	4	--	4	0%
Gray vireo	4	--	4	0%
Northern rough-winged swallow	--	4	4	0%
Western kingbird	4	--	4	0%
Barn swallow	3	--	3	0%
Curve-billed thrasher	3	--	3	0%
House sparrow	--	3	3	0%
Lucy's warbler	--	3	3	0%
Golden-fronted woodpecker	--	2	2	0%
Great horned owl	1	1	2	0%
Hooded oriole	2	--	2	0%
Rock wren	1	1	2	0%
Varied bunting	2	--	2	0%
Yellow-billed cuckoo	--	2	2	0%
Yellow-rumped warbler	2	--	2	0%
Bewick's wren	1	--	1	0%
Black-chinned hummingbird	1	--	1	0%
Broad-tailed hummingbird	1	--	1	0%
Common nighthawk	1	--	1	0%
Indigo bunting	--	1	1	0%
Mallard	--	1	1	0%
Northern harrier	1	--	1	0%
Peregrine falcon	--	1	1	0%
Red-tailed hawk	1	--	1	0%
Scissor-tailed flycatcher	1	--	1	0%
Western wood-pewee	1	--	1	0%
Unidentified bird	*50*	*17*	*67*	*3%*
Unidentified sparrow	*15*	*--*	*15*	*1%*
Unidentified hummingbird	*--*	*3*	*3*	*0%*
Unidentified thrasher	*2*	*--*	*2*	*0%*
Unidentified duck	*--*	*1*	*1*	*0%*
Unidentified swallow	*1*	*--*	*1*	*0%*
Unidentified warbler	*--*	*1*	*1*	*0%*
Total	**1,825**	**690**	**2,515**	**100%**

Note: Species are listed in rank order of detection, from the most to least commonly observed. Relative detectability among species has not been taken into account; thus, rank order provides only a general indication of relative abundance. Detectability will be explicitly accounted for in periodic synthesis reports.

3.3 Carlsbad Caverns National Park

3.3.1 2010 sampling

During June of 2010, we sampled nine transects/grids at Carlsbad Caverns NP (Figure 3.3.1-1, -2). Eight transects/grids were in grassland habitat with 6 to 16 points each and surveyed once. One transect/grid was in riparian habitat with seven points and was visited twice. The total sample for Carlsbad Caverns NP was 85 survey points (Table 3.3.1).

3.3.2 Results and discussion

During 2010, 827 birds of 46 species were counted at Carlsbad Caverns NP (Table 3.3.2). Black-throated sparrow was the most commonly counted species (18%). Blue grosbeak (8%), turkey vulture (8%), Cassin's sparrow (7%), and northern mocking bird (7%) were also common.

Bird activity at Carlsbad Caverns NP lasted for only a short period of time each day. The habitat grades from grasslands below the plateau to very sparse desert scrub on top. Rufous-crowned and Cassin's sparrows were abundant as well as the typical mix of desert scrub birds including black-throated sparrow, blue grosbeak, and pyrrhuloxia. We detected a black-chinned sparrow here as well as cave swallow and western kingbird which we rarely saw at other parks in the CHDN.

Turkey vulture (*Cathartes aura*) was a commonly counted species at Carlsbad Caverns NP in 2010.

Table 3.3.1. Habitat class, number of survey points, and sampling dates for each transect or grid at Carlsbad Caverns NP, 2010

Transect/Grid	Habitat class	Survey points	# visits	Visit 1	Visit 2
CH-CC1	Grassland	6	1	6/30/2010	--
CH-CC2	Grassland	7	1	6/30/2010	--
CH-CC3	Grassland	6	1	6/27/2010	--
CH-CC4	Grassland	9	1	6/29/2010	--
CH-CC5	Grassland	16	1	6/3/2010	--
CH-CC6	Grassland	14	1	6/2/2010	--
CH-CC7	Grassland	6	1	6/24/2010	--
CH-CC8	Grassland	7	1	6/24/2010	--
CH-CCRI	Riparian	7	2	6/26/2010	6/27/2010

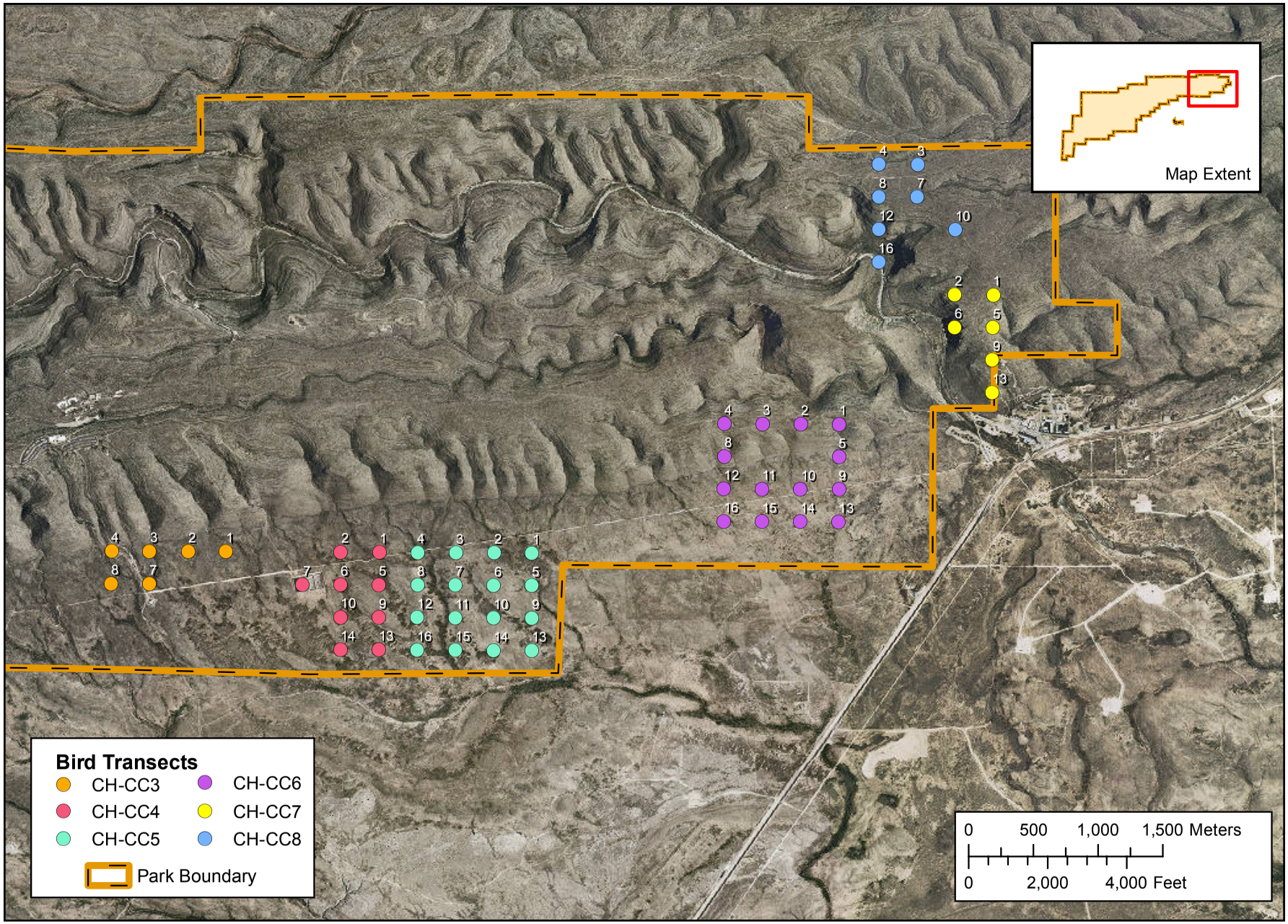

Figure 3.3.1-1. Point locations sampled at Carlsbad Caverns NP, East, 2010.

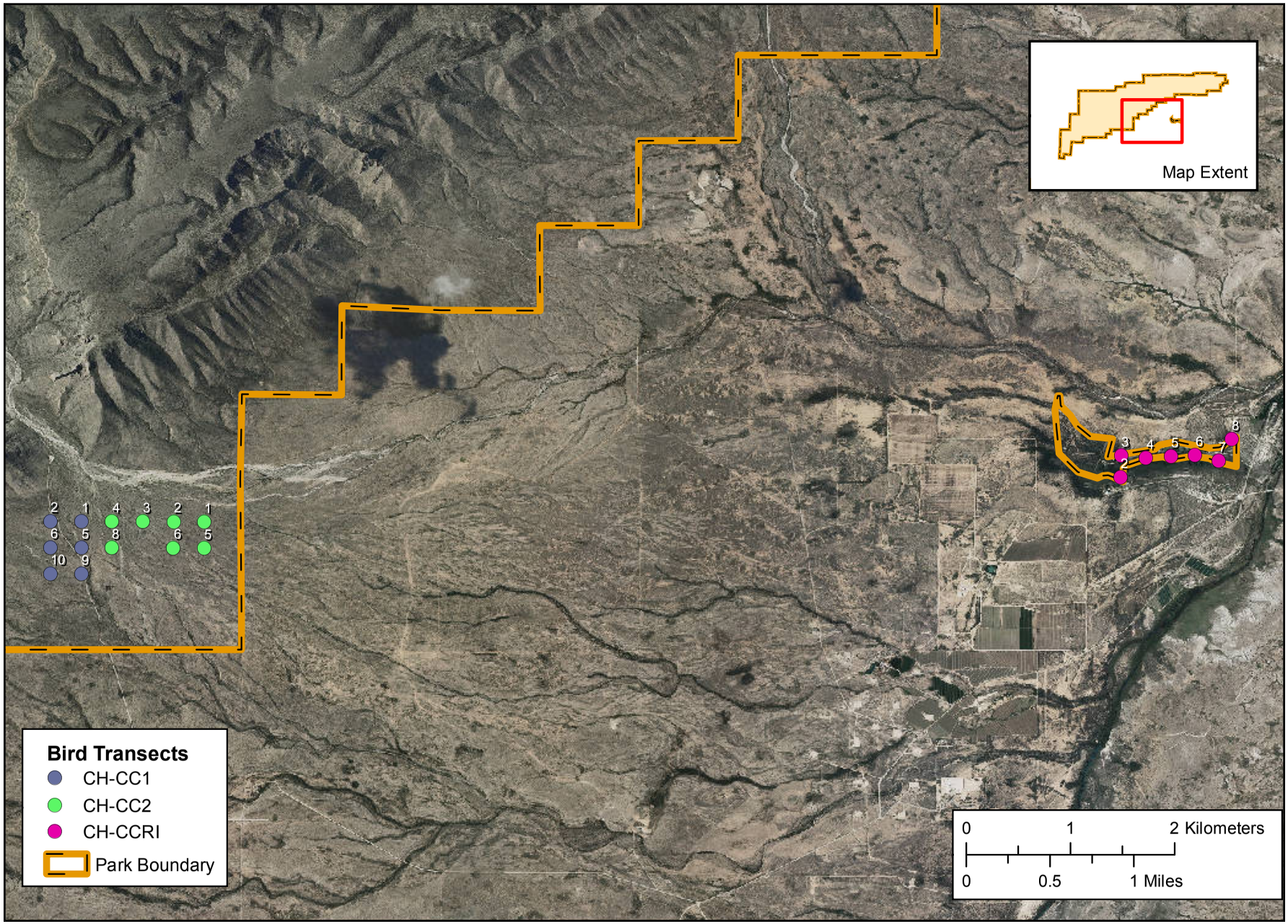

Figure 3.3.1-2. Point locations sampled at Carlsbad Caverns NP, West, 2010.

Table 3.3.2. Number of birds detected of each species in each habitat class, Carlsbad Caverns NP, 2010

Species	Habitat class		# of birds detected	
	Grassland	Riparian	Total	% of total
Black-throated sparrow	152	--	152	18%
Blue grosbeak	54	12	66	8%
Turkey vulture	20	45	65	8%
Cassin's sparrow	56	--	56	7%
Northern mockingbird	53	2	55	7%
Rufous-crowned sparrow	38	--	38	5%
Scaled quail	36	--	36	4%
Mourning dove	32	3	35	4%
White-winged dove	1	31	32	4%
Ash-throated flycatcher	26	4	30	4%
Yellow-breasted chat	--	28	28	3%
Western kingbird	22	1	23	3%
Pyrrhuloxia	19	--	19	2%
Canyon towhee	16	--	16	2%
House finch	7	6	13	2%
Painted bunting	1	12	13	2%
Scott's oriole	13	--	13	2%
Cassin's kingbird	--	12	12	1%
Brown-headed cowbird	3	6	9	1%
Cave swallow	9	--	9	1%
Lesser goldfinch	--	8	8	1%
Bell's vireo	--	7	7	1%
Indigo bunting	--	7	7	1%
Bewick's wren	4	2	6	1%
Vermilion flycatcher	--	6	6	1%
Summer tanager	--	5	5	1%
Northern cardinal	1	3	4	0%
Orchard oriole	--	4	4	0%
Canyon wren	3	--	3	0%
Ladder-backed woodpecker	1	2	3	0%
Lesser nighthawk	1	2	3	0%
Rock wren	3	--	3	0%
Verdin	3	--	3	0%
Wild turkey	--	3	3	0%
Black-tailed gnatcatcher	2	--	2	0%
Cliff swallow	2	--	2	0%
Common nighthawk	2	--	2	0%
Barn swallow	1	--	1	0%
Black-chinned hummingbird	--	1	1	0%
Black-chinned sparrow	1	--	1	0%
Cactus wren	1	--	1	0%
Chihuahuan raven	1	--	1	0%

Table 3.3.2. Number of birds detected of each species in each habitat class, Carlsbad Caverns NP, 2010, cont.

Species	Habitat class		# of birds detected	
	Grassland	Riparian	Total	% of total
Gray hawk	--	1	1	0%
Killdeer	1	--	1	0%
Say's phoebe	--	1	1	0%
Violet-green swallow	1	--	1	0%
Unidentified bird	*2*	*20*	*22*	*3%*
Unidentified sparrow	*2*	*--*	*2*	*0%*
Unidentified swallow	*1*	*1*	*2*	*0%*
Unidentified dove	*--*	*1*	*1*	*0%*
Total	**591**	**236**	**827**	**100%**

Note: Species are listed in rank order of detection, from the most to least commonly observed. Relative detectability among species has not been taken into account; thus, rank order provides only a general indication of relative abundance. Detectability will be explicitly accounted for in periodic synthesis reports.

3.4 Fort Davis National Historic Site

3.4.1 2010 sampling

During 2010, we sampled 24 survey points on one transect/grids two times each at Fort Davis NHS, for a total sample of 48 points (Figure 3.4.1). All points were in the grassland habitat class (Table 3.4.1).

3.4.2 Results and discussion

During 2010, 533 birds of 34 species were counted at Fort Davis NHS (Table 3.4.2). Cliff swallow was the most commonly counted species (10%). Canyon wren (8%), rufous-crowned sparrow (8%), white-winged dove (7%), and black-throated sparrow (6%) were also common.

The managed grassland and desert scrub around the historic site supported black-throated sparrow, cactus wren, lark sparrow, northern mockingbird, Say's phoebe, and Scott's oriole. We detected Cassin's kingbird and Scott's oriole in the canyon. In the oak vegetation up against the basalt palisades, we observed ash-throated flycatcher, black-chinned hummingbird, black-headed grosbeak, blue grosbeak, lesser goldfinch, northern cardinal, phainopepla, and summer tanager. Within the palisades there were abundant singing canyon wren, rufus-crowned sparrow, and white-winged dove. We also detected a few cliff swallows and rock wrens. Up the trail at the crest of the basalt palisades, the grasslands and shrubbery supported a similar complex of birds in addition to canyon towhee, house finch, and red-tailed hawk.

Black-throated sparrow (*Amphispiza bilineata*) was one of the most commonly counted species at Fort Davis NHS in 2010.

Table 3.4.1. Habitat class, number of survey points, and sampling dates at Fort Davis NHS, 2010

Transect/Grid	Habitat class	Survey points	# visits	Visit 1	Visit 2
CH-FODA	Grassland	24	2	6/13/2010	6/16/2010

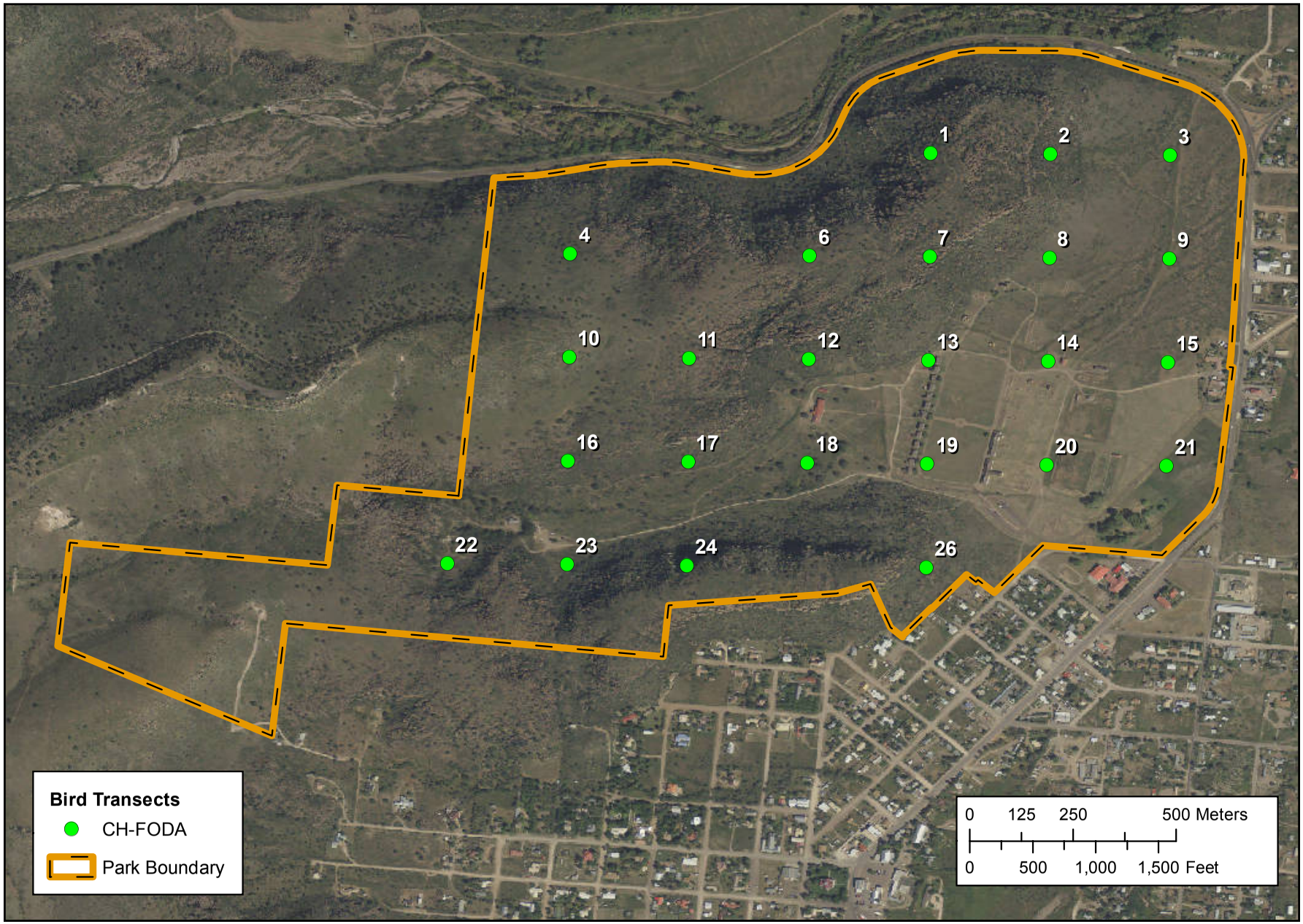

Figure 3.4.1. Point locations sampled at Fort Davis NHS, 2010.

Table 3.4.2. Number of birds detected of each species in each habitat class, Fort Davis NHS, 2010

Species	# of birds detected	
	Total (grassland)	% of total
Cliff swallow	51	10%
Canyon wren	45	8%
Rufous-crowned sparrow	40	8%
White-winged dove	35	7%
Black-throated sparrow	31	6%
Blue grosbeak	26	5%
Cassin's kingbird	25	5%
Rock wren	22	4%
Lark sparrow	17	3%
Phainopepla	16	3%
Black-crested titmouse	15	3%
Northern mockingbird	15	3%
Ash-throated flycatcher	14	3%
Brown-headed cowbird	13	2%
Canyon towhee	13	2%
Northern cardinal	13	2%
Turkey vulture	13	2%
Barn swallow	12	2%
Lesser goldfinch	12	2%
Bewick's wren	9	2%
Black-chinned hummingbird	9	2%
Say's phoebe	9	2%
Acorn woodpecker	8	2%
Cactus wren	8	2%
Mourning dove	8	2%
Scott's oriole	7	1%
Ladder-backed woodpecker	6	1%
Verdin	3	1%
Black-headed grosbeak	2	0%
House finch	2	0%
Chihuahuan raven	1	0%
House sparrow	1	0%
Red-tailed hawk	1	0%
Summer tanager	1	0%
Unidentified bird	*23*	*4%*
Unidentified hummingbird	*4*	*1%*
Unidentified sparrow	*2*	*0%*
Unidentified swallow	*1*	*0%*
Total	**533**	**100%**

Note: Species are listed in rank order of detection, from the most to least commonly observed. Relative detectability among species has not been taken into account; thus, rank order provides only a general indication of relative abundance. Detectability will be explicitly accounted for in periodic synthesis reports.

3.5 Guadalupe Mountains National Park

3.5.1 2010 sampling

During June 2010, we sampled a total of nine transects/grids at Guadalupe Mountains NP (Figure 3.5.1). Eight transects/grids were in grassland habitat with six to nine survey points each and were visited once each. One transect/grid was in riparian habitat with 16 survey points visited twice each. The total sample for Guadalupe Mountains NP was 93 survey points (Table 3.5.1).

Spotted towhee (*Pipilo maculatus*) was one of the most commonly counted species at Guadalupe Mountains NM in 2010.

3.5.2 Results and discussion

During 2010, 741 birds of 56 species were counted at Guadalupe Mountains NP (Table 3.5.2). Black-throated sparrow was the most commonly counted species (12%). Other common species included spotted towhee (6%), cactus wren (5%), Scott's oriole (4%), rufous-crowned sparrow (4%), northern mockingbird (4%), plumbeous vireo (4%), violet-green swallow (4%), and mourning dove (4%).

There were nine grassland transects and one riparian transect in Guadalupe Mountains NP. Seven of the nine grassland transects were located in a flat salt basin to the west of the mountains. This area had large swaths of sand dunes and a mix of creosote scrub and grasslands. Common bird species in this area included black-throated sparrow, blue grosbeak, Cassin's sparrow, lesser nighthawk, loggerhead shrike, and pyrrhuloxia. The main highlight here was a pair of burrowing owls in a patch of quartz dunes and grassland. The remaining grassland transects were similar to much of the habitat at Big Bend with very similar birds. The most conspicuous species was rufous-crowned sparrow. Ash-throated flycatcher, black-throated sparrow, and blue grosbeak were also abundant.

The riparian transect at Guadalupe Mountains NP was located in a deep canyon draining from the highest part of the range. There was only intermittent water flow and very little sediment deposited so most of the vegetation was more characteristic of grasslands at higher elevations than riparian areas in the Chihuahuan Desert. Open woodlands of oak, bigtooth maple, and ponderosa pine formed the primary habitat here. The most common species were Bewick's wren, black-headed grosbeak, broad-tailed hummingbird, blue-gray gnatcatcher, rufous-crowned sparrow, spotted towhee, western tanager, western wood-pewee, and white-winged dove. Some highlights included black-chinned sparrow, golden eagle, hepatic tanager, peregrine falcon, and a single yellow-breasted chat at the first point. This was probably the most diverse survey area in the CHDN in terms of birds and vegetation.

Table 3.5.1. Habitat class, number of survey points, and sampling dates for each transect or grid at Guadalupe Mountains NP, 2010

Transect/Grid	Habitat class	Survey points	# visits	Visit 1	Visit 2
CH-GM1	Grassland	9	1	6/19/2010	--
CH-GM2	Grassland	9	1	6/18/2010	--
CH-GM3	Grassland	7	1	6/18/2010	--
CH-GM4	Grassland	6	1	6/16/2010	--
CH-GM5	Grassland	8	1	6/19/2010	--
CH-GM7	Grassland	8	1	6/21/2010	--
CH-GM8	Grassland	8	1	6/21/2010	--
CH-GM9	Grassland	6	1	6/20/2010	--
CH-GMRI	Riparian	16	2	6/20/2010	6/29/2010

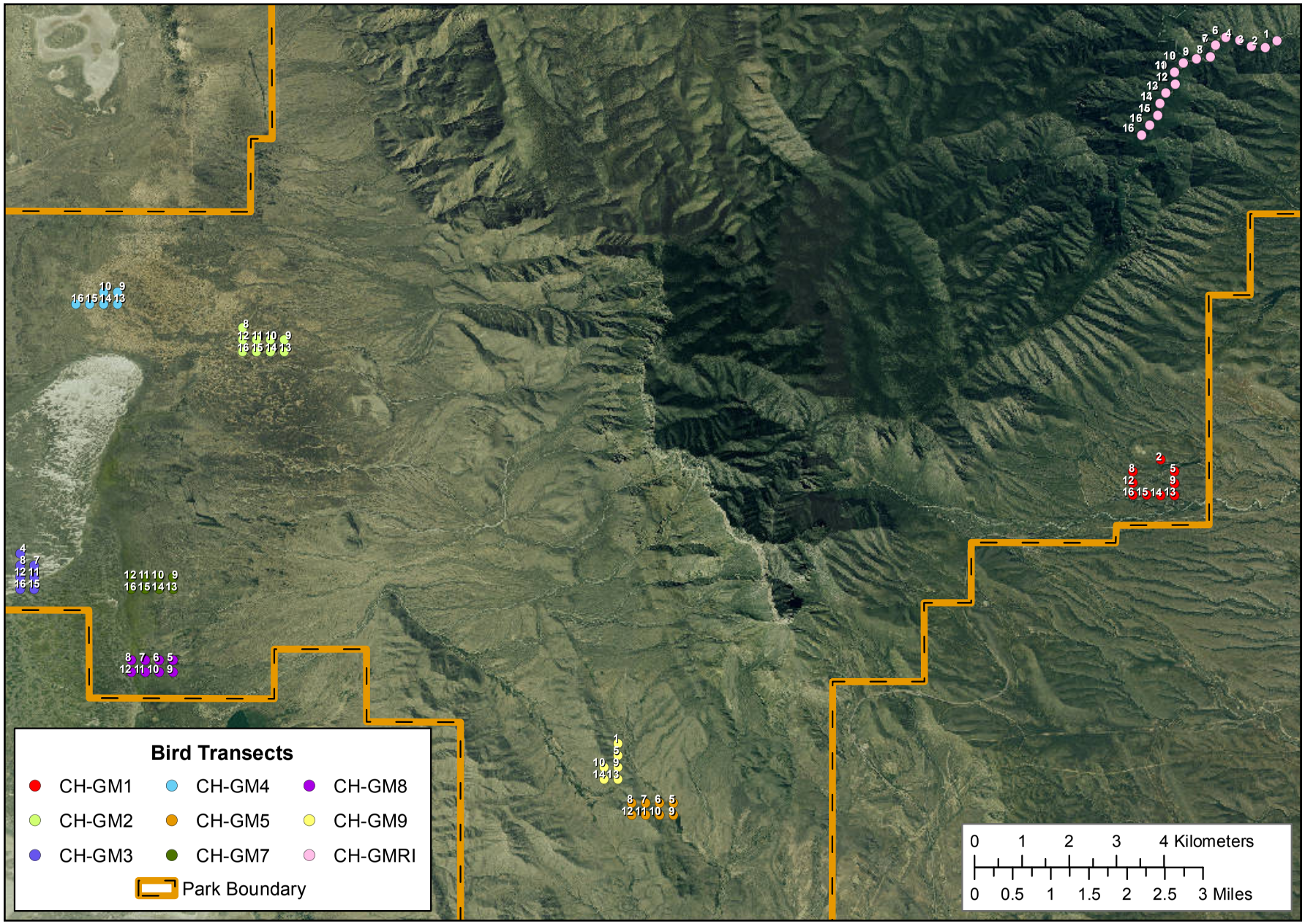

Figure 3.5.1. Point locations sampled at Guadalupe Mountains NP, 2010.

Table 3.5.2. Number of birds detected of each species in each habitat class, Guadalupe Mountains NP, 2010

Species	Habitat class		# of birds detected	
	Grassland	Riparian	Total	% of total
Black-throated sparrow	92	--	92	12%
Spotted towhee	--	46	46	6%
Cactus wren	34	--	34	5%
Scott's oriole	21	10	31	4%
Western wood-pewee	--	30	30	4%
Rufous-crowned sparrow	10	19	29	4%
Northern mockingbird	26	2	28	4%
Plumbeous vireo	1	27	28	4%
Violet-green swallow	--	28	28	4%
Mourning dove	27	--	27	4%
Bewick's wren	7	17	24	3%
Western tanager	--	24	24	3%
Black-headed grosbeak	--	21	21	3%
Blue-gray gnatcatcher	--	20	20	3%
Blue grosbeak	13	6	19	3%
Cassin's sparrow	19	--	19	3%
Pyrrhuloxia	18	--	18	2%
White-winged dove	3	14	17	2%
Ash-throated flycatcher	10	6	16	2%
Lesser goldfinch	--	13	13	2%
White-throated swift	--	12	12	2%
Brown-headed cowbird	--	11	11	1%
Cassin's kingbird	--	11	11	1%
Black-chinned sparrow	--	9	9	1%
Western kingbird	9	--	9	1%
Broad-tailed hummingbird	--	8	8	1%
Canyon towhee	8	--	8	1%
Scaled quail	8	--	8	1%
Canyon wren	--	7	7	1%
Loggerhead shrike	7	--	7	1%
Black-tailed gnatcatcher	5	1	6	1%
Lesser nighthawk	6	--	6	1%
Say's phoebe	6	--	6	1%
Warbling vireo	--	6	6	1%
Hepatic tanager	--	5	5	1%
House finch	1	4	5	1%
Curve-billed thrasher	4	--	4	1%
Ladder-backed woodpecker	2	2	4	1%
Turkey vulture	3	--	3	0%
Verdin	3	--	3	0%
Black-chinned hummingbird	--	2	2	0%
Burrowing owl	2	--	2	0%

Table 3.5.2. Number of birds detected of each species in each habitat class, Guadalupe Mountains NP, 2010, cont.

Species	Habitat class		# of birds detected	
	Grassland	Riparian	Total	% of total
Common poorwill	2	--	2	0%
White-breasted nuthatch	--	2	2	0%
Yellow-breasted chat	--	2	2	0%
Common nighthawk	1	--	1	0%
Cordilleran flycatcher	--	1	1	0%
Crissal thrasher	1	--	1	0%
Golden eagle	--	1	1	0%
Greater roadrunner	1	--	1	0%
Horned lark	1	--	1	0%
Northern cardinal	--	1	1	0%
Peregrine falcon	--	1	1	0%
Red-tailed hawk	1	--	1	0%
Rock wren	1	--	1	0%
Western scrub-jay	1	--	1	0%
Unidentified bird	*8*	*5*	*13*	*2%*
Unidentified hummingbird	*1*	*3*	*4*	*1%*
Unidentified dove	*--*	*1*	*1*	*0%*
Total	**363**	**378**	**741**	**100%**

Note: Species are listed in rank order of detection, from the most to least commonly observed. Relative detectability among species has not been taken into account; thus, rank order provides only a general indication of relative abundance. Detectability will be explicitly accounted for in periodic synthesis reports.

3.6 White Sands National Monument

3.6.1 2010 sampling

During June of 2010, we sampled two transects/grids at White Sands NM one time each (Figures 3.6.1). Each transect/grid was located in grassland habitat and had seven or eight survey points, for a total sample of 15 points (Table 3.6.1).

3.6.2 Results and discussion

During 2010, 102 birds of 14 species were counted at White Sands NM (Tables 3.6.2). The most commonly counted species was black-throated sparrow (38%). Blue grosbeak (13%), pyrrhuloxia (11%), lesser nighthawk (9%), and northern mockingbird (6%) were also common.

We only completed two transects in White Sands NM because we were not authorized to access much of the area. If this park will be surveyed in the future, it is important to plan ahead and arrange for authorized rangers to escort field technicians to the survey sites. The habitat is a mix of playa lakes, creosote scrub, and sand dunes. The birds found on the two transects were typical of desert scrub in much of the CHDN with no highlights to report except one out of place Brewer's sparrow which was probably a very late or very early migrant.

Lesser nighthawk (*Chordeiles acutipennis*) was one of the most commonly counted species at White Sands NM in 2010.

Table 3.6.1. Habitat class, number of survey points, and sampling dates for each transect or grid at White Sands NM, 2010

Transect/Grid	Habitat class	Survey points	# visits	Visit 1	Visit 2
CH-WS1	Grassland	8	1	6/28/2010	--
CH-WS9	Grassland	7	1	6/28/2010	--

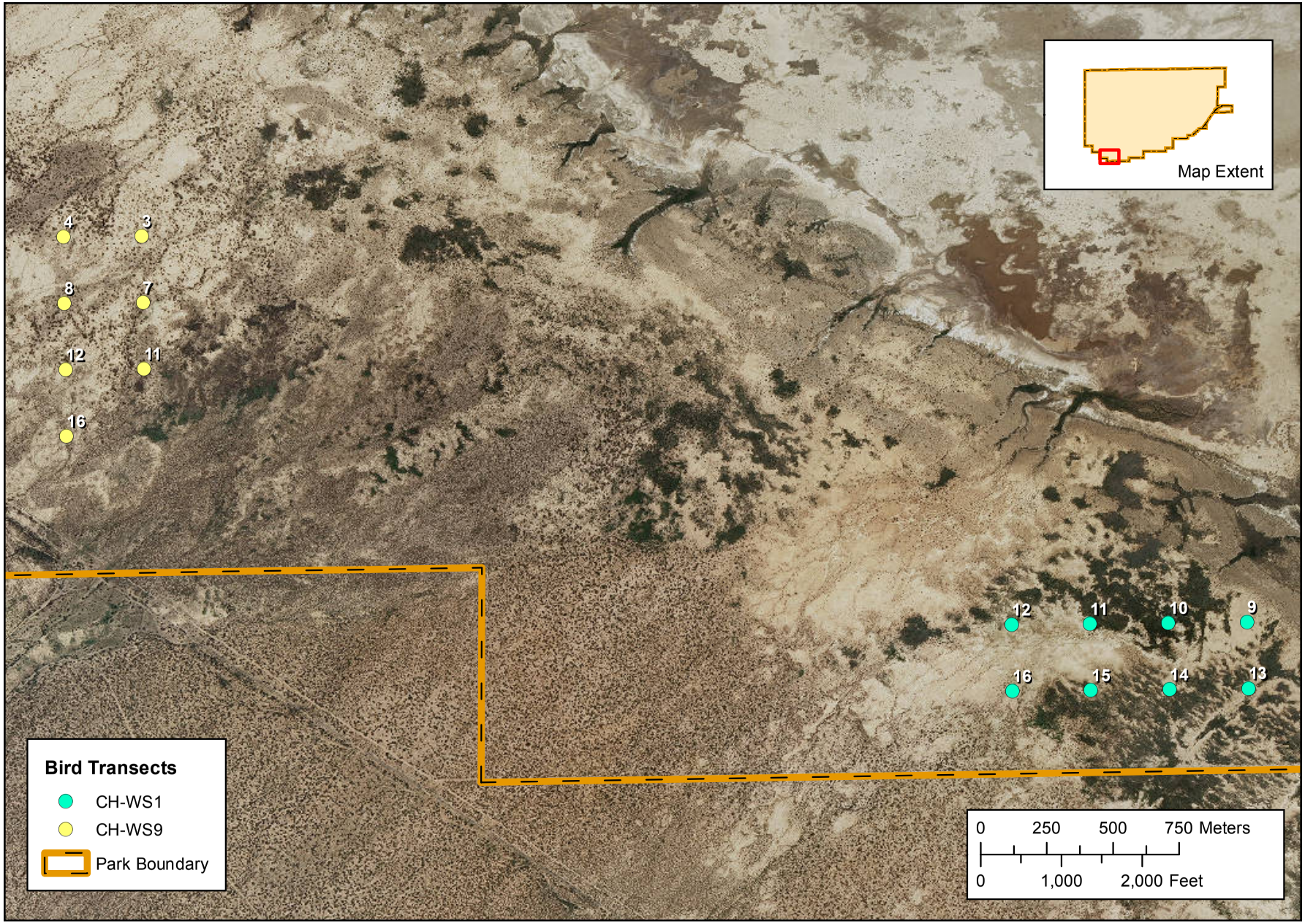

Figure 3.6.1. Point locations sampled at White Sands NM, 2010.

Table 3.6.2. Number of birds detected of each species in each habitat class, White Sands NM, 2010

Species	# of birds detected	
	Total (grassland habitat)	% of total
Black-throated sparrow	39	38%
Blue grosbeak	13	13%
Pyrrhuloxia	11	11%
Lesser nighthawk	9	9%
Northern mockingbird	6	6%
Cassin's sparrow	4	4%
Verdin	4	4%
Black-tailed gnatcatcher	3	3%
Chihuahuan raven	3	3%
Mourning dove	3	3%
Scaled quail	2	2%
Ash-throated flycatcher	1	1%
Brewer's sparrow	1	1%
Scott's oriole	1	1%
Unidentified bird	*2*	*2%*
Total	**102**	**100%**

Note: Species are listed in rank order of detection, from the most to least commonly observed. Relative detectability among species has not been taken into account; thus, rank order provides only a general indication of relative abundance. Detectability will be explicitly accounted for in periodic synthesis reports.

4 Literature Cited

Alcock, J. 2005. Animal behavior: An evolutionary approach. Sunderland, Ma.: Sinauer Associates.

Barrows, C. W., M. B. Swartz, W. L. Hodges, M. F. Allen, J. T. Rotenberry, B. L. Li, T. A. Scott, and X. W. Chen. 2005. A framework for monitoring multiple-species conservation plans. Journal of Wildlife Management 69:1333–1345.

Bibby, C. J., N. D. Burgess, D. A. Hill, and S. Mustoe. 2000. Bird census techniques. Second ed. London: Academic Press.

Bryce, S. A., R. M. Hughes, and P. R. Kaufmann. 2002. Development of a bird integrity index: Using bird assemblages as indicators of riparian condition. Environmental Management 30:294–310.

Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to distance sampling: Estimating abundance of biological populations. Oxford, U.K.: Oxford University Press.

Burnham, K. P., D. R. Anderson, and J. L. Laake. 1980. Estimation of density from line transect sampling of biological populations. Wildlife Monographs, no. 72.

Canterbury, G. E., T. E. Martin, D. R. Petit, L. J. Petit, and D. F. Bradford. 2000. Bird communities and habitat as ecological indicators of forest condition in regional monitoring. Conservation Biology 14:544–558.

Dale, V. H., and S. C. Beyeler. 2001. Challenges in the development and use of ecological indicators. Ecological Indicators 1:3–10.

Diefenbach, D. R., D. W. Brauning, and J. A. Mattice. 2003. Variability in grassland bird counts related to observer differences and species detection rates. Auk 120:1168–1179.

Field, S. A., A. J. Tyre, and H. P. Possingham. 2005. Optimizing allocation of monitoring effort under economic and observational constraints. Journal of Wildlife Management 69:473–482.

Holmes, R. T., and T. W. Sherry. 2001. Thirty-year bird population trends in an unfragmented temperate deciduous forest: Importance of habitat change. Auk 118:589–609.

Hutto, R. L. 1985. Habitat selection by nonbreeding, migratory, land birds. Pages 455–476 in M. L. Cody, ed., Habitat selection in birds. Orlando, Fla.: Academic Press.

Krueper, D., J. Bart, and T. D. Rich. 2003. Response of vegetation and breeding birds to the removal of cattle on the San Pedro River, Arizona (USA). Conservation Biology 17:607–615.

MacKenzie, D. I., J. D. Nichols, J. A. Royle, K. H. Pollock, L. L. Bailey, and J. E. Hines. 2006. Occupancy estimation and modeling: Inferring patterns and dynamics of species. Burlington, Ma.: Elsevier Press.

MacKenzie, D. I., J. D. Nichols, J. E. Hines, M. G. Knutson, and A. B. Franklin. 2003. Estimating site occupancy, colonization, and local extinction when a species is detected imperfectly. Ecology 84:2200–2207.

Manley, P. N., W. J. Zielinski, M. D. Schlesinger, and S. R. Mori. 2004. Evaluation of a multiple-species approach to monitoring species at the ecoregional scale. Ecological Applications 14:296–310.

NPS (National Park Service). 1992. NPS-75: Natural resources inventory and monitoring guidelines. U.S. Department of Interior, Washington, D.C.

NPS, CHDN (Chihuahuan Desert Inventory and Monitoring Network). 2010. Chihuahuan Desert Network vital signs monitoring plan. Natural Resource Report NPS/CHDN/NRR—2010/188. NationalPark Service, Fort Collins, Colorado.

Powell, B. F., A. D. Flesch, D. Angell, K. Beaupré, W. L. Halvorson, and R.E. Bennetts. In review. Landbird monitoring protocol for the Sonoran Desert, Southern Plains, and Chihuahuan Desert Networks. Version 1.00. Natural Resource Report NPS/SODN/NRTR-2010/00X. National Park Service, Fort Collins, Colorado.

Powell, B. F., A. D. Flesch, T. Mau-Crimmins, D. Angell, K. Beaupre, and W. L. Halvorson. 2007. Landbird monitoring protocol for the Sonoran Desert Network. Version 1.02. Unpublished protocol to the National Park Service, Sonoran Desert Network Inventory and Monitoring Program, Tucson, Az.

Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A variable circular-plot method for estimating bird numbers. Condor 82:309–313.

Ringold, P. L., J. Alegria, R. L. Czaplewski, B. S. Mulder, T. Tolle, and K. Burnett. 1996. Adaptive monitoring design for ecosystem management. Ecological Applications 6:745–747.

Sekercioglu, C. H. 2002. Impacts of birdwatching on human and avian communities. Environmental Conservation 29:282–289.

Stevens, L. E., and B. D. Gold. 2003. Monitoring for adaptive management of the Colorado River Ecosystem in Glen and Grand canyons. Pages 101–134 in D. E. Busch and J. C. Trexler, eds., Monitoring ecosystems: Interdisciplinary approaches for evaluating ecoregional initiatives. Washington, D.C.: Island Press.

Thomas, L., J. L. Laake, S. Strindberg, F. F. C. Marques, S. T. Buckland, D. L. Borchers, D. R. Anderson, K. P. Burnham, S. L. Pollard J. H. Hedley, J. R. B. Bishop, and T. A. Marques. 2005. Distance 5.0. Release Beta 5. Research unit for wildlife population assessment, University of St. Andrews, U.K. http:/www.ruspa.st-and.ac.uk/distance.

Wiens, J. A. 1985. Habitat selection in variable environments: Shrub-steppe birds. Pages 191–226 *in* M. L. Cody, ed., Habitat selection in birds. Orlando, Fl.: Academic Press.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 960/106748, February 2011

National Park Service
U.S. Department of the Interior

Natural Resource Program Center
1201 Oak Ridge Drive, Suite 150
Fort Collins, Colorado 80525

www.nature.nps.gov