National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

Landbird Monitoring in the Sonoran Desert Network

2011 Annual Report

Natural Resource Technical Report NPS/SODN/NRTR—2012/574

ON THE COVER

Phainopepla (*Phainopepla nitens*). Photo © Moez Ali.

Landbird Monitoring in the Sonoran Desert Network

2011 Annual Report

Natural Resource Technical Report NPS/SODN/NRTR—2012/574

Authors

Moez Ali
Rocky Mountain Bird Observatory
230 Cherry Street, Suite 150
Fort Collins, Colorado 80521

Kristen Beaupré
National Park Service
Sonoran Desert Network
7660 E. Broadway Blvd, Suite 303
Tucson, Arizona 85710

Patricia Valentine-Darby
University of West Florida
Department of Biology
11000 University Parkway
Pensacola, Florida 32514

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

Project Contact

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

May 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado 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 Sonoran Desert Network website, http://science.nature.nps.gov/im/units/SODN, as well as at the Natural Resource Publications Management web site, http://www.nature.nps.gov/publications/NRPM.

Please cite this publication as:

Ali, M., K. Beaupré, P. Valentine-Darby, and C. White. 2012. Landbird monitoring in the Sonoran Desert Network: 2011 annual report. Natural Resource Technical Report NPS/SODN/NRTR—2012/574. National Park Service, Fort Collins, Colorado.

NPS 960/114156, May 2012

Contents

Acronyms xi

Executive Summary xiii

1 Introduction 1
- 1.1 Background 1
- 1.2 Program Goals and Objectives 2

2 Methods 3
- 2.1 Methods 3
- 2.2 Bird Surveys 4
- 2.3 Additional Monitoring to Augment Bird Sampling 5
- 2.4 Reporting 6
- 2.5 Accessing the Data 6

3 Results and Discussion 7
- 3.1 Casa Grande Ruins National Monument 22
- 3.2 Chiricahua National Monument 25
- 3.3 Coronado National Memorial 30
- 3.4 Fort Bowie National Historic Site 34
- 3.5 Gila Cliff Dwellings National Monument 38
- 3.6 Montezuma Castle National Monument 40
- 3.7 Organ Pipe Cactus National Monument 46
- 3.8 Saguaro National Park 50
- 3.9 Tonto National Monument 59
- 3.10 Tumacácori National Historical Park 63
- 3.11 Tuzigoot National Monument 67

4 Literature Cited 71

Figures

Figure 2.1.2. Dates when sampling was conducted in SODN parks, 2011. 4

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. 5

Figure 3.1.1. Point locations targeted for annual sampling at Casa Grande Ruins National Monument. 23

Figure 3.2.1. Point locations targeted for annual sampling at Chiricahua National Monument. 26

Figure 3.3.1. Point locations targeted for annual sampling at Coronado National Memorial. 31

Figure 3.4.1. Point locations targeted for annual sampling at Fort Bowie National Historic Site. 35

Figure 3.5.1. Point locations targeted for annual sampling at Gila Cliff Dwellings National Monument. Sampling was not conducted in 2011 due to wildfire 39

Figure 3.6.1-1. Point locations targeted for annual sampling at Montezuma Castle National Monument, Castle Unit. 41

Figure 3.6.1-2. Point locations targeted for annual sampling at Montezuma Castle National Monument, Well Unit. 44

Figure 3.7.1. Point locations targeted for annual sampling at Organ Pipe Cactus National Monument. 47

Figure 3.8.1-1. Point locations targeted for annual sampling at Saguaro National Park, Rincon Mountain District. 52

Figure 3.8.1-2. Point locations targeted for annual sampling at Saguaro National Park, Tucson Mountain District. 57

Figure 3.9.1. Point locations targeted for annual sampling at Tonto National Monument. 60

Figure 3.10.1. Point locations targeted for annual sampling at Tumacácori National Historical Park... 64

Figure 3.11.1. Point locations targeted for annual sampling at Tuzigoot National Monument. 68

Tables

Table 1.1-1. Parks in the Sonoran Desert Inventory & Monitoring Network (SODN) 1

Table 2.1.1-1. Habitat classes and major types by park 3

Table 2.1.1-2. Number of transects or grids of each habitat class surveyed in each SODN park, 2011 3

Table 3-1. Numbers of point counts (# of counts from a given point during a given sampling occasion) and individual birds counted in each habitat class at each SODN park, 2011 7

Table 3-2. Number of species observed in each habitat class at each park, 2011 7

Table 3-3. Total number of individual birds observed of each species during surveys in SODN parks, 2011 8

Table 3-4. Parks where each species was detected, April through June 2011 11

Table 3.1.1. Habitat type, number of points, and sampling dates for each transect or grid at Casa Grande Ruins NM, 2011 22

Table 3.1.2 Number of birds detected of each species in each habitat type, Casa Grande Ruins NM, 2011 24

Table 3.2.1. Habitat type, number of points, and sampling dates for each transect or grid at Chiricahua NM, 2011 25

Table 3.2.2. Number of birds detected of each species in each habitat type, Chiricahua NM, 2011 27

Table 3.3.1. Habitat type, number of points, and sampling dates for each transect or grid at Coronado NMem, 2011 30

Table 3.3.2. Number of birds detected of each species in each habitat type, Coronado NMem, 2011 32

Table 3.4.1. Habitat type, number of points, and sampling dates for each transect or grid at Fort Bowie NHS, 2011 34

Table 3.4.2. Number of birds detected of each species in each habitat type, Fort Bowie NHS, 2011 36

Table 3.6.1. Habitat type, number of points, and sampling dates for each transect or grid at Montezuma Castle NM, 2011 40

Table 3.6.2-1. Number of birds detected of each species in each habitat type, Montezuma Castle NM-Castle Unit, 2011 42

Table 3.6.2-2. Number of birds detected of each species in each habitat type, Montezuma Castle NM-Well Unit, 2011 45

Table 3.7.1. Habitat type, number of points, and sampling dates for each transect or grid at Organ Pipe Cactus NM, 2011 46

Table 3.7.2. Number of birds detected of each species in each habitat type, Organ Pipe Cactus NM, 2011 48

Table 3.8.1. Habitat type, number of points, and sampling dates for each transect or grid at Saguaro NP, 2011 51

Table 3.8.2-1. Number of birds detected of each species in each habitat type, Saguaro NP-Rincon Mountain District, 2011 53

Table 3.8.2-2. Number of birds detected of each species in each habitat type, Saguaro NP-Tucson Mountain District, 2011 58

Table 3.9.1. Habitat type, number of points, and sampling dates for each transect or grid at Tonto NM, 2011 59

Table 3.9.2. Number of birds detected of each species in each habitat type, Tonto NM, 2011 61

Table 3.10.1. Habitat type, number of points, and sampling dates for each transect or grid at Tumacácori NHP, 2011 63

Table 3.10.2. Number of birds detected of each species in each habitat type, Tumacácori NHP, 2011....65

Table 3.11.1. Habitat type, number of points, and sampling dates for each transect or grid at Tuzigoot NM, 2011....67

Table 3.11.2. Number of birds detected of each species in each habitat type, Tuzigoot NM, 2011....69

Photos

White-winged Dove (*Zenaida asiatica*) was the third most commonly counted species in the SODN in 2011....10

Great Horned Owls (*Bubo virginianus*) were observed at Casa Grande Ruins NM in 2011....22

An Elegant Trogon (*Sayornis nigricans*), not regularly recorded at Chiricahua NM, was observed in 2011....25

Red-breasted Nuthatch (*Sitta canadensis*) was detected at Coronado NMem for the first time in 2011.. 30

Black-chinned Hummingbird (*Archilochus alexandri*) was the fifth most commonly counted species at Fort Bowie NHS in 2011. 34

The Spotted Towhee (*Pipilo maculatus*) is known to occur at Gila Cliff Dwellings NM. 38

Olive-sided Flycatcher (*Contopus cooperi*) was detected at the Well Unit for the first time in 2011. 40

A pair of Vermillion Flycatchers (*Pyrocephalus rubinus*) was observed at Organ Pipe Cactus NM in 2011. 46

Verdin (*Auriparus flaviceps*) was a common species at both Saguaro NP units in 2011. 50

White-throated Swift (*Aeronautes saxatalis*) was one of the most commonly detected species at Saguaro NP in 2011. 51

Black-headed Grosbeak (*Pheucticus melanocephalus*) was detected at the Rincon Mountain District in 2011....56

Gambel's Quail (*Callipepla gambelii*), the most commonly counted species at Tonto NM in 2011....59

Marsh Wren (*Cistothorus palustris*) were observed for the first time at Tumacácori NHP in 2011....63

Common Yellowthroat (*Geothlypis trichas*) was detected at Tumacácori NHP, as well as two other park units, in 2011....66

Yellow Warbler (*Dendroica petechia*) was a common species at Tuzigoot NM in 2011....67

Acronyms

CAGR	Casa Grande Ruins National Monument
CHIR	Chiricahua National Monument
CORO	Coronado National Memorial
FOBO	Fort Bowie National Historic Site
GICL	Gila Cliff Dwellings National Monument
MOCA	Montezuma Castle National Monument
NHS	national historic site
NHP	national historical park
NM	national monument
NMem	national memorial
NP	national park
NPS	National Park Service
ORPI	Organ Pipe Cactus National Monument
RMBO	Rocky Mountain Bird Observatory
SAGE	Saguaro National Park–Rincon Mountain District
SAGU	Saguaro National Park
SAGW	Saguaro National Park–Tucson Mountain District
SODN	Sonoran Desert Network
TONT	Tonto National Monument
TUMA	Tumacácori National Historical Park
TUZI	Tuzigoot National Monument

Executive Summary

In 2011, landbirds were surveyed within 10 of the 11 Sonoran Desert Network (SODN) parks. Sampling could not be conducted at Gila Cliff Dwellings National Monument (NM) due to a widlfire that burned through the park. Sample points were located along a transect (in most cases) or a grid. A total of 41 transects or grids was surveyed in 2011. 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 into 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 conducted twice 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 had a total of 563 point counts on 41 transects or grids. Of these, 393 were point counts in upland habitat and 170 were point counts in riparian habitat. We recorded a total of 10,882 individual birds of 176 species during on our point counts, with an additional 196 birds detected as flyovers. Saguaro National Park (NP) had the highest number of birds detected (n = 3,447), as well as the highest number of survey points. Coronado National Memorial (NMem) had the lowest number of birds detected (n = 370). We observed the greatest number of species at Saguaro NP (n = 127) and the fewest at Casa Grande Ruins NM (n = 39). Species richness and community composition varied widely among the parks surveyed. Gila Woodpecker was the most commonly detected species within the SODN (n = 737), followed by Mourning Dove (n = 575) and White-winged Dove (n = 511). Thirty-two species were detected at only one of the 10 parks surveyed; 10 species (e.g., Common Raven and Gray Flycatcher) were detected at all 10 parks surveyed; and numerous species were detected at two or few parks. New species, previously unverified in a given park, were recorded for seven parks; some of these detections were incidental to the surveys.

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 SODN 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 Sonoran Desert Inventory & Monitoring Network (SODN) includes 11 parks in southern Arizona and New Mexico (Table 1.1-1). Collectively, these parks are representative of most of the ecological communities present within the Sonoran Desert and Apache Highlands Ecoregions (NPS 2005).

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 SODN parks. Landbirds are a conspicuous component of many ecosystems, have high body temperatures and 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 SODN (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." Bird-

Table 1.1-1. Parks in the Sonoran Desert Inventory & Monitoring Network (SODN)

Park	Park Acronymn	Area (Acres)	Area (Hectares)
Casa Grande Ruins National Monument (NM)	CAGR	472	191
Chiricahua National Monument (NM)	CHIR	11,984	4,852
Coronado National Memorial (NMem)	CORO	4,750	1,923
Fort Bowie National Historic Site (NHS)	FOBO	1,000	404
Gila Cliff Dwellings National Monument (NM)	GICL	533	216
Montezuma Castle National Monument (NM)	MOCA	858	347
Organ Pipe Cactus National Monument (NM)	ORPI	330,688	133,882
Saguaro National Park (NP)	SAGU	102,011	41,300
Tonto National Monument (NM)	TONT	1,120	453
Tumacácori National Historical Park (NHP)	TUMA	356	144
Tuzigoot National Monument (NM)	TUZI	373	149

watching, 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 SODN began monitoring birds in spring 2007; 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 SODN 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, described below, that are complementary and together provide a comprehensive assessment of changing bird populations and communities. Although we have selected these objectives, 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 a broader ecological context.

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 the Distance program for subsequent analyses (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; the methods are robust and widely accepted 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. (2007) and Bennetts et al. (2012, 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 mesic riparian and upland habitat classes, although SODN parks contain a wide range of upland vegetation (and, by extension, bird) communities. The dominant vegetation communities represented by upland areas in SODN parks can be further stratified into three major habitat types: desert scrub, grassland/savanna, and forest and woodland (Table 2.1.1-1).

Table 2.1.1-2. Number of transects or grids of each habitat class surveyed in each SODN park unit, 2011

Park unit	Riparian	Upland
Casa Grande Ruins NM	--	1
Chiricahua NM	--	6
Coronado NMem	--	2
Fort Bowie NHS	1	1
Gila Cliff Dwellings NM	--	--
Montezuma Castle NM– Castle Unit	2	1
Montezuma Castle NM–Well Unit	1	--
Organ Pipe Cactus NM	2	4
Saguaro NP–SAGE	1	8
Saguaro NP–SAGW	--	5
Tonto NM	1	1
Tumacácori NHP	2	--
Tuzigoot NM	2	--

Table 2.1.1-1. Habitat classes and major types by park

Habitat class	Major habitat types	Parks
Upland	Desert scrub	• Casa Grande Ruins NM • Montezuma Castle NM • Organ Pipe Cactus NM • Saguaro NP–Tucson Mountain District (SAGW) • at <4,000 feet in Saguaro NP–Rincon Mountain District (SAGE) and Tonto NM • Tumacácori NHP • Tuzigoot NM
Upland	Grassland/savanna	• Chiricahua NM • Coronado NMem • Fort Bowie NHS
Upland	Forest and Woodland	• Chiricahua NM • Coronado NMem • Gila Cliff Dwellings NM • Saguaro NP–SAGE
Riparian	Riparian	• Fort Bowie NHS • Gila Cliff Dwellings NM • Montezuma Castle NM–Castle Unit • Montezuma Castle NM–Well Unit • Organ Pipe Cactus NM • Saguaro NP–SAGE • Tonto NM • Tumacácori NHP • Tuzigoot NM

In 2011, we surveyed landbirds within 10 of the 11 SODN parks; we were unable to sample in Gila Cliff Dwellings National Monument (NM) due to a wildfire that burned through the park. Sample points were located along a transect (in most cases) or a grid. Note that in Chapter 3 we may use the terms "transect" and "grid" interchangably. A total of 41 transects or grids were surveyed in 2011 (Table 2.1.1-2). In most parks, we used sites selected with methodology outlined in Powell et al. (2007). Exceptions occurred at Organ Pipe Cactus NM and Saguaro National Park (NP), because of safety concerns related to undocumented immigration and smuggling. Details of these exceptions are presented in Bennetts et al. (2012, in review).

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 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 SODN parks.

The timing of breeding varies among species and depends on a number of factors, including latitude and elevation. Birds at southern latitudes and lower elevations tend to breed earlier than those at higher latitudes and elevations. Consequently, parks with a wide elevation range (e.g., SAGU) also had a wide range of sampling dates. 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

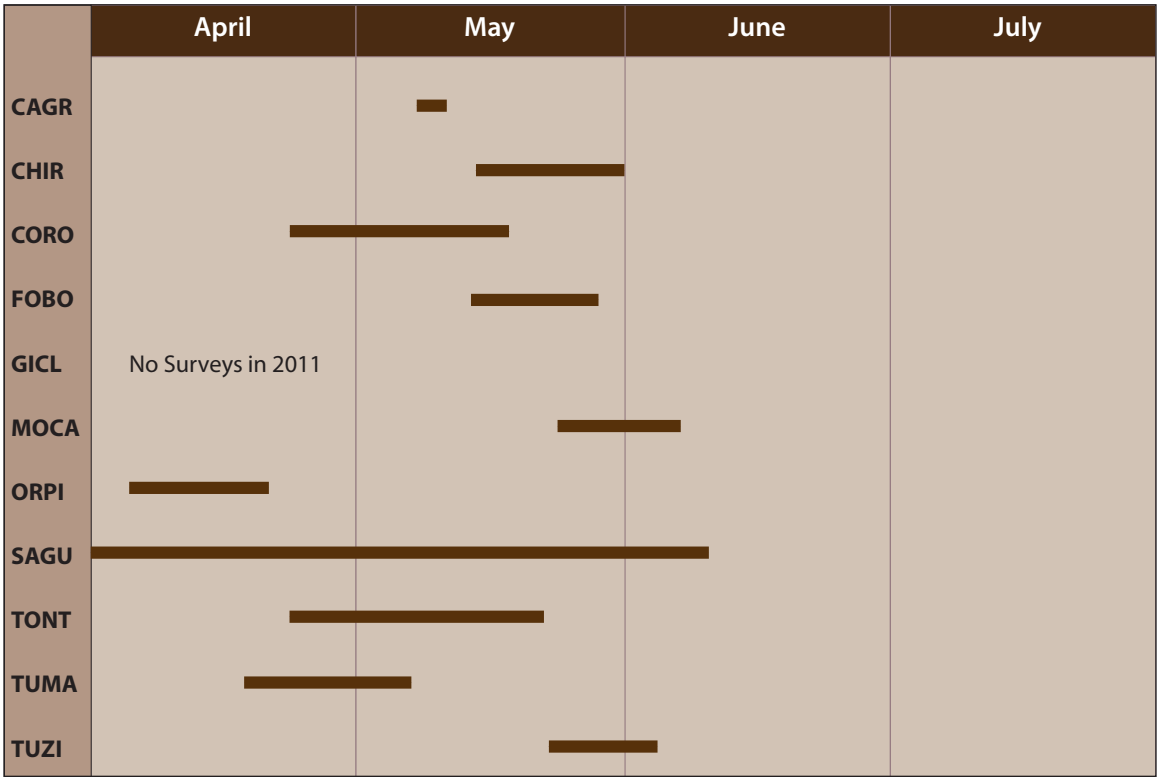


Figure 2.1.2. Dates when sampling was conducted in SODN parks, 2011.

evolved from the variable circular plot approach (Reynolds et al. 1980) and distance sampling of line transects (Burnham et al. 1980). A point-transect is a line transect of zero length (i.e., a point) (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 handheld GPS (Global Positioning System) unit to locate successive survey points. While walking between points, observers recorded species previously unconfirmed in a particular park.

Surveys were conducted twice for each transect or grid to facilitate occupancy estimates, which rely on an encounter-history matrix derived from repeated visits, rather than a detection function to account for detectability. Only two of the 41 transects, both at Saguaro NP, were visited once.

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. Six-minute counts are consistent with region-wide bird monitoring efforts being conducted by Rocky Mountain Bird Observatory (RMBO) and its parterns.

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 SODN

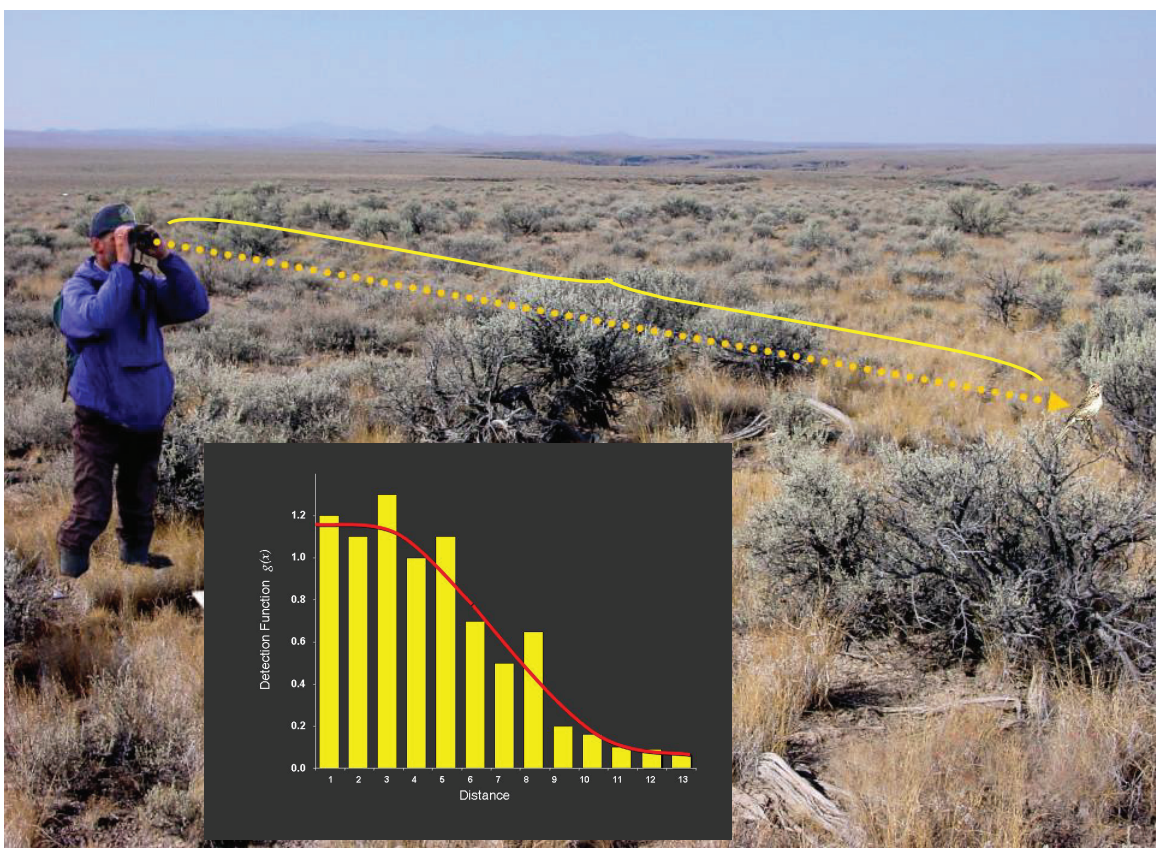


Figure 2.2. Distance sampling works by estimating a detection profile (graph) as a function of distance from which either individual or groups of birds are observed from the transect.

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.

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 a broader ecological context.

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 a 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.

2.5 Accessing the Data

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 SODN 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. SODN and its parks will have easy access to the data upon completion of the new Avian Data Center, expected around February, 2012.

3 Results and Discussion

We had a total of 563 point counts (the number of counts from a given point during a given sampling occasion) on 41 transects or grids (Table 3-1). Of these, 393 points were sampled in upland habitats and 170 in riparian habitats. We recorded a total of 10,882 birds of 176 species on our survey points, with an additional 196 birds detected as flyovers.

Saguaro NP had the highest number of birds detected (n = 3,447), as well as the highest number of point counts. Coronado NMem had the lowest number of birds detected (n = 370). We observed the greatest number of species at Saguaro NP (n = 127) and the fewest at Casa Grande Ruins NM (n = 39) (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.

Gila Woodpecker was the most commonly detected species within the SODN (n = 737), followed by Mourning Dove (n = 575) and White-winged Dove (n = 511) (see Table 3-3). Thirty-two species were detected at only one of the 10 parks surveyed; 10 species (e.g., Common Raven and Gray Flycatcher) were detected at all 10 parks surveyed; and numerous species were detected at one or very few parks (see Table 3-4).

Table 3-2. Number of species observed in each habitat class at each park, 2011

Park	Species detected		
	Upland	Riparian	Total[1]
Casa Grande Ruins NM	39	--	39
Chiricahua NM	101	--	101
Coronado NMem	60	--	60
Fort Bowie NHS	54	55	70
Gila Cliff Dwellings NM	--[2]	--[2]	--[2]
Montezuma Castle NM	55	68	78
Organ Pipe Cactus NM	51	52[3]	65
Saguaro NP	120	52	127
Tonto NM	61	58	75
Tumacácori NHP	--	85	85
Tuzigoot NM	--	68	68
Total[1]	**165**	**133**	**176**

[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; #s do not include incidental observations.

[2] Sampling was not conducted at the park in 2011 due to wildfire.

[3] Riparian habitat sampled at ORPI was xeroriparian, thus not directly comparable to more mesic habitats.

Table 3-1. Numbers of point counts (# of counts from a given point during a given sampling occasion) and individual birds counted in each habitat class at each SODN park, 2011

Park	Upland		Riparian		Total birds detected
	# Point counts	Birds counted	# Point counts	Birds counted	
Casa Grande Ruins NM	18	516	--	--	516
Chiricahua NM	84	1,358	--	--	1,358
Coronado NMem	28	370	--	--	370
Fort Bowie NHS	14	235	16	358	593
Gila Cliff Dwellings NM[1]	--	--	--	--	--
Montezuma Castle NM	16	264	38	828	1,092
Organ Pipe Cactus NM	56	615	28	446	1,061
Saguaro NP	159	2,966	16	481	3,447
Tonto NM	18	358	16	354	712
Tumacácori NHP	--	--	28	958	958
Tuzigoot NM	--	--	28	775	775
Total	**393**	**6,682**	**170**	**4,200**	**10,882**

Note: Detections do not include flyovers. # point counts represent the sum of one or two visits, rather than independent visits.

[1] Sampling was not conducted at Gila Cliff Dwellings NM in 2011 due to the Miller Fire, which burned through the park in May 2011.

Table 3-3. Total number of birds observed of each species during surveys in SODN parks, 2011

Common name	# of birds
Gila Woodpecker	737
Mourning Dove	575
White-winged Dove	511
Ash-throated Flycatcher	468
House Finch	370
Cactus Wren	339
Lucy's Warbler	333
Gambel's Quail	308
Verdin	278
Bewick's Wren	275
Black-throated Sparrow	220
Curve-billed Thrasher	219
Turkey Vulture	179
White-throated Swift	177
Brown-crested Flycatcher	165
Red-winged Blackbird	164
Phainopepla	159
Scott's Oriole	157
Canyon Towhee	151
Lesser Goldfinch	147
Black-throated Gray Warbler	133
Northern Cardinal	128
Cassin's Kingbird	127
Ladder-backed Woodpecker	117
Lark Sparrow	117
Gilded Flicker	108
Great-tailed Grackle	106
Brown-headed Cowbird	104
Yellow Warbler	101
Yellow-rumped Warbler	101
Rufous-crowned Sparrow	99
Spotted Towhee	98
Common Raven	96
Mexican Jay	95
Black-chinned Hummingbird	94
Pyrrhuloxia	93
Black-headed Grosbeak	89
Summer Tanager	89
Western Tanager	86
Violet-green Swallow	83
Black-tailed Gnatcatcher	78
Lazuli Bunting	76
Wilson's Warbler	76
Northern Mockingbird	75
Abert's Towhee	72
Blue Grosbeak	71
Bell's Vireo	67
Broad-tailed Hummingbird	63
European Starling	59
Costa's Hummingbird	58
Bridled Titmouse	56
Canyon Wren	56
Common Yellowthroat	56
Bullock's Oriole	55
Hooded Oriole	55
Bushtit	53
Cliff Swallow	52
Song Sparrow	52
Blue-gray Gnatcatcher	50
Rock Wren	50
Rock Pigeon	49
Western Kingbird	45
Western Wood-Pewee	45
Green-tailed Towhee	43
Red-tailed Hawk	43
Vermilion Flycatcher	42
Yellow-breasted Chat	40
Pine Siskin	37
Gray Flycatcher	36
Northern Rough-winged Swallow	36
Warbling Vireo	33
Acorn Woodpecker	32
Brewer's Sparrow	32
Chipping Sparrow	31
Greater Roadrunner	29
Orange-crowned Warbler	27
Rufous-winged Sparrow	27
Say's Phoebe	27
Anna's Hummingbird	26
Plumbeous Vireo	26
White-breasted Nuthatch	26
Barn Swallow	25
Townsend's Warbler	25
American Kestrel	24
Hermit Thrush	24
White-crowned Sparrow	24

Table 3-3. Total number of birds observed of each species during surveys in all SODN parks, 2011, cont.

Common name	# of birds
Broad-billed Hummingbird	23
Gray Hawk	23
American Robin	21
Eurasian Collared-Dove	21
Hammond's Flycatcher	21
Ruby-crowned Kinglet	21
Band-tailed Pigeon	20
Great Horned Owl	20
Northern Flicker	19
Pygmy Nuthatch	19
Red-faced Warbler	18
Dusky-capped Flycatcher	16
Hepatic Tanager	16
Common Black-Hawk	15
Eastern Meadowlark	15
House Wren	15
Hutton's Vireo	15
Black-chinned Sparrow	14
Cedar Waxwing	14
MacGillivray's Warbler	14
Pacific-slope Flycatcher	14
Virginia's Warbler	14
Arizona Woodpecker	13
Black Vulture	13
Cooper's Hawk	13
Double-crested Cormorant	13
Vaux's Swift	13
Western Scrub-Jay	13
Black Phoebe	12
Crissal Thrasher	11
Belted Kingfisher	10
Grace's Warbler	10
Gray Vireo	10
Zone-tailed Hawk	10
Bank Swallow	9
Mallard	9
Yellow-eyed Junco	9
Hairy Woodpecker	8
House Sparrow	8
Northern Beardless-Tyrannulet	8
Painted Redstart	8
Virginia Rail	8
Botteri's Sparrow	7
Horned Lark	7
Hermit Warbler	6
Juniper Titmouse	6
Bronzed Cowbird	5
Killdeer	5
Lesser Nighthawk	5
Loggerhead Shrike	5
Steller's Jay	5
Swainson's Thrush	5
Wild Turkey	5
Burrowing Owl	4
Great Blue Heron	4
Greater Pewee	4
Peregrine Falcon	4
Red-breasted Nuthatch	4
Wood Duck	4
Common Ground-Dove	3
Cordilleran Flycatcher	3
Dusky Flycatcher	3
Lincoln's Sparrow	3
Mexican Chickadee	3
Montezuma Quail	3
Nashville Warbler	3
Northern Goshawk	3
Olive Warbler	3
Olive-sided Flycatcher	3
Brewer's Blackbird	2
Brown Creeper	2
Indigo Bunting	2
Mountain Chickadee	2
Prairie Falcon	2
Rufous Hummingbird	2
Sharp-shinned Hawk	2
Western Bluebird	2
Black-crowned Night-Heron	1
Cassin's Vireo	1
Common Poorwill	1
Elegant Trogon	1
Green Heron	1
Northern Pygmy-Owl	1
Red Crossbill	1
Swainson's Hawk	1
Tree Swallow	1

Common name	# of birds
Western Screech-Owl	1
Whip-poor-will	1
Willow Flycatcher	1
Yellow-billed Cuckoo	1
Unidentified birds	*62*
Total	**10,882**

Note: Species are listed in rank order from most to least commonly detected. Number of birds is the total number of individuals counted. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. 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 identified by our birding team, but not as part of our regular survey) are not included in this table; they are included in individual park species tables.

© ROBERT SHANTZ

White-winged Dove (*Zenaida asiatica*) was the third most commonly counted species in the SODN in 2011.

Table 3-4. Parks where each species was detected, April through June 2011

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Abert's Towhee	*Melozone aberti*						●	o	●	●	●	●
Acorn Woodpecker	*Melanerpes formicivorus*		●	o	o	o		o	●			
American Avocet	*Recurvirostra americana*							o				
American Coot	*Fulica americana*						o	o				o
American Crow	*Corvus brachyrhynchos*											o
American Goldfinch	*Spinus tristis*						o	o				
American Kestrel	*Falco sparverius*	●	o	o	o	o	●	●	●	●	●	o
American Pipit	*Anthus rubescens*	o			o		o	o			o	o
American Redstart	*Setophaga ruticilla*		o					o				o
American Robin	*Turdus migratorius*		●	o	●	o	●	o	●	o	●	o
American White Pelican	*Pelecanus erythrorhynchos*							o		o		
American Wigeon	*Anas americana*						o	o				o
Anna's Hummingbird	*Calypte anna*	●	o	●	●		●	o	●	●	●	o
Arizona Woodpecker	*Picoides arizonae*		●	●					●			
Ash-throated Flycatcher	*Myiarchus cinerascens*	●	●	●	●	o	●	●	●	●	●	●
Baird's Sandpiper	*Calidris bairdii*						o	o				
Bald Eagle	*Haliaeetus leucocephalus*		o		o	o				o		o
Baltimore Oriole	*Icterus galbula*										o	
Band-tailed Pigeon	*Patagioenas fasciata*		●	●		o		o	●			
Bank Swallow	*Riparia riparia*	●				o	o	o		o	o	o
Barn Owl	*Tyto alba*	o		o	o	o	o	o	o	o	o	o
Barn Swallow	*Hirundo rustica*	●	o	o	o	o	●	●	●	●	●	o
Bell's Vireo	*Vireo bellii*			o	o	o	o	●	●	●	●	o
Belted Kingfisher	*Megaceryle alcyon*						●		o			●
Bendire's Thrasher	*Toxostoma bendirei*	o			o			o	o			o
Bewick's Wren	*Thryomanes bewickii*	o	●	●	●	o	●	●	●	●	●	●
Black Phoebe	*Sayornis nigricans*	o	o	o	o	o	●	o	●	o	o	o
Black Rail	*Laterallus jamaicensis*							o				
Black Tern	*Chlidonias niger*							o				o
Black Vulture	*Coragyps atratus*			o	o			o	●		o	
Black-and-white Warbler	*Mniotilta varia*							o				
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*										o	
Black-chinned Hummingbird	*Archilochus alexandri*	●	●	o	●	o	●	●	●	●	●	●
Black-chinned Sparrow	*Spizella atrogularis*	o	●	●	●		o	o	●	●		

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Black-crowned Night-Heron	*Nycticorax nycticorax*						o	o			o	●
Black-headed Grosbeak	*Pheucticus melanocephalus*		●	●	●	o	●	●	●	●	●	●
Black-necked Stilt	*Himantopus mexicanus*	o						o				
Blackpoll Warbler	*Dendroica striata*							o				
Black-tailed Gnatcatcher	*Polioptila melanura*	o	o		o		o	●	●	●	o	o
Black-throated Blue Warbler	*Dendroica caerulescens*							o				
Black-throated Gray Warbler	*Dendroica nigrescens*	o	●	●	●	o	●	●	●	●	o	●
Black-throated Green Warbler	*Dendroica virens*							o				
Black-throated Sparrow	*Amphispiza bilineata*	●	●	●	●		●	●	●	●	o	●
Blue Grosbeak	*Passerina caerulea*		●	o	●	o	●	●	o	o	●	●
Blue-gray Gnatcatcher	*Polioptila caerulea*	o	●	o	●	o	●	●	●	●	●	●
Blue-headed Vireo	*Vireo solitarius*						o		o			
Blue-throated Hummingbird	*Lampornis clemenciae*		o	o								
Blue-winged Teal	*Anas discors*						o	o				o
Bonaparte's Gull	*Chroicocephalus philadelphia*							o				o
Botteri's Sparrow	*Peucaea botterii*		o	●	o							
Brewer's Blackbird	*Euphagus cyanocephalus*	o			o	o	o	●	o	o	o	o
Brewer's Sparrow	*Spizella breweri*	o	●	o	o	o	o	●	●	●	●	o
Bridled Titmouse	*Baeolophus wollweberi*		●	o	o	o	●		●		●	●
Broad-billed Hummingbird	*Cynanthus latirostris*		o	o	●			o	●		●	
Broad-tailed Hummingbird	*Selasphorus platycercus*		●	●	●	o	o	●	●	o	o	o
Bronzed Cowbird	*Molothrus aeneus*	●	●	o	o		o	o	o	o	o	●
Brown Creeper	*Certhia americana*		o	o	o	o	o	o	●		o	o
Brown Pelican	*Pelecanus occidentalis*							o				
Brown Thrasher	*Toxostoma rufum*							o				
Brown-crested Flycatcher	*Myiarchus tyrannulus*	o	●	●	●		●	o	●	●	●	●
Brown-headed Cowbird	*Molothrus ater*	●	●	●	●	o	●	o	●	●	●	●
Buff-breasted Flycatcher	*Empidonax fulvifrons*		o						o			
Buff-collared Nightjar	*Caprimulgus ridgwayi*							o				
Bufflehead	*Bucephala albeola*						o	o				o
Bullock's Oriole	*Icterus bullockii*	o	●	●	●	o	●	●	●	o	●	●

● = species detected in 2011 survey

● = species detected in 2011 incidental to the survey

o = species not detected in 2011 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] No surveys were conducted in Gila Cliff Dwellings NM in 2011 due to wildfire

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Burrowing Owl	*Athene cunicularia*	●						o				
Bushtit	*Psaltriparus minimus*		●	●	o	o	o	o	●	o	o	o
Cactus Wren	*Campylorhynchus brunneicapillus*	o	●	●	●		●	●	●	●	o	●
California Gull	*Larus californicus*							o				o
Calliope Hummingbird	*Stellula calliope*		o	o	o	o	o	o	o		o	o
Canada Goose	*Branta canadensis*						o	o				o
Canvasback	*Aythya valisineria*						o	o				o
Canyon Towhee	*Melozone fusca*	o	●	●	●	o	o	●	●	●	o	●
Canyon Wren	*Catherpes mexicanus*		●	●	o	o	●	●	●	●		●
Cassin's Finch	*Carpodacus cassinii*		o	o	o		o		o	o		
Cassin's Kingbird	*Tyrannus vociferans*	o	●	●	●	o	●	o	●	●	●	●
Cassin's Sparrow	*Peucaea cassinii*		o	o	o				o		o	
Cassin's Vireo	*Vireo cassinii*			o	o				o	o	●	
Cattle Egret	*Bubulcus ibis*						o	o				o
Cedar Waxwing	*Bombycilla cedrorum*		o	o	●		●	o	●	o	●	o
Chestnut-collared Longspur	*Calcarius ornatus*			o								
Chihuahuan Raven	*Corvus cryptoleucus*		o	o	o						o	
Chipping Sparrow	*Spizella passerina*	o	●	o	o	o	o	●	●	o	●	o
Chukar	*Alectoris chukar*									o		
Cinnamon Teal	*Anas cyanoptera*						o	o				o
Clapper Rail	*Rallus longirostris*											o
Clark's Nutcracker	*Nucifraga columbiana*		o			o		o	o			
Clay-colored Sparrow	*Spizella pallida*							o				
Cliff Swallow	*Petrochelidon pyrrhonota*	●	o		o	o	●	o	o	o	●	o
Common Black-Hawk	*Buteogallus anthracinus*		o		o	o	●	o	o		●	o
Common Goldeneye	*Bucephala clangula*							o				o
Common Ground-Dove	*Columbina passerina*	o	o	o	●			o	o	o	●	
Common Loon	*Gavia immer*						o	o				
Common Merganser	*Mergus merganser*					o	o	o				o
Common Moorhen	*Gallinula chloropus*							o				o
Common Nighthawk	*Chordeiles minor*		o	o	o	o	o		o			o
Common Poorwill	*Phalaenoptilus nuttallii*	o	o	o	o	o	o	o	●	o	o	o
Common Raven	*Corvus corax*	●	●	●	●	o	●	●	●	●	●	●
Common Snipe	*Gallinago gallinago*						o	o			o	o

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Common Tern	*Sterna hirundo*							o				
Common Yellowthroat	*Geothlypis trichas*					o	●	o	o		●	●
Cooper's Hawk	*Accipiter cooperii*	o	●	●	o	o	●	●	●	●	●	o
Cordilleran Flycatcher	*Empidonax occidentalis*		●	o		o		o	●			
Costa's Hummingbird	*Calypte costae*	o		o	o		o	●	●	●	o	o
Crested Caracara	*Caracara cheriway*							o	o			
Crissal Thrasher	*Toxostoma crissale*	o	o	o	●		o	●	●	●	o	o
Curve-billed Thrasher	*Toxostoma curvirostre*	o	●	●	●	o	●	●	●	●	o	
Dark-eyed Junco	*Junco hyemalis*		o	o	o	o	o	o	o	o	o	o
Dickcissel	*Spiza americana*							o				
Double-crested Cormorant	*Phalacrocorax auritus*							o		●	o	o
Dusky Flycatcher	*Empidonax oberholseri*		●	o	o	o	o		●	o	o	o
Dusky-capped Flycatcher	*Myiarchus tuberculifer*		●	o	o	o	o		o		●	o
Eared Grebe	*Podiceps nigricollis*							o				o
Eastern Bluebird	*Sialia sialis*		o	o					o			
Eastern Meadowlark	*Sturnella magna*		o	●	o		o	o	o			o
Eastern Phoebe	*Sayornis phoebe*							o			o	
Elegant Trogon	*Trogon elegans*		●	o			o		o			
Elf Owl	*Micrathene whitneyi*	o	o	o	o	o	o	o	o	o	o	o
Eurasian Collared-Dove	*Streptopelia decaocto*	●	●				●		●	o	●	o
European Starling	*Sturnus vulgaris*	●					o	o	o	o	●	●
Evening Grosbeak	*Coccothraustes vespertinus*		o				o	o	o			
Ferruginous Hawk	*Buteo regalis*	o	o				o	o				
Ferruginous Pygmy-Owl	*Glaucidium brasilianum*							o				
Flammulated Owl	*Otus flammeolus*		o	o		o			o			
Forster's Tern	*Sterna forsteri*							o				
Fox Sparrow	*Passerella iliaca*			o				o	o			
Franklin's Gull	*Larus pipixcan*											o
Gadwall	*Anas strepera*						o	o				o
Gambel's Quail	*Callipepla gambelii*	●	●	o	●	o	●	●	●	●	●	●
Gila Woodpecker	*Melanerpes uropygialis*	●	●	o	o		●	●	●	●	●	●

● = species detected in 2011 survey

●[1] = species detected in 2011 incidental to the survey

o = species not detected in 2011 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] No surveys were conducted in Gila Cliff Dwellings NM in 2011 due to wildfire

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Gilded Flicker	*Colaptes chrysoides*	●						●	●	●	●	
Golden Eagle	*Aquila chrysaetos*		o	o	o	o	o	o	o	o	o	o
Golden-crowned Kinglet	*Regulus satrapa*		o					o	o			
Golden-crowned Sparrow	*Zonotrichia atricapilla*							o				
Golden-winged Warbler	*Vermivora chrysoptera*							o				
Grace's Warbler	*Dendroica graciae*		●			o		o	●			
Grasshopper Sparrow	*Ammodramus savannarum*		o	o	o							
Gray Catbird	*Dumetella carolinensis*					o						
Gray Flycatcher	*Empidonax wrightii*	●	●	●	●	o	●	●	●	●	●	●
Gray Hawk	*Buteo nitidus*		o						●	o	●	
Gray Vireo	*Vireo vicinior*		o		●		o	o	●	●	o	o
Great Blue Heron	*Ardea herodias*	o	o			o	●	o	o	●	o	●
Great Egret	*Ardea alba*	o					o	o			o	o
Great Horned Owl	*Bubo virginianus*	●	o	o	o	o	o	●	●	o	o	o
Greater Pewee	*Contopus pertinax*		o	o		o			●			
Greater Roadrunner	*Geococcyx californianus*	●	o	o	o	o	●	●	●	●	●	o
Greater White-fronted Goose	*Anser albifrons*						o					o
Greater Yellowlegs	*Tringa melanoleuca*						o	o				o
Great-tailed Grackle	*Quiscalus mexicanus*	●	o		o		o	o	●	o	●	●
Green Heron	*Butorides virescens*						o	o				●
Green Kingfisher	*Chloroceryle americana*										o	
Green-tailed Towhee	*Pipilo chlorurus*	o	●	●	●	o	o	●	●	●	●	o
Green-winged Teal	*Anas crecca*						o	o				o
Hairy Woodpecker	*Picoides villosus*		●	o		o			●			
Hammond's Flycatcher	*Empidonax hammondii*	o	●	●	●	o	●	o	●	●	o	●
Harris's Hawk	*Parabuteo unicinctus*	o		o				o	o	o	o	
Heermann's Gull	*Larus heermanni*							o				
Hepatic Tanager	*Piranga flava*		●	o		o	o		●		●	
Hermit Thrush	*Catharus guttatus*		●	o	o	o	●	o	●	o	●	o
Hermit Warbler	*Dendroica occidentalis*	o	●	o				●	●			
Herring Gull	*Larus argentatus*							o				
Hooded Merganser	*Lophodytes cucullatus*							o	o			o
Hooded Oriole	*Icterus cucullatus*	o	o	o	●		●	●	●	●	o	●

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Horned Lark	*Eremophila alpestris*	●	o	●	o		o	o				o
House Finch	*Carpodacus mexicanus*	●	●	●	●	o	●	●	●	●	●	●
House Sparrow	*Passer domesticus*	●		o			o	o	o	o	●	o
House Wren	*Troglodytes aedon*		●	o	o	o	●	o	●	●	●	o
Hutton's Vireo	*Vireo huttoni*		●	●	●	o	o	o	●	o	o	o
Inca Dove	*Columbina inca*	o		o			o	o	o		o	o
Indigo Bunting	*Passerina cyanea*				o	o	●	o	o	o	o	o
Juniper Titmouse	*Baeolophus ridgwayi*		●		o	o	o		●			
Killdeer	*Charadrius vociferus*	●	o		o	o	●	o	o		o	●
Ladder-backed Woodpecker	*Picoides scalaris*	o	●	●	●	o	●	●	●	●	●	●
Lark Bunting	*Calamospiza melanocorys*	o		o	o	o	o	o	o			o
Lark Sparrow	*Chondestes grammacus*	o	●	o	o	o	o	●	●	o	●	o
Lawrence's Goldfinch	*Carduelis lawrencei*							o	o			
Lazuli Bunting	*Passerina amoena*	●	●	●	●	o	●	●	●	●	●	●
Le Conte's Thrasher	*Toxostoma lecontei*							o				
Least Bittern	*Ixobrychus exilis*							o				o
Least Grebe	*Tachybaptus dominicus*							o				
Least Sandpiper	*Calidris minutilla*						o	o				o
Least Tern	*Sterna antillarum*							o				
Lesser Goldfinch	*Carduelis psaltria*	o	●	●	●	o	●	●	●	●	●	●
Lesser Nighthawk	*Chordeiles acutipennis*	●			●		o	●	●	o	o	o
Lesser Scaup	*Aythya affinis*						o	o				o
Lesser Yellowlegs	*Tringa flavipes*						o	o				o
Lewis's Woodpecker	*Melanerpes lewis*					o	o	o	o		o	
Lincoln's Sparrow	*Melospiza lincolnii*	o	●	o	o	o	o	o	●	o	o	o
Loggerhead Shrike	*Lanius ludovicianus*	o	o	o	o		o	●	o	o	o	o
Long-billed Curlew	*Numenius americanus*							o				
Long-billed Dowitcher	*Limnodromus scolopaceus*							o				
Long-eared Owl	*Asio otus*		o		o	o		o	o			
Louisiana Waterthrush	*Parkesia motacilla*										o	
Lucifer Hummingbird	*Calothorax lucifer*			o								

● = species detected in 2011 survey

●[1] = species detected in 2011 incidental to the survey

o = species not detected in 2011 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] No surveys were conducted in Gila Cliff Dwellings NM in 2011 due to wildfire

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Lucy's Warbler	*Oreothlypis luciae*	o	●	●	●	o	●	●	●	●	●	●
MacGillivray's Warbler	*Oporornis tolmiei*	o	●	o	●	o	●	●	●	●	●	●
Magnificent Hummingbird	*Eugenes fulgens*		o	o					o			
Magnolia Warbler	*Dendroica magnolia*							o				
Mallard	*Anas platyrhynchos*	o				o	●	o	o	o	●	●
Marsh Wren	*Cistothorus palustris*						o	o	●[1]		●[1]	o
Merlin	*Falco columbarius*	o		o	o	o	o	o	o	o	o	o
Mexican Chickadee	*Poecile sclateri*		●									
Mexican Jay	*Aphelocoma ultramarina*		●	●	o	o	o		●			
Mississippi Kite	*Ictinia mississippiensis*										●[1]	
Montezuma Quail	*Cyrtonyx montezumae*		o	o	●	o			o			
Mountain Bluebird	*Sialia currucoides*		o	o			o	o	o		o	o
Mountain Chickadee	*Poecile gambeli*					o			●			
Mourning Dove	*Zenaida macroura*	●	●	●	●	o	●	●	●	●	●	●
Nashville Warbler	*Oreothlypis ruficapilla*	o	●	o	●		o	o	●	o	o	o
Northern Beardless-Tyrannulet	*Camptostoma imberbe*		o				o	o	●	o	●	●
Northern Cardinal	*Cardinalis cardinalis*	o	●	●	●		●	●	●	●	●	●
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	o	o	o		o
Northern Mockingbird	*Mimus polyglottos*	●	●	●	●	o	●	●	●	●	●	●
Northern Parula	*Parula americana*								o		o	
Northern Pintail	*Anas acuta*						o	o				o
Northern Pygmy-Owl	*Glaucidium gnoma*		o	o	o	o	o		●			
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	●	o		o	o	●	o	o	o	●	●
Northern Saw-whet Owl	*Aegolius acadicus*		o	o		o	o		o			
Northern Shoveler	*Anas clypeata*						o	o				o
Northern Waterthrush	*Parkesia noveboracensis*				o		o	o			o	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
Osprey	*Pandion haliaetus*		o		o		o	o	o	o		o
Ovenbird	*Seiurus aurocapilla*		●[1]	o				o			o	
Pacific-slope Flycatcher	*Empidonax difficilis*		●	o	●		o	o	●	●	●	o

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Painted Bunting	*Passerina ciris*							o			o	
Painted Redstart	*Myioborus pictus*	o	●	●		o	o	o	●	●		
Peregrine Falcon	*Falco peregrinus*	o	●	o	o	o	o	●	●	o	o	o
Phainopepla	*Phainopepla nitens*	o	o	o	●		●	●	●	●	●	●
Pied-billed Grebe	*Podilymbus podiceps*						o	o				o
Pine Siskin	*Spinus pinus*		●	o	●		o	o	●	o	●	o
Pinyon Jay	*Gymnorhinus cyanocephalus*		o	o		o	o		o			
Plain-capped Starthroat	*Heliomaster constantii*			o								
Plumbeous Vireo	*Vireo plumbeus*		●	o	●	o	●		●	o	●	o
Prairie Falcon	*Falco mexicanus*	o	o	o	o	o	o	o	●	o		o
Purple Finch	*Carpodacus purpureus*							o	o			
Purple Martin	*Progne subis*		o			o	o	o	o	o	o	o
Pygmy Nuthatch	*Sitta pygmaea*		o			o			●			
Pyrrhuloxia	*Cardinalis sinuatus*	o	o	o	o			●	●	●	●	
Red Crossbill	*Loxia curvirostra*		o			o	●		o			o
Red Phalarope	*Phalaropus fulicarius*							o				
Red-breasted Merganser	*Mergus serrator*							o				
Red-breasted Nuthatch	*Sitta canadensis*		●	●		o	o	o	●			
Red-breasted Sapsucker	*Sphyrapicus ruber*							o				
Red-eyed Vireo	*Vireo olivaceus*							o				
Red-faced Warbler	*Cardellina rubrifrons*		●	o		o			●			
Redhead	*Aythya americana*						o	o				o
Red-naped Sapsucker	*Sphyrapicus nuchalis*		o	o	o	o	o	o	o	o		o
Red-necked Phalarope	*Phalaropus lobatus*							o				
Red-tailed Hawk	*Buteo jamaicensis*	●	●	o	o	o	●	●	●	o	o	●
Red-winged Blackbird	*Agelaius phoeniceus*	●					●	o	o	o	o	●
Ring-billed Gull	*Larus delawarensis*							o				o
Ring-necked Duck	*Aythya collaris*							o				o
Rock Pigeon	*Columba livia*	●		o			o	o	o		●	o
Rock Wren	*Salpinctes obsoletus*	o	●	●	●	o	o	o	●	●	o	●
Roseate Spoonbill	*Platalea ajaja*							o				

● = species detected in 2011 survey

●[1] = species detected in 2011 incidental to the survey

o = species not detected in 2011 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] No surveys were conducted in Gila Cliff Dwellings NM in 2011 due to wildfire

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			o				o				
Rose-throated Becard	*Pachyramphus aglaiae*										o	
Rough-legged Hawk	*Buteo lagopus*		o								o	
Ruby-crowned Kinglet	*Regulus calendula*	o	●	●	●		o	o	●	o	●	o
Ruddy Duck	*Oxyura jamaicensis*						o	o				o
Rufous Hummingbird	*Selasphorus rufus*		o	o	o	o	o	●	o	o	o	o
Rufous-crowned Sparrow	*Aimophila ruficeps*		●	●	●	o	o	o	●	●	o	o
Rufous-winged Sparrow	*Aimophila carpalis*	o			o			o	●	o	●	
Sabine's Gull	*Xema sabini*											o
Sage Sparrow	*Amphispiza belli*						o	o				o
Sage Thrasher	*Oreoscoptes montanus*					o	o	o	o			
Sandhill Crane	*Grus canadensis*	o	o		o			o				
Savannah Sparrow	*Passerculus sandwichensis*		o	o	o			o			o	
Say's Phoebe	*Sayornis saya*	o	●	●	●	o	●	●	o	●	●	●
Scaled Quail	*Callipepla squamata*		o	o	o				o			
Scarlet Tanager	*Piranga olivacea*							o				
Scissor-tailed Flycatcher	*Tyrannus forficatus*							o				
Scott's Oriole	*Icterus parisorum*		●	●	●		●	●	●	●	o	o
Semipalmated Plover	*Charadrius semipalmatus*							o				
Sharp-shinned Hawk	*Accipiter striatus*	o	o	●	o	o	o	o	●	o	o	o
Short-eared Owl	*Asio flammeus*						o					
Short-tailed Hawk	*Buteo brachyurus*		o									
Snow Goose	*Chen caerulescens*						o					
Snowy Egret	*Egretta thula*						o	o			o	o
Solitary Sandpiper	*Tringa solitaria*						o	o				o
Song Sparrow	*Melospiza melodia*				o	o	●	o	o		●	●
Sora	*Porzana carolina*							o				o
Spotted Owl	*Strix occidentalis*		o						o			
Spotted Sandpiper	*Actitis macularius*				o	o	o	o	o		o	o
Spotted Towhee	*Pipilo maculatus*		●	●	o	o	o	●	●	o		o
Steller's Jay	*Cyanocitta stelleri*		o	o	o	o		o	●	o		
Stilt Sandpiper	*Calidris himantopus*							o				
Streak-backed Oriole	*Icterus pustulatus*										o	
Sulphur-bellied Flycatcher	*Myiodynastes luteiventris*		o	o					o			

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Summer Tanager	*Piranga rubra*		●	o	●	o	●	o	●	o	●	●
Swainson's Hawk	*Buteo swainsoni*	o	o	o	o	o	o	o	●	o	o	o
Swainson's Thrush	*Catharus ustulatus*		o	o	●	o	o	o		●	●	o
Swamp Sparrow	*Melospiza georgiana*							o				
Tennessee Warbler	*Oreothlypis peregrina*							o				
Thick-billed Kingbird	*Tyrannus crassirostris*							o		o	o	
Townsend's Solitaire	*Myadestes townsendi*		o	o	o	o	o	o	o	o	o	o
Townsend's Warbler	*Dendroica townsendi*		●	o	●	o	●	o	●	●	o	o
Tree Swallow	*Tachycineta bicolor*	o				o	o	o	o		o	●
Tropical Kingbird	*Tyrannus melancholicus*							o			o	
Turkey Vulture	*Cathartes aura*	o	●	●	●	o	●	o	●	●	●	●
Varied Bunting	*Passerina versicolor*							o	o		o	
Varied Thrush	*Ixoreus naevius*							o				
Vaux's Swift	*Chaetura vauxi*				●		o	●	o	●	o	
Verdin	*Auriparus flaviceps*	●	●	●	●		●	●	●	●	●	●
Vermilion Flycatcher	*Pyrocephalus rubinus*	o	o	●	o	o	●	●	●	o	●	●
Vesper Sparrow	*Pooecetes gramineus*	o	o	o	o	o	o	o	o		o	o
Violet-crowned Hummingbird	*Amazilia violiceps*			o							o	
Violet-green Swallow	*Tachycineta thalassina*	o	●	●	o	o	●	●	●	●	●	o
Virginia Rail	*Rallus limicola*											●
Virginia's Warbler	*Oreothlypis virginiae*	o	●	●	●	o	o	●	●	o	o	o
Warbling Vireo	*Vireo gilvus*		●	●	●	o	●	●	●	●	●	●
Western Bluebird	*Sialia mexicana*		o	o	o	o	o	o	●	o		o
Western Grebe	*Aechmophorus occidentalis*							o				
Western Kingbird	*Tyrannus verticalis*	●	●	●	o	o	●	●	●	●	●	●
Western Meadowlark	*Sturnella neglecta*	o	o	o	o		o	o	o	o	o	o
Western Sandpiper	*Calidris mauri*	o					o	o				o
Western Screech-Owl	*Megascops kennicottii*	o	o	o	o	o	o	o	o	●	o	o
Western Scrub-Jay	*Aphelocoma californica*		o	●	●	o	o		●	o	o	o
Western Tanager	*Piranga ludoviciana*	●	●	●	●	o	●	o	●	●	o	●
Western Wood-Pewee	*Contopus sordidulus*	o	●	o	●	o	●	o	o	●	●	●

● = species detected in 2011 survey

●[1] = species detected in 2011 incidental to the survey

o = species not detected in 2011 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] No surveys were conducted in Gila Cliff Dwellings NM in 2011 due to wildfire

Table 3-4. Parks where each species was detected, April through June 2011, cont.

Common name	Scientific name	CAGR	CHIR	CORO	FOBO	GICL [1]	MOCA	ORPI	SAGU	TONT	TUMA	TUZI
Whip-poor-will	*Caprimulgus vociferus*		●	o		o			o			
Whiskered Screech-Owl	*Megascops trichopsis*		o	o					o			
White-breasted Nuthatch	*Sitta carolinensis*		●	o	o	o	o		●		●	o
White-crowned Sparrow	*Zonotrichia leucophrys*	o	●	o	o	o	●	o	●	●	●	o
White-eared Hummingbird	*Hylocharis leucotis*		o	o							o	
White-faced Ibis	*Plegadis chihi*	o						o			o	o
White-tailed Kite	*Elanus leucurus*			o				o				
White-throated Sparrow	*Zonotrichia albicollis*				o			o			o	
White-throated Swift	*Aeronautes saxatalis*	o	●	●	●	o	●	●	●	●	o	o
White-winged Dove	*Zenaida asiatica*	●	●	●	●	o	●	●	●	●	●	●
Wild Turkey	*Meleagris gallopavo*		●	●		o			o			
Willet	*Tringa semipalmata*						o	o				
Williamson's Sapsucker	*Sphyrapicus thyroideus*		o	o		o	o		o			
Willow Flycatcher	*Empidonax traillii*					o		o				●
Wilson's Phalarope	*Phalaropus tricolor*						o	o				o
Wilson's Warbler	*Wilsonia pusilla*	●	●	●	●	o	●	●	●	●	●	●
Wood Duck	*Aix sponsa*						o	o				●
Wood Stork	*Mycteria americana*							o				
Worm-eating Warbler	*Helmitheros vermivorum*										o	
Yellow Warbler	*Dendroica petechia*	o	●	o	●	o	●	o	●	●	●	●
Yellow-bellied Sapsucker	*Sphyrapicus varius*									o		
Yellow-billed Cuckoo	*Coccyzus americanus*		o	o	o	o	●		o	o	o	o
Yellow-breasted Chat	*Icteria virens*			o	o	o	●	o	o	o	●	●
Yellow-eyed Junco	*Junco phaeonotus*		●	o					●			
Yellow-green Vireo	*Vireo flavoviridis*								o			
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	o				o	o	o	o	o	o	o
Yellow-rumped Warbler	*Dendroica coronata*	●	●	●	●	o	o	●	●	●	●	●
Yellow-throated Vireo	*Vireo flavifrons*						o			o	o	
Zone-tailed Hawk	*Buteo albonotatus*	o	●	o	●	o	o	o	o	●	o	o

● = species detected in 2011 survey

●[1] = species detected in 2011 incidental to survey

o = species not detected in 2011 survey, but known to occur in the park, including species that migrate through or winter in the park

[1] No surveys were conducted in Gila Cliff Dwellings NM in 2011 due to wildfire

3.1 Casa Grande Ruins National Monument

3.1.1 2011 sampling

During May of 2011, we sampled one grid at Casa Grande Ruins NM (Figure 3.1.1). The grid was in upland (desert scrub) habitat (Table 3.1.1). The nine points on the grid were surveyed two times for a total of 18 point counts at the park in 2011.

3.1.2 Results and discussion

During 2011, 516 birds of 39 species were counted at Casa Grande Ruins NM (Table 3.1.2). Great-tailed Grackle was the most commonly counted species (16%), followed by Mourning Dove (16%), European Starling (10%), Red-winged Blackbird (10%), and Rock Pigeon (9%). No new species were detected for the park during the survey.

As in previous years, several species were frequently recorded as flyovers and also at lengthy distances in the sparse, open, desert and surrounding agricultural habitats where the visibility is good. These include Mourning Dove, Great-tailed Grackle, Rock Pigeon, Red-winged Blackbird, and European Starling. Regular breeders, such as White-winged Dove, House Finch, Verdin, and Gambel's Quail, were also noted in good numbers. Migrant diversity and numbers were unusually low in the limited habitat, with Gray Flycatcher, Lazuli Bunting, Western Tanager, Wilson's Warbler, and Yellow-rumped Warbler the most notable. Nesting Burrowing Owls held the same territories as in 2010, and Great Horned Owls with large juveniles were observed in the ruins ramada where they have been regular breeders in past.

Table 3.1.1. Habitat type, number of points, and sampling dates for each transect or grid at Casa Grande Ruins NM, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
U	Upland	Desert scrub	9	2	5/10/2011	5/11/2011

© ROB BENNETTS

Great Horned Owls (*Bubo virginianus*) were observed at Casa Grande Ruins NM in 2011.

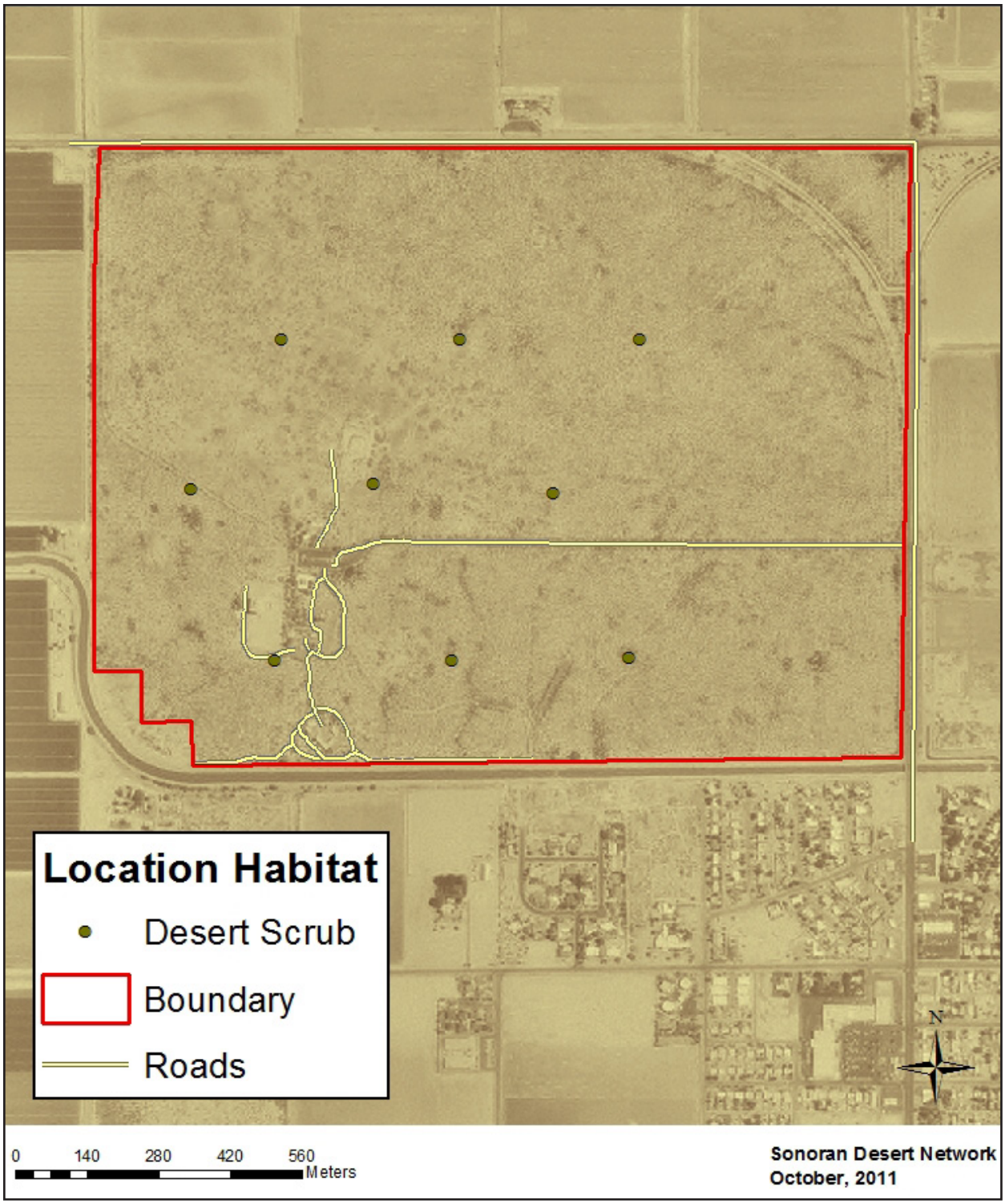


Figure 3.1.1. Point locations targeted for annual sampling at Casa Grande Ruins NM, 2011.

Table 3.1.2. Number of birds detected of each species counted, Casa Grande Ruins NM, 2011

Species	# of birds detected: Total (desert scrub habitat)	# of birds detected: % of total
Great-tailed Grackle	85	16
Mourning Dove	81	16
European Starling	54	10
Red-winged Blackbird	53	10
Rock Pigeon	46	9
Gambel's Quail	30	6
Cliff Swallow	29	6
White-winged Dove	18	3
House Finch	14	3
Verdin	13	3
Anna's Hummingbird	9	2
Bank Swallow	9	2
Barn Swallow	7	1
House Sparrow	7	1
Ash-throated Flycatcher	6	1
Eurasian Collared-Dove	5	1
Red-tailed Hawk	5	1
American Kestrel	4	1
Burrowing Owl	4	1
Bronzed Cowbird	3	1
Brown-headed Cowbird	3	1
Gila Woodpecker	3	1
Gray Flycatcher	3	1
Greater Roadrunner	3	1
Common Raven	2	0
Gilded Flicker	2	0
Great Horned Owl	2	0
Horned Lark	2	0
Killdeer	2	0
Western Kingbird	2	0
Yellow-rumped Warbler	2	0
Black-chinned Hummingbird	1	0
Black-throated Sparrow	1	0
Lazuli Bunting	1	0
Lesser Nighthawk	1	0
Northern Mockingbird	1	0
Northern Rough-winged Swallow	1	0
Western Tanager	1	0
Wilson's Warbler	1	0
Total	**516**	**100**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

3.2 Chiricahua National Monument

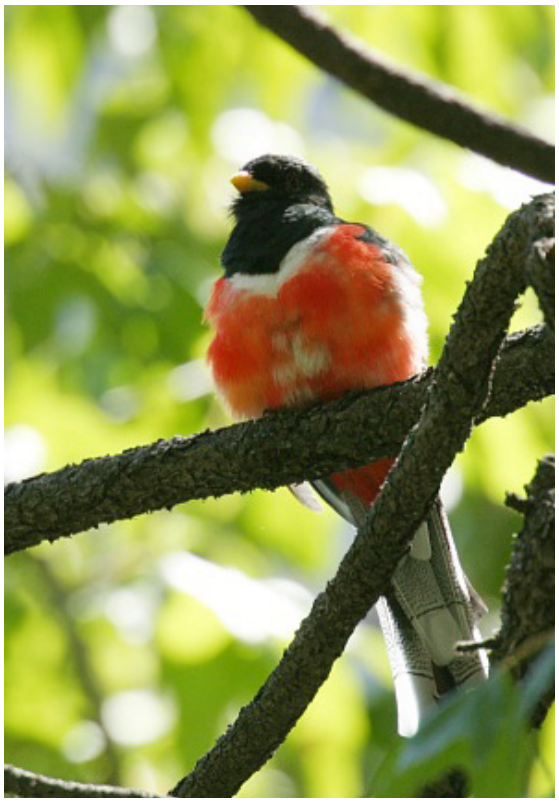
3.2.1 2011 sampling

During May of 2011, we sampled six transects/grids, each with seven points, two times for a total sample of 84 point counts at Chiricahua NM (Figure 3.2.1). All transects were in the upland habitat class of either grassland/savanna or woodland habitat types (Table 3.2.1).

3.2.2 Results and discussion

During 2011, 1,358 birds of 101 species were counted at Chiricahua NM (Table 3.2.2). Bewick's Wren was the most commonly counted species (6%). Also common were Turkey Vulture (6%), Spotted Towhee (5%), Black-throated Gray Warbler (5%), and Mexican Jay (5%).

Two new high elevation transects were added this season to replace the previous two which were inaccessible in rugged and steep terrain. Species diversity on all the six transects remained high with good detections of breeders and migrants in the mixed habitats of pine-oak woodland, deciduous riparian, upland desert, and oak-chaparral. High counts were notable for Turkey Vulture, Mexican Jay, Black-throated Gray Warbler, Western Tanager, Black-headed Grosbeak, Violet-green Swallow, Spotted Towhee, Cassin's Kingbird, Arizona Woodpecker, Canyon Wren, Acorn Woodpecker, and Bewick's Wren. Unusual sightings included an Ovenbird, an eastern species rare in migration, and a male Elegant Trogon, a rare and low density species not regularly recorded in the park. The Ovenbird (an incidental sighting) is a new species for the park. A pair of Northern Goshawks at Massai Point was also notable, and Mexican Chickadees on the Whitetail transect were unusual given the elevation and habitat.



© ROBERT SHANTZ

An Elegant Trogon (*Sayornis nigricans*), not regularly recorded at Chiricahua NM, was observed in 2011.

A significant event in 2011 was the huge Horseshoe Two wildfire, which burned most of the Chiricahua Mountains, including large portions of the park. The fire burned just after the surveys were completed in May. It will be interesting to see the effects of the fire next season with the habitat regeneration and bird dispersal in the park and on the transects.

Table 3.2.1. Habitat type, number of points, and sampling dates for each transect or grid, Chiricahua NM, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
High3	Upland	Woodland	7	2	515/2011	5/31/2011
High4	Upland	Woodland	7	2	515/2011	5/31/2011
Mid1	Upland	Grassland/Savanna	7	2	5/14/2011	5/30/2011
Mid2	Upland	Grassland/Savanna	7	2	5/14/2011	5/29/2011
Picket	Upland	Woodland	7	2	5/13/2011	5/29/2011
White	Upland	Woodland	7	2	5/13/2011	5/30/2011

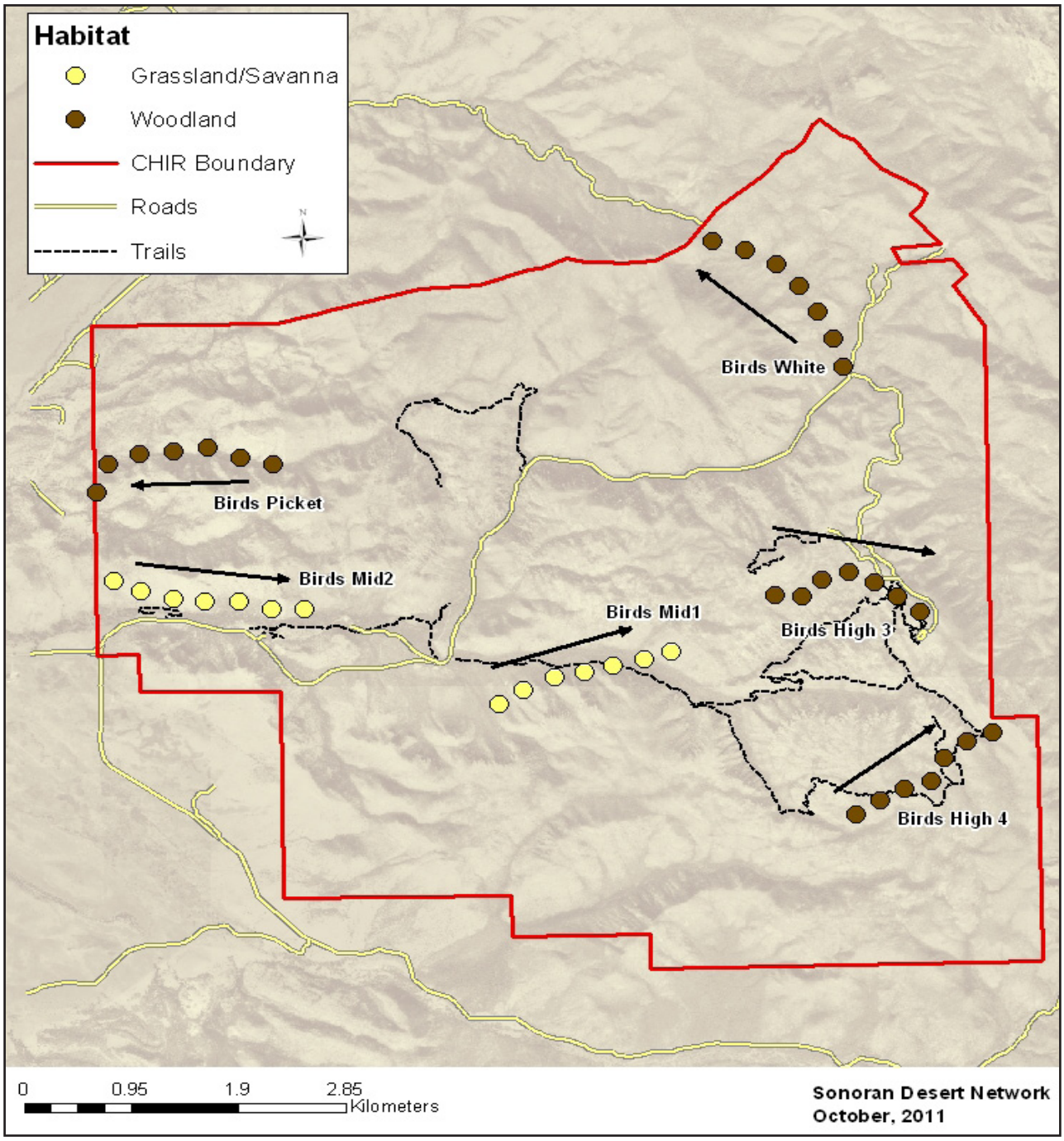


Figure 3.2.1. Point locations targeted for annual sampling at Chiricahua NM, 2011.

Table 3.2.2. Number of birds detected of each species in each habitat type, Chiricahua NM, 2011

Species	Habitat type		# of birds detected	
	Grassland/ Savanna	Woodland	Total	% of total
Bewick's Wren	31	54	85	6
Turkey Vulture	14	68	82	6
Spotted Towhee	4	67	71	5
Black-throated Gray Warbler	22	46	68	5
Mexican Jay	22	45	67	5
Black-headed Grosbeak	6	41	47	3
White-winged Dove	18	26	44	3
White-throated Swift	22	16	38	3
Western Tanager	12	23	35	3
Cassin's Kingbird	25	9	34	3
Yellow-rumped Warbler	4	30	34	3
Rufous-crowned Sparrow	19	13	32	2
Violet-green Swallow	10	19	29	2
Western Wood-Pewee	16	13	29	2
Scott's Oriole	15	13	28	2
Acorn Woodpecker	9	18	27	2
Ash-throated Flycatcher	11	15	26	2
Mourning Dove	14	12	26	2
Bushtit	3	22	25	2
Canyon Wren	12	11	23	2
White-breasted Nuthatch	8	14	22	2
Bridled Titmouse	14	7	21	2
House Finch	13	5	18	1
Pine Siskin	5	13	18	1
Plumbeous Vireo	11	7	18	1
Black-chinned Hummingbird	10	7	17	1
Wilson's Warbler	4	13	17	1
Gambel's Quail	5	11	16	1
Hermit Thrush	1	15	16	1
Band-tailed Pigeon	3	12	15	1
Broad-tailed Hummingbird	4	11	15	1
Common Raven	3	10	13	1
Arizona Woodpecker	8	3	11	1
Ruby-crowned Kinglet	2	9	11	1
Dusky-capped Flycatcher	4	6	10	1
Hutton's Vireo	1	9	10	1
Northern Mockingbird	3	7	10	1
Red-faced Warbler	2	8	10	1
Blue-gray Gnatcatcher	4	5	9	1
Brown-crested Flycatcher	8	1	9	1
Canyon Towhee	7	2	9	1

Table 3.2.2. Number of birds detected of each species in each habitat type, Chiricahua NM, 2011, cont.

Species	Habitat type		# of birds detected	
	Grassland/ Savanna	Woodland	Total	% of total
Hammond's Flycatcher	4	5	9	1
Black-throated Sparrow	3	5	8	1
Blue Grosbeak	2	6	8	1
Eurasian Collared-Dove	8	--	8	1
Hepatic Tanager	6	2	8	1
Rock Wren	5	3	8	1
Black-chinned Sparrow	3	4	7	1
Cactus Wren	5	2	7	1
Gray Flycatcher	2	5	7	1
Townsend's Warbler	1	6	7	1
Ladder-backed Woodpecker	3	3	6	0
Lark Sparrow	3	3	6	0
Northern Flicker	4	2	6	0
Pacific-slope Flycatcher	1	5	6	0
Red-tailed Hawk	4	2	6	0
Brewer's Sparrow	--	5	5	0
Bullock's Oriole	1	4	5	0
Hairy Woodpecker	--	5	5	0
Lazuli Bunting	2	3	5	0
Orange-crowned Warbler	1	4	5	0
Painted Redstart	2	3	5	0
Brown-headed Cowbird	2	2	4	0
Chipping Sparrow	2	2	4	0
Lesser Goldfinch	2	2	4	0
Wild Turkey	4	--	4	0
American Robin	--	3	3	0
Hermit Warbler	--	3	3	0
MacGillivray's Warbler	1	2	3	0
Mexican Chickadee	--	3	3	0
Say's Phoebe	2	1	3	0
Virginia's Warbler	--	3	3	0
Zone-tailed Hawk	1	2	3	0
Cordilleran Flycatcher	--	2	2	0
Dusky Flycatcher	--	2	2	0
Gila Woodpecker	--	2	2	0
Northern Goshawk	--	2	2	0
Olive Warbler	--	2	2	0
Red-breasted Nuthatch	--	2	2	0
Summer Tanager	1	1	2	0
Verdin	--	2	2	0
Warbling Vireo	--	2	2	0

Table 3.2.2. Number of birds detected of each species in each habitat type, Chiricahua NM, 2011, cont.

Species	Habitat type		# of birds detected	
	Grassland/ Savanna	Woodland	Total	% of total
White-crowned Sparrow	--	2	2	0
Yellow Warbler	1	1	2	0
Bronzed Cowbird	--	1	1	0
Cooper's Hawk	--	1	1	0
Curve-billed Thrasher	--	1	1	0
Elegant Trogon	1	--	1	0
Grace's Warbler	--	1	1	0
Green-tailed Towhee	--	1	1	0
House Wren	--	1	1	0
Juniper Titmouse	--	1	1	0
Lincoln's Sparrow	--	1	1	0
Lucy's Warbler	1	--	1	0
Nashville Warbler	--	1	1	0
Northern Cardinal	--	1	1	0
Olive-sided Flycatcher	1	--	1	0
Peregrine Falcon	--	1	1	0
Western Kingbird	--	1	1	0
Whip-poor-will	--	1	1	0
Yellow-eyed Junco	--	1	1	0
Ovenbird (incidental)	**--**	**--**	**--**	**--**
Total	**488**	**870**	**1,358**	**100**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

3.3 Coronado National Memorial

3.3.1 2011 sampling

During April and May of 2011, we sampled two transects at Coronado NMem (Figure 3.3.1), each with seven points. The transects, one grassland/savanna and one woodland, were sampled twice (Table 3.3.1), for a total of 28 point counts at the park.

© ROBERT SHANTZ

Red-breasted Nuthatch (*Sitta canadensis*) was detected at Coronado NMem for the first time in 2011.

3.3.2 Results and discussion

During 2011, 370 birds of 60 species were counted at Coronado NMem (Table 3.3.2). Mourning Dove was the most commonly counted species (8%). Bushtit (6%), Ash-throated Flycatcher (6%), Bewick's Wren (4%), House Finch (4%), Western Tanager (4%), and White-winged Dove (4%) were also common. As described below, one new species was detected for the park.

High numbers of grassland species (e.g., Eastern Meadowlark and Botteri's Sparrow) and open country species (e.g., Ash-throated Flycatcher, White-winged Dove, and Western Kingbird) were detected. Flocks of Western Tanagers and Black-headed Grosbeaks were also seen migrating through the desert grassland en route to the mountain foothills, and a nice mix of migrant vireos, flycatchers, orioles, hummingbirds, and warblers also added to the diversity. One high elevation transect was dropped due to the rugged terrain and habitat, but the second montane transect still hosted good numbers of Bewick's Wren, Spotted Towhee, Rufous-crowned Sparrow, and Bushtit. Interesting was the lack of the usually vocal Montezuma Quail, which is detected regularly throughout the park, and a low count for Black-chinned Sparrow on the high elevation transect. Highlights included Red-breasted Nuthatch at Montezuma Pass (a new species for the park and notable for the transect's elevation and habitat), and singles of migrant Sharp-shinned Hawk and Magnificent Hummingbird, which have not been seen regularly in the park in recent years.

After the surveys were completed, the Monument Fire burned through the park in June. It is unclear whether the bird transects were affected. It will be interesting to note the bird detections and diversity in the spring of 2012 as the habitat regenerates.

Table 3.3.1. Habitat type, number of points, and sampling dates for each transect or grid, Coronado NMem, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
401	Upland	Grassland/Savanna	7	2	4/26/2011	5/16/2011
502	Upland	Woodland	7	2	4/27/2011	5/17/2011

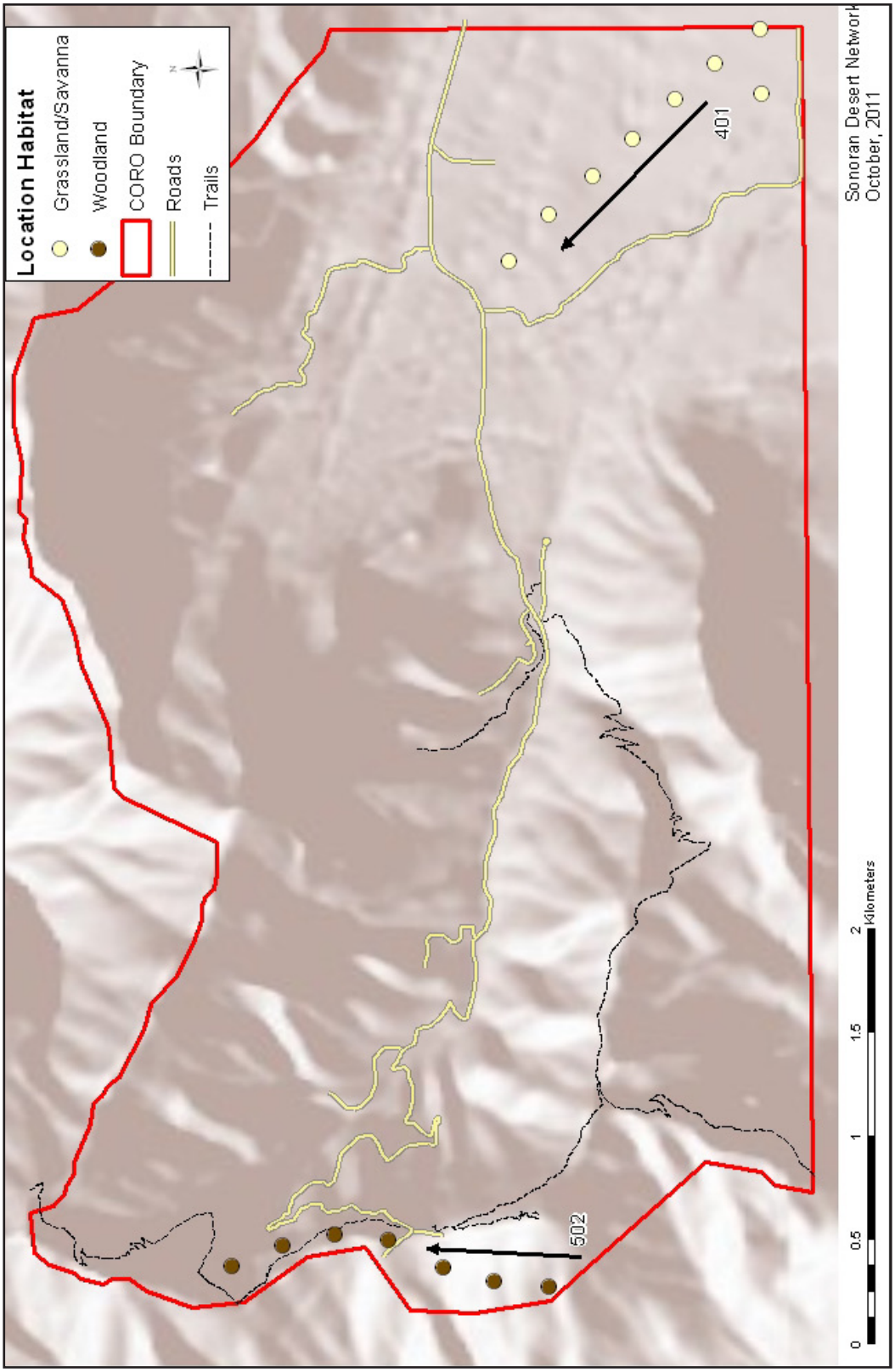


Figure 3.3.1. Point locations targeted for annual sampling at Coronado NMem, 2011.

Table 3.3.2. Number of birds detected of each species in each habitat type, Coronado NMem, 2011

Species	Habitat type		# of birds detected	
	Grassland/ Savanna	Woodland	Total	% of total
Mourning Dove	26	3	29	8
Bushtit	7	16	23	6
Ash-throated Flycatcher	19	3	22	6
Bewick's Wren	5	11	16	4
House Finch	13	3	16	4
Western Tanager	13	3	16	4
White-winged Dove	11	5	16	4
Cassin's Kingbird	6	9	15	4
Eastern Meadowlark	15	--	15	4
Rufous-crowned Sparrow	1	13	14	4
Scott's Oriole	10	4	14	4
Canyon Towhee	6	6	12	3
Yellow-rumped Warbler	5	6	11	3
Mexican Jay	7	2	9	2
Lazuli Bunting	3	5	8	2
Violet-green Swallow	--	8	8	2
Western Kingbird	8	--	8	2
Black-throated Gray Warbler	1	6	7	2
Botteri's Sparrow	7	--	7	2
Gray Flycatcher	3	3	6	2
Green-tailed Towhee	2	4	6	2
Spotted Towhee	--	6	6	2
Turkey Vulture	--	6	6	2
Black-headed Grosbeak	1	4	5	1
Horned Lark	5	--	5	1
Rock Wren	--	5	5	1
White-throated Swift	--	5	5	1
Ladder-backed Woodpecker	2	2	4	1
Say's Phoebe	4	--	4	1
Black-throated Sparrow	2	1	3	1
Brown-headed Cowbird	3	--	3	1
Canyon Wren	--	3	3	1
Northern Mockingbird	3	--	3	1
Verdin	3	--	3	1
Western Scrub-Jay	--	3	3	1
Anna's Hummingbird	1	1	2	1
Brown-crested Flycatcher	2	--	2	1
Bullock's Oriole	2	--	2	1
Common Raven	--	2	2	1
Curve-billed Thrasher	--	2	2	1

Table 3.3.2. Number of birds detected of each species in each habitat type, Coronado NMem, 2011, cont.

Species	Habitat type		# of birds detected	
	Grassland/ Savanna	Woodland	Total	% of total
Lesser Goldfinch	1	1	2	1
Lucy's Warbler	2	--	2	1
Vermilion Flycatcher	2	--	2	1
Wilson's Warbler	2	--	2	1
Arizona Woodpecker	--	1	1	0
Band-tailed Pigeon	--	1	1	0
Black-chinned Sparrow	--	1	1	0
Broad-tailed Hummingbird	--	1	1	0
Cactus Wren	--	1	1	0
Cooper's Hawk	1	--	1	0
Hammond's Flycatcher	--	1	1	0
Hutton's Vireo	--	1	1	0
Orange-crowned Warbler	1	--	1	0
Painted Redstart	--	1	1	0
Red-breasted Nuthatch	**--**	**1**	**1**	**0**
Ruby-crowned Kinglet	1	--	1	0
Sharp-shinned Hawk	--	1	1	0
Virginia's Warbler	1	--	1	0
Warbling Vireo	1	--	1	0
Wild Turkey	1	--	1	0
Total	**209**	**161**	**370**	**100%**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

3.4 Fort Bowie National Historic Site

3.4.1 2011 sampling

During May of 2011, we sampled two transects/grids at Fort Bowie NHS (Figure 3.4.1). One transect, with eight points, was in the riparian habitat class, and the other transect, with seven points, was in the upland habitat class (grassland/savanna habitat type; Table 3.4.1). Each transect was visited twice for a total of 30 point counts at the park in 2011.

© ROBERT SHANTZ

Black-chinned Hummingbird (*Archilochus alexandri*) was the fifth most commonly counted species at Fort Bowie NHS in 2011.

3.4.2 Results and discussion

During 2011, 593 birds of 70 species were counted at Fort Bowie NHS (Table 3.4.2). The Ash-throated Flycatcher was the most commonly counted species (9%). White-winged Dove (9%), Broad-tailed Hummingbird (6%), Northern Cardinal (5%), and Black-chinned Hummingbird (4%) were also common. Vaux's Swift was a new addition to the park list in 2011.

The riparian transect at Siphon Canyon continued to be the most active, with many breeders and migrants detected along the narrow riparian corridor and adjacent desert upland, including high counts for Ash-throated Flycatcher, White-winged Dove, Bewick's Wren, Northern Cardinal, Scott's Oriole, Cassin's Kingbird, and Black-chinned Hummingbird. Migrants were plentiful, with large numbers of Broad-tailed Hummingbird favoring the flowering desert willows, and flocks of Western Tanager and Black-headed Grosbeak congregating en route to the mountains. Breeding records for Zone-tailed Hawk, Western Scrub-Jay and Crissal Thrasher were again expected in low numbers, with Gray Vireo notable as a low density species and a rare breeder in southern Arizona. Notable low counts included those of Blue Grosbeak, Summer Tanager, Indigo Bunting, Northern Mockingbird, and Turkey Vulture. After the surveys were completed, the Horseshoe Two fire that burned through Chiricahua NM also encroached on Fort Bowie NHS and may have affected the park and the bird transects; a pre-sampling visit in the spring of 2012 will determine this. With the dramatic fire damage so close to the park, it will be interesting to see how species adapt and what we will notice in the detections in 2012.

Table 3.4.1. Habitat type, number of points, and sampling dates for each transect or grid, Fort Bowie NHS, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
SPN	Riparian	Riparian	8	2	5/12/2011	5/28/2011
UpW	Upland	Grassland/Savanna	7	2	5/12/2011	5/28/2011

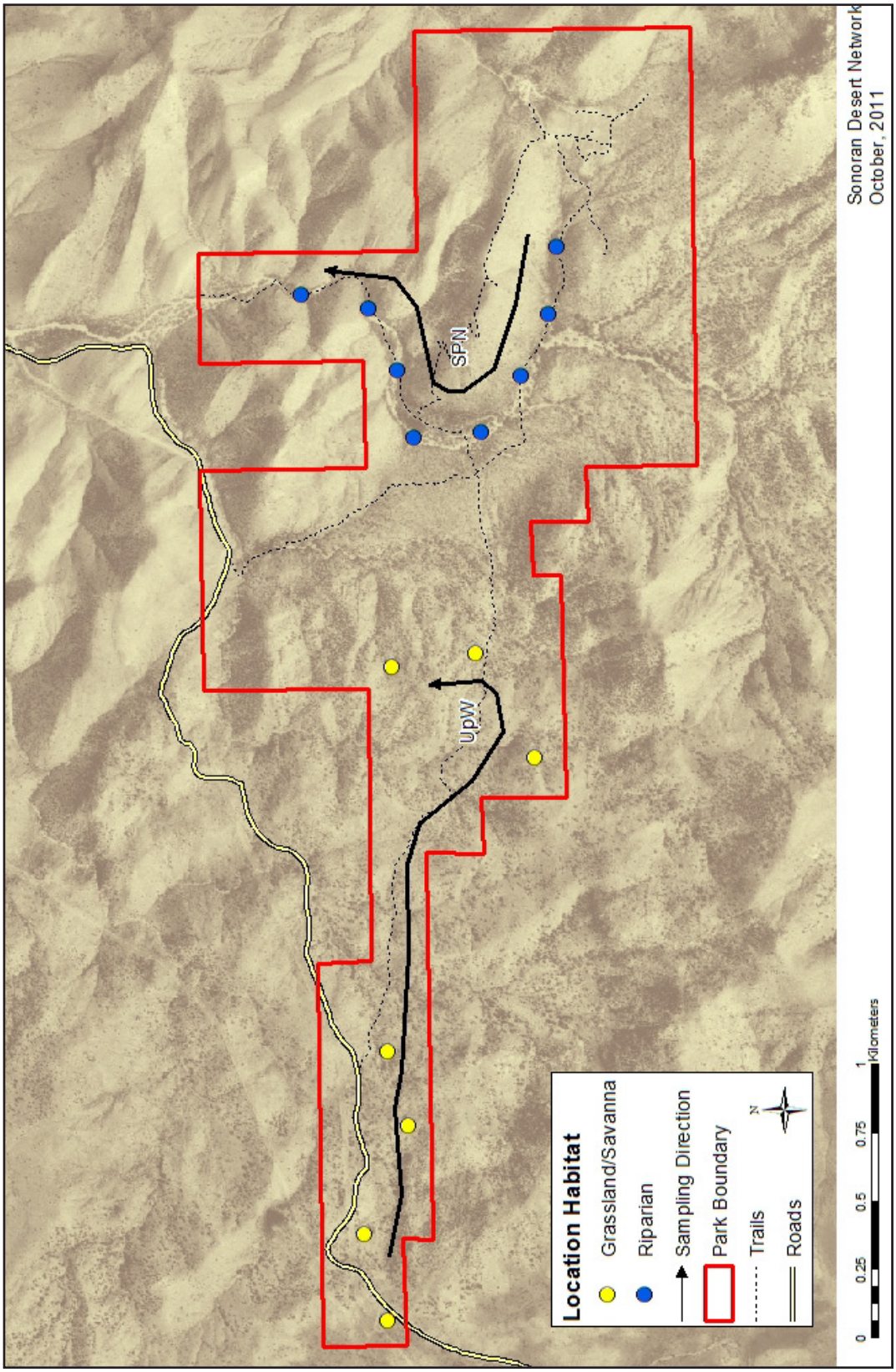


Figure 3.4.1. Point locations targeted for annual sampling at Fort Bowie NHS, 2011.

Table 3.4.2. Number of birds detected of each species in each habitat type, Fort Bowie NHS, 2011

Species	Habitat type		# of birds detected	
	Grassland/ Savanna	Riparian	Total	% of total
Ash-throated Flycatcher	28	24	52	9
White-winged Dove	23	28	51	9
Broad-tailed Hummingbird	4	33	37	6
Northern Cardinal	3	28	31	5
Black-chinned Hummingbird	3	22	25	4
Bewick's Wren	9	11	20	3
Mourning Dove	9	11	20	3
Black-headed Grosbeak	8	11	19	3
Gambel's Quail	2	16	18	3
Rufous-crowned Sparrow	10	7	17	3
Western Tanager	7	10	17	3
House Finch	3	13	16	3
Scott's Oriole	9	7	16	3
Lucy's Warbler	1	14	15	3
Black-throated Sparrow	7	6	13	2
Yellow-rumped Warbler	8	4	12	2
Wilson's Warbler	5	6	11	2
Black-throated Gray Warbler	6	4	10	2
Cassin's Kingbird	5	5	10	2
Verdin	1	9	10	2
White-throated Swift	--	9	9	2
Canyon Towhee	4	4	8	1
Western Scrub-Jay	4	4	8	1
Common Raven	6	1	7	1
Hooded Oriole	--	6	6	1
Ladder-backed Woodpecker	3	3	6	1
Orange-crowned Warbler	5	1	6	1
Cedar Waxwing	--	5	5	1
Lazuli Bunting	4	1	5	1
Northern Mockingbird	2	3	5	1
Phainopepla	--	5	5	1
Pine Siskin	4	1	5	1
Townsend's Warbler	4	1	5	1
Turkey Vulture	2	3	5	1
Brown-crested Flycatcher	4	--	4	1
Brown-headed Cowbird	1	3	4	1
Cactus Wren	2	2	4	1
Crissal Thrasher	1	3	4	1
Say's Phoebe	4	--	4	1
Summer Tanager	--	4	4	1

Table 3.4.2. Number of birds detected of each species in each habitat type, Fort Bowie NHS, 2011, cont.

Species	Habitat type		# of birds detected	
	Grassland/ Savanna	Riparian	Total	% of total
Vaux's Swift	**4**	**--**	**4**	**1**
Broad-billed Hummingbird	1	2	3	1
Gray Vireo	1	2	3	1
Hammond's Flycatcher	2	1	3	1
Montezuma Quail	3	--	3	1
Pacific-slope Flycatcher	--	3	3	1
Rock Wren	3	--	3	1
Ruby-crowned Kinglet	1	2	3	1
Swainson's Thrush	--	3	3	1
Virginia's Warbler	3	--	3	1
Warbling Vireo	2	1	3	1
Zone-tailed Hawk	--	3	3	1
Curve-billed Thrasher	2	--	2	0
Gray Flycatcher	--	2	2	0
Green-tailed Towhee	--	2	2	0
Lesser Goldfinch	--	2	2	0
MacGillivray's Warbler	1	1	2	0
Western Wood-Pewee	--	2	2	0
Yellow Warbler	2	--	2	0
American Robin	--	1	1	0
Anna's Hummingbird	1	--	1	0
Black-chinned Sparrow	1	--	1	0
Blue Grosbeak	1	--	1	0
Blue-gray Gnatcatcher	--	1	1	0
Bullock's Oriole	1	--	1	0
Common Ground-Dove	--	1	1	0
Hutton's Vireo	1	--	1	0
Lesser Nighthawk	1	--	1	0
Nashville Warbler	1	--	1	0
Plumbeous Vireo	--	1	1	0
Unidentified Raptor	*1*	--	*1*	*0*
Unidentified Swallow	*1*	--	*1*	*0*
Total	**235**	**358**	**593**	**100**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

3.5 Gila Cliff Dwellings National Monument

3.5.1 2011 sampling

Due to the devastating Miller Fire that burned through Gila Cliff Dwellings NM in May, we were unable to survey the transects in 2011. Both the riparian and upland transects (two total; see Figure 3.5.1) were severely burned. It will be interesting to see the habitat regeneration and bird species adapting to the changes during 2012 sampling.

© ROBERT SHANTZ

The Spotted Towhee (*Pipilo maculatus*) is known to occur at Gila Cliff Dwellings NM.

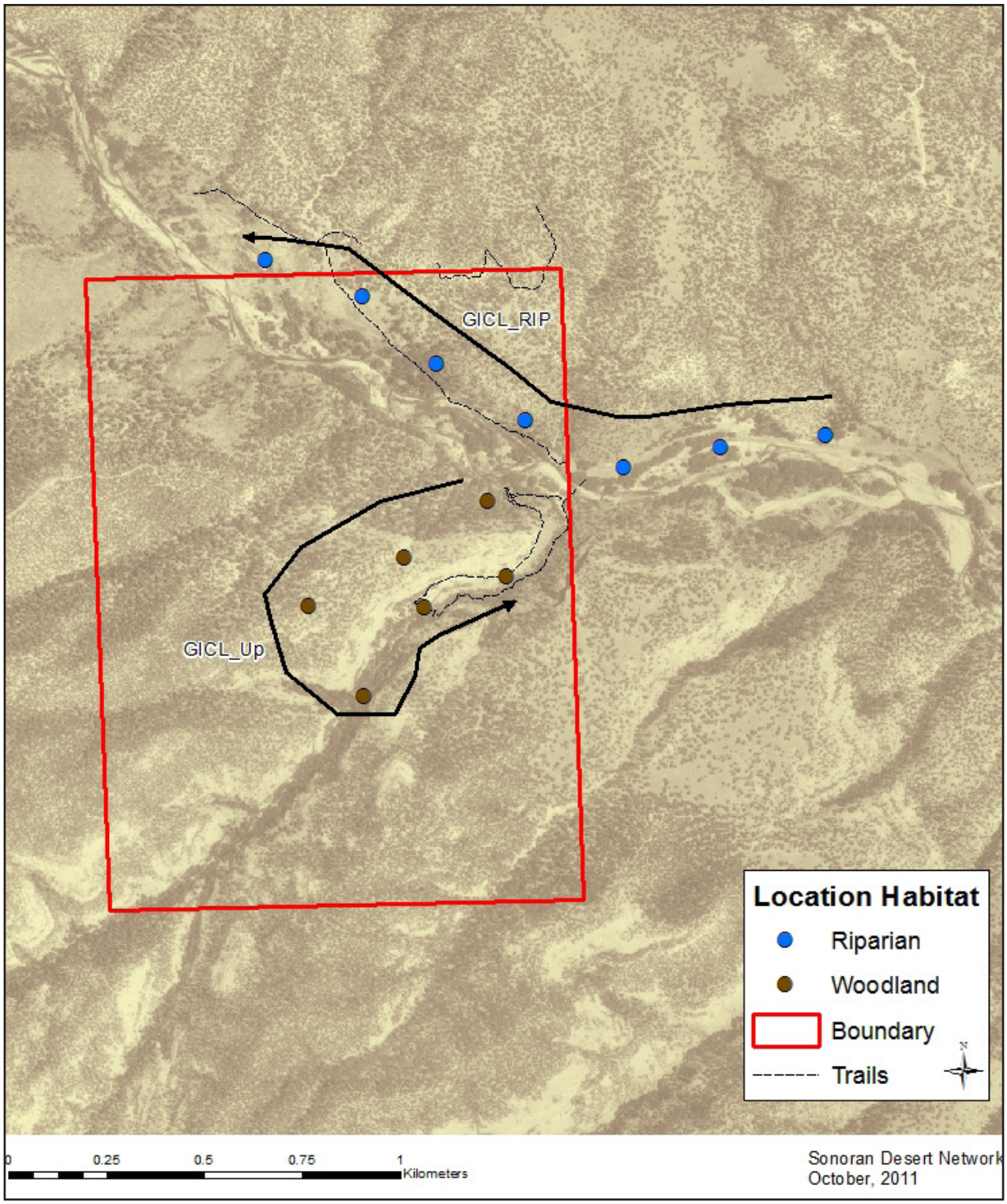


Figure 3.5.1. Point locations targeted for annual sampling at Gila Cliff Dwellings NM. Sampling was not conducted in 2011 due to wildfire.

3.6 Montezuma Castle National Monument

3.6.1 2011 sampling

During May and June of 2011, we sampled four transects/grids at Montezuma Castle NM (Figures 3.6.1-1 and 3.6.1-2). Three transects were located at the Castle Unit: two in riparian habitat and one in upland desert scrub. Six points were sampled on the riparian transects and eight points were sampled on the upland desert scrub transect. The one transect at the Well Unit, with seven points, was in riparian habitat. Each point was surveyed twice for a total of 54 point counts at Montezuma Castle NM (Table 3.6.1).

3.6.2 Results and discussion

During 2011, 1,092 birds of 78 species were counted at Montezuma Castle NM (Tables 3.6.2-1 and 3.6.2-2). Overall, Lucy's Warbler was the most commonly counted species, followed by Mourning Dove. At the Castle Unit, the most commonly counted species were Lucy's warbler (9%), Mourning Dove (6%), Brown-crested Flycatcher (5%), Bewick's Wren (5%), and House Finch (5%). At the Well Unit, the most commonly counted species were Lucy's Warbler and Yellow Warbler (both 10%), Mourning Dove (8%), Lesser Goldfinch (6%), Gila Woodpecker (5%), Song Sparrow (5%), Brown-crested flycatcher (5%), and Summer Tanager (5%). There were no new additions to the park list in 2011, but the Olive-sided Flycatcher was detected at the Well Unit for the first time.

The expected riparian breeders, including Lucy's Warbler, Song Sparrow, Bewick's Wren, Summer Tanager, Brown-crested Flycatcher, House Finch, and Yellow Warbler, were numerous. Phainopepla and Yellow-breasted Chat were detected in higher numbers than previous years. Three pairs of Common Black-Hawk were occupying nest sites used last year, and Eurasian Collared-Dove and White-winged Dove were counted in relatively high numbers for the park units, perhaps indicating an increase in the area. A single Yellow-billed Cuckoo was detected in suitable breeding habitat, although this species' numbers were low throughout the region this year.

© ROBERT SHANTZ

Olive-sided Flycatcher (*Contopus cooperi*) was detected at the Well Unit for the first time in 2011.

Table 3.6.1. Habitat type, number of points, and sampling dates for each transect or grid, Montezuma Castle NM, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
R1 (Castle Unit)	Riparian	Riparian	6	2	5/26/2011	6/4/2011
R2 (Castle Unit)	Riparian	Riparian	6	2	5/26/2011	6/4/2011
Up1 (Castle Unit)	Upland	Desert scrub	8	2	5/24/2011	6/2/2011
R (Well Unit)	Riparian	Riparian	7	2	5/24/2011	6/2/2011

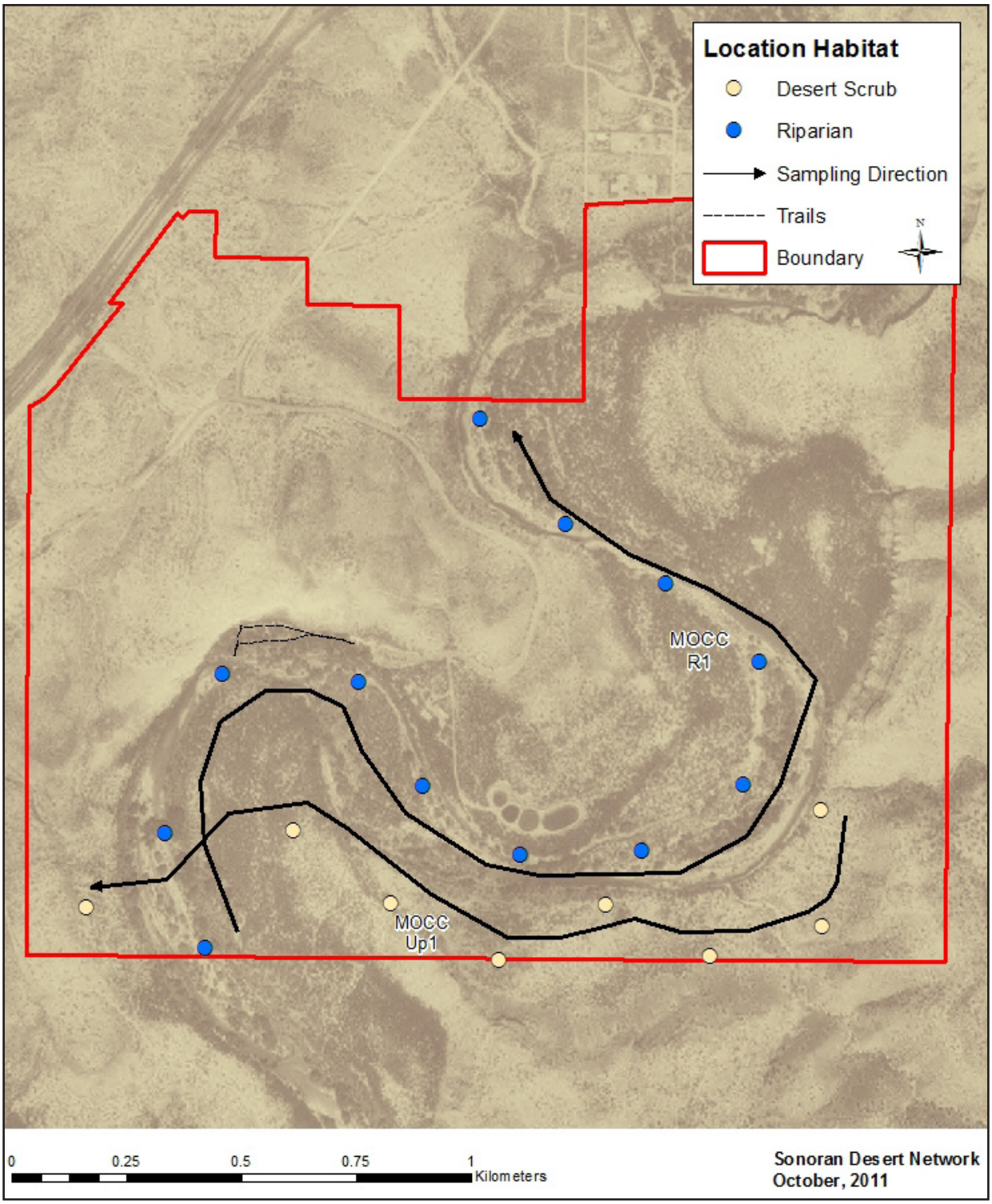


Figure 3.6.1-1. Point locations targeted for annual sampling at Montezuma Castle NM, Castle Unit, 2011.

Table 3.6.2-1. Number of birds detected of each species in each habitat type, Montezuma Castle NM–Castle Unit, 2011

Species	Habitat type		# of birds detected	
	Desert scrub	Riparian	Total	% of total
Lucy's Warbler	17	57	74	9
Mourning Dove	18	31	49	6
Brown-crested Flycatcher	6	35	41	5
Bewick's Wren	13	26	39	5
House Finch	10	28	38	5
Blue Grosbeak	2	27	29	4
Ash-throated Flycatcher	12	12	24	3
Phainopepla	17	7	24	3
Summer Tanager	3	21	24	3
Brown-headed Cowbird	--	23	23	3
Yellow Warbler	10	13	23	3
Gila Woodpecker	7	14	21	3
Cliff Swallow	8	12	20	3
Turkey Vulture	17	3	20	3
Abert's Towhee	5	13	18	2
Cassin's Kingbird	5	12	17	2
Violet-green Swallow	4	13	17	2
Northern Rough-winged Swallow	2	14	16	2
Verdin	5	10	15	2
Yellow-breasted Chat	--	15	15	2
Hooded Oriole	5	9	14	2
Ladder-backed Woodpecker	3	11	14	2
Lesser Goldfinch	1	11	12	2
Black-throated Sparrow	6	5	11	1
Bullock's Oriole	5	5	10	1
Common Black-Hawk	6	4	10	1
Curve-billed Thrasher	9	1	10	1
Lazuli Bunting	6	4	10	1
Song Sparrow	1	9	10	1
White-throated Swift	6	4	10	1
Common Raven	5	4	9	1
Northern Mockingbird	5	3	8	1
Warbling Vireo	2	6	8	1
Wilson's Warbler	3	5	8	1
Common Yellowthroat	--	7	7	1
Gambel's Quail	3	4	7	1
Say's Phoebe	4	3	7	1
Black Phoebe	1	5	6	1
Northern Cardinal	2	4	6	1
Western Tanager	2	4	6	1

Table 3.6.2-1. Number of birds detected of each species in each habitat type, Montezuma Castle NM–Castle Unit, 2011, cont.

Species	Habitat type		# of birds detected	
	Desert scrub	Riparian	Total	% of total
Barn Swallow	5	--	5	1
Black-chinned Hummingbird	1	4	5	1
Cactus Wren	4	1	5	1
Canyon Wren	2	3	5	1
Belted Kingfisher	--	4	4	1
Cedar Waxwing	--	4	4	1
Red-tailed Hawk	2	2	4	1
Western Wood-Pewee	2	2	4	1
Bridled Titmouse	--	3	3	0
Mallard	--	3	3	0
Vermilion Flycatcher	1	2	3	0
Black-headed Grosbeak	--	2	2	0
Blue-gray Gnatcatcher	1	1	2	0
Cooper's Hawk	--	2	2	0
Indigo Bunting	--	2	2	0
MacGillivray's Warbler	1	1	2	0
American Kestrel	1	--	1	0
Anna's Hummingbird	1	--	1	0
Black-throated Gray Warbler	1	--	1	0
Greater Roadrunner	1	--	1	0
Hammond's Flycatcher	1	--	1	0
Hermit Thrush	1	--	1	0
House Wren	1	--	1	0
Killdeer	--	1	1	0
Red Crossbill	--	1	1	0
Scott's Oriole	1	--	1	0
Townsend's Warbler	--	1	1	0
White-crowned Sparrow	1	--	1	0
Yellow-billed Cuckoo	--	1	1	0
Unidentified Woodpecker	--	*1*	*1*	*0*
Total	**264**	**535**	**799**	**100%**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

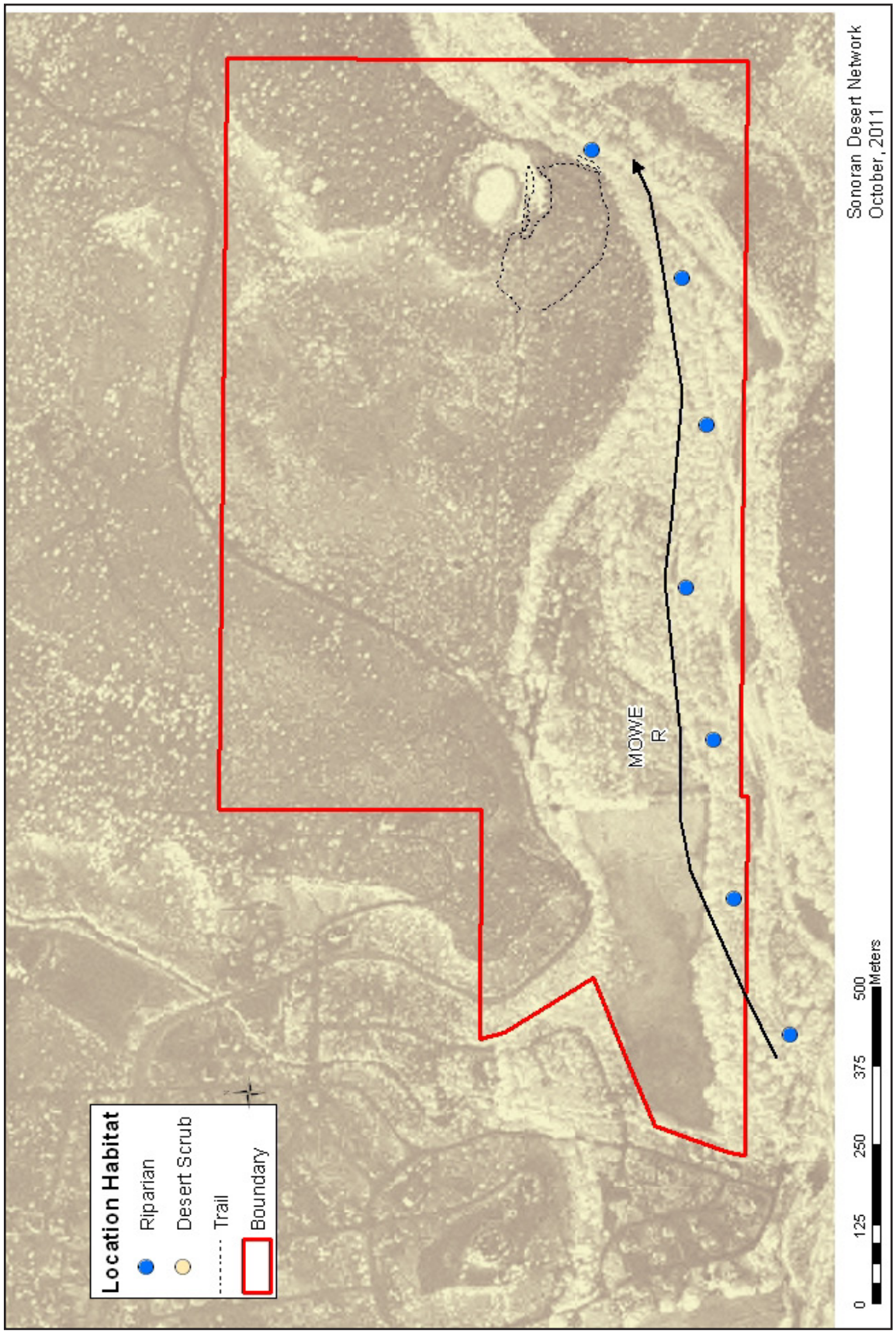


Figure 3.6.1-2. Point locations targeted for annual sampling at Montezuma Castle NM, Well Unit, 2011.

Table 3.6.2-2. Number of birds detected of each species in each habitat type, Montezuma Castle NM–Well Unit, 2011

Species	# of birds detected	
	Total (riparian habitat)	% of total
Lucy's Warbler	28	10
Yellow Warbler	28	10
Mourning Dove	22	8
Lesser Goldfinch	19	6
Gila Woodpecker	16	5
Song Sparrow	16	5
Brown-crested Flycatcher	15	5
Summer Tanager	15	5
House Finch	14	5
Blue Grosbeak	10	3
Brown-headed Cowbird	10	3
Bewick's Wren	8	3
Bullock's Oriole	8	3
Black-chinned Hummingbird	7	2
Warbling Vireo	6	2
Yellow-breasted Chat	6	2
Common Yellowthroat	5	2
Western Wood-Pewee	5	2
Common Black-Hawk	4	1
Ladder-backed Woodpecker	4	1
Northern Cardinal	4	1
Phainopepla	4	1
White-winged Dove	4	1
Cassin's Kingbird	3	1
Northern Mockingbird	3	1
Northern Rough-winged Swallow	3	1
Abert's Towhee	2	1
Black Phoebe	2	1
Black-headed Grosbeak	2	1
Common Raven	2	1
Eurasian Collared-Dove	2	1
Plumbeous Vireo	2	1
Red-winged Blackbird	2	1
Verdin	2	1
American Robin	1	0
Bridled Titmouse	1	0
Canyon Wren	1	0
Gray Flycatcher	1	0
Great Blue Heron	1	0
Olive-sided Flycatcher	1	0
Turkey Vulture	1	0
Vermilion Flycatcher	1	0
Western Kingbird	1	0
Wilson's Warbler	1	0
Total	**293**	**100%**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

3.7 Organ Pipe Cactus National Monument

3.7.1 2011 sampling

During April of 2011, we sampled six transects, each with seven points, at Organ Pipe Cactus NM (Figure 3.7.1). All transects were sampled two times, for a total of 84 point counts during 2011. Two transects were in riparian (xeroriparian) habitats and four were in upland (desert scrub) habitats (Table 3.7.1).

3.7.2 Results and discussion

During 2011, 1,061 birds of 65 species were counted at Organ Pipe Cactus NM (Table 3.7.2). Gila Woodpecker was the most commonly counted species (13%). Ash-throated Flycatcher (12%), Mourning Dove (8%), Cactus Wren (7%), White-winged Dove (6%), House Finch (5%), and Black-throated Sparrow (5%) were also common. No new species were detected for the park during the survey.

With the earlier sampling dates in April compared to previous years, resident desert species such as Gila Woodpecker, Cactus Wren, Black-throated Sparrow, Curve-billed Thrasher, Black-tailed Gnatcatcher, Gambel's Quail, Costa's Hummingbird, and Verdin were detected in higher numbers and with more juveniles. As a result of the earlier sampling dates, most migrant breeding species had not yet fully arrived at the park; Brown-crested Flycatcher, White-winged Dove, Ash-throated Flycatcher, Lucy's Warbler, and Scott's Oriole were recorded in lower numbers than in previous years. Migrant vireos, warblers, orioles, flycatchers, tanagers, grosbeaks, swallows, and hummingbirds were also in low densities with the earlier sampling dates, but along with lingering winter species such as Green-tailed Towhee, Lark Bunting, Brewer's Sparrow, Yellow-rumped Warbler, and Anna's Hummingbird, made for a nice mix of diversity.

© ROBERT SHANTZ

A pair of Vermillion Flycatchers (*Pyrocephalus rubinus*) was observed at Organ Pipe Cactus NM in 2011.

Highlights included: a territorial, and possibly breeding, Ferruginous Pygmy-Owl— a rare and endangered species not recorded every year; a credible report of a Brant at Quitobaquito Springs— a Pacific coast goose species very rare inland and which would be a new addition to the park list; migrant Vaux's Swifts not recorded in recent years; uncommon Black-crowned Night-Heron at the visitor center pond; a mated pair of Vermilion Flycatchers, quite unusual this far west; and Peregrine Falcon— a rare breeder in the park.

Table 3.7.1. Habitat type, number of points, and sampling dates for each transect or grid, Organ Pipe Cactus NM, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
R1	Riparian	Xeroriparian	7	2	4/5/2011	4/19/2011
R2	Riparian	Xeroriparian	7	2	4/4/2011	4/18/2011
U1	Upland	Desert scrub	7	2	4/6/2011	4/20/2011
U12	Upland	Desert scrub	7	2	4/5/2011	4/19/2011
U4	Upland	Desert scrub	7	2	4/4/2011	4/18/2011
U5	Upland	Desert scrub	7	2	4/6/2011	4/20/2011

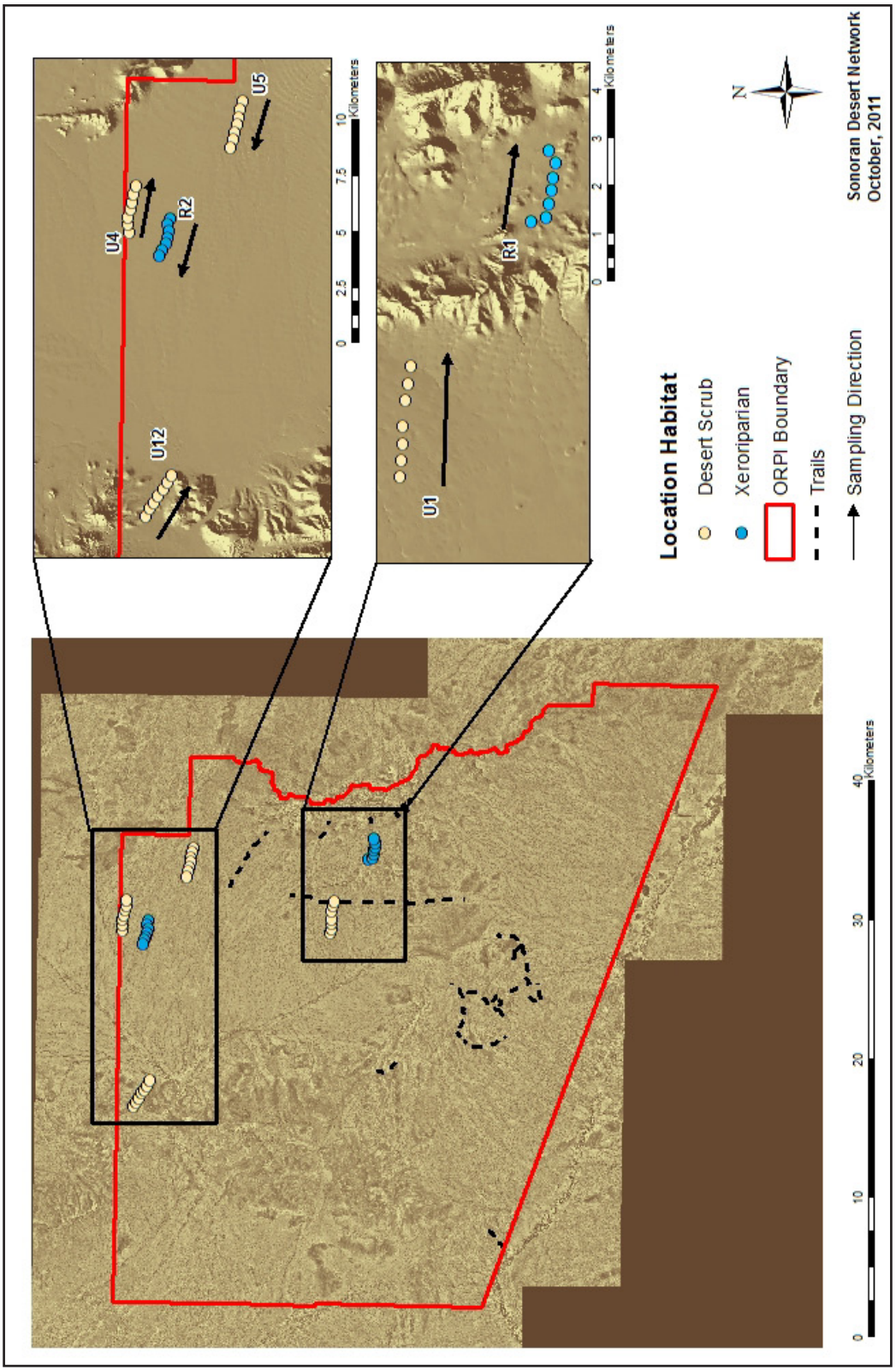


Figure 3.7.1. Point locations targeted for annual sampling at Organ Pipe Cactus NM, 2011.

Table 3.7.2. Number of birds detected of each species in each habitat type, Organ Pipe Cactus NM, 2011

Species	Habitat type		# of birds detected	
	Desert scrub	Xeroriparian	Total	% of total
Gila Woodpecker	87	49	136	13
Ash-throated Flycatcher	93	30	123	12
Mourning Dove	51	31	82	8
Cactus Wren	34	39	73	7
White-winged Dove	36	25	61	6
House Finch	32	18	50	5
Black-throated Sparrow	28	21	49	5
Verdin	22	25	47	4
Scott's Oriole	30	12	42	4
Curve-billed Thrasher	18	21	39	4
Black-tailed Gnatcatcher	22	16	38	4
Lucy's Warbler	16	19	35	3
Gambel's Quail	20	11	31	3
Phainopepla	9	16	25	2
Gilded Flicker	8	9	17	2
Canyon Towhee	7	9	16	2
Costa's Hummingbird	13	3	16	2
Greater Roadrunner	7	5	12	1
Ladder-backed Woodpecker	5	7	12	1
American Kestrel	5	6	11	1
Hooded Oriole	2	7	9	1
Lazuli Bunting	5	4	9	1
Lesser Goldfinch	2	6	8	1
Bullock's Oriole	2	5	7	1
Common Raven	6	1	7	1
Pyrrhuloxia	3	4	7	1
Vaux's Swift	4	3	7	1
Brewer's Sparrow	3	3	6	1
Wilson's Warbler	2	4	6	1
Loggerhead Shrike	5	--	5	0
Orange-crowned Warbler	4	1	5	0
Crissal Thrasher	2	2	4	0
Great Horned Owl	1	3	4	0
Black-throated Gray Warbler	1	2	3	0
Chipping Sparrow	1	2	3	0
Yellow-rumped Warbler	2	1	3	0
Bell's Vireo	2	--	2	0
Black-chinned Hummingbird	1	1	2	0
Black-headed Grosbeak	--	2	2	0
Brewer's Blackbird	--	2	2	0

Table 3.7.2. Number of birds detected of each species in each habitat type, Organ Pipe Cactus NM, 2011, cont.

Species	Habitat type		# of birds detected	
	Desert scrub	Xeroriparian	Total	% of total
Cooper's Hawk	2	--	2	0
Lesser Nighthawk	2	--	2	0
Northern Cardinal	--	2	2	0
Red-tailed Hawk	1	1	2	0
Rufous Hummingbird	1	1	2	0
Barn Swallow	1	--	1	0
Bewick's Wren	--	1	1	0
Blue Grosbeak	1	--	1	0
Blue-gray Gnatcatcher	--	1	1	0
Broad-tailed Hummingbird	--	1	1	0
Canyon Wren	1	--	1	0
Gray Flycatcher	--	1	1	0
Green-tailed Towhee	--	1	1	0
Lark Sparrow	--	1	1	0
MacGillivray's Warbler	--	1	1	0
Northern Mockingbird	--	1	1	0
Peregrine Falcon	1	--	1	0
Say's Phoebe	1	--	1	0
Spotted Towhee	--	1	1	0
Vermilion Flycatcher	1	--	1	0
Violet-green Swallow	1	--	1	0
Virginia's Warbler	--	1	1	0
Warbling Vireo	1	--	1	0
Western Kingbird	--	1	1	0
White-throated Swift	1	--	1	0
Unidentified Flicker	*8*	*4*	*12*	*1*
Unidentified Woodpecker	*--*	*2*	*2*	*0*
Unidentified Hummingbird	*1*	*--*	*1*	*0*
Total	**615**	**446**	**1061**	**100%**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

3.8 Saguaro National Park

3.8.1 2011 sampling

During April, May, or June of 2011, we sampled 14 transects at Saguaro NP (Figures 3.8.1-1 and 3.8.1-2). Nine transects were in the Rincon Mountain District (SAGE) and five were in the Tucson Mountain District (SAGW). Of those in the Rincon Mountain District, eight were in the upland habitat class (desert scrub, forest, or woodland habitat types), and one was in the riparian habitat class (Table 3.8.1). The five transects in the Tucson Mountain District were in upland desert scrub habitat. All transects/grids at the park had six to eight points each, and all but two were visited twice (see Table 3.8.1). The total number of point counts at Saguaro NP in 2011 was 175.

© ROBERT SHANTZ

Verdin (*Auriparus flaviceps*) was a common species at both park units in 2011.

3.8.2 Results and discussion

During 2011, 3,447 birds of 127 species were counted at Saguaro NP (Tables 3.8.2-1 and 3.8.2-2). Gila Woodpecker and White-winged Dove were the most commonly counted species. At the Rincon Mountain District (SAGE), 2,048 birds of 120 species were counted. Species counted in the highest numbers were Gila Woodpecker (9%), White-winged Dove (8%), Cactus Wren (5%), Ash-throated Flycatcher (5%), and Mourning Dove (4%). At the Tucson Mountain District (SAGW), 1,399 birds of 58 species were counted. Species counted in the highest numbers were Gila Woodpecker (19%), Cactus Wren (8%), Curve-billed Thrasher (6%), White-throated Swift (6%), and Verdin (6%). There were two new species (incidental detections or fly-overs) at the park in 2011: Marsh Wren and Black-crowned Night-Heron.

On the upland desert transects at both units, resident breeders were detected in higher numbers with the earlier sampling dates in April, and many species were recorded breeding or with juveniles. As noted above, Gila Woodpecker was the most numerous , and Cactus Wren, Curve-billed Thrasher, Gambel's Quail, Black-throated Sparrow, and Verdin also had high counts. Neotropical migrant species were diverse; the most notable species was Gray Vireo, which had a high count at both park units, and is a poorly known species in spring migration with only a few records in southern Arizona. Flyover Black-crowned Night-Herons, an unusual species migrating through upland desert, were observed at SAGW. Saguaro-nesting Purple Martins were recorded in lower numbers, and Yellow-billed Cuckoos were not recorded given the earlier sampling dates; both species are late spring migrants from the tropics.

At the Rincon Creek transect at SAGE, creek levels and surface water pools were unusually low due to the poor winter rains, and the riparian corridor remained dormant most of the spring. The lack of lush undergrowth and delayed canopy leafing accounted for fewer detections of Bell's Vireo, Yellow Warbler, Northern Beardless-Tyrannulet, and Yellow-breasted Chat— species which have been irregular in dry springs but respond well to wet winters. Resident Northern Cardinal, Abert's Towhee, Lesser Goldfinch, and Bewick's Wren numbers were normal despite this, and migrant breeders such as Lucy's Warbler, Vermilion Flycatcher, Ash-throated Flycatcher, and White-winged Dove seemed more numerous. The site is also a good wintering ground for a diverse mix of species including sparrows, thrushes, flycatchers, and warblers. Breeding Gray Hawk, Zone-tailed Hawk, and Great Horned Owl occupied nesting sites as in previous years and were observed with juveniles.

The high elevation transects in the Rincon Mountains at SAGE were also sampled earlier than in previous seasons, and the unseasonably low temperatures in May accounted for less diversity and lower numbers of montane breeders and migrants. Two new transects were established at Grass Shack campground, and the two Manning Camp transects were only sampled once due to the National Forest fire closure in June. Cassin's

Finch and Northern Goshawk were notable as they are quite uncommon. Nocturnal owls were represented well at both camps, with Elf, Western Screech, Whiskered Screech, Spotted, and Flammulated Owls quite vocal.

Table 3.8.1. Habitat type, number of points, and sampling dates for each transect or grid, Saguaro NP, 2011

Transect/Grid	Habitat class	Habitat type	#points	# visits	Visit 1	Visit 2
SAGE-008	Upland	Desert scrub	7	2	4/10/2011	4/25/2011
SAGE-112	Upland	Desert scrub	7	2	4/8/2011	4/24/2011
SAGE-113	Upland	Forest	7	1	5/2/2011	--
SAGE-115	Upland	Desert scrub	7	2	4/7/2011	4/24/2011
SAGE-139	Upland	Desert scrub	6	2	4/9/2011	4/23/2011
SAGE-191	Upland	Forest	6	1	5/2/2011	--
SAGE-403	Upland	Woodland	6	2	5/1/2011	6/9/2011
SAGE-404	Upland	Woodland	6	2	5/1/2011	6/9/2011
SAGE-LRC	Riparian	Riparian	8	2	4/10/2011	4/25/2011
SAGW-204	Upland	Desert scrub	7	2	4/2/2011	4/11/2011
SAGW-212	Upland	Desert scrub	6	2	4/3/2011	4/12/2011
SAGW-213	Upland	Desert scrub	7	2	4/2/2011	4/11/2011
SAGW-238	Upland	Desert scrub	6	2	4/1/2011	4/15/2011
SAGW-239	Upland	Desert scrub	8	2	4/3/2011	4/14/2011

© ROBERT SHANTZ

White-throated Swift (*Aeronautes saxatalis*) was one of the most commonly detected species at Saguaro NP in 2011.

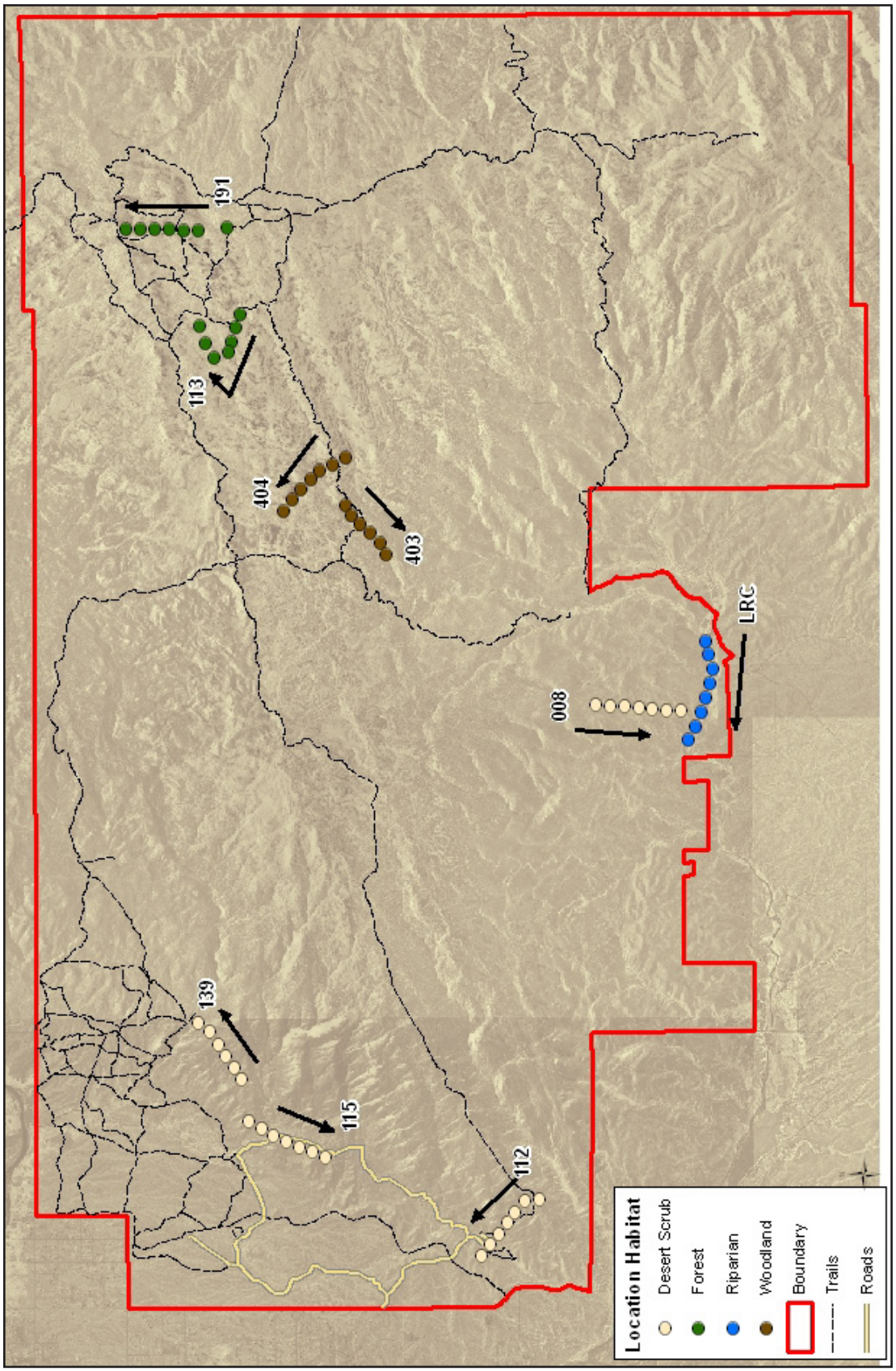


Figure 3.8.1-1. Point locations targeted for annual sampling at Saguaro NP, Rincon Mountain District (SAGE), 2011.

Table 3.8.2-1. Number of birds detected of each species in each habitat type, Saguaro NP–Rincon Mountain District (SAGE), 2011

Species	Habitat type				# of birds detected	
	Desert scrub	Forest	Riparian	Woodland	Total	% of total
Gila Woodpecker	133	--	50	--	183	9
White-winged Dove	124	--	36	7	167	8
Cactus Wren	86	--	19	--	105	5
Ash-throated Flycatcher	61	--	18	19	98	5
Mourning Dove	45	--	43	2	90	4
House Finch	63	--	14	--	77	4
Gambel's Quail	42	--	31	--	73	4
Verdin	43	--	20	--	63	3
Lucy's Warbler	34	--	27	--	61	3
Curve-billed Thrasher	50	--	8	--	58	3
Canyon Towhee	37	--	6	9	52	3
Black-throated Sparrow	48	--	3	--	51	2
Gilded Flicker	40	--	8	--	48	2
Pyrrhuloxia	42	--	2	--	44	2
Bewick's Wren	--	--	13	30	43	2
Black-throated Gray Warbler	5	2	1	30	38	2
Rufous-crowned Sparrow	8	--	--	22	30	1
Scott's Oriole	21	--	--	8	29	1
Northern Cardinal	6	--	20	--	26	1
Blue-gray Gnatcatcher	5	--	6	15	26	1
Yellow-rumped Warbler	4	17	--	2	23	1
Spotted Towhee	--	5	--	15	20	1
Mexican Jay	--	--	--	19	19	1
Pygmy Nuthatch	--	19	--	--	19	1
White-throated Swift	12	--	--	6	18	1
Turkey Vulture	14	--	--	3	17	1
Rock Wren	11	1	--	5	17	1
Ladder-backed Woodpecker	8	--	9	--	17	1
Lesser Goldfinch	6	--	10	1	17	1
Black-chinned Hummingbird	7	--	8	1	16	1
Abert's Towhee	--	--	16	--	16	1
Rufous-winged Sparrow	--	--	16	--	16	1
Black-tailed Gnatcatcher	15	--	--	--	15	1
American Robin	--	15	--	--	15	1
Green-tailed Towhee	4	--	9	1	14	1
Red-tailed Hawk	7	--	6	--	13	1
Bell's Vireo	1	--	12	--	13	1
Lazuli Bunting	10	1	--	1	12	1
Brown-crested Flycatcher	9	--	3	--	12	1
Canyon Wren	1	1	--	10	12	1
Costa's Hummingbird	11	--	--	--	11	1

Table 3.8.2-1. Number of birds detected of each species in each habitat type, Saguaro NP–Rincon Mountain District, 2011, cont.

Species	Habitat type				# of birds detected	
	Desert scrub	Forest	Riparian	Woodland	Total	% of total
Common Raven	9	--	1	1	11	1
Brown-headed Cowbird	4	--	7	--	11	1
Gray Flycatcher	7	--	2	1	10	0
Lark Sparrow	5	--	5	--	10	0
Western Tanager	5	--	2	2	9	0
Broad-tailed Hummingbird	1	--	--	8	9	0
Grace's Warbler	--	9	--	--	9	0
Vermilion Flycatcher	--	--	8	--	8	0
House Wren	--	6	1	1	8	0
Red-faced Warbler	--	8	--	--	8	0
Yellow-eyed Junco	--	8	--	--	8	0
Hooded Oriole	7	--	--	--	7	0
Anna's Hummingbird	5	--	1	1	7	0
Townsend's Warbler	5	--	--	2	7	0
Phainopepla	4	--	3	--	7	0
Broad-billed Hummingbird	4	--	--	3	7	0
Hepatic Tanager	--	1	--	6	7	0
Gray Vireo	6	--	--	--	6	0
Northern Mockingbird	6	--	--	--	6	0
Great Horned Owl	5	--	1	--	6	0
Chipping Sparrow	4	--	--	2	6	0
Violet-green Swallow	1	--	2	3	6	0
Cassin's Kingbird	--	--	4	2	6	0
Northern Flicker	--	2	3	1	6	0
Hermit Thrush	--	4	--	2	6	0
White-crowned Sparrow	4	--	--	1	5	0
Wilson's Warbler	2	--	3	--	5	0
Black-headed Grosbeak	1	3	--	1	5	0
Hammond's Flycatcher	1	1	--	3	5	0
Summer Tanager	--	--	4	1	5	0
Bushtit	--	--	--	5	5	0
Juniper Titmouse	--	--	--	5	5	0
Steller's Jay	--	5	--	--	5	0
Virginia's Warbler	--	2	--	3	5	0
Bullock's Oriole	4	--	--	--	4	0
Pine Siskin	3	--	1	--	4	0
Gray Hawk	--	--	4	--	4	0
Western Kingbird	--	--	4	--	4	0
Greater Pewee	--	3	1	--	4	0
Acorn Woodpecker	--	--	--	4	4	0

Table 3.8.2-1. Number of birds detected of each species in each habitat type, Saguaro NP–Rincon Mountain District, 2011, cont.

Species	Habitat type				# of birds detected	
	Desert scrub	Forest	Riparian	Woodland	Total	% of total
Band-tailed Pigeon	--	4	--	--	4	0
Black Phoebe	--	--	--	4	4	0
Bridled Titmouse	--	--	--	4	4	0
American Kestrel	3	--	--	--	3	0
Barn Swallow	3	--	--	--	3	0
Black-chinned Sparrow	3	--	--	--	3	0
Orange-crowned Warbler	3	--	--	--	3	0
Greater Roadrunner	2	--	1	--	3	0
Hermit Warbler	2	--	--	1	3	0
Brewer's Sparrow	1	--	2	--	3	0
Ruby-crowned Kinglet	1	1	--	1	3	0
Cedar Waxwing	--	--	3	--	3	0
Hairy Woodpecker	--	3	--	--	3	0
Hutton's Vireo	--	1	--	2	3	0
White-breasted Nuthatch	--	3	--	--	3	0
Plumbeous Vireo	2	--	--	--	2	0
Warbling Vireo	2	--	--	--	2	0
Yellow Warbler	--	--	2	--	2	0
Lincoln's Sparrow	--	--	1	1	2	0
Brown Creeper	--	2	--	--	2	0
Mountain Chickadee	--	2	--	--	2	0
Pacific-slope Flycatcher	--	--	--	2	2	0
Peregrine Falcon	--	--	--	2	2	0
Western Bluebird	--	2	--	--	2	0
Western Scrub-Jay	--	--	--	2	2	0
Dusky Flycatcher	1	--	--	--	1	0
MacGillivray's Warbler	1	--	--	--	1	0
Nashville Warbler	1	--	--	--	1	0
Swainson's Hawk	1	--	--	--	1	0
Northern Beardless-Tyrannulet	--	--	1	--	1	0
Arizona Woodpecker	--	--	--	1	1	0
Cooper's Hawk	--	--	--	1	1	0
Cordilleran Flycatcher	--	1	--	--	1	0
Crissal Thrasher	--	--	--	1	1	0
Northern Goshawk	--	1	--	--	1	0
Northern Pygmy-Owl	--	--	--	1	1	0
Olive Warbler	--	1	--	--	1	0
Painted Redstart	--	1	--	--	1	0
Red-breasted Nuthatch	--	1	--	--	1	0
Marsh Wren (incidental)	**--**	**--**	**--**	**--**	**--**	**--**
Unidentified Flicker	*7*	--	--	--	*7*	*0*

Species	Habitat type				# of birds detected	
	Desert scrub	Forest	Riparian	Woodland	Total	% of total
Unidentified Warbler	--	*2*	--	--	*2*	*0*
Unidentified Bird	--	--	--	*1*	*1*	*0*
Unidentified Cardinal	*1*	--	--	--	*1*	*0*
Unidentified Hummingbird	*1*	--	--	--	*1*	*0*
Total	**1,141**	**138**	**481**	**288**	**2,048**	**100**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

© TOM JOHNSON

Black-headed Grosbeak (*Pheucticus melanocephalus*) was detected at the Rincon Mountain District in 2011.

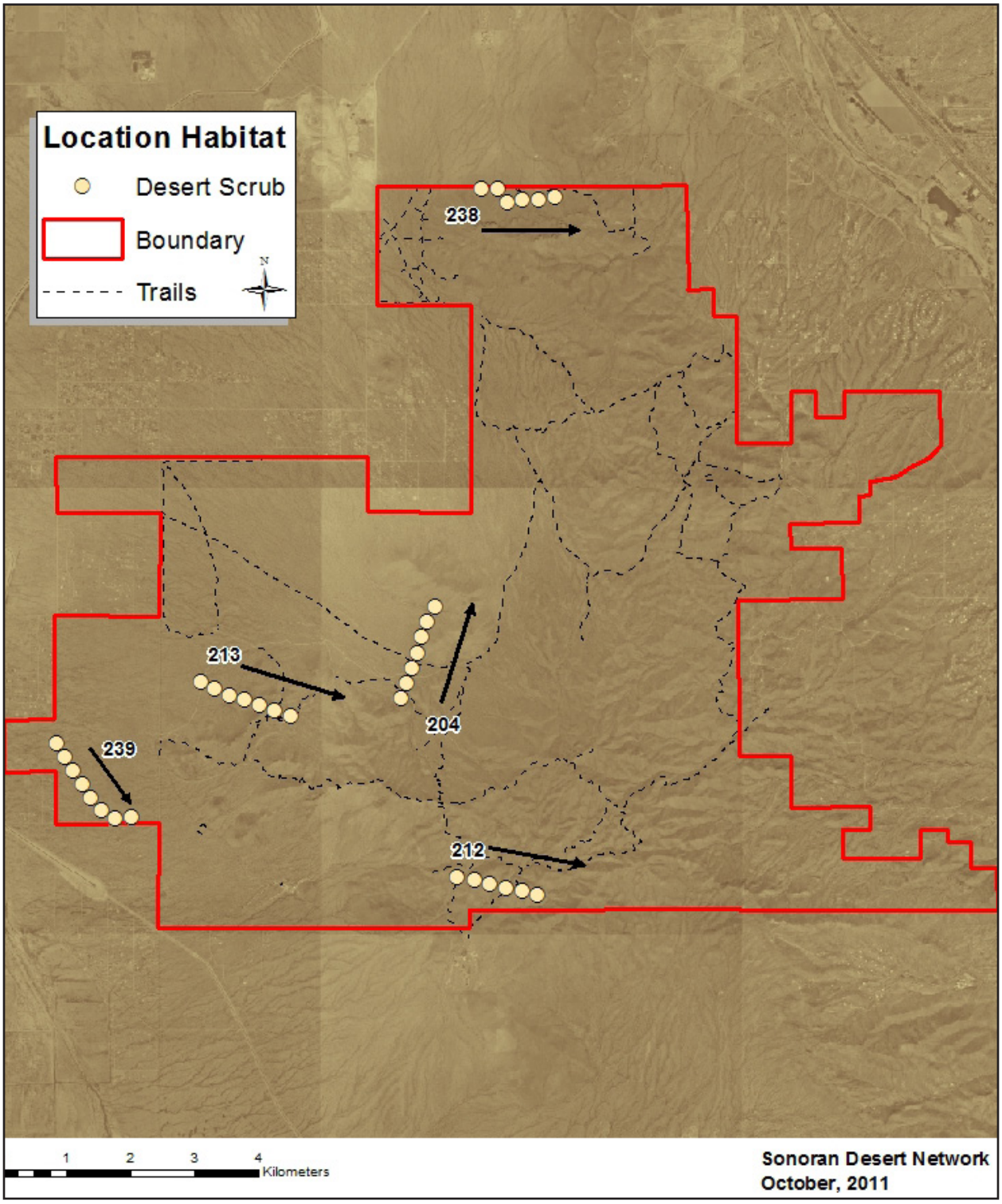


Figure 3.8.1-2. Point locations targeted for annual sampling at Saguaro NP, Tucson Mountain District (SAGW), 2011.

Table 3.8.2-2. Number of birds detected of each species in each habitat type, Saguaro NP–Tucson Mountain District (SAGW), 2011

Species	# of birds detected: Total (desert scrub habitat)	# of birds detected: % of total
Gila Woodpecker	272	19
Cactus Wren	114	8
Curve-billed Thrasher	87	6
White-throated Swift	85	6
Verdin	81	6
Ash-throated Flycatcher	67	5
Gambel's Quail	63	5
White-winged Dove	62	4
House Finch	58	4
Mourning Dove	52	4
Black-throated Sparrow	43	3
Gilded Flicker	39	3
Pyrrhuloxia	36	3
Canyon Towhee	33	2
Ladder-backed Woodpecker	28	2
Costa's Hummingbird	22	2
Lesser Goldfinch	21	2
Common Raven	18	1
Black-tailed Gnatcatcher	17	1
Lucy's Warbler	16	1
Scott's Oriole	16	1
Black Vulture	13	1
Violet-green Swallow	13	1
Brewer's Sparrow	10	1
Turkey Vulture	10	1
Great Horned Owl	8	1
Pine Siskin	7	1
Red-tailed Hawk	7	1
Canyon Wren	6	0
Rock Wren	6	0
Blue-gray Gnatcatcher	4	0
Bullock's Oriole	4	0
Greater Roadrunner	4	0
Green-tailed Towhee	4	0
Warbling Vireo	4	0
Yellow-rumped Warbler	4	0
Black-throated Gray Warbler	3	0
Brown-headed Cowbird	3	0
Eurasian Collared-Dove	3	0
Phainopepla	3	0
Rufous-winged Sparrow	3	0
Anna's Hummingbird	2	0
Great-tailed Grackle	2	0
Northern Cardinal	2	0
Prairie Falcon	2	0
Rufous-crowned Sparrow	2	0
Acorn Woodpecker	1	0
American Kestrel	1	0
Barn Swallow	1	0
Common Poorwill	1	0
Lazuli Bunting	1	0
Lesser Nighthawk	1	0
Northern Mockingbird	1	0
Orange-crowned Warbler	1	0
Plumbeous Vireo	1	0
Ruby-crowned Kinglet	1	0
Sharp-shinned Hawk	1	0
Virginia's Warbler	1	0
Black-crowned Night-Heron (flyover)	**--**	**--**
Unidentified Flicker	*26*	*2*
Unidentified Flycatcher	*1*	*0*
Unidentified Hummingbird	*1*	*0*
Total	**1,399**	**100%**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat.

3.9 Tonto National Monument

3.9.1 2011 sampling

During April and May of 2011, we sampled two transects or grids at Tonto NM (Figure 3.9.1). One transect was in riparian habitat with eight points (Table 3.9.1). The other was in upland (desert scrub) habitat with nine points. Each point was surveyed twice for a total of 34 point counts at Tonto NM.

3.9.2 Results and discussion

During 2011, 712 birds of 75 species were counted at Tonto NM (Table 3.9.2). Gambel's Quail was the most commonly counted species (7%). Bell's Vireo (6%), Black-throated sparrow (5%), Ash-throated Flycatcher (4%), and White-winged Dove (4%) were also common. One new species, Vaux's Swift, was observed in 2011.

Migration was quite slow throughout the park, especially in the narrow riparian transect, which usually hosts a good diversity of species along the flowing creek. Notable species included Painted Redstart, Gray Vireo, and nesting Cooper's Hawk at the same nest site from previous years. Bell's Vireo, Ash-throated Flycatcher, and Lucy's Warbler were the most numerous in the riparian zone, and were also in high numbers on the upland desert transect, along with White-winged Dove, Gambel's Quail, and Black-throated Sparrow. The Turkey Vulture roost and breeding colony of White-throated Swifts on the cliffs also seemed to be in relatively high numbers. Migrant hummingbirds, orioles, tanagers, and flycatchers favored the feeders at the park housing along the riparian transect, accounting for high detections given the slow migration in the rest of the park. Pyrrhuloxia was quite unusual this far north, and Vaux's Swift was a new addition to the park list.

Table 3.9.1. Habitat type, number of points, and sampling dates for each transect or grid, Tonto NM, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
RIP	Riparian	Riparian	8	2	4/22/2011	5/23/2011
UpW	Upland	Desert scrub	9	2	4/22/2011	5/23/2011

© ROBERT SHANTZ

Gambel's Quail (*Callipepla gambelii*), the most commonly counted species at Tonto NM in 2011.

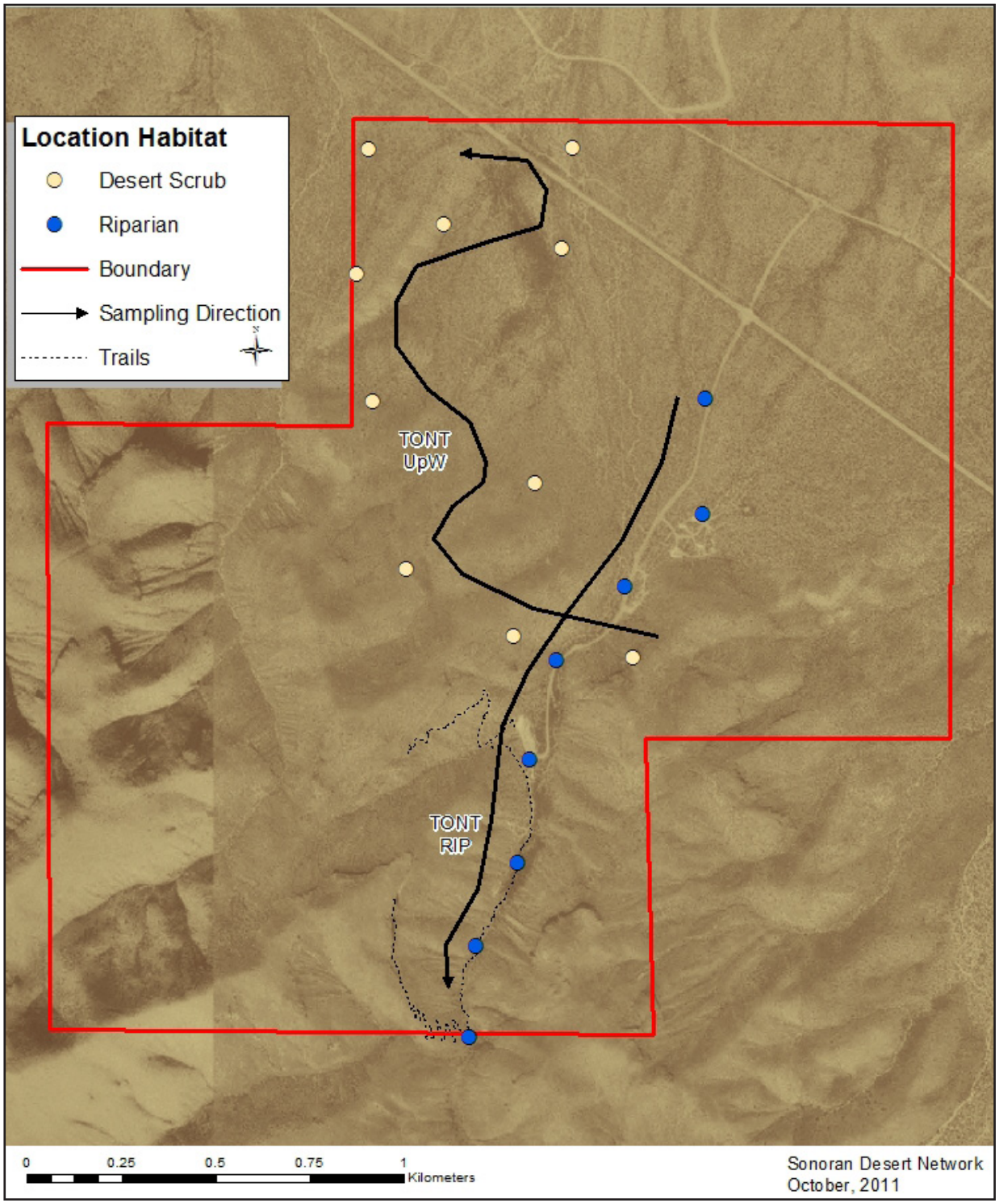


Figure 3.9.1. Point locations targeted for annual sampling at Tonto NM, 2011.

Table 3.9.2. Number of birds detected of each species in each habitat type, Tonto NM, 2011

Species	Habitat type		# of birds detected	
	Desert scrub	Riparian	Total	% of total
Gambel's Quail	27	20	47	7
Bell's Vireo	16	26	42	6
Black-throated Sparrow	20	18	38	5
Ash-throated Flycatcher	20	12	32	4
White-winged Dove	18	14	32	4
Lucy's Warbler	24	6	30	4
Cactus Wren	11	18	29	4
Turkey Vulture	20	5	25	4
Northern Cardinal	8	15	23	3
Brown-crested Flycatcher	9	11	20	3
Canyon Towhee	10	10	20	3
Curve-billed Thrasher	7	13	20	3
Verdin	10	10	20	3
Gila Woodpecker	6	13	19	3
Phainopepla	9	9	18	3
House Finch	8	9	17	2
Northern Mockingbird	9	7	16	2
Hooded Oriole	2	13	15	2
Lesser Goldfinch	2	13	15	2
Double-crested Cormorant	11	2	13	2
Scott's Oriole	7	4	11	2
White-throated Swift	4	7	11	2
Common Raven	8	1	9	1
Costa's Hummingbird	2	7	9	1
Lazuli Bunting	7	2	9	1
Rock Wren	2	7	9	1
Black-chinned Hummingbird	1	7	8	1
Black-tailed Gnatcatcher	2	6	8	1
Green-tailed Towhee	2	6	8	1
Violet-green Swallow	8	--	8	1
Wilson's Warbler	3	5	8	1
Brown-headed Cowbird	6	1	7	1
Mourning Dove	6	1	7	1
Abert's Towhee	1	4	5	1
Blue-gray Gnatcatcher	1	4	5	1
Greater Roadrunner	5	--	5	1
Ladder-backed Woodpecker	3	2	5	1
Townsend's Warbler	--	5	5	1
White-crowned Sparrow	5	--	5	1
Brewer's Sparrow	2	2	4	1

Table 3.9.2. Number of birds detected of each species in each habitat type, Tonto National Monument, 2011, cont.

Species	Habitat type		# of birds detected	
	Desert scrub	Riparian	Total	% of total
Canyon Wren	--	4	4	1
Cooper's Hawk	1	3	4	1
Rufous-crowned Sparrow	1	3	4	1
Say's Phoebe	1	3	4	1
Western Kingbird	3	1	4	1
Yellow-rumped Warbler	2	2	4	1
Zone-tailed Hawk	3	1	4	1
Warbling Vireo	--	3	3	0
Yellow Warbler	1	2	3	0
American Kestrel	2	--	2	0
Anna's Hummingbird	--	2	2	0
Bewick's Wren	2	--	2	0
Black-chinned Sparrow	--	2	2	0
Black-headed Grosbeak	1	1	2	0
Black-throated Gray Warbler	2	--	2	0
Cassin's Kingbird	1	1	2	0
Crissal Thrasher	--	2	2	0
Great Blue Heron	2	--	2	0
House Wren	--	2	2	0
Northern Flicker	2	--	2	0
Vaux's Swift	**2**	**--**	**2**	**0**
Barn Swallow	1	--	1	0
Gilded Flicker	--	1	1	0
Gray Flycatcher	1	--	1	0
Gray Vireo	--	1	1	0
Hammond's Flycatcher	--	1	1	0
MacGillivray's Warbler	--	1	1	0
Orange-crowned Warbler	1	--	1	0
Pacific-slope Flycatcher	--	1	1	0
Painted Redstart	--	1	1	0
Pyrrhuloxia	1	--	1	0
Swainson's Thrush	1	--	1	0
Western Screech-Owl	1	--	1	0
Western Tanager	1	--	1	0
Western Wood-Pewee	--	1	1	0
Unidentified bird	*3*	--	*3*	*0%*
Total	**358**	**354**	**712**	**100%**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

3.10 Tumacácori National Historical Park

3.10.1 2011 sampling

During April and May of 2011, we sampled two transects at Tumacácori NHP (Figure 3.10.1). Both transects, with seven points each, were in riparian habitat (Table 3.10.1). Each point was surveyed twice, for a total of 28 point counts at the park in 2011.

3.10.2 Results and discussion

During 2011, 958 birds of 85 species were counted at Tumacácori NHP (Table 3.10.2). Lark Sparrow was the most commonly counted species (10%). Gila Woodpecker (6%), White-winged Dove (6%), Bewick's Wren (4%), Lucy's Warbler (4%), Brown-crested Flycatcher (4%), and Lesser Goldfinch (4%) were also common. As noted below, two new species were recorded for the park in 2011outside of our surveys.

The transects abounded with many of the expected summer breeders, like White-winged Dove, Yellow Warbler, Summer Tanager, Yellow-breasted Chat, Bell's Vireo, and Brown-crested Flycatcher. High counts for residents such as Bewick's Wren, Abert's Towhee, Gila Woodpecker, Lesser Goldfinch, and Song Sparrow were also notable, including breeding White-breasted Nuthatch and Bridled Titmouse. Vermilion Flycatcher and Lark Sparrow were quite numerous, three pairs of Gray Hawks were observed nesting, and Tropical Kingbirds were vocal where they have bred in recent years. Mississippi Kite and Marsh Wren were new additions to the park list, but were not detected during our regular surveys. The agricultural sections of the park were favored by numerous blackbirds, flycatchers, kingbirds, sparrows, doves and open country species, including Eurasian Collared-Dove and Rock Pigeon (which are sometimes absent from the park).

© ROBERT SHANTZ

Marsh Wren (*Cistothorus palustris*) were observed for the first time at Tumacácori NHP in 2011 (outside of regular surveys).

Table 3.10.1. Habitat type, number of points, and sampling dates for each transect or grid, Tumacácori NHP, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
Est	Riparian	Riparian	7	2	4/17/2011	5/6/2011
Wst	Riparian	Riparian	7	2	4/17/2011	5/6/2011

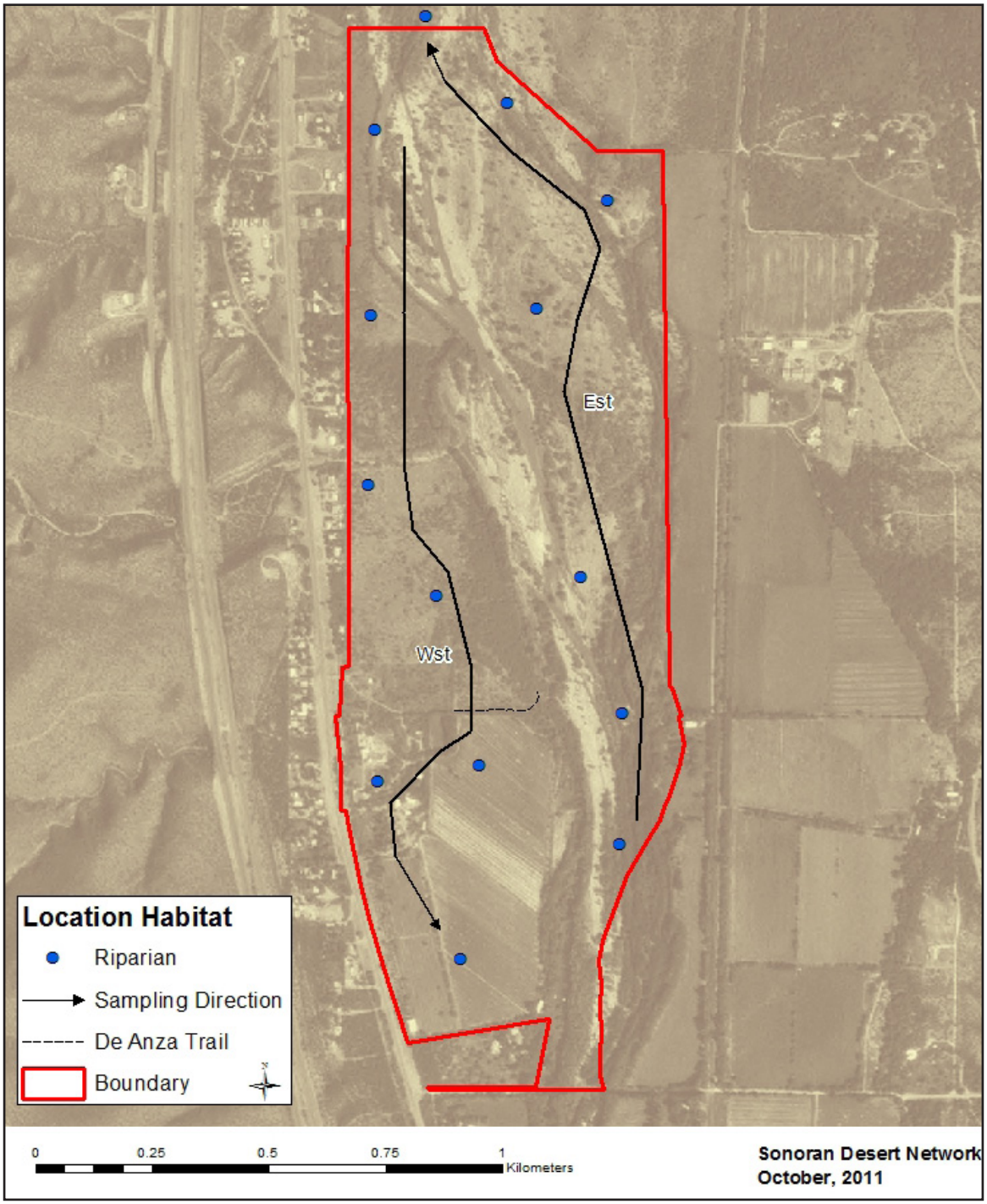


Figure 3.10.1. Point locations targeted for annual sampling at Tumacácori NHP, 2011.

Table 3.10.2. Number of birds detected of each species in each habitat type, Tumacácori NHP, 2011

Species	# of birds detected		Species	# of birds detected	
	Total (riparian habitat)	% of total		Total (riparian habitat)	% of total
Lark Sparrow	100	10	Orange-crowned Warbler	5	1
Gila Woodpecker	61	6	Pyrrhuloxia	5	1
White-winged Dove	55	6	Brewer's Sparrow	4	0
Bewick's Wren	42	4	Gray Flycatcher	4	0
Lucy's Warbler	42	4	Northern Flicker	4	0
Brown-crested Flycatcher	39	4	Northern Mockingbird	4	0
Lesser Goldfinch	39	4	Cliff Swallow	3	0
Mourning Dove	37	4	Common Yellowthroat	3	0
Cassin's Kingbird	31	3	Eurasian Collared-Dove	3	0
Bridled Titmouse	26	3	House Wren	3	0
Phainopepla	26	3	MacGillivray's Warbler	3	0
House Finch	25	3	Mallard	3	0
Vermilion Flycatcher	24	3	Pine Siskin	3	0
Summer Tanager	22	2	Rock Pigeon	3	0
Northern Cardinal	21	2	American Kestrel	2	0
Brown-headed Cowbird	20	2	Anna's Hummingbird	2	0
Gray Hawk	19	2	Cedar Waxwing	2	0
Chipping Sparrow	18	2	Common Ground-Dove	2	0
Ladder-backed Woodpecker	16	2	Cooper's Hawk	2	0
Abert's Towhee	15	2	European Starling	2	0
Lazuli Bunting	14	1	Gambel's Quail	2	0
Broad-billed Hummingbird	13	1	Northern Rough-winged Swallow	2	0
Turkey Vulture	12	1	Pacific-slope Flycatcher	2	0
Yellow Warbler	12	1	Plumbeous Vireo	2	0
Verdin	11	1	Ruby-crowned Kinglet	2	0
White-crowned Sparrow	11	1	Say's Phoebe	2	0
Bell's Vireo	10	1	American Robin	1	0
Wilson's Warbler	10	1	Black-headed Grosbeak	1	0
Ash-throated Flycatcher	9	1	Blue Grosbeak	1	0
Western Kingbird	9	1	Blue-gray Gnatcatcher	1	0
Rufous-winged Sparrow	8	1	Cassin's Vireo	1	0
Barn Swallow	7	1	Common Black-Hawk	1	0
Black-chinned Hummingbird	7	1	Gilded Flicker	1	0
Green-tailed Towhee	7	1	Greater Roadrunner	1	0
Yellow-breasted Chat	7	1	Hepatic Tanager	1	0
Yellow-rumped Warbler	7	1	Hermit Thrush	1	0
Common Raven	6	1	House Sparrow	1	0
Dusky-capped Flycatcher	6	1	Olive-sided Flycatcher	1	0
Northern Beardless-Tyrannulet	6	1	Swainson's Thrush	1	0
Song Sparrow	6	1	Violet-green Swallow	1	0
Bullock's Oriole	5	1	Warbling Vireo	1	0
Great-tailed Grackle	5	1	Western Wood-Pewee	1	0

Table 3.10.2. Number of birds detected of each species in each habitat type, Tumacácori NHP, 2011, cont.

Species	# of birds detected	
	Total (riparian habitat)	% of total
White-breasted Nuthatch	1	0
Marsh Wren (incidental)	--	--
Mississippi Kite (incidental)	--	--
Unidentified Hummingbird	*1*	*0%*
Total	**958**	**100%**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

© DAVE MENKE

Common Yellowthroat (*Geothlypis trichas*) was detected at Tumacácori NHP, as well as two other park units, in 2011.

3.11 Tuzigoot National Monument

3.11.1 2011 sampling

During May and June of 2011, we sampled two transects at Tuzigoot NM (Figure 3.11.1). Both transects, with seven points each, were in riparian habitat (Table 3.11.1). The transects were sampled twice, for a total of 28 point counts at the park in 2011.

3.11.2 Results and discussion

During 2011, 775 birds of 68 species were counted at Tuzigoot NM (Table 3.11.2). Red-winged Blackbird was the most commonly counted species (14%). Mourning Dove (10%), Phainopepla (6%), Common Yellowthroat (5%), Lucy's Warbler (4%), and Yellow Warbler (4%) were also common. One new species, Northern Beardless-Tyrannulet, was recorded during the surveys.

Tavasci Marsh continued to host the large breeding population of Red-winged Blackbirds, while other wetland species, such as Green Heron, Double-crested Cormorant, Great Blue Heron, Black-crowned Night-Heron, Sora, and Virginia Rail, were recorded in low numbers. Wood Duck and Mallard with young were also observed, although the open water at the marsh is rapidly receding with the encroaching dense cattails. Common Black-Hawk was seen carrying nesting material, and Cattle Egret and Willow Flycatcher (an uncommon endangered species) were also recorded. Migrant hummingbirds, orioles, and tanagers favored the feeders at the park housing (visible from the upland transect) and accounted for most of the detections of these species. Also notable was a singing Northern Beardless-Tyrannulet, a new species for the park; the species is more common along riparian zones in southern Arizona, but has been spreading north in recent years.

Table 3.11.1. Habitat type, number of points, and sampling dates for each transect or grid, Tuzigoot NM, 2011

Transect/Grid	Habitat class	Habitat type	# points	# visits	Visit 1	Visit 2
Est	Riparian	Riparian	7	2	5/25/2011	6/3/2011
Wst	Riparian	Riparian	7	2	5/25/2011	6/3/2011

© ROBERT SHANTZ

Yellow Warbler (*Dendroica petechia*) was a common species at Tuzigoot NM in 2011.

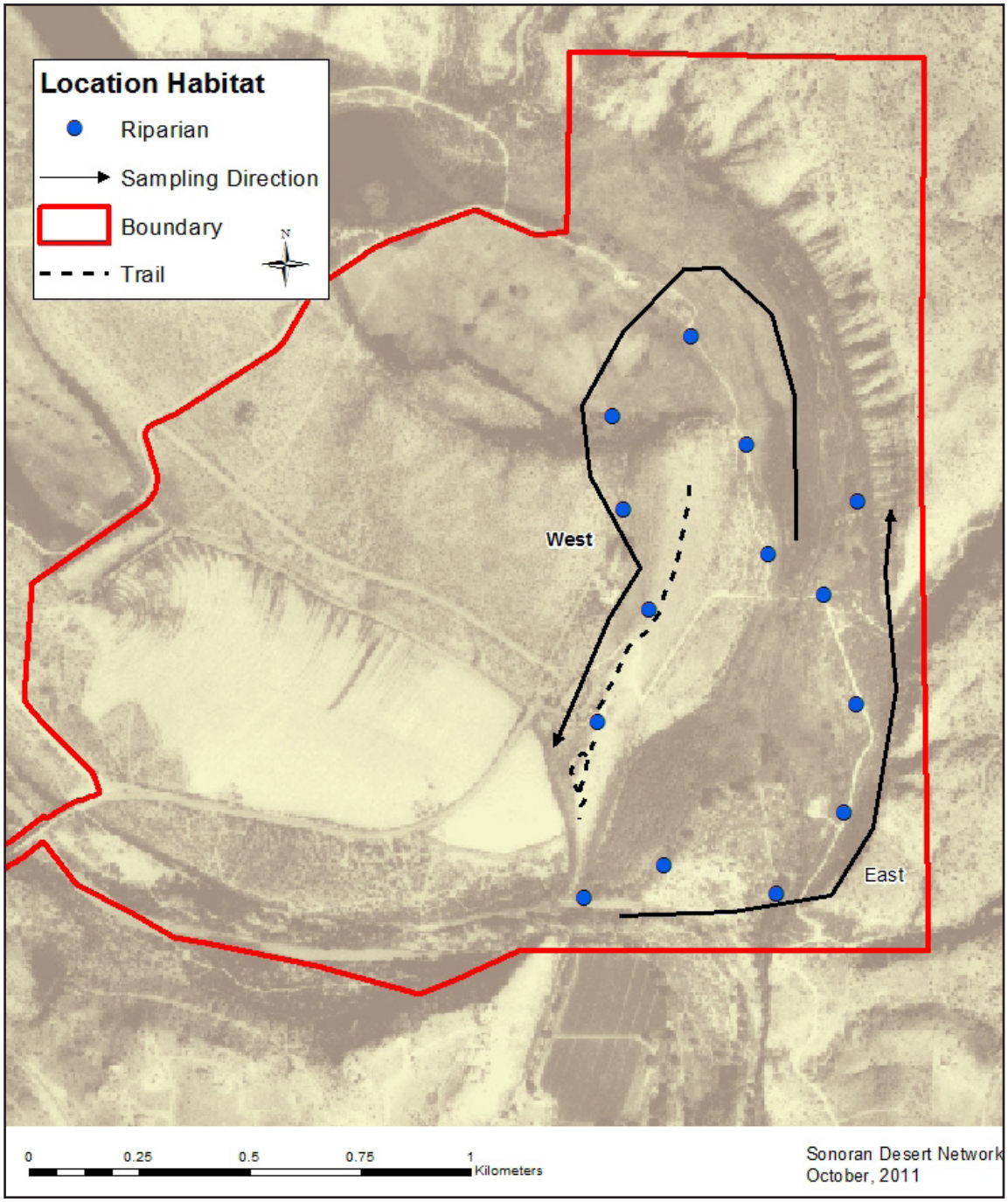


Figure 3.11.1. Point locations targeted for annual sampling at Tuzigoot NM, 2011.

Table 3.11.2. Number of birds detected of each species in each habitat type, Tuzigoot NM, 2011

Species	# of birds detected: Total (riparian habitat)	# of birds detected: % of total
Red-winged Blackbird	109	14
Mourning Dove	80	10
Phainopepla	47	6
Common Yellowthroat	41	5
Lucy's Warbler	29	4
Yellow Warbler	29	4
House Finch	27	3
Gila Woodpecker	24	3
Brown-crested Flycatcher	23	3
Blue Grosbeak	21	3
Gambel's Quail	21	3
Song Sparrow	20	3
Bewick's Wren	19	2
Northern Mockingbird	17	2
Summer Tanager	17	2
Abert's Towhee	16	2
Brown-headed Cowbird	16	2
Western Kingbird	15	2
Great-tailed Grackle	14	2
Northern Rough-winged Swallow	14	2
Northern Cardinal	12	2
Yellow-breasted Chat	12	2
Verdin	11	1
Common Raven	10	1
Ash-throated Flycatcher	9	1
Bullock's Oriole	9	1
Cassin's Kingbird	9	1
Lesser Goldfinch	8	1
Virginia Rail	8	1
Wilson's Warbler	7	1
Belted Kingfisher	6	1
Black-chinned Hummingbird	6	1
Red-tailed Hawk	6	1
Ladder-backed Woodpecker	5	1
Black-headed Grosbeak	4	1
Hooded Oriole	4	1
Wood Duck	4	1
Black-throated Sparrow	3	0
European Starling	3	0
Mallard	3	0
Vermilion Flycatcher	3	0
Western Wood-Pewee	3	0
Killdeer	2	0
Lazuli Bunting	2	0
Rock Wren	2	0
Say's Phoebe	2	0
Warbling Vireo	2	0
Black-crowned Night-Heron	1	0
Black-throated Gray Warbler	1	0
Blue-gray Gnatcatcher	1	0
Bridled Titmouse	1	0
Bronzed Cowbird	1	0
Cactus Wren	1	0
Canyon Towhee	1	0
Canyon Wren	1	0
Gray Flycatcher	1	0
Great Blue Heron	1	0
Green Heron	1	0
Hammond's Flycatcher	1	0
MacGillivray's Warbler	1	0
Northern Beardless-Tyrannulet	**1**	**0**
Northern Flicker	1	0
Tree Swallow	1	0
Turkey Vulture	1	0
Western Tanager	1	0
White-winged Dove	1	0
Willow Flycatcher	1	0
Yellow-rumped Warbler	1	0
Total	**775**	**100%**

Note: New species that have not previously been verified for the park are shown in bold and shaded. 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. Because of the potential to confound future comparisons, these values exclude observations of species flying overhead/not using the habitat. Species noted as incidental were identified by our birding team, but not as part of our regular survey.

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.

Bennetts, R.E., B.F. Powell, A. D. Flesch, D. Angell, K. Beaupré, and W. L. Halvorson. 2012 (in review). Landbird monitoring protocol for the Sonoran Desert, Southern Plains, and Chihuahuan Desert Networks. Version 1.00. Natural Resource Report NPS/SOPN/NRTR-2012/XXX. National Park Service, Fort Collins, Colorado.

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.

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

——. 2005. Sonoran Desert Network vital signs monitoring plan. Technical Report NPS/IMR/SODN-003. National Park Service, Denver, Co.

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 960/114156, May 2012

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
1201 Oak Ridge Drive, Suite 150
Fort Collins, Colorado 80525

www.nature.nps.gov