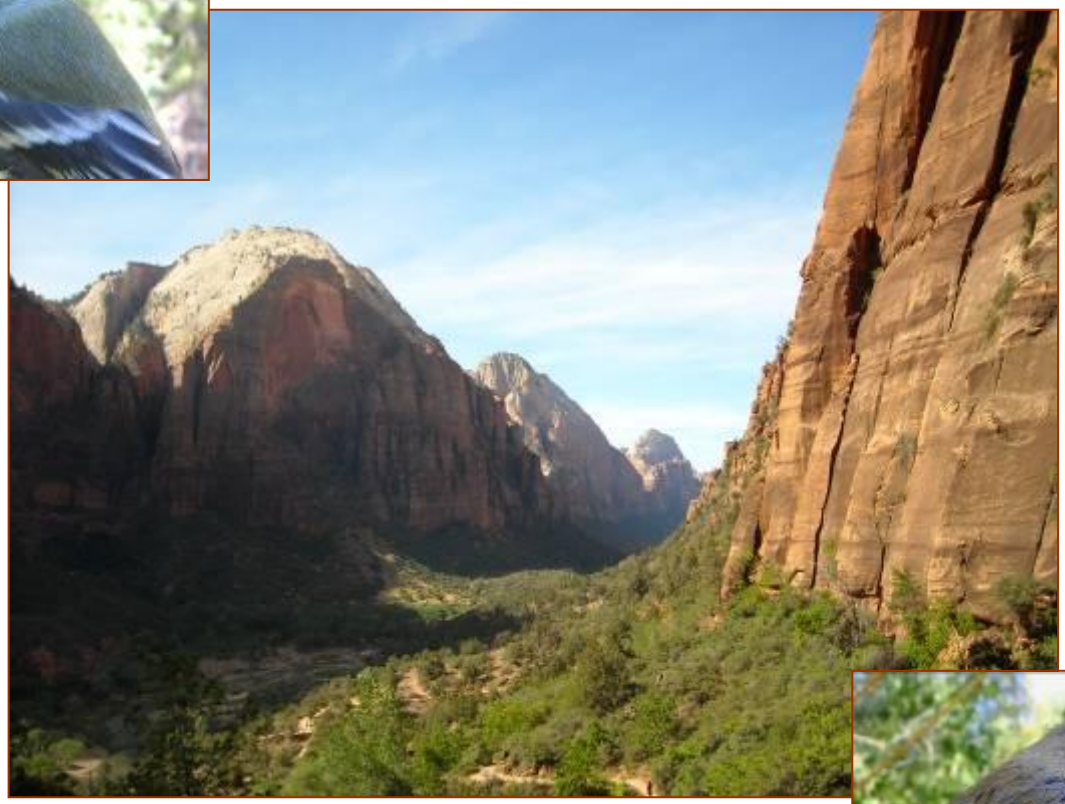
Monitoring the Birds of the National Park Service, Northern Colorado Plateau Network (NCPN): 2008 Field Season Report



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December 2008

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ROCKY MOUNTAIN BIRD OBSERVATORY

***Mission**: To conserve birds and their habitats*

***Vision**: Native bird populations are sustained in healthy ecosystems*

***Core Values**: (Our goals for achieving our mission)*

1. ***Science** provides the foundation for effective bird conservation.*
2. ***Education** is critical to the success of bird conservation.*
3. ***Stewardship** of birds and their habitats is a shared responsibility.*

RMBO accomplishes its mission by:

***Partnering** with state and federal natural resource agencies, private landowners, schools, and other nonprofits for conservation.*

***Studying** bird responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.*

***Monitoring** long-term trends in bird populations for our region.*

***Providing** active, experiential, education programs that create an awareness and appreciation for birds.*

***Sharing** the latest information in land management and bird conservation practices.*

***Developing** voluntary, working partnerships with landowners to engage them in conservation.*

***Working** across political and jurisdictional boundaries including, counties, states, regions, and national boundaries. Our conservation work emphasizes the Western United States, including the Great Plains, as well as Latin America.*

***Creating** informed publics and building consensus for bird conservation needs.*

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EXECUTIVE SUMMARY

In 2005, Rocky Mountain Bird Observatory (RMBO) and the National Park Service (NPS), initiated *Monitoring Birds of the National Park Service, Northern Colorado Plateau Network* (NCPN), using a protocol similar to other RMBO monitoring programs as delineated by Panjabi et al. (2006). This monitoring program continued through 2008. RMBO designed the program to provide statistically rigorous long-term trend data for populations of most diurnal, regularly breeding landbird species in the NCPN. The program provides information needed to effectively manage and conserve bird populations in the NCPN, including the spatial distribution, abundance, and relationship to important habitat characteristics for each species. The program also supports the NCPN's efforts to develop long-term natural resource monitoring plans for its park units, and contributes to RMBO's broader landscape-scale breeding bird monitoring program, which currently includes 11 states in the Rocky Mountains and Great Plains regions.

The program consists of 45 point transects (15 transects each in low-elevation riparian, pinyon-juniper, and sage shrubland habitats) within 11 different parks. Each transect is conducted two times each spring/summer. We use program DISTANCE to generate density estimates using data collected at point count stations.

In 2008, we detected a total of 9,548 individual birds of 119 species on point transects. We detected 3,590 individual birds of 84 species in low-elevation riparian habitat, 2,832 individual birds of 70 species in pinyon-juniper habitat, and 3,126 individual birds of 89 species in sage shrubland habitat.

In 2008, as in 2007, we pooled the 2005-2008 point transect data to determine density estimates for each year. This allowed us to calculate density estimates for some low-density species that did not have large enough sample sizes to calculate density estimates using only the 2008 data. The pooled 2005-2008 data yielded robust density estimates (CV < 50%) for 34 species and moderately robust estimates (CV = 50-75%) for 13 additional species. We should be able to reach our target of detecting a population change of at least 3% within 30 years for these 47 species, which represent 39 percent of all species detected on point transects in the NCPN during 2005-2008 and represent more than 90 percent of all individual birds observed during 2005-2008.

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INTRODUCTION

Program History

In 1995 the Rocky Mountain Bird Observatory (RMBO), in conjunction with the Colorado Division of Wildlife (CDOW), the United States Forest Service (USFS), the Bureau of Land Management (BLM) and the National Park Service (NPS), began efforts to create and conduct a Colorado-wide program to monitor breeding-bird populations. Since then, RMBO has continually expanded its monitoring efforts to include neighboring states using a similar transect selection protocol and survey methodology. In 2005 RMBO began work with the National Park Service to monitor landbirds in 11 National Parks in three states (CO, WY, UT) in the Northern Colorado Plateau Inventory and Monitoring Network (NCPN). We plan to continue to build partnerships and to expand the level of effort so that bird population monitoring occurs across Bird Conservation Regions (BCR).

Monitoring Objectives

RMBO's bird monitoring programs are designed to provide population status trend estimates for all regularly-occurring breeding landbird species within each program area. Initially, we expect to collect data to provide "early-warning" information for all species that can be monitored through a habitat-based approach. After establishing this monitoring framework, we anticipate collecting more demographic information and testing *a priori* hypotheses to determine the possible reasons for any observed declines and to better inform management decisions. Herein we discuss the initial "early-warning" monitoring framework, the monitoring goals and progress. In the future, with the initial trend information, we hope to develop and establish the second phase of the program to gather demographic and other information to address specific management issues.

The specific objectives of RMBO's monitoring program are:

1.) to integrate existing bird monitoring efforts in the region to provide better information on distribution and abundance of all breeding birds, and especially for priority species;
2.) to provide basic habitat association data for most bird species to address habitat management issues;
3.) to provide long-term status and trend estimates for all regularly occurring breeding landbird species in the region, with a target of detecting a minimum rate of population change of 3.0% per year over a maximum time period of 30 years;
4.) to maintain a high-quality database that is accessible to all of our collaborators as well as the public on the web in the form of raw and summarized data and,
5.) to generate decision support tools such as population estimate models that help guide conservation efforts and provide a better measure of our conservation success.

METHODS

Study Area

In winter 2005, the National Park Service selected three habitats (low-elevation riparian, pinyon-juniper, and sage shrubland) in which to place 45 point transects. These habitats were selected by a panel of National Park Service resource managers on the basis of distinct avifaunal communities, as well as management questions associated with each in the NCPN. During the spring and summer of 2005, RMBO staff established the 45 transects.

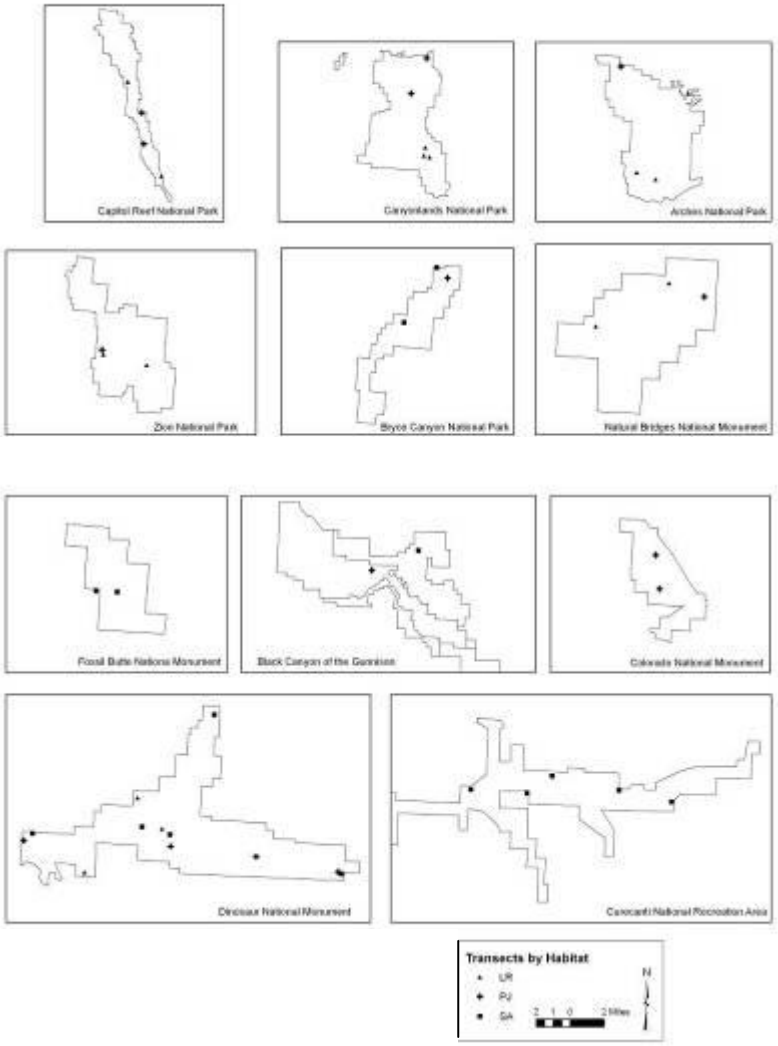

Figure 1. Point-transect locations within the National Park Service Northern Colorado Plateau Network.

Low-elevation Riparian

This habitat is comprised mostly of scattered stands of Fremont cottonwood (*Populus fremontii*) and boxelder (*Acre negundo*) along perennial streams, sometimes within deeply-cut canyons. Tamarisk (*Tamarix sp*), also known as saltcedar, is an exotic species that has invaded much of the low-elevation riparian habitat of the western United States. While the NPS is working to eradicate tamarisk in many of its park units, it is still fairly common in this habitat type.

Pinyon-Juniper

Pinyon-juniper typically lies just above semidesert shrubland in elevation. It covers most of the ridges and mesas in the NCPN and is the most extensive habitat there. Pinyon-juniper varies in composition with various ratios of its two main components – pinyon pine (*Pinus edulis*) and juniper (*Juniperus* spp.).

Sage Shrubland

The sagebrush shrubland community occurs extensively on the Colorado Plateau. The stands of sage that we survey in the NCPN are generally narrow "fingers" of pure sage and our point-count stations are often near forests. The most common species of sagebrush in the NCPN are big sagebrush (*Artemisia tridentata*) and mountain sagebrush (*Artemisia frigida*).

Field Personnel

Three experienced biologists with excellent aural and visual bird-identification skills comprised the RMBO staff who executed the field component of NCPN in 2008. Each biologist had several years experience with RMBO bird monitoring protocol and had excellent knowledge of local birds. Each biologist also completed a training program at the beginning of the season to ensure full understanding of the field protocols.

Site Selection

Transect sites were selected during the winter of 2005, and ground-proofed that spring. The sites were randomly selected from a pool of habitat "stands" that were accessible (not on plateaus with vertical cliffs) and large enough to accommodate transects of 15 point counts. All transects were established during the 2005 field season, and no changes have been made to them since.

Point Transect Protocol

We conducted point transects following protocol established by Leukering (2000) and modified by Panjabi et al. (2006) in order to sample bird populations in each habitat selected for monitoring. We conducted all transects during mornings, between ½-hour before sunrise and 11 AM; we completed most transects before 10 AM.

We conducted 15 five-minute point counts at stations located at 250-m intervals along each point transect. In order to increase our sample size, we conducted each of the 45 transects two times (each visit was on a separate day). We recorded all bird detections on standardized forms. We recorded Fly-overs (birds flying over, but not using the immediate surrounding landscape) but excluded them analyses of density. For each bird detected, we recorded the species, sex, how it was detected (e.g., call, song, drumming, etc.), and distance from the observation point. Whenever possible, we measured distances using laser rangefinders. When it was not possible to measure the distance to a bird, we used rangefinders to gauge distance estimates by measuring to some nearby object.

We recorded atmospheric data (i.e., temperature in degrees Fahrenheit, cloud cover, precipitation, and wind speed using the Beaufort scale) and the time at the start and end of each transect. We measured distances between count stations using hand-held Global Positioning System units. We recorded all GPS data in Universal Transverse Mercator (UTM) North American Datum 1983. At each count station, we recorded UTM coordinates, whether or not the station was within 100m of a road, and vegetation data, including the structural stage and canopy closure of the forest, mean canopy height, the types and relative proportions of overstory trees, the sub-canopy volume and tree species composition, and the percent coverage and types of shrubs within a 50 m radius of the point. We recorded these data prior to beginning each bird count.

Data Analysis

We used Program DISTANCE (Thomas et al. 2006) to generate density estimates (*D*) using data collected at point count stations. The notation, concepts, and analysis methods of Distance were developed by Buckland et al. (1993). In Distance analysis, a unique detection function is fit to each distribution of distances associated with a species in a given habitat. Because the detection function is unique to each species in each habitat, Distance analysis avoids some serious problems inherent in traditional analyses of point count data (e.g., unquantifiable differences in detectability among habitats, species, and years). Distance analysis relies on three assumptions, all of which are reasonably well met by our protocol: 1) all birds at distance=0 are detected, 2) distances of birds close to the point are measured accurately, and 3) birds do not move in response to the observer's presence.

We pooled the 2005-2008 point transect data in each habitat type to determine density estimates for each year. This allowed us to calculate density estimates for some low-density species that would not have had large enough sample sizes to calculate density estimates if we had used only the 2008 data.

RESULTS

In 2008, we conducted a total of 1285 point counts along 43 point transects (all transects were conducted twice) in three habitats between 01 May and 22 June, 2008 (Table 1).

Table 1. Bird sampling periods and effort in each habitat in the Northern Colorado Plateau Network (NCPN), summer 2008.

Habitat	Dates Sampled	# Transects	# Point Counts
Low-Elevation Riparian	01 May – 22 June	15*	450
Pinyon-Juniper	03 May – 28 June	14*	415
Sage Shrubland	05 May – 23 June	14*	420
All habitats	**01 May – 28 June**	**43***	**1285**

*All transects were conducted twice.

We detected a total of 9,548 individual birds of 119 species on point transects (Table 2). We detected 52 species in sufficient numbers to estimate density in at least one habitat, and we were able to estimate density in multiple habitats for many of those (Tables 3-5).

We detected 3,590 individual birds of 84 species in low-elevation riparian, 2,832 individual birds of 70 species in pinyon-juniper, and 3,126 individual birds of 89 species in sage shrubland (Table 2). Of the three habitats surveyed, the average number of species detected per transect was highest in low-elevation riparian and lowest in sage shrubland (Table 2).

Table 2. Bird totals and average number of birds and species in habitats surveyed in the Northern Colorado Plateau Network (NCPN), summer 2008.

Habitat	# Birds Detected	# Species Detected	Avg. Birds per Transect	Avg. Species per Transect
Low-Elevation Riparian	3590	84	120	25
Pinyon-Juniper	2832	70	101	21
Sage Shrubland	3126	89	112	20
All habitats	**9548**	**119**	**111**	**22**

Low-Elevation Riparian (LR)

We conducted 450 point counts along 15 transects in low-elevation riparian between 01 May and 22 June, 2008 (Table 1). We detected a total of 3,590 individual birds in this habitat, with an average of 120 birds per transect (Table 2). We detected 84 species in this habitat with an average of 25 species per transect (Table 2).

The pooled 2005-2008 point transect data from low-elevation riparian yielded robust density estimates (CV < 50%) for 25 species and moderately robust estimates (CV = 50-75%) for seven additional species (Table 3). We should be able to reach our target of detecting a population change of at least 3% within 30 years for these 32 species,

which represent 38 percent of all species detected and more than 90 percent of all individual birds detected in low-elevation riparian habitat.

Violet-green Swallow, Black-chinned Hummingbird, Yellow Warbler, Blue-gray Gnatcatcher, and Lazuli Bunting had the highest estimated densities of all species detected in low-elevation riparian (listed in order of highest to lowest density). Twenty-seven species – Mourning Dove, White-throated Swift, Black-chinned Hummingbird, Western Wood-Pewee, Say's Phoebe, Ash-throated Flycatcher, Plumbeous Vireo, Warbling Vireo, Common Raven, Violet-green Swallow, Bushtit, Rock Wren, Canyon Wren, House Wren, American Robin, Virginia's Warbler, Yellow Warbler, Common Yellowthroat, Yellow-breasted Chat, Spotted Towhee, Black-throated Sparrow, Song Sparrow, Black-headed Grosbeak, Lazuli Bunting, Brown-headed Cowbird, House Finch, and Lesser Goldfinch – had higher estimated densities in low-elevation riparian than in the other two habitats surveyed.

Table 3. Estimated densities of breeding birds in low-elevation riparian habitat in the Northern Colorado Plateau Network (NCPN), summers 2005-2008[1].

Species	Year	D	LCL	UCL	CV	n
Mourning Dove	2005	23.5	13.2	41.9	35.0	91
	2006	14.2	9.7	20.8	22.5	124
	2007	15.5	10.7	22.3	21.6	155
	2008	18.1	9.9	33.3	36.5	100
White-throated Swift	2005	52.4	28.5	96.3	37.6	153
	2006	50.9	30.4	85.2	31.2	172
	2007	67.0	41.0	109.5	29.8	209
	2008	33.7	18.8	60.4	35.9	96
Black-chinned Hummingbird	2005	131.3	83.4	206.7	27.3	18
	2006	196.5	119.6	322.9	29.8	27
	2007	82.9	46.9	146.6	34.1	12
	2008	82.9	48.7	141.2	31.9	12
Western Wood-Pewee	2005	4.3	2.4	7.8	35.2	25
	2006	5.6	2.7	11.4	42.8	32
	2007	5.3	2.5	11.2	44.6	31
	2008	5.5	2.2	13.6	55.3	30
Say's Phoebe	2005	2.7	1.6	4.6	32.3	41
	2006	6.0	3.3	10.8	35.3	56
	2007	2.3	1.3	4.0	34.2	35
	2008	7.0	3.9	12.6	35.3	51
Ash-throated Flycatcher	2005	16.7	11.3	24.7	23.3	152
	2006	17.8	13.0	24.2	18.2	235
	2007	17.4	12.7	23.9	18.6	204
	2008	28.8	19.1	43.6	25.2	191
Gray Vireo	2005	1.2	0.6	2.4	41.7	17
	2006	2.5	1.3	5.1	41.7	36
	2007	1.2	0.5	2.9	52.7	18
	2008	1.9	1.0	3.4	36.5	27
Plumbeous Vireo	2005	12.0	8.3	17.2	21.3	53
	2006	19.7	13.0	29.9	24.4	86

Species	Year	D	LCL	UCL	CV	n
	2007	15.1	10.0	22.9	24.3	66
	2008	10.8	8.0	14.6	17.6	48
Warbling Vireo	2005	4.3	2.1	8.8	42.4	20
	2006	9.7	4.7	19.9	43.0	44
	2007	6.3	2.8	14.2	49.1	29
	2008	7.4	4.4	12.3	30.4	34
Western Scrub-Jay	2005	3.3	1.8	6.2	37.7	18
	2006	3.5	2.0	6.3	34.8	27
	2007	3.6	1.8	6.9	40.0	23
	2008	2.7	1.1	6.6	54.7	22
Common Raven	2005	1.8	1.1	2.8	26.9	26
	2006	1.3	0.7	2.4	36.5	23
	2007	1.8	1.1	3.1	30.5	28
	2008	2.6	1.6	4.0	26.1	45
Violet-green Swallow	2005	50.7	26.4	97.4	41.0	111
	2006	165.5	106.4	257.3	26.5	225
	2007	104.8	57.1	192.4	38.0	149
	2008	129.7	70.5	238.8	38.1	123
Juniper Titmouse	2005	4.8	2.4	9.5	41.6	29
	2006	16.5	7.9	34.7	46.3	25
	2007	14.0	4.8	40.7	70.8	43
	2008	8.7	4.4	17.4	42.6	44
Bushtit	2005	34.3	4.0	295.4	135.4	4
	2006	57.5	19.8	166.8	69.2	12
	2007	23.6	5.4	102.2	100.0	1
	2008	23.6	5.4	102.2	100.0	1
Rock Wren	2005	5.8	3.5	9.7	30.6	74
	2006	11.5	7.2	18.5	28.1	100
	2007	9.0	5.7	14.0	26.4	131
	2008	10.0	6.0	16.8	30.7	80
Canyon Wren	2005	1.3	0.7	2.5	36.8	31
	2006	3.2	2.0	5.1	27.2	71
	2007	1.8	1.0	3.3	35.4	42
	2008	1.2	0.5	2.8	50.6	28
Bewick's Wren	2005	5.4	2.5	11.8	48.4	50
	2006	16.1	8.9	29.2	35.5	110
	2007	8.7	4.3	17.8	43.5	61
	2008	6.7	3.1	14.6	48.0	70
House Wren	2005	18.9	7.6	47.3	57.6	41
	2006	5.6	2.0	15.8	64.9	43
	2007	5.5	2.0	15.5	66.0	32
	2008	10.8	3.9	29.7	62.9	48
Blue-gray Gnatcatcher	2005	55.2	40.2	76.0	18.7	110
	2006	73.7	50.6	107.2	21.9	150
	2007	54.3	38.3	77.0	20.4	113
	2008	64.9	42.3	99.4	24.9	134
American Robin	2005	9.4	4.4	20.0	46.8	16
	2006	3.6	1.8	7.5	44.8	26
	2007	4.0	1.9	8.1	43.8	31

Species	Year	D	LCL	UCL	CV	n
	2008	9.7	4.2	22.0	51.8	37
Virginia's Warbler	2005	6.4	3.4	11.8	37.5	35
	2006	29.3	12.2	70.4	53.8	41
	2007	8.8	4.7	16.5	37.7	36
	2008	13.2	7.6	22.9	32.9	82
Yellow Warbler	2005	68.9	34.3	138.2	41.4	142
	2006	76.8	35.9	164.3	45.5	157
	2007	65.5	31.0	138.5	44.7	136
	2008	82.3	41.0	165.6	41.5	171
Black-throated Gray Warbler	2005	6.4	3.2	12.6	40.6	38
	2006	14.3	9.1	22.5	26.4	84
	2007	9.5	6.5	14.0	22.2	57
	2008	20.6	11.4	37.1	34.6	123
Common Yellowthroat	2005	11.1	4.9	25.3	51.0	12
	2006	26.4	10.1	68.9	60.3	28
	2007	23.2	7.4	72.7	73.6	25
	2008	4.6	1.0	20.5	103.1	5
Yellow-breasted Chat	2005	19.3	6.4	58.7	71.3	40
	2006	8.0	2.6	24.7	71.9	53
	2007	5.3	1.6	17.3	76.6	50
	2008	4.7	1.9	11.7	57.8	43
Spotted Towhee	2005	43.3	32.0	58.5	17.6	243
	2006	109.3	84.1	142.0	15.2	431
	2007	58.7	42.6	81.1	18.7	291
	2008	41.2	30.6	55.4	17.3	231
Chipping Sparrow	2005	5.8	3.1	10.8	37.5	15
	2006	5.9	3.0	11.5	40.3	15
	2007	14.4	7.0	29.5	43.6	35
	2008	15.2	8.3	27.6	36.2	38
Black-throated Sparrow	2005	4.1	1.6	10.0	56.1	48
	2006	8.6	4.1	18.2	45.6	52
	2007	8.6	3.2	23.4	62.5	61
	2008	11.5	5.2	25.4	48.3	67
Song Sparrow	2005	34.8	13.8	87.9	57.8	46
	2006	19.9	8.4	47.0	52.6	57
	2007	14.3	5.8	35.1	55.2	50
	2008	10.0	4.6	21.6	47.1	44
Black-headed Grosbeak	2005	2.7	0.9	8.4	72.9	13
	2006	5.9	2.9	11.9	43.3	28
	2007	3.3	1.4	7.6	51.5	16
	2008	3.9	1.8	8.4	46.4	19
Lazuli Bunting	2005	75.0	35.6	157.7	45.6	157
	2006	58.7	27.6	125.2	45.3	141
	2007	48.5	26.4	89.2	36.0	172
	2008	62.0	29.4	131.0	44.7	157
Brown-headed Cowbird	2005	13.9	5.6	34.3	56.8	10
	2006	14.2	7.3	27.7	41.1	30
	2007	6.4	2.7	15.6	55.0	18
	2008	7.0	3.1	15.7	50.7	14

Species	Year	D	LCL	UCL	CV	n
House Finch	2005	19.5	13.0	29.2	23.6	108
	2006	29.0	20.8	40.4	19.4	171
	2007	29.0	19.7	42.7	22.6	177
	2008	29.6	21.0	41.8	20.1	180
Lesser Goldfinch	2005	14.3	7.2	28.4	41.4	26
	2006	38.5	24.6	60.3	26.9	62
	2007	39.4	19.6	78.9	43.7	97
	2008	39.3	19.0	81.3	45.3	54

[1]D = estimated density (birds/km^2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D.

Pinyon-Juniper (PJ)

We conducted 415 point counts along 14 transects in pinyon-juniper between 03 May and 28 June, 2008 (Table 1). We detected a total of 2,832 individual birds in this habitat, with an average of 101 birds per transect (Table 2). We detected a total of 70 species in this habitat with an average of 21 species per transect (Table 2).

The pooled 2005-2008 point transect data from pinyon-juniper yielded robust density estimates (CV < 50%) for 17 species and moderately robust estimates (CV = 50-75%) for eight additional species (Table 4). We should be able to reach our target of detecting a population change of at least 3% within 30 years for these 25 species, which represent 36 percent of all species detected and more than 90 percent of all individual birds detected in pinyon-juniper habitat.

Blue-gray Flycatcher, Black-throated Gray Warbler, Violet-green Swallow, Juniper Titmouse, and Gray Flycatcher had the highest estimated densities of all species detected in pinyon-juniper (listed in order of highest to lowest density). Thirteen species – Gray Flycatcher, Dusky Flycatcher, Gray Vireo, Western Scrub-Jay, Pinyon Jay, Juniper Titmouse, White-breasted Nuthatch, Bewick's Wren, Blue-gray Gnatcatcher, Black-throated Gray Warbler, Western Tanager, and Chipping Sparrow – had higher estimated densities in pinyon-juniper than in the other two habitats surveyed.

Table 4. Estimated densities of breeding birds in pinyon-juniper habitat in the Northern Colorado Plateau Network (NCPN), summers 2005-2008[1].

Species	Year	D	LCL	UCL	CV	n
Mourning Dove	2005	15.7	10.6	23.1	22.7	180
	2006	12.8	8.8	18.6	22.1	221
	2007	14.0	9.1	21.7	25.6	231
	2008	16.9	11.5	24.8	22.3	201
White-throated Swift	2005	18.8	8.4	41.9	50.5	94
	2006	18.7	8.6	40.6	47.6	102
	2007	16.4	8.6	31.3	39.7	119
	2008	23.0	11.2	47.2	44.1	75
Gray Flycatcher	2005	30.4	22.2	41.7	18.7	115
	2006	24.2	15.5	37.6	26.0	90

Species	Year	D	LCL	UCL	CV	n
	2007	22.4	12.7	39.3	33.3	84
	2008	29.2	17.2	49.8	31.3	102
Dusky Flycatcher	2005	3.8	1.2	12.6	76.9	12
	2006	12.0	4.8	29.8	55.9	37
	2007	9.3	3.3	26.5	65.5	29
	2008	13.8	4.8	39.9	66.1	40
Say's Phoebe	2005	2.2	1.2	3.9	35.2	35
	2006	0.8	0.3	1.9	53.8	13
	2007	0.6	0.2	1.6	59.5	10
	2008	0.9	0.5	1.7	37.3	14
Ash-throated Flycatcher	2005	11.6	8.4	16.1	19.6	123
	2006	12.1	8.3	17.7	22.6	125
	2007	11.5	7.5	17.7	25.7	121
	2008	12.4	8.3	18.7	24.3	120
Gray Vireo	2005	8.3	5.3	13.1	26.2	85
	2006	6.6	3.6	12.0	34.9	67
	2007	7.5	4.5	12.6	30.2	77
	2008	10.3	6.2	17.1	29.5	98
Plumbeous Vireo	2005	6.4	3.4	11.8	36.9	65
	2006	4.7	2.3	9.3	41.2	47
	2007	5.0	2.7	9.3	36.3	51
	2008	5.0	2.6	9.5	38.0	47
Western Scrub-Jay	2005	2.6	1.4	4.8	37.9	42
	2006	55.7	14.3	216.9	96.2	41
	2007	12.2	3.9	38.0	76.1	40
	2008	4.8	2.6	9.1	38.2	37
Pinyon Jay	2005	2.3	1.1	5.1	47.5	51
	2006	3.7	1.8	7.6	45.7	84
	2007	3.8	2.1	6.8	34.7	105
	2008	3.0	1.3	7.0	53.3	25
Common Raven	2005	0.5	0.3	0.7	24.2	41
	2006	0.3	0.2	0.5	35.5	30
	2007	0.9	0.6	1.3	22.5	72
	2008	1.9	1.1	3.2	32.7	42
Violet-green Swallow	2005	26.0	7.9	85.1	82.0	36
	2006	40.9	11.6	144.6	88.7	53
	2007	50.5	13.9	183.5	91.2	60
	2008	43.0	12.7	146.0	85.2	44
Juniper Titmouse	2005	30.1	21.2	43.0	20.9	86
	2006	25.1	15.4	40.8	28.6	77
	2007	26.4	15.0	46.2	33.1	83
	2008	32.7	20.6	51.8	26.8	98
Bushtit	2005	106.7	51.9	219.7	44.5	14
	2006	50.3	20.0	126.1	58.1	10
	2007	15.8	5.2	47.8	69.4	5
	2008	14.2	3.6	55.0	81.8	4
White-breasted Nuthatch	2005	5.1	1.6	16.0	75.7	16
	2006	6.5	2.3	18.3	67.8	19
	2007	7.1	2.5	20.3	69.2	22

Species	Year	D	LCL	UCL	CV	n
	2008	3.8	1.2	12.1	76.3	11
Rock Wren	2005	7.0	4.6	10.8	25.8	109
	2006	3.0	1.8	5.1	30.5	108
	2007	4.6	2.8	7.5	29.1	103
	2008	9.3	5.5	15.7	31.5	113
Canyon Wren	2005	1.2	0.6	2.6	47.2	16
	2006	0.3	0.1	0.7	62.7	26
	2007	0.6	0.2	1.5	56.9	24
	2008	0.2	0.0	1.6	169.5	5
Bewick's Wren	2005	15.2	8.4	27.7	37.3	146
	2006	23.3	14.8	36.7	26.7	145
	2007	20.8	12.3	35.1	30.9	121
	2008	15.1	8.2	27.8	36.1	111
Blue-gray Gnatcatcher	2005	121.9	61.7	241.0	43.0	144
	2006	150.2	79.3	284.5	39.8	97
	2007	89.1	61.7	128.6	22.0	129
	2008	70.8	33.0	151.9	48.5	103
Mountian Bluebird	2005	12.1	4.6	32.3	62.2	65
	2006	6.0	1.8	20.4	80.6	34
	2007	7.9	2.5	24.3	73.5	40
	2008	6.6	2.3	19.1	68.4	34
American Robin	2005	1.3	0.6	2.8	46.0	30
	2006	1.5	0.7	3.2	44.0	39
	2007	3.7	1.3	10.1	64.7	39
	2008	1.4	0.4	4.5	74.9	26
Virginia's Warbler	2005	10.8	5.0	23.6	47.3	55
	2006	9.8	3.4	28.2	66.9	35
	2007	4.0	1.3	11.9	69.7	34
	2008	7.0	2.9	16.9	54.9	24
Black-throated Gray Warbler	2005	102.1	55.1	189.3	38.7	269
	2006	83.5	59.6	116.9	19.9	356
	2007	80.8	57.7	113.1	19.8	324
	2008	56.5	41.5	77.0	18.1	345
Western Tanager	2005	1.3	0.5	3.7	63.9	18
	2006	2.1	1.0	4.2	43.4	27
	2007	2.3	1.1	4.8	45.3	30
	2008	1.5	0.5	4.4	70.1	18
Spotted Towhee	2005	8.1	4.6	14.3	33.8	94
	2006	19.9	9.8	40.4	43.4	76
	2007	22.4	11.2	45.0	42.1	123
	2008	7.8	3.6	16.7	46.9	50
Chipping Sparrow	2005	18.1	10.5	31.3	33.1	88
	2006	27.2	15.1	49.0	36.1	66
	2007	31.2	17.3	56.4	36.1	86
	2008	24.0	14.2	40.5	31.7	107
Lark Sparrow	2005	2.5	1.0	6.2	54.4	24
	2006	1.9	0.5	6.6	82.2	17
	2007	1.9	0.6	6.1	72.1	19
	2008	1.5	0.5	4.5	66.3	14

Species	Year	D	LCL	UCL	CV	n
Black-throated Sparrow	2005	3.5	1.9	6.7	38.2	46
	2006	10.7	5.4	21.4	41.6	75
	2007	13.8	6.6	28.8	44.2	99
	2008	9.2	3.3	25.2	62.5	74
Western Meadowlark	2005	2.5	0.8	7.7	72.4	49
	2006	1.7	0.4	6.8	90.8	34
	2007	1.3	0.4	4.4	81.7	25
	2008	0.9	0.3	3.1	77.3	17
House Finch	2005	18.4	11.9	28.3	25.3	101
	2006	11.1	5.8	21.3	38.3	71
	2007	22.9	14.6	36.1	26.4	148
	2008	20.6	12.4	34.1	29.4	128

[1]D = estimated density (birds/km^2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D.

Sage Shrubland (SA)

We conducted 420 point counts along 14 transects in sage shrubland between 5 May and 23 June, 2008 (Table 1). We detected a total of 3,126 individual birds in this habitat, with an average of 7.0 birds per point count (Table 2). We detected 89 species in this habitat with an average of 112 species per transect and 20 species per transect (Table 2).

The pooled 2005-2008 point transect data from sage shrubland yielded robust density estimates (CV < 50%) for 16 species and moderately robust estimates (CV = 50-75%) for five additional species (Table 5). We should be able to reach our target of detecting a population change of at least 3% within 30 years for these 21 species, which represent 24 percent of all species detected and more than 90 percent of all individual birds detected in sage shrubland habitat.

Brewer's Sparrow, Vesper Sparrow, Green-tailed Towhee, Broad-tailed Hummingbird, and Blue-gray Gnatcatcher had the highest estimated densities of all species detected in sage shrubland (listed in order of highest to lowest density). Thirteen species – Broad-tailed Hummingbird, Northern Flicker, Black-billed Magpie, Horned Lark, Mountain Bluebird, Sage Thrasher, Green-tailed Towhee, Brewer's Sparrow, Vesper Sparrow, Lark Sparrow, Sage Sparrow, Western Meadowlark, and Brewer's Blackbird – had higher estimated densities in sage shrubland than in the other two habitats surveyed.

Table 5. Estimated densities of breeding birds in sage shrubland habitat in the Northern Colorado Plateau Network (NCPN), summers 2005-2008[1].

Species	Year	D	LCL	UCL	CV	n
Mourning Dove	2005	2.6	1.3	5.3	42.5	82
Mourning Dove	2006	2.6	1.8	3.9	23.4	149
Mourning Dove	2007	3.8	2.1	6.9	35.4	76

Species	Year	D	LCL	UCL	CV	n
Mourning Dove	2008	4.5	2.3	8.8	39.6	79
Broad-tailed Hummingbird	2005	11.6	3.8	35.1	73.8	22
Broad-tailed Hummingbird	2006	11.0	3.5	34.5	76.1	21
Broad-tailed Hummingbird	2007	12.6	3.4	46.3	89.1	24
Broad-tailed Hummingbird	2008	19.7	7.2	53.8	65.9	35
Northern Flicker	2005	0.3	0.2	0.5	29.1	21
Northern Flicker	2006	1.7	0.7	4.2	56.4	28
Northern Flicker	2007	1.3	0.4	4.0	74.8	17
Northern Flicker	2008	0.2	0.1	0.3	35.5	10
Dusky Flycatcher	2005	3.0	1.1	8.6	65.5	32
Dusky Flycatcher	2006	5.3	2.3	12.2	50.7	56
Dusky Flycatcher	2007	5.5	2.4	12.5	50.1	57
Dusky Flycatcher	2008	7.2	3.3	15.8	47.1	71
Black-billed Magpie	2005	2.6	1.3	5.3	42.9	67
Black-billed Magpie	2006	2.8	1.6	4.8	32.1	87
Black-billed Magpie	2007	1.6	0.9	2.8	34.3	46
Black-billed Magpie	2008	1.4	0.7	2.5	37.7	42
Common Raven	2005	0.3	0.1	0.5	39.2	20
Common Raven	2006	0.6	0.4	0.9	26.1	41
Common Raven	2007	0.7	0.5	1.0	19.1	59
Common Raven	2008	0.5	0.3	0.8	24.9	41
Horned Lark	2005	3.0	1.3	6.8	49.5	27
Horned Lark	2006	3.5	1.7	6.9	41.8	29
Horned Lark	2007	4.0	1.9	8.6	46.2	36
Horned Lark	2008	2.1	0.8	6.0	64.3	18
Rock Wren	2005	3.2	1.9	5.3	29.9	88
Rock Wren	2006	4.5	2.4	8.6	39.6	165
Rock Wren	2007	6.3	3.1	13.1	43.9	75
Rock Wren	2008	4.3	2.3	8.0	37.5	89
Blue-gray Gnatcatcher	2005	9.2	4.6	18.5	41.4	32
Blue-gray Gnatcatcher	2006	5.2	3.0	8.8	31.6	18
Blue-gray Gnatcatcher	2007	3.7	1.7	8.5	49.5	12
Blue-gray Gnatcatcher	2008	13.6	8.3	22.2	28.9	44
Mountian Bluebird	2005	7.0	4.1	12.0	31.8	61
Mountian Bluebird	2006	8.6	5.9	12.5	21.9	79
Mountian Bluebird	2007	8.8	5.4	14.4	28.5	81
Mountian Bluebird	2008	8.1	5.6	11.6	21.4	68
American Robin	2005	2.6	1.6	4.4	30.2	46
American Robin	2006	4.7	2.5	9.0	38.3	84
American Robin	2007	3.3	1.9	5.7	32.4	59
American Robin	2008	2.8	1.7	4.6	30.2	45
Sage Thrasher	2005	2.7	1.3	5.4	41.6	84
Sage Thrasher	2006	2.5	1.2	5.6	47.3	79
Sage Thrasher	2007	2.4	1.2	4.9	42.3	76
Sage Thrasher	2008	5.0	2.5	10.0	40.4	148
Virginia's Warbler	2005	1.5	0.6	4.0	61.1	23
Virginia's Warbler	2006	1.9	0.8	4.5	52.8	29
Virginia's Warbler	2007	1.1	0.3	4.5	94.8	17
Virginia's Warbler	2008	2.6	0.9	7.8	67.6	38

Species	Year	D	LCL	UCL	CV	n
Black-throated Gray Warbler	2005	2.5	1.0	6.1	56.4	28
Black-throated Gray Warbler	2006	2.1	0.8	5.7	62.0	24
Black-throated Gray Warbler	2007	1.3	0.4	4.0	70.2	15
Black-throated Gray Warbler	2008	3.1	0.9	11.2	83.7	33
Western Tanager	2005	0.5	0.1	1.5	73.6	14
Western Tanager	2006	0.6	0.2	1.9	77.3	17
Western Tanager	2007	0.9	0.3	3.0	73.5	28
Western Tanager	2008	0.7	0.2	2.8	90.5	20
Green-tailed Towhee	2005	29.2	18.0	47.4	28.2	290
Green-tailed Towhee	2006	41.2	23.5	72.5	33.0	414
Green-tailed Towhee	2007	30.6	17.7	52.9	32.0	308
Green-tailed Towhee	2008	26.7	16.4	43.5	28.2	251
Spotted Towhee	2005	5.9	3.0	11.7	40.4	64
Spotted Towhee	2006	6.3	3.5	11.2	34.0	68
Spotted Towhee	2007	4.8	2.7	8.7	34.7	52
Spotted Towhee	2008	7.5	4.2	13.6	34.5	76
Chipping Sparrow	2005	7.7	4.3	13.9	35.6	32
Chipping Sparrow	2006	13.5	7.4	24.7	36.2	57
Chipping Sparrow	2007	11.9	5.7	24.9	44.9	48
Chipping Sparrow	2008	11.0	4.4	27.4	55.9	44
Brewer's Sparrow	2005	73.7	53.8	101.0	18.2	539
Brewer's Sparrow	2006	78.1	56.5	108.0	18.7	576
Brewer's Sparrow	2007	68.2	50.1	92.8	17.8	502
Brewer's Sparrow	2008	64.1	49.5	83.1	15.0	442
Vesper Sparrow	2005	28.5	19.6	41.4	22.3	292
Vesper Sparrow	2006	22.8	16.2	32.0	19.8	397
Vesper Sparrow	2007	47.2	32.9	67.6	21.5	422
Vesper Sparrow	2008	41.9	27.1	64.7	25.5	393
Lark Sparrow	2005	8.5	3.8	19.1	48.6	90
Lark Sparrow	2006	10.1	5.0	20.3	41.8	109
Lark Sparrow	2007	6.3	2.7	14.7	51.1	69
Lark Sparrow	2008	2.4	0.9	5.8	55.3	24
Black-throated Sparrow	2005	0.9	0.3	2.4	65.9	11
Black-throated Sparrow	2006	2.0	0.8	5.0	55.5	33
Black-throated Sparrow	2007	2.7	1.1	6.8	57.9	19
Black-throated Sparrow	2008	0.5	0.1	2.5	102.4	3
Sage Sparrow	2005	2.9	1.0	8.7	68.2	36
Sage Sparrow	2006	2.1	0.7	6.6	72.4	25
Sage Sparrow	2007	2.5	0.8	7.8	71.0	31
Sage Sparrow	2008	1.7	0.4	7.7	100.7	20
Western Meadowlark	2005	4.4	2.2	8.5	40.1	138
Western Meadowlark	2006	4.3	2.5	7.4	32.5	162
Western Meadowlark	2007	6.5	3.3	12.6	40.3	131
Western Meadowlark	2008	8.2	4.0	16.8	42.6	173
Brewer's Blackbird	2005	0.9	0.4	2.2	52.6	7
Brewer's Blackbird	2006	6.3	3.5	11.5	35.8	43
Brewer's Blackbird	2007	3.2	1.4	7.3	51.5	18
Brewer's Blackbird	2008	1.1	0.3	4.9	101.0	8
House Finch	2005	0.4	0.2	0.8	45.5	6

Species	Year	D	LCL	UCL	CV	n
House Finch	2006	3.6	2.1	6.3	32.6	63
House Finch	2007	2.2	1.0	5.1	50.7	40
House Finch	2008	2.4	1.3	4.3	36.0	39

[1]D = estimated density (birds/km^2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D.

DISCUSSION

2008 Accomplishments

In 2008 we conducted all transects except for PJ09 and SA11, which are both located in Dinosaur National Monument. Both transects are accessed via dirt roads. We attempted to reach them on three separate occasions, but were unable to do so because of wet, impassable roads. After the third attempt, the window of acceptable dates to run transects had passed, so we did not make any further attempts.

2008 Distance Analysis

As mentioned in the "Methods" section of this report, in 2007 we departed from our 2005 and 2006 analyses methods and pooled the 2005-2007 point transect data to determine density estimates for each year. Doing so provided more statistically rigorous analyses and also allowed us to calculate density estimates for some low-density species that would not have had large enough sample sizes to calculate density estimates if we had used only the 2007 data. We continued this protocol in 2008.

In Tables 3-5, we give density estimates for all four years' data (2005-2008). We have done this for two reasons – in order to provide a comparison of the four years' density estimates, and more importantly, to provide more statistically rigorous estimates for 2005, 2006, and 2007. The density estimates that are presented in this report should replace the estimates provided in the 2005, 2006, and 2007 reports.

Prospects for Population Monitoring

The National Park Service's project objective is to determine status and trends of breeding bird species density in low-elevation riparian, pinyon-juniper, and sagebrush habits. While determining bird population trends is a long-term goal, and we will not be able to make any statements about trends until after several years, in the short term, this program provides information needed to effectively manage and conserve bird populations in the NCPN, including the spatial distribution, abundance, and relationship to important habitat characteristics for each species.

RMBO typically uses the Partners in Flight (PIF 2005) Plan as a guideline for bird conservation. PIF is a partnership of federal and state agencies, industry, non-governmental organizations, and many others, with the goal of conserving North American birds. In 1991, PIF began developing a formal species assessment process that could provide consistent, scientific evaluations of conservation status across all bird species in North America, and identify areas most important to the conservation of each species. This process applies quantitative rule sets to complex biological data on the population size, distribution, population trend, threats, and regional abundance of individual bird species to generate simple numerical scores that rank each species in terms of its biological vulnerability and regional status. The process results in global and regional conservation assessments of each bird species that, among other uses, can be used to objectively assign regional and continental conservation priorities among birds.

PIF identifies 50 bird species as “Important Species” for Bird Conservation in Region (BCR) 16, which includes almost all of the NCPN. It identifies 41 bird species as “Important Species” for Bird Conservation in Region (BCR) 10, which includes Fossil Butte National Monument. The U.S. Fish and Wildlife Service (USFWS) identifies 41 species as “Birds of Conservation Concern” for USFWS Region 6 (Mountain-Prairie Region), which includes all of Utah, Colorado, and Wyoming. In 2008, we collected data for 36 species that are on one or more of those lists. For these species, we provide detailed information about their regional distribution, conservation status, and natural history in the species accounts (Appendix A). Of the 36 species, 22 were detected in sufficient numbers to calculate a density estimate in at least one habitat on NCPN. We provide detailed information on the density estimates in the species accounts (Appendix A).

The habitat-stratified point transects yielded robust density estimates (CV < 50%) for 41 species and moderately robust estimates (CV = 50-75%) for 11 additional species. We should be able to detect habitat-specific population trends for these 52 species, which represent 40 percent of all species detected on point transects in the NCPN during 2005-2008, and represent more than 90 percent of all individual birds observed during 2005-2008. The other 60% of species (~10% of birds observed) fall into one of the following categories:

1) Low-density, highly localized species such as Black-chinned Sparrow ;
2) Low-density, widespread species such as Golden Eagle;
3) Species that occur mainly outside the NCPN in other habitats, such as Olive-sided Flycatcher;
4) Nocturnal species such as Common Nighthawk;
5) Colonially nesting species such as Great Blue Heron; and
6) Species that are most readily detectable prior to late May, such as Greater Sage-Grouse.

It is possible that species in the aforementioned groups could be monitored through additional effort using one or more of the following survey techniques:

1) Additional point transects in existing habitats;
2) Censusing small but localized populations;
3) Censusing birds at nesting sites (e.g., colonies, eyries, etc);
4) Species-specific call-response surveys;
5) Nocturnal surveys;
6) Wetland surveys; and
7) Early-season (i.e., winter/spring) surveys.

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APPENDIX A. SPECIES ACCOUNTS

In this section we present an account for each bird species detected in 2008 that is of management interest, as designated by the Partners in Flight (PIF).

All species accounts follow the same format with an overview of our findings, and a table of the density estimates by habitat (providing there were sufficient data). In the density estimate tables we present *N, the number of individuals observed*, and if we were able to calculate a density estimate for the species in at least one habitat, we also present *n, the number of observations to estimate density*. These numbers may be different as often several individuals are detected in a single observation (cluster), as when birds are in a flock. While the number of individuals observed is of interest, especially for rare species, density estimates are derived using only independent observations (clusters).

Northern Harrier
(*Circus cyaneus*)

*PIF BCR 10 Species of Regional Concern
*USFWS Region 6 Species of Conservation Concern

Northern Harriers nest in a wide variety of open grasslands and brushlands throughout the NCPN (Righter et al. 2004). In 2008, we detected six individual Northern Harriers on NCPN transects. Northern Harriers, like other raptors, are difficult to monitor using the point-transect protocol because of their low densities and large territories. Therefore, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Northern Harrier on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	2
Pinyon-Juniper	ID	--	--	--	--	--
Sage Shrubland	ID	--	--	--	--	4

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Golden Eagle
(*Aquila chrysaetos*)

*PIF BCR 16 Species of Regional Concern

Golden Eagles nest throughout the Colorado Plateau region in cliff country, from desert canyons to high mesas (Righter et al. 2004). In 2008, we detected six individual Golden Eagles on NCPN transects. Golden Eagles, like other raptors, are difficult to monitor using the point-transect protocol because of their low densities and large territories. Therefore, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Golden Eagle on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	--
Pinyon-Juniper	ID	--	--	--	--	2
Sage Shrubland	ID	--	--	--	--	4

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Peregrine Falcon
(*Falco peregrinus*)

*USFWS Region 6 Species of Conservation Concern

Peregrine Falcons nest throughout the Colorado Plateau region where towering cliffs, usually near water, are available. Once near extinction, its population in the region has recovered well (Righter et al. 2004). In 2008, we detected 10 individual Peregrine Falcons on NCPN transects. Peregrine Falcons, like other raptors, are difficult to monitor using point-transect protocol, because of their low densities and large territories. Therefore, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Peregrine Falcon on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	7
Pinyon-Juniper	ID	--	--	--	--	--
Sage Shrubland	ID	--	--	--	--	3

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Common Nighthawk
(*Chordeiles minor*)
*PIF BCR 16 Species of Regional Concern

In 2008, we detected two Common Nighthawks on NCPN transects. Due to Common Nighthawk's nocturnal behavior, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN. Evening or nighttime surveys may provide a means by which to track the species' population in the NCPN.

Total number of detections, number of individuals, and habitat-specific density estimates for Common Nighthawk on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	1
Pinyon-Juniper	ID	--	--	--	--	1
Sage Shrubland	ID	--	--	--	--	--

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

White-throated Swift
(*Aeronautes saxatalis)*

*PIF BCR 16 Species of Continental Concern and Regional Stewardship
*PIF BCR 10 Species of Continental Concern

White-throated Swifts typically nest on high cliffs in small colonies (Righter et al. 2004). In 2008, we detected 772 individual White-throated Swifts in three habitats on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of White-throated Swift in low-elevation riparian and pinyon-juniper habitats in the NCPN. However, because of White-throated Swift's colonial nature, obtaining reliable sample size from year to year may be difficult.

Total number of detections, number of individuals, and habitat-specific density estimates for White-throated Swift on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	33.7	18.8	60.4	35.9	96	324
Pinyon-Juniper	23.0	11.2	47.2	44.1	75	142
Sage Shrubland	ID	--	--	--	--	48

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Broad-tailed Hummingbird
(*Selasphorus platycercus)*

*PIF BCR 16 Species of Regional Stewardship

On the Colorado Plateau, Broad-tailed Hummingbirds inhabit a variety of forest types, wetlands, and riparian areas (Righter et al. 2004). In 2008, we detected 76 individual Broad-tailed Hummingbirds on NCPN transects. We detected Broad-tailed Hummingbirds in largest numbers in sage shrubland habitat, but most of those detections were from individuals using bordering habitats such as pinyon-juniper and riparian. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Broad-tailed Hummingbird in at least one habitat in the NCPN.

Total number of detections, number of individuals, and habitat-specific density estimates for Broad-tailed Hummingbird on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	15
Pinyon-Juniper	ID	--	--	--	--	19
Sage Shrubland	19.7	7.2	53.8	65.9	35	42

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Olive-sided Flycatcher
(*Contopus cooperi*)

*PIF BCR 16 Species of Continental Concern
*PIF BCR 10 Species of Continental Concern and Regional Concern

Olive-sided Flycatchers occur throughout the Colorado Plateau region, but they are usually never abundant. They will utilize low-elevation pinyon-juniper stands for nesting when they provide adequate perches for singing and foraging, but they prefer high-elevation conifers (Righter et al. 2004). In 2008, we detected two individual Olive-sided Flycatchers on NCPN transects. Most of our detections of the species were from ponderosa pine stands on the periphery of low-elevation riparian and pinyon-juniper habitat that we were sampling. Given the specific habitat requirements of Olive-sided Flycatcher, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Olive-sided Flycatcher on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	--
Pinyon-Juniper	ID	--	--	--	--	1
Sage Shrubland	ID	--	--	--	--	1

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Dusky Flycatcher
(*Empidonax oberholseri*)

*PIF BCR 10 Species of Continental Stewardship and Regional Stewardship

Dusky Flycatchers nest in a variety of shrubby habitats, especially those with some Gamble oak component (Righter et al. 2004). In 2008, we detected 136 Dusky Flycatchers on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Dusky Flycatcher in pinyon-juniper and sage shrubland habitats.

Total number of detections, number of individuals, and habitat-specific density estimates for Dusky Flycatcher on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	20
Pinyon-Juniper	13.8	4.8	39.9	66.1	40	44
Sage Shrubland	7.2	3.3	15.8	47.1	71	72

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Cordilleran Flycatcher
(*Empidonax occidentalis*)

*PIF BCR 16 Species of Regional Stewardship

Cordilleran Flycatchers nest in forested areas with cliffs or rocky ledges and in riparian areas with available vertical surfaces. The species is also occasionally found in pinyon-juniper stands that have some element of deciduous vegetation (Righter et al. 2004). In 2008, we detected three Cordilleran Flycatcher on NCPN transects. Given the specific habitat requirements of Cordilleran Flycatcher, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Cordilleran Flycatcher on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	3
Pinyon-Juniper	ID	--	--	--	--	--
Sage Shrubland	ID	--	--	--	--	--

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Say's Phoebe
(*Sayornis saya)*

*PIF BCR 16 Species of Regional Stewardship

Say's Phoebes nest in niches and crevasses of cliffs and rocky outcrops in open shrubland habitats and along streams in those habitats (Righter et al. 2004). In 2008, we detected 95 individual Say's Phoebes on NCPN transects. This species arrives on its breeding grounds earlier that most other migrants, and as a result, our surveys may miss the period when it is most actively singing. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Say's Phoebe in at least low-elevation riparian habitat.

Total number of detections, number of individuals, and habitat-specific density estimates for Say's Phoebe on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	7.0	3.9	12.6	35.3	51	63
Pinyon-Juniper	0.9	0.5	1.7	37.3	14	15
Sage Shrubland	ID	--	--	--	--	17

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Gray Vireo
(*Vireo vicinior)*

*PIF BCR 16 Species of Continental Concern, Regional Concern, and Regional Stewardship
*USFWS Region 6 Species of Conservation Concern

Gray Vireos nest in arid pinyon-juniper habitat usually with a deciduous shrub component (Righter et al. 2004). In 2008, we detected 150 individual Gray Vireos on NCPN transects. Most of our detections of Gray Vireo on NCPN transects were from pinyon-juniper habitat. The detections from low-elevation riparian and sage shrubland habitats were always associated with nearby pinyon-juniper. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Gray Vireo in pinyon-juniper, and perhaps low-elevation riparian habitats.

Total number of detections, number of individuals, and habitat-specific density estimates for Gray Vireo on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	1.9	1.0	3.4	36.5	27	37
Pinyon-Juniper	10.3	6.2	17.1	29.5	98	113
Sage Shrubland	ID	--	--	--	--	--

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Plumbeous Vireo
(*Vireo plumbeus)*

*PIF BCR 16 Species of Regional Stewardship

Plumbeous Vireos commonly nest throughout the Colorado Plateau region on ridges, mesas, mountain slopes, and plateaus. They nest most often in pinyon-juniper woodlands where they prefer the taller, denser stands. They also, less frequently, nest in riparian cottonwood habitats (Righter et al. 2004). In 2008, we detected 131 individual Plumbeous Vireos on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Plumbeous Vireo in low-elevation riparian and pinyon-juniper habitats.

Total number of detections, number of individuals, and habitat-specific density estimates for Plumbeous Vireo on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	10.8	8.0	14.6	17.6	48	65
Pinyon-Juniper	5.0	2.6	9.5	38.0	47	61
Sage Shrubland	ID	--	--	--	--	5

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Warbling Vireo
(*Vireo gilvus*)

*PIF BCR 16 Species of Regional Stewardship

Warbling Vireos nest in a variety of habitats, including pinyon-juniper, and cottonwood galleries in riparian habitat (Righter et al. 2004). Although Warbling Vireos will breed in the low elevations of NCPN, they are much more common in higher-elevation deciduous forests. In 2008, we detected 51 individual Warbling Vireos on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Warbling Vireo in low-elevation riparian habitat.

Total number of detections, number of individuals, and habitat-specific density estimates for Warbling Vireo on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	7.4	4.4	12.3	30.4	34	44
Pinyon-Juniper	ID	--	--	--	--	3
Sage Shrubland	ID	--	--	--	--	4

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Pinyon Jay
(*Gymnorhinus cyanocephalus)*

*PIF BCR Species of Continental Concern, Continental Stewardship, Regional Concern, and Regional Stewardship
*PIF BCR 10 Species of Continental Concern

Pinyon Jays are rarely found in habitats other than pinyon juniper. They are important for the overall health of pinyon forests as they cache (basically planting) large amounts of seeds. They frequently travel in large flocks, and it is rare to detect a single individual (Righter et al. 2004). In 2008, we detected 74 individual Pinyon Jays on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Pinyon Jay in pinyon-juniper habitat.

Total number of detections, number of individuals, and habitat-specific density estimates for Pinyon Jay on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	2
Pinyon-Juniper	3.0	1.3	7.0	53.3	25	54
Sage Shrubland	ID	--	--	--	--	18

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Clark's Nutcracker
(*Nucifraga columbiana*)

*PIF BCR 16 Species of Continental Stewardship and Regional Stewardship
*PIF BCR 10 Species of Continental Stewardship and Regional Stewardship

On the Colorado Plateau, Clark's Nutcrackers nest on mountain slopes and mesa tops, usually above 6,000 feet (Righter et al 2004). They travel long distances in search of food, which may explain our detections of the species in low elevations in the NCPN. In 2008, we detected 17 individual Clark's Nutcrackers on NCPN transects. Given the specific habitat requirements of Clark's Nutcracker, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Clark's Nutcracker on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	--
Pinyon-Juniper	ID	--	--	--	--	5
Sage Shrubland	ID	--	--	--	--	12

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Black-billed Magpie
(*Pica hudsonia*)

*PIF BCR 16 Species of Regional Stewardship

Black-billed Magpies occur throughout the Colorado Plateau region. Since they require a supply of mud to construct nests, they are most often found near water sources. They have adapted well to human disturbances, though, and are also often seen near development, particularly roads, where they forage for road-kill and refuse (Righter et al 2004). In 2008, we detected 54 individual Black-billed Magpies on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Black-billed magpie in sage shrubland habitat in the NCPN.

Total number of detections, number of individuals, and habitat-specific density estimates for Black-billed Magpie on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	--
Pinyon-Juniper	ID	--	--	--	--	3
Sage Shrubland	1.4	0.7	2.5	37.7	42	51

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Violet-green Swallow
(*Tachycineta thalassina)*

*PIF BCR 16 Species of Regional Stewardship

Violet-green Swallows often nest on cliffs, sometimes near White-throated Swifts. They will also nest in aspen stands or in ponderosa pine snags, often in association with Tree Swallows (Righter et al. 2004). In 2008, we detected 429 individual Violet-green Swallows on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Violet-green Swallow in low-elevation riparian and pinyon-juniper habitats.

Total number of detections, number of individuals, and habitat-specific density estimates for Violet-green Swallow on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	129.7	70.5	238.8	38.1	123	338
Pinyon-Juniper	43.0	12.7	146.0	85.2	44	68
Sage Shrubland	ID	--	--	--	--	23

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Juniper Titmouse
(*Baeolophus ridgwayi)*

*PIF BCR 16 Species of Regional Concern

Common birds of the Colorado Plateau region, Juniper Titmice nest in knotholes or other natural cavities that occur abundantly in junipers (Righter et al. 2004). They begin nesting in early May, before most of our field work begins, so our detections of the species may not accurately represent its actual abundance in the NCPN. In 2008, we detected 159 individual Juniper Titmice on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Juniper Titmouse in pinyon-juniper and low-elevation riparian habitats.

Total number of detections, number of individuals, and habitat-specific density estimates for Juniper Titmouse on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	8.7	4.4	17.4	42.6	44	49
Pinyon-Juniper	32.7	20.6	51.8	26.8	98	106
Sage Shrubland	ID	--	--	--	--	4

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Pygmy Nuthatch
(*Sitta pygmaea*)

*PIF BCR 16 Species of Regional Concern

Pygmy Nuthatches are closely associated with ponderosa pine. Sometimes they will use other habitats, especially pinyon-juniper, but invariably these are within a short distance of ponderosa pine (Righter et al. 2004). In 2008, we detected seven individual Pygmy Nuthatches on NCPN transects. All of our detections of the species were from ponderosa pine bordering the habitats that we were surveying. Given the specific habitat requirements of Pygmy Nuthatch, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Pygmy Nuthatch on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	--
Pinyon-Juniper	ID	--	--	--	--	5
Sage Shrubland	ID	--	--	--	--	2

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Rock Wren
(*Salpinctes obsoletus)*

*PIF BCR 16 Species of Regional Stewardship

Rock Wrens typically inhabit rocky outcrops and slopes in open areas (Righter et al. 2004). In 2008, we detected 303 individual Rock Wrens on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Rock Wren all habitats that we survey in the NCPN.

Total number of detections, number of individuals, and habitat-specific density estimates for Rock Wren on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	10.0	6.0	16.8	30.7	80	94
Pinyon-Juniper	9.3	5.5	15.7	31.5	113	117
Sage Shrubland	4.3	2.3	8.0	37.5	89	92

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Canyon Wren
(*Catherpes mexicanus)*

*PIF BCR 16 Species of Regional Concern

Canyon Wrens nest throughout the Colorado Plateau region on high cliffs, generally near streams or rivers, which carve out the canyons that they prefer (Righter et al. 2004). In 2008, we detected 37 individual Canyon Wrens on NCPN transects. Most of our detections of Canyon Wrens were in low-elevation riparian habitat, where the steep canyon walls that the species prefer are prevalent. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Canyon Wren in low-elevation riparian, and perhaps pinyon-juniper habitat in the NCPN.

Total number of detections, number of individuals, and habitat-specific density estimates for Canyon Wren on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	1.2	0.5	2.8	50.6	28	32
Pinyon-Juniper	0.2	0.0	1.6	169.5	5	5
Sage Shrubland	ID	--	--	--	--	--

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Bewick's Wren
(*Thryomanes bewickii*)

*USFWS Region 6 Species of Conservation Concern

Bewick's Wren occurs throughout most of the Colorado Plateau region and breeds in a variety of habitats that contain brush (Righter et al. 2004). The species was detected in greatest numbers in pinyon-juniper habitat, but was also common in low riparian habitat. In 2008, we detected 205 individual Bewick's Wrens on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Bewick's Wren in low-elevation riparian and pinyon-juniper habitats.

Total number of detections, number of individuals, and habitat-specific density estimates for Bewick's Wren on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	6.7	3.1	14.6	48.0	70	77
Pinyon-Juniper	15.1	8.2	27.8	36.1	111	125
Sage Shrubland	ID	--	--	--	--	3

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

American Dipper
(*Cinclus mexicanus*)

*PIF BCR 10 Species of Regional Stewardship

American Dippers nest along montane streams, normally at elevations of 7,000 to 11,000 feet. In the NCPN, they have been found on Jones Creek in Dinosaur National Monument. In 2008, we detected two individuals there. Given the specific habitat requirements of American Dipper, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for American Dipper on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	2
Pinyon-Juniper	ID	--	--	--	--	--
Sage Shrubland	ID	--	--	--	--	--

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Western Bluebird
(*Sialia mexicana*)

*PIF BCR 16 Species of Regional Stewardship

Western Bluebird is a cavity-nester that prefers ponderosa pine forests but will also nest in pinyon-juniper habitat (Righter et al. 2004). In 2007, we detected 18 individual Western Bluebirds on NCPN transects. Given the specific habitat requirements of Western Bluebird, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Western Bluebird on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	4
Pinyon-Juniper	ID	--	--	--	--	--
Sage Shrubland	ID	--	--	--	--	14

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Mountain Bluebird
(*Salia currucoides)*

*PIF BCR 16 Species of Regional Concern, Continental Stewardship, and Regional Stewardship

Mountain Bluebirds are secondary cavity nesters that rely largely on cavities excavated by woodpeckers for nest sites (Righter et al 2004). In 2008, we detected 116 individual Mountain Bluebirds on NCPN transects. While we detected the largest numbers of Mountain Bluebirds in sage shrubland habitat, most of those detections were related to bordering pinyon-juniper habitat. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Mountain Bluebird in pinyon-juniper and sage shrubland habitats.

Total number of detections, number of individuals, and habitat-specific density estimates for Mountain Bluebird on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	2
Pinyon-Juniper	6.6	2.3	19.1	68.4	34	40
Sage Shrubland	8.1	5.6	11.6	21.4	68	74

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Townsend's Solitaire
(*Myadestes townsendi)*

*PIF BCR 10 Species of Regional Stewardship

Townsend's Solitaires nest in all types of montane woodlands and forests. However, they generally prefer habitat higher in elevation than those that we sample in the NCPN. In 2008, we detected six individual Townsend's Solitaires on NCPN transects. Given the specific habitat requirements of Townsend's Solitaire, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Townsend's Solitaire on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	3
Pinyon-Juniper	ID	--	--	--	--	3
Sage Shrubland	ID	--	--	--	--	--

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Virginia's Warbler
(*Vermivora virginiae)*

*PIF BCR 16 Species of Continental Concern, Regional Concern, and Regional Stewardship
*USFWS Region 6 Species of Conservation Concern

Virginia's warblers nest in dense shrublands, usually on the slopes of mesas and in open ravines (Righter et al. 2004). In 2008, we detected 161 individual Virginia's Warblers on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Virginia's Warbler in all three habitats that we survey in the NCPN.

Total number of detections, number of individuals, and habitat-specific density estimates for Virginia's Warbler on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	13.2	7.6	22.9	32.9	82	94
Pinyon-Juniper	7.0	2.9	16.9	54.9	24	26
Sage Shrubland	2.6	0.9	7.8	67.6	38	41

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Black-throated Gray Warbler
(*Dendroica nigrescens*)

*PIF BCR 16 Species of Regional Concern

On the Colorado Plateau, Black-throated Gray Warblers prefer large stands of pinyon-dominated woodland. It is very rare to find the species outside of pinyon-juniper habitat during the breeding season (Righter et al 2004). In 2008, we detected 566 individual Black-throated Gray Warblers on NCPN transects. Black-throated Gray Warbler is one of the the most abundant species in the NCPN. While it seems to be common in all three habitats, when the species was detected in either low-elevation riparian or sage shrubland habitat, there was always nearby pinyon-juniper habitat. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Black-throated Gray Warbler in all three habitats that we survey in the NCPN. However, it should be noted that while we give density estimates for all three habitats, the estimates for sage shrubland and riparian are highly dependent upon pinyon-juniper stands bordering those habitats.

Total number of detections, number of individuals, and habitat-specific density estimates for Black-throated Gray Warbler on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	20.6	11.4	37.1	34.6	123	139
Pinyon-Juniper	56.5	41.5	77.0	18.1	345	394
Sage Shrubland	3.1	0.9	11.2	83.7	33	33

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Grace's Warbler
(*Dendroica graciae*)

*PIF BCR 16 Species of Continental Concern and Regional Concern

Grace's Warblers nest in open, mature ponderosa pine forests that typically have understories of scrub oak (Righter et al. 2004). In 2008, we detected 31 individual Grace's Warblers on NCPN transects. All of our detections of this species were from ponderosa pine stands bordering our sage shrubland and pinyon-juniper transects. Given the specific habitat requirements of Grace's Warbler, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Grace's Warbler on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	--
Pinyon-Juniper	ID	--	--	--	--	17
Sage Shrubland	ID	--	--	--	--	14

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Green-tailed Towhee
(*Pipilo chlorurus)*

*PIF BCR 16 Species of Continental Stewardship and Regional stewardship

On the Colorado Plateau, Green-tailed Towhee is one of the most abundant breeding birds of sagebrush habitats (Righter et al. 2004). In 2008, we detected 302 individual Green-tailed Towhees on NCPN transects; an overwhelming majority of the detections were in sage shrubland habitat. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Green-tailed Towhee in sage shrubland habitat.

Total number of detections, number of individuals, and habitat-specific density estimates for Green-tailed Towhee on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	--
Pinyon-Juniper	ID	--	--	--	--	12
Sage Shrubland	26.7	16.4	43.5	28.2	251	290

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Brewer's Sparrow
(*Spizella breweri)*

*PIF BCR 16 Species Continental Concern and Regional Concern
*PIF BCR 10 Species of Continental Concern and Regional Concern
*USFWS Region 6 Species of Conservation Concern

On the Colorado Plateau, Brewer's Sparrows prefer sagebrush but will also breed in greasewood, rabbitbrush, and other shrubby habitats (Righter et al. 2004). In 2008, we detected 539 individual Brewer's Sparrows on NCPN transects. We detected Brewer's Sparrow almost exclusively in sage habitat. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Brewer's Sparrow in sage shrubland habitat.

Total number of detections, number of individuals, and habitat-specific density estimates for Brewer's Sparrow on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	2
Pinyon-Juniper	ID	--	--	--	--	79
Sage Shrubland	64.1	49.5	83.1	15.0	442	518

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Black-throated Sparrow
(*Amphispixza bilineata)*

*PIF BCR 16 Species of Regional Concern

On the Colorado Plateau, Black-throated Sparrows nest in arid low-elevation habitats with widely scattered shrubs and trees (Righter et al. 2004). In 2008, we detected 151 individual Black-throated Sparrows on NCPN transects. Although we detected Black-throated Sparrows in all three habitats, they were typically using very arid areas within those habitats. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Black-throated Sparrow in pinyon-juniper and low-elevation riparian, and perhaps sage shrubland habitat.

Total number of detections, number of individuals, and habitat-specific density estimates for Black-throated Sparrow on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	11.5	5.2	25.4	48.3	67	72
Pinyon-Juniper	9.2	3.3	25.2	62.5	74	76
Sage Shrubland	0.5	0.1	2.5	102.4	3	3

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Sage Sparrow
(*Amphispiza belli)*

*PIF BCR 16 Species of Regional Concern

Sage Sparrows nest primarily in large, unbroken stands of sagebrush (Righter et al. 2004). In 2008, we detected 21 individual Sage Sparrows in sage shrubland habitat on NCPN transects. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Sage Sparrow in sage shrubland habitat.

Total number of detections, number of individuals, and habitat-specific density estimates for Sage Sparrow on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	1
Pinyon-Juniper	ID	--	--	--	--	--
Sage Shrubland	1.7	0.4	7.7	100.7	20	20

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Lazuli Bunting
(*Psserina amoena*)

*PIF BCR 10 Species of Regional Stewardship

Lazuli Bunting nests throughout the Colorado Plateau region along rivers and streams. In 2008, we detected 190 individual Lazuli Buntings in the NCPN; most were detected in low-elevation riparian habitat. If the 2005-2008 data are indicative of the abundance and distribution of the species in the NCPN, we should be able to monitor density of Lazuli Bunting in low-elevation riparian habitat.

Total number of detections, number of individuals, and habitat-specific density estimates for Lazuli Bunting on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	62.0	29.4	131.0	44.7	157	176
Pinyon-Juniper	ID	--	--	--	--	1
Sage Shrubland	ID	--	--	--	--	40

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Cassin's Finch
(*Carpodacus cassinii*)

*PIF BCR 16 Species of Regional Concern
*PIF BCR 10 Species of Regional Concern, Continental Stewardship, and Regional Stewardship

Cassin's Finches nest in all coniferous forests, but they prefer high elevation conifers and are typically found above 7,000 feet during the breeding season (Righter et al. 2004). In 2008, we detected 14 individual Cassin's Finches on NCPN transects. Given the specific habitat requirements of Cassin's Finch, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Cassin's Finch on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	--
Pinyon-Juniper	ID	--	--	--	--	11
Sage Shrubland	ID	--	--	--	--	3

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

Pine Siskin
(*Carduelis pinus*)

*PIF BCR 16 Species of Regional Concern and Regional Stewardship

Pine Siskins nest primarily in spruce-fir forests, but may use a variety of coniferous forests, including pinyon-juniper (Righter et al. 2004). In 2008, we detected 17 individual Pine Siskins on NCPN transects. Given the specific habitat requirements of Pine Siskin, it is unlikely we will ever detect the species in large enough numbers to estimate its density in the NCPN habitats that we survey. We will, however, be able to track the species' presence there.

Total number of detections, number of individuals, and habitat-specific density estimates for Pine Siskin on the NCPN monitoring project, 2008.

Habitat	D	LCL	UCL	CV	n	N
Low-elevation Riparian	ID	--	--	--	--	6
Pinyon-Juniper	ID	--	--	--	--	--
Sage Shrubland	ID	--	--	--	--	10

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of observations used to estimate D; N = number of individuals observed on transects; ID = insufficient data.

APPENDIX B. List of all bird species observed during point transects in the Northern Colorado Plateau Network (NCPN), 2008, with management designation and species totals.

Common Name	Management Designation			Individuals Detected			
	PIF BCR 16	PIF BCR 10	USFWS	LR	PJ	SA	Total
Canada Goose				20	0	0	20
Mallard				10	1	6	17
Common Merganser				4	0	0	4
Wild Turkey				7	0	0	7
Gambel's Quail				1	0	0	1
Double-crested Cormorant				0	1	0	1
Great Blue Heron				0	0	3	3
Turkey Vulture				3	4	2	9
Osprey				0	0	1	1
Northern Harrier		RC	BCC	2	0	4	6
Sharp-shinned Hawk				0	0	2	2
Cooper's Hawk				4	0	1	5
Northern Goshawk				0	0	1	1
Red-tailed Hawk				2	2	5	9
Golden Eagle	RC		BCC	0	2	4	6
American Kestrel				1	0	8	9
Peregrine Falcon			BCC	7	0	3	10
Prairie Falcon				0	0	2	2
Sandhill Crane				0	0	2	2
Killdeer				0	0	3	3
Mourning Dove				113	209	79	401
Great Horned Owl				1	0	0	1
Common Nighthawk	RC			1	1	0	2
White-throated Swift	CC,RS	CC		324	142	48	514
Black-chinned Hummingbird				45	8	0	53
Broad-tailed Hummingbird	RS			15	19	42	76
Williamson's Sapsucker				0	0	1	1
Red-naped Sapsucker				1	0	0	1
Downy Woodpecker				8	0	0	8
Hairy Woodpecker				15	2	0	17
Northern Flicker				8	2	12	22
Olive-sided Flycatcher	CC	CC,RC		0	1	1	2
Western Wood-Pewee				39	2	3	44
Hammond's Flycatcher				0	7	2	9
Gray Flycatcher				4	124	14	142
Dusky Flycatcher		CS,RS		20	44	72	136
Cordilleran Flycatcher	RS			3	0	0	3
Black Phoebe				13	0	0	13
Say's Phoebe	RS			63	15	17	95
Ash-throated Flycatcher				201	143	14	358
Western Kingbird				6	0	0	6
Loggerhead Shrike				0	0	1	1
Gray Vireo	CC,RC,RS		BCC	37	113	0	150

Common Name	Management Designation			Individuals Detected			
	PIF BCR 16	PIF BCR 10	USFWS	LR	PJ	SA	Total
Plumbeous Vireo	RS			65	61	5	131
Warbling Vireo	RS			44	3	4	51
Steller's Jay				0	3	6	9
Western Scrub-Jay				28	50	7	85
Pinyon Jay	CC,RC,CS	CC		2	54	18	74
Clark's Nutcracker	CS,RS	CS,RS		0	5	12	17
Black-billed Magpie	RS			0	3	51	54
American Crow				0	0	4	4
Common Raven				51	45	75	171
Horned Lark				0	1	22	23
Tree Swallow				19	0	83	102
Violet-green Swallow	RS			338	68	23	429
Rough-winged Swallow				4	0	4	8
Bank Swallow				0	0	1	1
Cliff Swallow				0	0	87	87
Barn Swallow				0	0	1	1
Mountain Chickadee				0	14	0	14
Juniper Titmouse	RC			49	106	4	159
Bushtit				11	18	1	30
Red-breasted Nuthatch				0	0	1	1
White-breasted Nuthatch				0	14	3	17
Pygmy Nuthatch	RC			0	5	2	7
Rock Wren	RS			94	117	92	303
Canyon Wren	RC			32	5	0	37
Bewick's Wren			BCC	77	125	3	205
House Wren				50	1	4	55
American Dipper		RS		2	0	0	2
Ruby-crowned Kinglet				1	8	0	9
Blue-gray Gnatcatcher				159	132	46	337
Western Bluebird	RS			4	0	14	18
Mountain Bluebird	RC,CS,RS			2	40	74	116
Townsend's Solitaire		RS		3	3	0	6
American Robin				46	33	52	131
Northern Mockingbird				0	9	8	17
Sage Thrasher				0	0	156	156
European Starling				0	0	17	17
Cedar Waxwing				1	0	0	1
Orange-crowned Warbler				1	1	0	2
Virginia's Warbler	CC,RC,RS		BCC	94	26	41	161
Lucy's Warbler				20	0	0	20
Yellow Warbler				181	0	1	182
Yellow-rumped Warbler				13	21	17	51
Black-throated Gray Warbler	RC			139	394	33	566
Grace's Warbler	CC,RC			0	17	14	31
MacGillivray's Warbler				1	2	1	4
Common Yellowthroat				9	0	0	9

Common Name	Management Designation			Individuals Detected			
	PIF BCR 16	PIF BCR 10	USFWS	LR	PJ	SA	Total
Wilson's Warbler				3	0	0	3
Yellow-breasted Chat				47	0	2	49
Western Tanager				20	18	21	59
Green-tailed Towhee	CS,RS			0	12	290	302
Spotted Towhee				263	64	78	405
Chipping Sparrow				40	123	55	218
Brewer's Sparrow	CC,RC	CC,RC	BCC	2	19	518	539
Vesper Sparrow				2	12	459	473
Lark Sparrow				10	16	25	51
Black-throated Sparrow	RC			72	76	3	151
Sage Sparrow	RC			1	0	20	21
Song Sparrow				57	0	5	62
Lincoln's Sparrow				2	0	0	2
White-crowned Sparrow				3	0	13	16
Dark-eyed Junco				3	19	13	35
Black-headed Grosbeak				21	9	7	37
Blue Grosbeak				6	0	0	6
Lazuli Bunting		RS		176	14	0	190
Red-winged Blackbird				0	0	2	2
Western Meadowlark				2	19	192	213
Brewer's Blackbird				0	0	10	10
Brown-headed Cowbird				17	14	16	47
Bullock's Oriole				12	0	1	13
Scott's Oriole				0	5	0	5
Cassin's Finch	RC	RC,CS,RS		0	11	3	14
House Finch				226	162	41	429
Pine Siskin	RC,RS			6	1	10	17
Lesser Goldfinch				75	11	1	87
American Goldfinch				6	0	1	7

[1] Common names are from the A.O.U. Check-list of North American Birds, Seventh Edition (2007).

[2] Special management designations: USFS=United States Forest Service, PIF=Partners In Flight (from the Species Assessment Database version 2005 found at www.rmbo.org, CC=Continental Concern Species, RC=Regional Concern Species, CS=Continental Stewardship Species, RS = Regional Stewardhip Species, USFWS=U.S. Fish and Wildlife Service, BCC = Bird of Conservation Concern.

[4] Habitats: LR=low-elevation riparian; PJ=pinyon-juniper; SA=Sage Shrubland