



Landbird Monitoring in the Northern Colorado Plateau Network

2010 Field Season Report

Natural Resource Technical Report NPS/NCPN/NRTR—2011/445



ON THE COVER

From left: Pinyon jay (Colorado NM), Yampa River (Dinosaur NM), ash-throated flycatcher (Colorado NM). Photos by Greg Joder, used with permission.

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Executive Summary

In 2010, the Rocky Mountain Bird Observatory (RMBO), in cooperation with its partner, the National Park Service, completed its sixth year of a habitat-based landbird monitoring program in the Northern Colorado Plateau Inventory and Monitoring Network (NCPN). This program is designed to provide rigorous population trend data on most diurnal, regularly occurring breeding landbird species throughout the network. This information is useful for land managers and supports the National Park Service's goal of developing long-term monitoring of biological indicators for network parks. The program, Monitoring Birds of the National Park Service, Northern Colorado Plateau Network, is also consistent with goals emphasized by the U.S. North American Bird Conservation Initiative Committee (U.S. NABCIC 2007).

RMBO surveyed 45 transects within 11 NCPN units, placing 15 transects in each of the three habitats of interest: low-elevation riparian, pinyon-juniper, and sage shrubland. To increase sample size, all transects were surveyed twice during the breeding season. Ten points were also conducted during the second year of a modified monitoring design at Pipe Spring National Monument.

This year, 100% of the assigned transects were surveyed, with 94 transect visits completed between May 8 and July 13. Not counting low-density species detections (birds detected between points), a total of 9,313 birds of 113 species were recorded in all habitats in 2010. In low-elevation riparian habitat, 2,844 birds of 83 species were detected. In pinyon-juniper habitat, 2,961 birds of 80 species were detected. In sage shrubland, 3,315 birds of 85 species were detected. A total of 193 birds of 29 species were detected in Pipe Spring National Monument. One new species (pink-sided dark-eyed junco) that was previously noted as probably present was recorded at Colorado National Monument, and two new species were recorded (black phoebe and Eurasian-collared dove) at Pipe Spring National Monument.

Data collected from 2005 to 2010 were pooled to generate density estimates for species with sufficient data. This year, density estimates were calculated for 60 species in at least one habitat. The data yielded robust density estimates (coefficient of variation <50%) for 41 species in 2010, and RMBO expects to reach its target of detecting a population change of at least 3% within 30 years for these 41 species. RMBO recorded 41 bird species that are of conservation and management concern throughout the NCPN, and calculated density estimates for 25 of those 41 species.

With the NCPN program in its sixth year, trend analyses were also conducted for those 25 of 41 species of conservation and management concern. Separate analyses were performed for each habitat. Significant trends were detected for six species, four of which had positive trend detection (black-throated sparrow and lazuli bunting, in low-elevation habitat; and dusky flycatcher and sage thrasher, in sage shrubland habitat) and two of which had negative trend detection (Bewick's wren, in pinyon-juniper habitat, and black-billed magpie, in sagebrush habitat). Populations appeared to be stable (no trend detected) for most species of conservation concern within the NCPN; however, Bewick's wren, in pinyon-juniper habitat, and black-billed magpie, in sagebrush habitat, appeared to be experiencing significant declines, warranting further investigation. The trend was not significant for Bewick's wren in low-elevation riparian habitat, although the density estimate in 2010 was the lowest estimated for the six years of this program. Long-term monitoring will continue to be necessary for interpreting population status and trends for avian species of the NCPN.

In December 2010, RMBO and NCPN staff met to discuss methods for improving statistical design and to review the current design, to ensure it is meeting the network's desired objectives. A new, more statistically rigorous, spatially balanced study design would allow RMBO to analyze data at a variety of spatial scales. In 2010, RMBO surveyed three transects within the NCPN utilizing this study design, which the NCPN may adopt in sage shrubland and pinyon-juniper habitats at larger parks, such as Dinosaur National Monument and Canyonlands National Park.

Acronyms

β_{trend}	beta estimate
BCR	bird conservation region
CI	confidence interval
CV	coefficient of variation
LR	low-elevation riparian
m	meters
NABCI	U.S. North American Bird Conservation Initiative
NCPN	Northern Colorado Plateau Network
NPS	National Park Service
NRA	national recreation area
PIF	Partners in Flight
PJ	pinyon-juniper
NM	national monument
NP	national park
RMBO	Rocky Mountain Bird Observatory
SA	sage shrubland

Author Information

ROCKY MOUNTAIN BIRD OBSERVATORY (RMBO)

Mission: To conserve birds and their habitats

Vision: Native bird populations are sustained in healthy ecosystems

Core Values

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:

- Monitoring long-term bird population trends to provide a scientific foundation for conservation action.
- Researching bird ecology and population response to anthropogenic and natural processes to evaluate and adjust management and conservation strategies using the best available science.
- Educating people of all ages through active, experiential programs that create an awareness and appreciation for birds.
- Fostering good stewardship on private and public lands through voluntary, cooperative partnerships that create win-win situations for wildlife and people.
- Partnering with state and federal natural resource agencies, private citizens, schools, universities, and other non-governmental organizations to build synergy and consensus for bird conservation.
- Sharing the latest information on bird populations, land management and conservation practices to create informed publics.
- Delivering bird conservation at biologically relevant scales by working across political and jurisdictional boundaries in western North America.

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1 Introduction

1.1 Program history

In 2010, the Rocky Mountain Bird Observatory (RMBO), in cooperation with its partner, the National Park Service (NPS), completed its sixth year of a habitat-based landbird monitoring program in the Northern Colorado Plateau Inventory and Monitoring Network (NCPN). This program was designed to provide rigorous population trend data on most diurnal, regularly occurring breeding landbird species in 11 national parks in three states (Colorado, Wyoming, and Utah) in the network. A second year of a modified monitoring design was also conducted at Pipe Spring National Monument, Arizona. In addition to monitoring landbird populations, this program generates information useful for managing birds, such as annual density estimates, habitat associations, and spatial distribution. It also supports the NCPN's implementation of long-term natural resource monitoring for its park units. Modeled after RMBO's Colorado habitat-based monitoring program (Leukering et al. 2000), *Monitoring Birds of the National Park Service, Northern Colorado Plateau Network* is consistent with goals emphasized by the U.S. North American Bird Conservation Initiative (NABCI) Committee (U.S. NABCI Monitoring Subcommittee 2007).

1.2 Reasons for monitoring

Monitoring is an essential component of wildlife management and conservation science (Witmer 2005; Marsh and Trenham 2008). Common goals of population monitoring are to estimate the population status of target species and to detect changes in populations over time (Thompson et al. 1998; Sauer and Knutson 2008). Effective monitoring programs can identify species that are at risk due to small or declining populations (Dreitz et al. 2006), provide an understanding of how management actions affect populations (Alexander et al. 2008; Lyons et al. 2008), evaluate population responses to landscape alteration and climate change (Baron et al. 2008; Lindenmayer and Likens 2009), and provide basic information on species distributions.

The apparent large-scale declines of avian populations and the loss, fragmentation, and degradation of native habitats highlight the need for extensive and rigorous landbird monitoring programs (Rich et al. 2004; U.S. NABCI 2009).

Population monitoring also helps to achieve the intent of legislation, such as the Migratory Bird Treaty Act (1918), National Environmental Policy Act (1969), Endangered Species Act (1973), National Forest Management Act (1976) and various state laws (Manley 1993; Sauer 1993).

1.3 Monitoring objectives

This program uses the Partners in Flight (PIF) Plan (Rich et al. 2004) as a guideline for bird conservation. PIF is a partnership of federal and state agencies, industry, non-governmental organizations, and many others who share the goal of conserving North American birds. In 1991, PIF began to develop a formal species-assessment process that could provide consistent scientific evaluations of conservation status across all bird species in North America and identify the most important focus areas for conservation of each species. This process applies quantitative rule sets to complex biological data on 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 can be used to objectively assign regional and continental conservation priorities among birds.

RMBO landbird monitoring programs are designed to provide population status and trend information for regularly occurring breeding landbird species within low-elevation riparian, pinyon-juniper, and sage shrubland habitats. Initially, the goal is to provide "early-warning" information for all monitored species through a habitat-based approach to data collection. It is expected that these data will lead to more questions and research areas to determine the possible reasons for any observed changes and to enable better-informed management decisions.

The specific objective of the NCPN monitoring program is to determine the status and trends in breeding-bird species' density in low-elevation riparian, pinyon-juniper, and sage shrubland habitats. To provide long-term status and trend estimates for landbirds in those habitats, RMBO has established a target of an 80% probability of detecting a minimum rate of population change of 3.0% per year in 30 years, with a Type I error rate of 10%. RMBO maintains a high-quality on-line database that is accessible to collaborators,

as well as to the public, in the form of raw and summarized data. RMBO will use these data to generate decision-support tools, such as population estimate models, to help guide conservation efforts and provide a better measure of conservation success.

1.4 Study areas

1.4.1 Low-elevation riparian habitat

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

1.4.2 Pinyon-juniper habitat

Pinyon-juniper habitat typically occurs at elevations just above semidesert shrubland. As the most extensive habitat in the NCPN, pinyon-juniper covers most of the ridges and mesas. The two main components of this habitat, pinyon pine (*Pinus edulis*) and juniper (*Juniperus* spp.), vary in composition.

1.4.3 Sage shrubland habitat

The sage shrubland community occurs extensively on the Colorado Plateau. The stands of this type that RMBO surveys in the NCPN are generally narrow “fingers” of pure sage; point-count stations are often located near forests. The most common sagebrush species in the NCPN are big sagebrush (*Artemisia tridentata*) and mountain sagebrush (*Artemisia frigida*).

1.4.4 Pipe Spring National Monument

Pipe Spring National Monument, at just 40 acres, contains a mixture of pinyon-juniper, low-elevation riparian, and semidesert shrubland habitats. Because most management actions focus on the main visitor area, monument staff is interested in seeing how the bird community changes here over time.

2 Methods

2.1 Site selection

In 2005, the NCPN selected three habitats in which to implement landbird monitoring: low-elevation riparian (LR), pinyon-juniper (PJ), and sage shrubland (SA). A panel of NPS resource managers selected these habitats because they represent distinct avifaunal communities and are each associated with park management questions.

The NPS and RMBO selected survey sites during winter 2005. For pinyon-juniper and sage shrubland habitat, GIS and the Southwest Regional Re-GAP Analysis Project (USFWS 2011) were used to randomly select sites from a pool of habitat “stands” that were large enough to accommodate transects consisting of 15 point-count stations spaced 250 m apart. Areas with >50% slope were excluded from the list of potential sites to ensure that selected stands could be accessed safely on foot.

For low-elevation riparian survey sites, options were limited to wadeable streams and excluded the Colorado, Green, Gunnison, and Virgin rivers. Survey locations for low-elevation riparian habitat were manually selected due to its limited extent in the area. RMBO staff groundtruthed the selected stands during early spring 2005, and established transects during the field season. In the few cases where the originally selected stands proved unacceptable, replacement stands were chosen in the same manner as the original stands. All transect locations were established during the 2005 field season, and the same locations have been surveyed each season.

2.2 Transect locations

During spring and summer 2005, RMBO staff established 45 transects in the three selected habitats (15 in each; see Table 2-1, Figures 2-1, 2-2, 2-3). In 2009, four point counts and area inventories were added at Pipe Spring National Monument (Figure 2-4).

2.2.1 Low-elevation riparian

Low-elevation riparian transects were established in Arches National Park (NP; 3), Canyonlands NP (3), Capitol Reef NP (2), Dinosaur Na-

Table 2-1. Landbird monitoring transects established in each NCPN habitat by park.

Park	Number of transects			
	LR	PJ	SA	Total
Arches NP	3	1	-	4
Black Canyon of the Gunnison NP	-	1	1	2
Bryce Canyon NP	-	1	2	3
Canyonlands NP	3	2	-	5
Capitol Reef NP	2	2	-	4
Colorado NM	-	2	-	2
Curecanti NRA	-	-	5	5
Dinosaur NM	3	4	5	12
Fossil Butte NM	-	-	2	2
Natural Bridges NM	2	1	-	3
Zion NP	2	1	-	3
Totals	15	15	15	45

tional Monument (NM; 3), Fossil Butte NM (2), Natural Bridges NM (2), and Zion NP (2).

2.2.2 Pinyon-juniper

Pinyon-juniper transects were established in Arches NP (1), Black Canyon of the Gunnison NP (1), Bryce Canyon NP (1), Canyonlands NP (2), Capitol Reef NP (2), Colorado NM (2), Dinosaur NM (4), Natural Bridges NM (1), and Zion NP (1).

2.2.3 Sage shrubland

Sage shrubland transects were established in Black Canyon of the Gunnison NP (1), Bryce Canyon NP (2), Curecanti National Recreation Area (5), and Dinosaur NM (5).

2.2.4 Pipe Spring National Monument

One observer spent two days conducting surveys at two locations at Pipe Spring National Monument. Due to the small size of this park (40 acres), four point count stations were visited in a mixture of pinyon-juniper, low-elevation riparian, and semidesert shrubland habitats. The observer then surveyed the main visitor area, conducting a 1,200 meter transect, with five point count stations (see Figure 2-4). Second visits were made 28 days later.

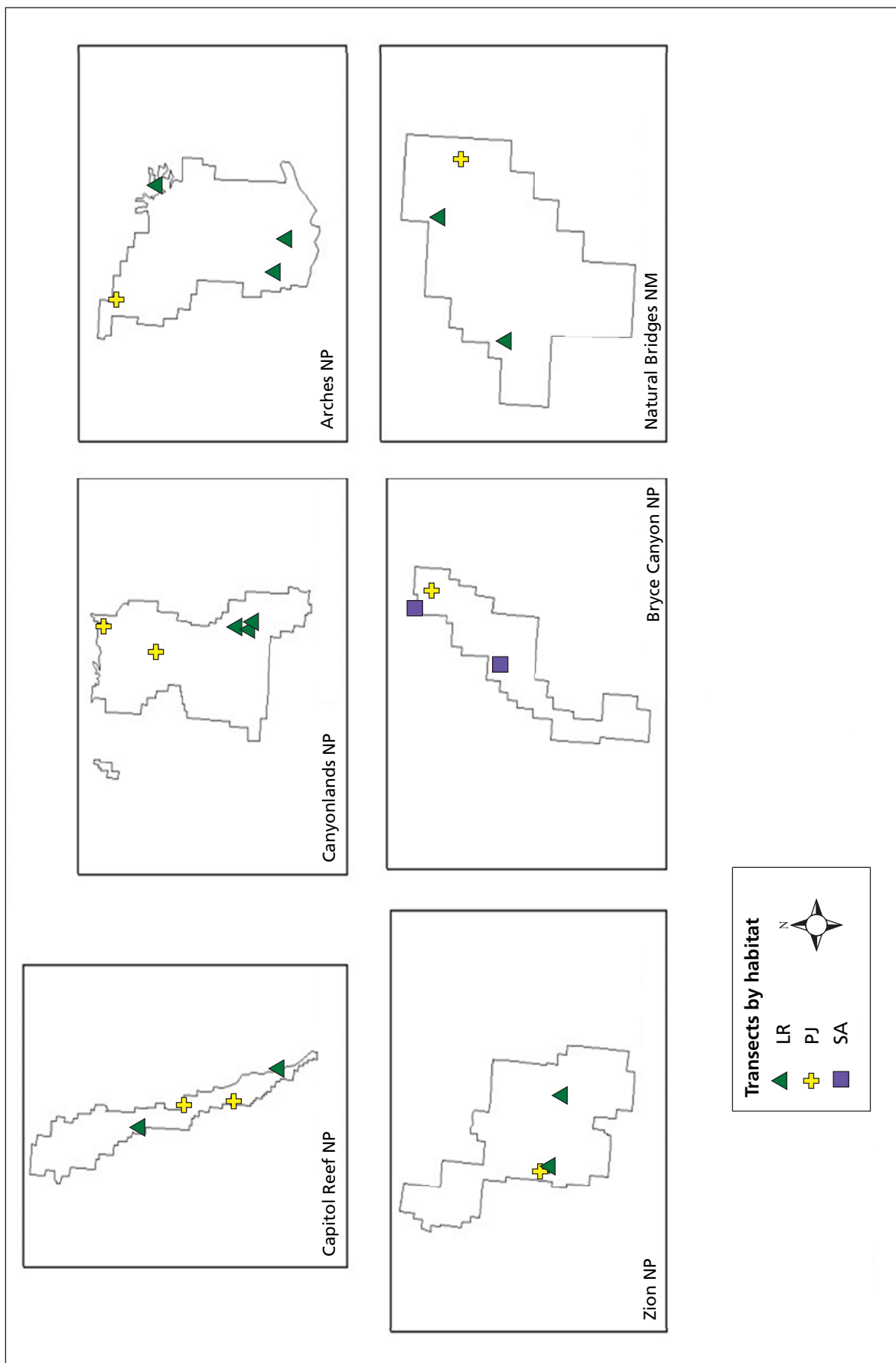


Figure 2-1. Utah transect locations by habitat within the Northern Colorado Plateau Network.

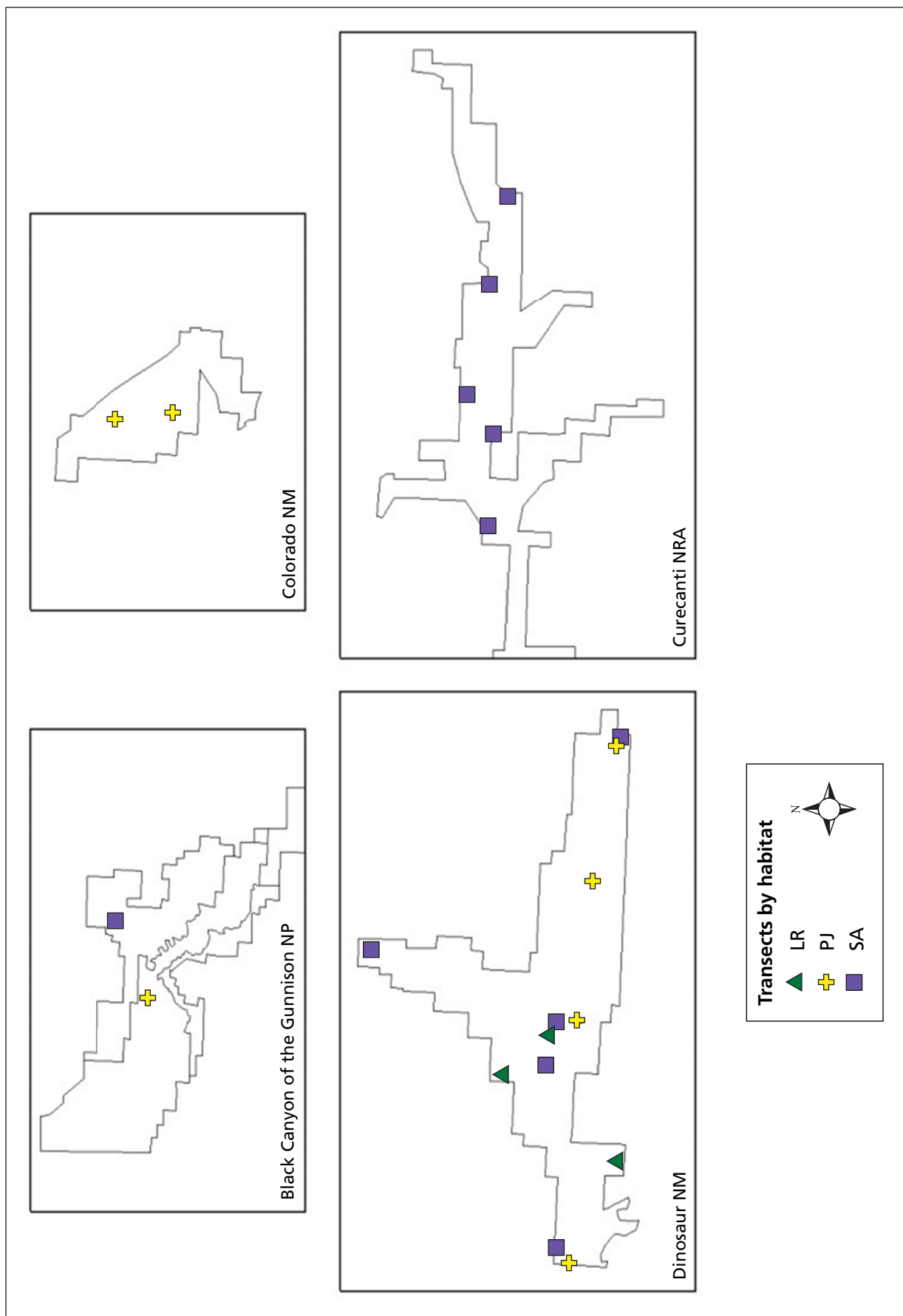


Figure 2-2. Colorado transect locations by habitat within the Northern Colorado Plateau Network.



Figure 2-3. Fossil Butte National Monument (Wyoming) transect locations.

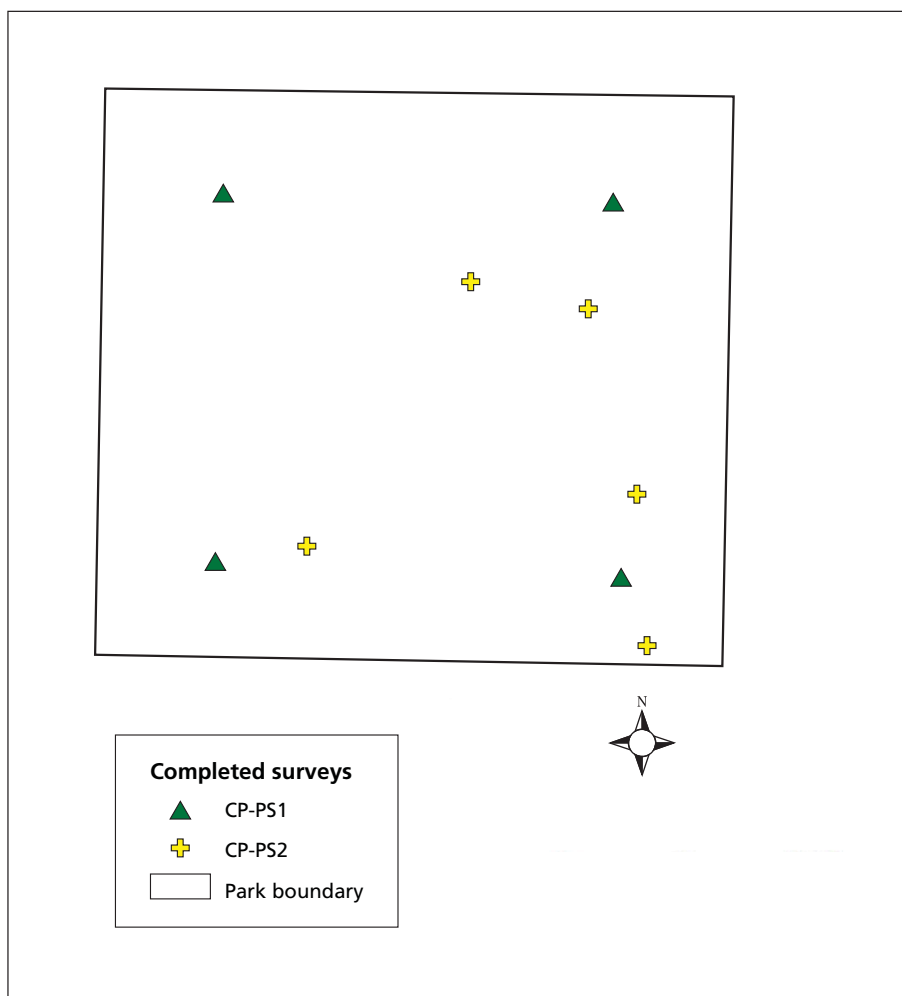


Figure 2-4. Pipe Spring National Monument (Arizona) survey locations.

2.3 Field personnel

In 2010, the RMBO field staff consisted of three experienced biologists with excellent aural and visual bird-identification skills. Two had previously surveyed NCPN sites. Each biologist completed a one-week training program at the beginning of the season to ensure full understanding of the field protocol.

2.4 Sampling design

Landbird populations were sampled in each habitat selected for monitoring following the protocol established by Leukering (2005) and modified by Hanni et al. (2009). All transects were surveyed between ½-hour before sunrise and 11 a.m. Fifteen 5-minute point counts were conducted at stations located at 250-m intervals along each transect. In order to increase the sample size, each of the 45 transects was surveyed two times during the summer, each visit occurring on a separate day. At each point, all birds detected during the five-minute survey were recorded. For every bird detected during the 5-minute period, observers recorded species, sex, horizontal distance from the observer, the minute when each bird was detected, and type of detection (e.g., call, song, or visual).

Observers measured radial distances to each bird using laser rangefinders. When it was not possible to measure distance to a bird, observers estimated distance by measuring to some nearby object. Observers also recorded birds flying over but not using the immediate surrounding landscape. For distribution mapping purposes, observers recorded the presence of all low-density species they detected when traveling between point-count locations. Low-density species are rare or difficult-to-detect species (e.g., woodpeckers, owls, raptors) that are generally recorded in low numbers.

Observers considered all non-independent detections of birds—that is, flocks or pairs of conspecific birds together in close proximity—as part of a cluster rather than as separate independent observations. Observers recorded clusters by recording the number of birds detected within the cluster along with a letter code to keep track of each distinct cluster.

At the start and end of each transect, observers recorded time, temperature in degrees Fahrenheit, percent cloud cover, precipitation type, and wind speed using the Beaufort scale. Distances

between points were measured using handheld Global Positioning System (GPS) units. All GPS data were recorded in Universal Transverse Mercator (UTM) North American Datum 1983 (NAD 83). Prior to beginning each point count, observers recorded UTM coordinates, vegetation data (within a 50-m radius), and distance from a road (if within 100 m) at each point. For vegetation data, observers recorded the habitat's structural stage as well as types, relative abundance, percent coverage, and mean height of trees, shrubs, and groundcover. If there was a distinct tree subcanopy present, the species of trees were recorded.

2.5 Data analysis

2.5.1 Distance analysis

The analysis software Distance 6.0 (Thomas et al. 2010) was used to estimate detection probabilities using point-count data. Distance data are analyzed by fitting a detection function to the distribution of recorded distances. The distribution of distances can be a function of characteristics of the object being recorded (e.g., for birds, size, color, movement, volume or frequency of song), the sampling landscape (e.g., vegetation density), and observer ability. 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 this program: (1) all birds at the point (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.

Densities were estimated of species for which at least 60 independent detections were obtained across years, within a sampled habitat. Birds flying over but not using the immediate surrounding landscape were excluded from analyses, as were birds detected between points. The following functions were fit to the distribution of distances for each species: Half normal key function with cosine series expansion, Uniform function with cosine series expansion, Hazard rate key function with cosine series expansion, and Hazard rate key function with simple polynomial series expansion (Buckland et al. 2001). Akaike's Information Criterion (AIC) was used to correct for small sample size, and model selection theory to select the most parsimonious detection function

for each species (Burnham and Anderson 2002). Variance was estimated in Distance using bootstrapping of transects within strata rather than empirical estimates, which tend to underestimate variance from small sample sizes.

Unless otherwise specified, all bird species names listed in this report are from the American Ornithologists' Union Checklist of North American Birds (AOU 2007).

2.5.2 Trend detection

Observed trends were modeled in populations of all species of conservation concern (see Appendix B) in each habitat with data from all years (2005–2010), using weighted regression and In-

formation-Theoretic model selection (Burnham and Anderson 2002). For each species, four different functions were modeled using Proc REG in SAS (SAS Institute 2007): no trend (intercept-only model), linear trend, quadratic trend, and loglinear (pseudo-threshold) trend. Akaike's Information Criterion (AIC) was used to correct for small sample size and to select the most parsimonious trend for each species (Burnham and Anderson 2002). Input data were density estimates and their variances, with the inverse of the variance used as a variable weight (giving more weight to more precise estimates). Confidence limits of the beta estimate (β_{trend}) were used to determine significance of the trend.

3 Results

In 2010, the sixth year of RMBO landbird monitoring in the NCPN, 1,262 point counts were conducted along 45 transects (all transects were surveyed twice) in three habitats between May 8 and July 13 (Table 3-1).

Not counting low-density species detections (birds detected between points), a total of 9,313 birds of 113 species were recorded in all habitats in 2010 (Table 3-2, Appendix A). In low-elevation riparian habitat, 2,844 birds of 83 species were detected. In pinyon-juniper habitat, 2,961 birds of 80 species were detected. In sage shrubland, 3,315 birds of 85 species were detected. A total of 193 birds of 29 species were detected in Pipe Spring National Monument. One new species, the dark-eyed junco, subspecies pink-sided (*Junco hyemalis*), was recorded at Colorado National Monument, where this species was previously noted as probably present. Two new species, black phoebe (*Sayornis nigricans*) and Eurasian collared-dove (*Streptopelia decaocto*) were recorded at Pipe Spring National Monument.

Density estimates were calculated for 60 species in at least one habitat. The habitat-stratified data yielded robust density estimates (CV <50%) for 41 species. These 41 species represented 36% of species and 89% of birds detected on NCPN transects during 2010.

RMBO recorded 41 bird species of conservation and management concern throughout the NCPN (Appendix B), and calculated density estimates for 25 of those species.

3.1 Low-elevation riparian

All 15 transects in low-elevation riparian habitat (LR) were surveyed twice this year. Density estimates were calculated for 38 species, 14 of which were priority species. The pooled data from 2005 to 2010 yielded robust density estimates (CV <50%) for 22 species and a moderately robust estimate (CV=50–75%) for three additional species (Table 3-3). RMBO expects to reach its target of detecting population changes of at least 3% within 30 years for these 22 species with robust density estimates, which represent 27% of species detected and 80% of birds detected in LR.

The following 10 species had the highest estimated densities of species recorded in LR in 2010 (listed in order from highest to lowest density):

Table 3-1. Bird sampling periods and effort in each habitat in the Northern Colorado Plateau Network, 2010.

Habitat	Dates sampled	# transects*	# point counts
Low-elevation riparian	May 11–July 13	15	389
Pinyon-juniper	May 8–July 12	15	432
Sage shrubland	May 21–July 9	15	441
All habitats	May 8–July 13	45	1,262

*Technicians surveyed all transects twice.

Table 3-2. Bird totals and averages by habitat in the Northern Colorado Plateau Network, 2010.

Habitat	# birds detected	Avg. # birds per transect	# species detected	Avg. # species per transect
Low-elevation riparian	2,882	96	83	28
Pinyon-juniper	2,987	100	80	26
Sage shrubland	3,347	112	85	26
All habitats	9,216	100	113	27

Numbers do not include low-density species detections (birds detected between points).

1. Black-chinned hummingbird
2. Yellow warbler
3. Blue-gray gnatcatcher
4. Violet-green swallow
5. Spotted towhee
6. Lazuli bunting
7. Ash-throated flycatcher
8. House finch
9. Plumbeous vireo
10. Chipping sparrow

The following 17 species had higher estimated densities in LR than in the other two habitats sampled in 2010 (listed in order from highest to lowest density):

1. Black-chinned hummingbird
2. Yellow warbler
3. Violet-green swallow
4. Spotted towhee
5. Lazuli bunting
6. Ash-throated flycatcher
7. Plumbeous vireo
8. Black-throated sparrow
9. Lesser goldfinch
10. White-throated swift
11. Yellow-breasted chat
12. American robin

13. Western tanager
14. Common yellowthroat
15. Rock wren
16. Warbling vireo
17. Western wood-pewee

3.1.1 Trend detection

Black-throated sparrow ($\beta_{\text{trend}}=3.57$; 95% CI=0.56, 6.59) and lazuli bunting ($\beta_{\text{trend}}=29.53$; 95% CI=

12.97, 46.08) both showed evidence of significant positive population change over the last six years (evident because the beta estimate was within the confidence limits). The best approximating model for black-throated sparrow was the linear trend (Figure 3-1). The best model for lazuli bunting was the loglinear trend (Figure 3-2). The best model for all other species of concern with density estimates in LR habitat was the intercept-only (constant) model.

Table 3-3. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL/UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in low-elevation riparian habitat in the Northern Colorado Plateau Network, 2005–2010.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
American robin	2005	7.03	1.57	31.49	113	16
	2006	10.40	2.60	41.57	101	26
	2007	12.78	3.42	47.79	94	34
	2008	15.82	3.87	64.59	103	40
	2009	---	---	---	---	6
	2010	7.67	1.98	29.69	97	20
Ash-throated flycatcher	2005	19.63	14.43	26.69	19	147
	2006	19.62	14.07	27.37	20	223
	2007	20.61	13.97	30.42	24	196
	2008	31.77	19.76	51.07	29	190
	2009	15.35	9.12	25.83	32	123
	2010	24.70	17.27	35.34	22	180
Black-chinned hummingbird	2005	271.21	137.06	536.67	35	18
	2006	291.73	162.41	524.02	30	20
	2007	172.22	91.51	324.09	33	12
	2008	156.52	84.58	289.65	32	11
	2009	243.58	129.65	457.64	33	14
	2010	180.81	98.33	332.47	31	11
Bewick's wren	2005	6.87	3.66	12.90	40	47
	2006	14.77	8.49	25.69	34	108
	2007	8.07	4.15	15.69	42	58
	2008	8.93	4.74	16.81	40	68
	2009	15.19	8.71	26.49	35	93
	2010	3.06	1.58	5.93	42	19

Table 3-3. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL/UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in low-elevation riparian habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Blue-gray gnatcatcher	2005	54.40	39.06	75.77	20	103
	2006	72.38	49.01	106.91	24	141
	2007	53.98	38.11	76.47	21	108
	2008	62.86	39.45	100.18	29	125
	2009	140.98	98.36	202.06	22	218
	2010	90.17	64.10	126.84	21	159
Brown-headed cowbird	2005	---	---	---	---	7
	2006	11.84	6.10	22.98	41	24
	2007	8.10	3.41	19.27	56	16
	2008	6.72	3.37	13.40	43	14
	2009	9.59	2.61	35.25	92	14
	2010	---	---	---	---	5
Black-headed grosbeak	2005	2.97	2.45	3.61	12	11
	2006	6.43	5.30	7.81	12	24
	2007	3.44	2.83	4.17	12	13
	2008	4.75	3.91	5.76	12	18
	2009	5.30	4.35	6.45	12	17
	2010	---	---	---	---	9
Blue grosbeak	2005	3.53	1.38	9.03	61	13
	2006	6.08	2.64	13.99	53	25
	2007	---	---	---	---	3
	2008	---	---	---	---	5
	2009	4.22	1.87	9.52	52	14
	2010	---	---	---	---	2
Black phoebe	2005	---	---	---	---	5
	2006	3.49	1.16	10.55	74	11
	2007	7.70	2.12	28.01	91	21
	2008	3.62	1.22	10.71	73	11
	2009	7.92	3.15	19.92	60	24
	2010	---	---	---	---	2
Black-throated sparrow	2005	3.91	1.68	9.08	54	48
	2006	7.21	4.15	12.55	34	51
	2007	8.34	3.29	21.13	60	61
	2008	10.12	5.40	18.96	39	67
	2009	28.33	13.78	58.26	44	139
	2010	16.13	8.02	32.45	44	59

Table 3-3. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL/UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in low-elevation riparian habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Black-throated gray warbler	2005	7.07	3.75	13.32	40	38
	2006	14.88	9.37	23.63	29	77
	2007	10.01	6.59	15.20	26	55
	2008	21.06	11.53	38.48	38	112
	2009	11.06	5.01	24.39	51	49
	2010	11.26	7.00	18.11	29	55
Bullock's oriole	2005	---	---	---	---	3
	2006	6.96	4.09	11.83	33	22
	2007	5.00	2.19	11.45	53	16
	2008	---	---	---	---	9
	2009	4.58	1.55	13.55	73	11
	2010	---	---	---	---	9
Bushtit	2005	23.62	12.24	45.56	40	14
	2006	44.98	28.93	69.94	27	56
	2007	6.27	3.11	12.61	44	11
	2008	---	---	---	---	5
	2009	10.45	5.44	20.08	41	15
	2010	---	---	---	---	0
Canyon wren	2005	1.32	0.77	2.27	33	28
	2006	3.28	2.04	5.27	29	68
	2007	1.71	0.97	3.04	36	38
	2008	1.33	0.57	3.11	55	28
	2009	1.36	0.68	2.69	43	25
	2010	---	---	---	---	1
Chipping sparrow	2005	---	---	---	---	6
	2006	---	---	---	---	8
	2007	16.07	8.22	31.40	42	29
	2008	15.61	8.02	30.38	42	28
	2009	19.95	9.56	41.64	47	25
	2010	17.37	8.41	35.88	46	28
Common raven	2005	2.62	1.45	4.72	37	14
	2006	1.73	0.78	3.80	50	12
	2007	2.33	1.16	4.67	44	14
	2008	5.26	2.77	10.01	40	36
	2009	---	---	---	---	7
	2010	4.57	2.30	9.07	43	27

Table 3-3. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL/UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in low-elevation riparian habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Common yellowthroat	2005	5.40	2.61	11.14	46	10
	2006	11.48	4.56	28.92	60	20
	2007	12.45	4.21	36.79	73	22
	2008	---	---	---	---	5
	2009	14.40	5.02	41.31	70	23
	2010	6.25	1.97	19.82	79	11
Gray vireo	2005	0.89	0.47	1.69	40	16
	2006	1.99	0.98	4.05	45	36
	2007	0.93	0.42	2.05	51	18
	2008	1.46	0.81	2.64	37	27
	2009	2.16	1.26	3.72	34	35
	2010	---	---	---	---	4
House finch	2005	18.43	16.16	21.02	8	112
	2006	26.54	23.50	29.96	7	177
	2007	27.48	24.18	31.22	8	189
	2008	27.67	24.46	31.29	7	189
	2009	30.52	26.44	35.24	9	160
	2010	18.44	16.18	21.02	8	111
House wren	2005	9.75	4.21	22.58	54	40
	2006	9.77	4.02	23.76	58	42
	2007	7.02	2.86	17.25	59	30
	2008	11.02	4.38	27.78	61	47
	2009	11.36	4.81	26.82	56	39
	2010	7.43	2.06	26.82	91	27
Juniper titmouse	2005	8.70	4.37	17.35	44	28
	2006	7.41	4.00	13.72	38	24
	2007	10.71	6.62	17.31	30	39
	2008	11.12	6.49	19.05	34	39
	2009	10.51	4.88	22.65	49	28
	2010	5.16	2.58	10.32	44	16
Lazuli bunting	2005	40.67	19.41	85.20	46	116
	2006	48.82	23.92	99.66	43	140
	2007	59.19	33.26	105.33	35	172
	2008	54.72	25.81	116.02	46	157
	2009	65.24	23.50	181.14	64	155
	2010	59.80	28.43	125.75	45	154

Table 3-3. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL/UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in low-elevation riparian habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Lesser goldfinch	2005	11.86	5.91	23.77	44	24
	2006	22.38	13.02	38.47	34	45
	2007	41.81	25.32	69.03	31	93
	2008	27.62	13.21	57.74	47	54
	2009	38.76	21.20	70.86	38	76
	2010	14.55	7.68	27.54	40	31
Mourning dove	2005	9.76	5.50	17.31	36	74
	2006	16.49	11.23	24.22	24	116
	2007	19.36	12.81	29.26	25	146
	2008	11.29	6.11	20.86	39	96
	2009	5.78	3.56	9.38	30	38
	2010	15.15	9.73	23.59	27	100
Plumbeous vireo	2005	11.21	7.64	16.43	24	52
	2006	18.20	11.68	28.36	27	85
	2007	13.54	8.95	20.48	25	63
	2008	10.06	7.14	14.18	21	48
	2009	16.93	10.97	26.13	27	67
	2010	17.44	11.51	26.41	25	74
Rock wren	2005	6.15	3.95	9.58	27	75
	2006	8.62	5.76	12.91	24	106
	2007	11.19	8.08	15.50	19	140
	2008	6.50	3.98	10.59	30	82
	2009	9.79	6.87	13.94	21	102
	2010	5.71	3.78	8.63	25	63
Say's phoebe	2005	3.56	2.39	5.29	24	41
	2006	5.53	3.33	9.17	31	62
	2007	3.28	2.20	4.90	25	38
	2008	4.74	2.60	8.62	38	52
	2009	5.97	3.23	11.02	38	55
	2010	2.79	1.60	4.87	35	29
Song sparrow	2005	19.50	7.91	48.07	59	49
	2006	20.94	9.84	44.55	48	62
	2007	17.15	7.51	39.20	53	51
	2008	16.92	8.96	31.97	40	50
	2009	13.70	5.02	37.35	67	30
	2010	---	---	---	---	8

Table 3-3. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL/UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in low-elevation riparian habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Spotted towhee	2005	42.72	30.07	60.70	21	226
	2006	100.21	70.38	142.67	21	413
	2007	57.85	38.90	86.02	24	274
	2008	46.27	30.50	70.17	26	208
	2009	88.72	61.61	127.77	21	310
	2010	74.34	50.24	110.00	23	282
Violet-green swallow	2005	60.98	42.44	87.61	22	99
	2006	181.01	118.51	276.46	26	216
	2007	116.78	78.97	172.70	24	142
	2008	150.67	90.07	252.05	32	121
	2009	135.17	93.59	195.21	23	159
	2010	80.06	48.85	131.22	31	98
Virginia's warbler	2005	9.15	5.17	16.21	36	32
	2006	12.14	4.84	30.47	60	41
	2007	9.76	5.53	17.25	35	34
	2008	19.18	11.98	30.71	29	69
	2009	---	---	---	---	2
	2010	8.45	4.50	15.87	40	26
Warbling vireo	2005	4.30	2.08	8.91	46	19
	2006	8.93	4.53	17.61	43	41
	2007	5.95	2.98	11.91	44	28
	2008	6.50	4.13	10.21	28	31
	2009	5.45	2.69	11.03	44	20
	2010	5.07	1.42	18.10	89	22
Western scrub-jay	2005	4.11	2.17	7.76	40	19
	2006	4.63	2.39	8.98	42	30
	2007	4.15	2.13	8.05	42	23
	2008	4.07	1.58	10.50	62	26
	2009	2.84	1.31	6.15	49	16
	2010	3.05	1.39	6.67	50	16
Western tanager	2005	---	---	---	---	8
	2006	6.08	3.39	10.91	36	20
	2007	---	---	---	---	7
	2008	3.26	1.46	7.27	51	11
	2009	---	---	---	---	3
	2010	6.55	2.55	16.79	61	15

Table 3-3. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL/UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in low-elevation riparian habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Western wood-pewee	2005	3.94	2.22	7.01	36	27
	2006	4.99	2.53	9.83	43	34
	2007	4.90	2.21	10.84	51	34
	2008	4.93	2.01	12.12	59	32
	2009	5.05	2.36	10.78	48	29
	2010	2.35	0.94	5.90	60	15
White-throated swift	2005	34.28	21.89	53.66	28	118
	2006	61.75	38.82	98.23	29	155
	2007	70.03	43.68	112.26	29	197
	2008	42.48	25.51	70.72	32	92
	2009	17.99	10.68	30.30	32	87
	2010	13.10	6.53	26.28	44	57
Yellow-breasted chat	2005	7.65	2.26	25.96	85	37
	2006	9.14	3.58	23.35	62	51
	2007	7.30	2.51	21.24	72	42
	2008	6.11	2.83	13.18	49	33
	2009	9.55	4.98	18.31	41	42
	2010	10.28	5.18	20.41	43	50
Yellow warbler	2005	66.60	33.73	131.49	43	121
	2006	66.89	33.91	131.94	43	121
	2007	49.50	23.31	105.13	48	96
	2008	67.94	36.02	128.15	40	126
	2009	134.57	66.40	272.73	44	207
	2010	99.86	54.69	182.34	37	161

Dashes indicate the sample size was insufficient for estimating density. Priority species are bolded. Sample sizes (n) indicate the number of individuals used in analyses, after truncation—not the number of individual birds actually detected.

Figure 3-1. Estimated densities and population trend of black-throated sparrow in low-elevation riparian habitat within the NCPN, 2005–2010. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

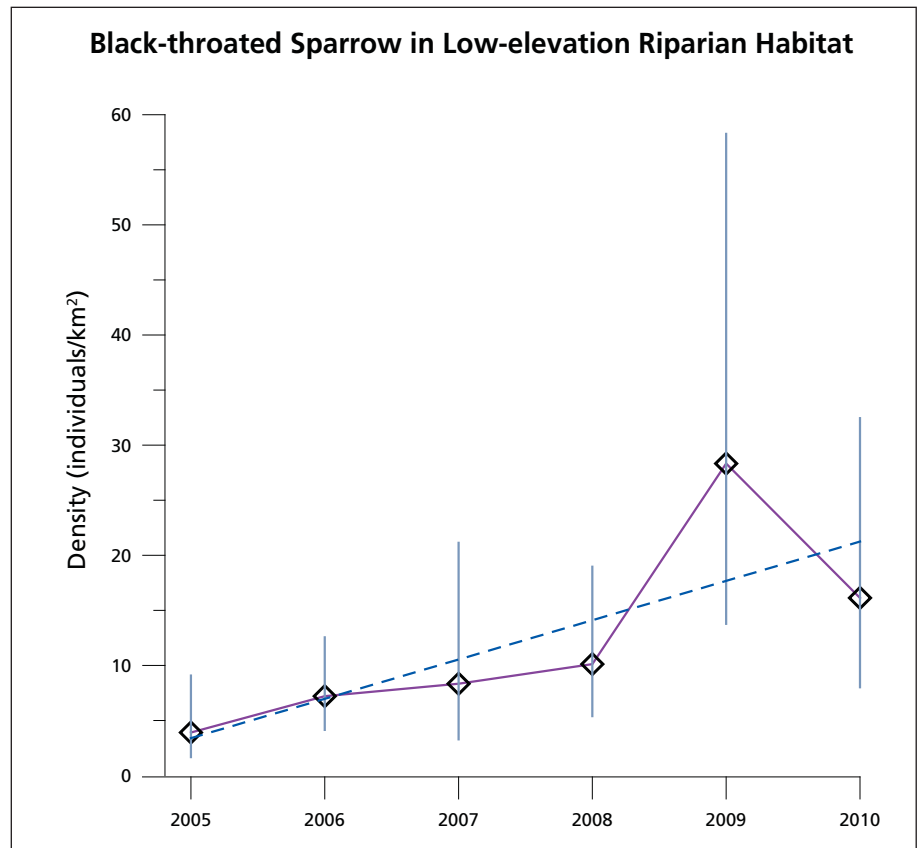
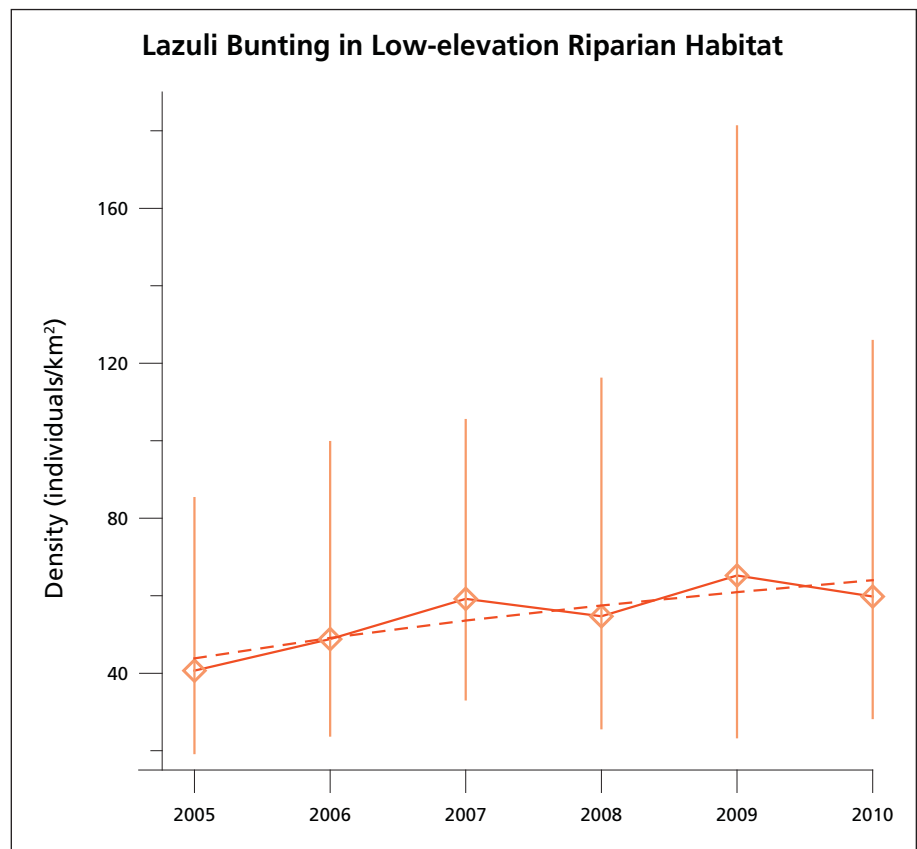


Figure 3-2. Estimated densities and population trend of lazuli bunting in low-elevation riparian habitat within the NCPN, 2005–2010. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.



3.2 Pinyon-juniper

All 15 transects in pinyon-juniper habitat (PJ) were surveyed twice this year. Density estimates were calculated for 37 species, 18 of which were priority species. The pooled data from 2005 to 2010 yielded robust density estimates (CV <50%) for 20 species and a moderately robust estimate (CV=50–75%) for five additional species (Table 3-4). RMBO expects to reach its target of detecting population changes of at least 3% within 30 years for those 20 species with robust density estimates, which represent 25% of species and 80% of individuals detected in PJ.

The following 10 species had the highest estimated densities of all species recorded in PJ in 2010 (listed in order from highest to lowest density):

1. Blue-gray gnatcatcher
2. Black-throated gray warbler
3. Juniper titmouse
4. Chipping sparrow
5. Gray flycatcher
6. Western scrub jay
7. Mourning dove
8. Spotted towhee
9. House finch
10. Gray vireo

The following 15 species had higher estimated densities in PJ than in the other two habitats sampled in 2010 (listed in order from highest to lowest density):

1. Blue-gray gnatcatcher
2. Black-throated gray warbler
3. Juniper titmouse
4. Chipping sparrow
5. Gray flycatcher
6. Western scrub-jay
7. House finch
8. Gray vireo
9. Virginia's warbler
10. Mountain bluebird
11. Pinyon jay
12. Dusky flycatcher
13. White-breasted nuthatch
14. Bewick's wren

3.2.1 Trend detection

Bewick's wren was the only species in PJ to show evidence of significant population change over the last six years ($\beta_{\text{trend}} = -2.68$; 95% CI = -3.85, -1.52), with a decreasing linear trend (Figure 3-3). The best approximating model for all other species of concern with density estimates in PJ habitat was the intercept-only (constant) model.

Table 3-4. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in pinyon-juniper habitat in the Northern Colorado Plateau Network, 2005–2010.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
American robin	2005	1.92	1.10	3.35	35	30
	2006	2.48	1.26	4.88	43	39
	2007	2.62	1.00	6.87	63	39
	2008	1.75	0.59	5.21	74	26
	2009	1.05	0.36	3.08	72	15
	2010	0.87	0.35	2.17	60	14
Ash-throated flycatcher	2005	11.49	8.45	15.62	19	119
	2006	11.33	7.77	16.54	23	115
	2007	11.05	7.45	16.38	24	114
	2008	11.95	7.97	17.92	25	113
	2009	11.39	8.10	16.03	21	102
	2010	7.92	5.74	10.93	20	78
Bewick's wren	2005	20.11	15.30	26.42	16	147
	2006	20.11	12.45	32.47	29	148
	2007	16.38	9.64	27.84	32	121
	2008	16.09	8.84	29.29	36	112
	2009	12.19	8.24	18.06	24	82
	2010	3.37	1.68	6.78	44	25
Blue-gray gnatcatcher	2005	109.51	74.04	161.96	24	127
	2006	81.98	47.30	142.09	34	93
	2007	111.31	76.01	163.01	23	127
	2008	94.70	59.45	150.85	29	99
	2009	219.94	160.70	301.04	19	228
	2010	128.32	83.55	197.07	27	139
Brown-headed cowbird	2005	4.47	2.15	9.29	46	18
	2006	4.01	1.70	9.42	55	14
	2007	4.71	1.83	12.07	62	17
	2008	3.10	1.22	7.87	61	11
	2009	5.56	2.99	10.33	39	18
	2010	---	---	---	---	7
Brewer's sparrow	2005	---	---	---	---	7
	2006	---	---	---	---	6
	2007	2.75	1.01	7.48	66	19
	2008	2.40	0.74	7.79	81	15
	2009	1.64	0.73	3.70	51	10
	2010	---	---	---	---	5

Table 3-4. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in pinyon-juniper habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Black-throated sparrow	2005	5.01	2.75	9.13	38	41
	2006	8.82	4.76	16.33	39	69
	2007	11.60	5.63	23.86	45	94
	2008	9.15	3.56	23.50	60	69
	2009	10.98	6.23	19.36	35	78
	2010	8.04	4.84	13.34	31	63
Black-throated gray warbler	2005	65.85	47.66	90.98	19	298
	2006	87.34	64.36	118.52	18	397
	2007	78.83	57.12	108.79	19	356
	2008	87.72	65.91	116.75	17	372
	2009	99.60	76.24	130.11	16	416
	2010	65.62	47.52	90.61	19	290
Bushtit	2005	86.22	50.89	146.08	33	40
	2006	57.94	34.65	96.89	32	31
	2007	---	---	---	---	15
	2008	---	---	---	---	8
	2009	77.59	45.08	133.54	34	44
	2010	---	---	---	---	1
Canyon wren	2005	0.39	0.15	1.02	62	15
	2006	0.56	0.22	1.46	62	22
	2007	0.64	0.22	1.81	70	24
	2008	---	---	---	---	5
	2009	0.41	0.15	1.13	67	16
	2010	---	---	---	---	3
Chipping sparrow	2005	20.64	12.81	33.25	30	56
	2006	17.71	11.19	28.01	28	46
	2007	26.23	15.04	45.74	35	67
	2008	29.96	19.12	46.94	28	73
	2009	64.05	34.83	117.77	37	133
	2010	35.90	20.73	62.15	34	86
Common raven	2005	0.75	0.40	1.39	37	14
	2006	0.50	0.26	0.98	42	11
	2007	1.59	1.06	2.40	25	36
	2008	0.99	0.53	1.87	40	20
	2009	---	---	---	---	4
	2010	0.88	0.55	1.40	29	18

Table 3-4. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in pinyon-juniper habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Dusky flycatcher	2005	3.92	1.28	11.96	76	12
	2006	12.13	5.30	27.74	53	35
	2007	9.33	3.85	22.62	57	28
	2008	15.83	5.10	49.14	76	40
	2009	4.93	1.61	15.15	76	14
	2010	5.56	1.85	16.72	75	16
Gray flycatcher	2005	27.52	20.74	36.51	17	114
	2006	21.16	14.27	31.39	24	86
	2007	20.28	11.80	34.86	34	84
	2008	26.23	16.23	42.38	30	101
	2009	48.17	33.64	68.99	22	177
	2010	30.92	23.88	40.04	16	123
Gray vireo	2005	6.57	4.27	10.12	27	76
	2006	5.47	2.92	10.26	40	63
	2007	6.29	3.95	10.01	29	74
	2008	8.30	5.11	13.49	30	91
	2009	12.58	9.75	16.24	16	136
	2010	9.96	6.99	14.20	22	113
Grace's warbler	2005	---	---	---	---	6
	2006	1.80	0.46	7.03	98	14
	2007	2.94	0.73	11.83	100	20
	2008	1.57	0.39	6.30	100	10
	2009	3.07	0.74	12.76	104	19
	2010	1.77	0.46	6.87	97	11
Green-tailed towhee	2005	1.57	0.77	3.19	44	15
	2006	---	---	---	---	6
	2007	3.21	0.88	11.75	91	30
	2008	1.39	0.47	4.11	73	12
	2009	---	---	---	---	8
	2010	---	---	---	---	3
House finch	2005	14.86	9.78	22.60	26	105
	2006	9.45	5.31	16.82	36	76
	2007	19.08	11.95	30.45	29	159
	2008	16.97	10.82	26.63	28	135
	2009	19.10	11.53	31.62	31	147
	2010	13.20	9.02	19.33	23	108

Table 3-4. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in pinyon-juniper habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Juniper titmouse	2005	21.48	14.35	32.16	25	78
	2006	18.56	11.63	29.62	29	71
	2007	19.69	11.47	33.81	34	78
	2008	23.30	14.08	38.56	31	87
	2009	53.63	37.73	76.25	21	196
	2010	36.99	25.16	54.37	24	138
Lark sparrow	2005	2.45	1.03	5.84	56	20
	2006	2.37	0.56	10.02	106	17
	2007	1.97	0.66	5.87	74	19
	2008	1.53	0.56	4.15	66	14
	2009	2.07	0.85	5.03	58	19
	2010	1.98	0.60	6.61	82	19
Mountain bluebird	2005	13.47	2.64	68.75	129	63
	2006	8.12	1.14	57.76	176	33
	2007	8.85	1.86	42.21	120	38
	2008	7.65	2.07	28.28	93	34
	2009	11.27	3.47	36.64	82	42
	2010	8.38	3.05	23.02	67	40
Mountain chickadee	2005	5.54	2.16	14.24	61	19
	2006	---	---	---	---	9
	2007	3.31	1.20	9.13	67	11
	2008	---	---	---	---	9
	2009	4.20	1.52	11.58	67	13
	2010	---	---	---	---	5
Mourning dove	2005	14.37	8.84	23.37	30	143
	2006	15.93	10.03	25.30	29	154
	2007	18.15	10.23	32.20	36	171
	2008	17.54	11.74	26.21	25	162
	2009	10.53	6.53	16.98	30	98
	2010	16.12	10.74	24.19	25	156
Pinyon jay	2005	2.03	1.04	3.95	42	46
	2006	4.45	2.19	9.05	45	78
	2007	6.20	3.43	11.19	37	102
	2008	1.66	0.63	4.36	62	25
	2009	2.51	1.32	4.80	41	54
	2010	7.07	3.88	12.88	38	116

Table 3-4. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in pinyon-juniper habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Plumbeous vireo	2005	7.11	4.04	12.53	35	62
	2006	5.12	2.76	9.49	39	44
	2007	5.07	2.91	8.81	35	44
	2008	5.27	2.90	9.59	38	43
	2009	5.18	2.13	12.61	58	42
	2010	9.72	5.77	16.38	32	83
Rock wren	2005	4.88	3.20	7.45	26	82
	2006	4.50	2.86	7.10	28	77
	2007	4.81	3.18	7.29	26	81
	2008	6.27	3.70	10.65	33	96
	2009	6.46	3.85	10.83	32	94
	2010	2.34	1.41	3.88	31	38
Say's phoebe	2005	1.72	1.05	2.80	30	29
	2006	---	---	---	---	9
	2007	---	---	---	---	8
	2008	0.70	0.39	1.25	36	11
	2009	0.91	0.54	1.55	33	14
	2010	1.18	0.56	2.50	47	19
Spotted towhee	2005	15.94	10.03	25.31	29	99
	2006	13.68	7.27	25.75	40	81
	2007	21.66	11.82	39.66	38	130
	2008	10.06	5.86	17.26	34	57
	2009	20.78	11.66	37.03	36	116
	2010	15.53	8.87	27.19	35	91
Vesper's sparrow	2005	---	---	---	---	9
	2006	1.26	0.40	3.97	78	16
	2007	1.26	0.37	4.30	85	15
	2008	---	---	---	---	8
	2009	2.00	0.52	7.61	96	21
	2010	2.01	0.70	5.78	71	25
Violet-green swallow	2005	10.24	4.82	21.72	40	34
	2006	14.08	6.29	31.48	43	50
	2007	16.81	7.15	39.50	46	59
	2008	19.62	8.82	43.63	42	44
	2009	12.54	6.13	25.64	38	35
	2010	8.57	3.65	20.10	45	29

Table 3-4. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in pinyon-juniper habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Virginia's warbler	2005	8.57	4.05	18.14	48	53
	2006	5.63	2.09	15.18	65	35
	2007	5.73	2.33	14.11	58	36
	2008	4.12	1.91	8.89	49	24
	2009	3.82	1.55	9.42	59	22
	2010	9.45	4.51	19.79	47	56
White-breasted nuthatch	2005	4.05	1.36	12.02	73	16
	2006	5.09	1.59	16.29	80	19
	2007	7.17	1.87	27.52	96	22
	2008	3.00	0.91	9.83	82	11
	2009	2.95	0.97	9.00	75	11
	2010	3.96	0.94	16.64	105	14
Western meadowlark	2005	2.53	0.82	7.79	77	42
	2006	1.29	0.33	5.11	100	22
	2007	1.59	0.33	7.68	121	21
	2008	0.89	0.26	3.06	86	14
	2009	1.76	0.46	6.75	97	28
	2010	---	---	---	---	5
Western shrub jay	2005	12.83	3.62	45.49	89	32
	2006	23.65	7.01	79.80	85	32
	2007	20.55	6.56	64.35	78	30
	2008	23.91	7.68	74.43	78	33
	2009	---	---	---	---	15
	2010	20.47	6.10	68.72	84	27
Western tanager	2005	1.55	0.67	3.57	54	17
	2006	2.36	1.27	4.38	39	25
	2007	2.91	1.32	6.43	51	30
	2008	1.78	0.59	5.32	74	17
	2009	---	---	---	---	8
	2010	1.72	0.57	5.24	75	17
White-throated swift	2005	14.75	8.63	25.20	33	90
	2006	17.99	8.54	37.91	48	95
	2007	21.60	13.41	34.81	30	113
	2008	16.23	8.01	32.90	45	73
	2009	8.56	5.22	14.06	31	48
	2010	6.43	3.34	12.37	40	33

Table 3-4. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in pinyon-juniper habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Yellow-rumped warbler	2005	1.52	0.43	5.31	87	11
	2006	3.77	1.11	12.79	84	29
	2007	1.69	0.37	7.74	114	11
	2008	2.31	0.62	8.68	94	15
	2009	---	---	---	---	1
	2010	---	---	---	---	8

Dashes indicate the sample size was insufficient for estimating density. Priority species are bolded. Sample sizes (n) indicate the number of individuals used in analyses, after truncation—not the number of individual birds actually detected.

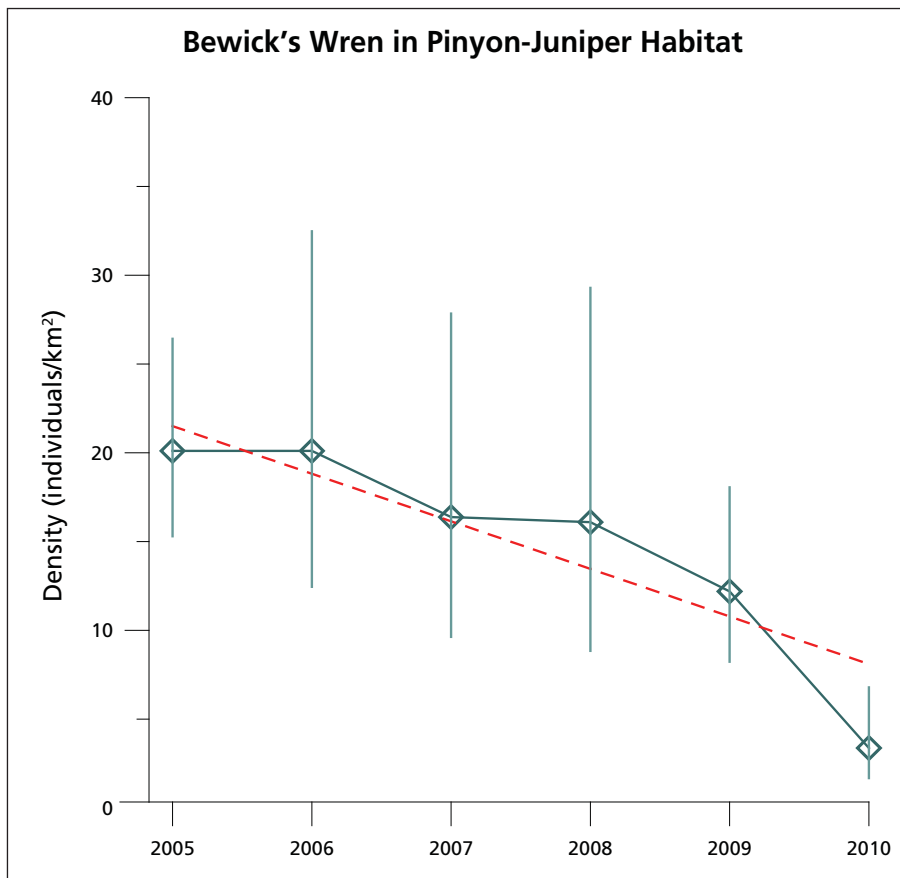


Figure 3-3. Estimated densities and population trend of Bewick's wren in pinyon-juniper habitat within the NCPN, 2005–2010. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

3.3 Sage shrubland

All 15 transects in sage shrubland habitat (SA) were surveyed twice this year. Density estimates were calculated for 34 species, 16 of which were priority species. The pooled data from 2005 to 2010 yielded robust density estimates (CV <50%) for 22 species and a moderately robust estimate (CV=50–75%) for six additional species (Table 3-5). RMBO expects to reach its target of detecting a population change of at least 3% within 30 years for these 22 species with robust density estimates, which represent 26% of species and 84% of individuals detected in SA.

The following 10 species had the highest estimated densities of all species recorded in SA in 2010 (listed in order from highest to lowest density):

1. Brewer's sparrow
2. Vesper sparrow
3. Green-tailed towhee
4. Chipping sparrow
5. Blue-gray gnatcatcher
6. Spotted towhee
7. Lark sparrow
8. Dusky flycatcher
9. Mountain bluebird
10. Lazuli bunting

The following 10 species had higher estimated densities in SA than in the other two habitats sampled in 2010 (listed in order from highest to lowest density):

1. Brewer's sparrow
2. Vesper sparrow
3. Green-tailed towhee
4. Lark sparrow
5. Sage thrasher
6. Western meadowlark
7. Horned lark
8. Brewer's blackbird
9. Black-billed magpie
10. Northern flicker

3.3.1 Trend detection

Black-billed magpie showed evidence of significant decreasing population change over the last six years (evident because the beta estimate was within the confidence limits; $\beta_{\text{trend}} = -3.10$; 95% CI = -5.01, -1.12). The best approximating model for black-billed magpie was the loglinear trend (Figure 3-4). In contrast, dusky flycatchers showed evidence of significant increasing population change ($\beta_{\text{trend}} = 6.18$; 95% CI = 2.29, 10.08). The best model for dusky flycatcher was the loglinear trend (Figure 3-5). Sage thrasher also showed significant increasing population change ($\beta_{\text{trend}} = 0.71$; 95% CI = 0.26, 1.15). The best model for sage thrasher was the linear trend (Figure 3-6). The best model for all other species of concern with density estimates in SA habitat was the intercept-only (constant) model.

3.4 Pipe Spring National Monument

To date, 38 species have been detected in Pipe Spring National Monument, totaling 335 individuals. Eurasian collared-dove, Gambel's quail, house sparrow, and red-winged blackbird were detected only in 2010.

Table 3-5. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in sage shrubland habitat in the Northern Colorado Plateau Network, 2005–2010.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
American robin	2005	2.51	1.37	4.60	38	39
	2006	4.70	2.27	9.75	46	79
	2007	3.28	1.58	6.82	47	54
	2008	2.42	1.33	4.39	37	36
	2009	1.88	0.92	3.84	45	28
	2010	2.87	1.47	5.60	42	46
Ash-throated flycatcher	2005	1.03	0.42	2.50	57	16
	2006	0.64	0.24	1.71	65	10
	2007	1.02	0.30	3.46	84	14
	2008	0.80	0.29	2.16	66	12
	2009	---	---	---	---	7
	2010	0.82	0.31	2.14	63	12
Black-billed magpie	2005	3.08	1.45	6.53	48	69
	2006	3.33	2.23	4.96	25	95
	2007	1.86	1.15	3.01	30	49
	2008	1.58	0.88	2.83	36	45
	2009	1.23	0.56	2.73	51	31
	2010	1.68	0.91	3.09	38	52
Blue-gray gnatcatcher	2005	9.93	4.63	21.29	49	31
	2006	5.53	2.94	10.41	40	18
	2007	3.90	1.78	8.55	50	12
	2008	14.70	8.89	24.31	31	44
	2009	13.69	6.82	27.47	44	38
	2010	14.74	8.09	26.87	38	47
Brown-headed cowbird	2005	---	---	---	---	4
	2006	4.98	2.63	9.45	40	26
	2007	2.11	1.01	4.41	47	12
	2008	2.72	1.43	5.19	40	14
	2009	---	---	---	---	8
	2010	---	---	---	---	6
Brewer's blackbird	2005	---	---	---	---	5
	2006	5.88	2.86	12.11	46	42
	2007	2.92	1.30	6.56	50	19
	2008	---	---	---	---	8
	2009	4.34	1.41	13.33	75	26
	2010	2.73	1.40	5.32	41	19

Table 3-5. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in sage shrubland habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Brewer's sparrow	2005	74.44	51.13	108.37	22	426
	2006	77.02	53.55	110.78	21	450
	2007	66.67	48.27	92.09	19	390
	2008	62.36	46.41	83.80	17	340
	2009	96.12	65.50	141.04	22	503
	2010	86.68	62.34	120.52	19	495
Broad-tailed hummingbird	2005	18.20	6.73	49.22	66	18
	2006	10.59	3.80	29.49	68	11
	2007	12.95	4.86	34.51	64	14
	2008	27.30	8.90	83.78	76	23
	2009	15.49	4.85	49.45	79	13
	2010	---	---	---	---	8
Black-throated sparrow	2005	0.63	0.24	1.66	64	10
	2006	1.86	0.90	3.84	46	32
	2007	1.19	0.50	2.85	56	19
	2008	---	---	---	---	3
	2009	1.95	0.59	6.40	82	28
	2010	---	---	---	---	8
Black-throated gray warbler	2005	2.34	0.98	5.60	57	28
	2006	1.70	0.71	4.07	57	21
	2007	1.23	0.41	3.64	74	15
	2008	2.26	0.85	6.05	65	29
	2009	4.05	1.59	10.28	61	47
	2010	1.41	0.59	3.40	57	17
Chipping sparrow	2005	5.69	3.07	10.55	39	31
	2006	9.24	5.37	15.88	34	53
	2007	8.85	4.08	19.22	50	47
	2008	7.85	3.42	18.02	54	44
	2009	7.70	3.90	15.21	43	41
	2010	17.79	10.04	31.53	36	94
Common raven	2005	0.21	0.11	0.41	43	11
	2006	0.74	0.44	1.26	33	29
	2007	1.00	0.60	1.66	32	50
	2008	0.63	0.36	1.11	35	31
	2009	0.54	0.27	1.07	43	24
	2010	0.83	0.48	1.45	34	41

Table 3-5. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in sage shrubland habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Dusky flycatcher	2005	3.35	1.22	9.22	68	30
	2006	5.89	2.82	12.31	47	55
	2007	6.14	2.69	14.02	53	57
	2008	8.12	3.78	17.44	49	69
	2009	8.94	3.81	20.98	55	75
	2010	7.27	3.69	14.32	43	68
Gray flycatcher	2005	2.12	1.15	3.91	38	24
	2006	---	---	---	---	8
	2007	---	---	---	---	7
	2008	1.28	0.39	4.14	81	14
	2009	2.54	1.02	6.35	60	25
	2010	1.91	0.97	3.79	43	23
Green-tailed towhee	2005	30.88	19.14	49.81	28	306
	2006	43.67	25.07	76.05	33	440
	2007	30.71	17.65	53.44	33	315
	2008	27.65	16.86	45.34	29	269
	2009	33.01	18.47	59.01	35	297
	2010	20.16	12.04	33.75	31	202
House finch	2005	---	---	---	---	4
	2006	4.52	2.71	7.53	32	59
	2007	2.55	1.07	6.10	57	34
	2008	2.76	1.57	4.84	35	34
	2009	4.29	1.58	11.59	66	49
	2010	1.54	0.84	2.82	38	20
Horned lark	2005	2.76	1.26	6.05	50	27
	2006	3.55	1.82	6.95	42	31
	2007	3.94	1.97	7.88	44	38
	2008	2.30	0.82	6.44	69	19
	2009	5.23	2.51	10.87	47	44
	2010	3.02	1.44	6.33	47	29
Lark sparrow	2005	9.15	4.32	19.35	48	85
	2006	10.13	5.45	18.85	39	97
	2007	6.36	3.04	13.31	47	63
	2008	2.56	1.09	6.00	55	24
	2009	13.39	5.54	32.33	56	118
	2010	8.41	4.19	16.87	44	72

Table 3-5. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in sage shrubland habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Lazuli bunting	2005	---	---	---	---	6
	2006	---	---	---	---	6
	2007	---	---	---	---	5
	2008	---	---	---	---	0
	2009	10.99	3.69	32.69	72	73
	2010	5.54	2.55	12.05	50	43
Mountain bluebird	2005	6.21	3.94	9.78	28	63
	2006	7.66	5.41	10.85	21	83
	2007	7.80	4.52	13.49	34	80
	2008	6.82	4.76	9.77	22	66
	2009	7.02	3.76	13.08	39	60
	2010	7.24	5.04	10.40	22	77
Mourning dove	2005	2.41	1.32	4.39	38	56
	2006	4.88	3.28	7.26	24	117
	2007	2.73	1.46	5.10	39	66
	2008	3.13	1.52	6.44	46	70
	2009	3.39	1.77	6.48	41	68
	2010	4.06	2.18	7.56	39	97
Northern flicker	2005	0.97	0.54	1.74	36	15
	2006	1.52	0.79	2.92	41	24
	2007	0.90	0.44	1.82	45	14
	2008	---	---	---	---	9
	2009	1.52	0.74	3.13	46	21
	2010	1.62	0.94	2.79	34	24
Rock wren	2005	3.90	2.50	6.09	28	86
	2006	7.16	4.26	12.05	32	163
	2007	3.35	1.62	6.96	46	74
	2008	4.17	2.39	7.25	35	88
	2009	3.55	2.05	6.14	34	71
	2010	3.03	1.74	5.27	35	66
Sage sparrow	2005	2.98	1.14	7.82	64	36
	2006	2.34	0.85	6.45	68	25
	2007	2.72	0.94	7.86	71	31
	2008	1.80	0.47	6.89	96	20
	2009	2.95	1.01	8.62	72	27
	2010	---	---	---	---	4

Table 3-5. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in sage shrubland habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Sage thrasher	2005	3.27	1.61	6.66	44	76
	2006	3.01	1.44	6.28	46	70
	2007	3.02	1.54	5.90	42	71
	2008	6.07	2.99	12.33	43	135
	2009	5.22	2.42	11.26	47	110
	2010	6.25	2.80	13.93	49	140
Say's phoebe	2005	0.80	0.37	1.74	49	12
	2006	0.90	0.52	1.56	34	15
	2007	---	---	---	---	8
	2008	0.99	0.38	2.56	62	15
	2009	1.29	0.50	3.36	62	17
	2010	1.19	0.52	2.72	53	19
Spotted towhee	2005	6.71	3.31	13.60	45	59
	2006	6.97	3.92	12.40	36	64
	2007	5.63	2.98	10.64	40	51
	2008	8.47	4.45	16.11	40	71
	2009	5.45	2.82	10.54	42	43
	2010	8.66	4.75	15.80	38	77
Vesper's sparrow	2005	26.18	18.60	36.84	20	303
	2006	35.40	25.83	48.51	18	419
	2007	36.52	26.25	50.79	19	430
	2008	36.38	23.72	55.81	25	397
	2009	42.00	26.49	66.59	27	441
	2010	43.04	31.05	59.67	19	499
Violet-green swallow	2005	6.20	2.67	14.40	44	18
	2006	9.47	3.57	25.09	52	26
	2007	---	---	---	---	15
	2008	12.18	1.17	126.70	170	15
	2009	6.66	2.59	17.14	51	22
	2010	5.02	2.09	12.07	44	16
Virginia's warbler	2005	1.41	0.63	3.18	52	23
	2006	1.74	0.80	3.76	49	30
	2007	1.09	0.27	4.40	102	17
	2008	2.62	0.90	7.60	72	40
	2009	1.45	0.54	3.89	66	21
	2010	1.55	0.61	3.90	61	25

Table 3-5. Estimated densities per km² (D), lower and upper 90% confidence limits on D (LCL,UCL), percent coefficient of variation of estimates (% CV), and sample sizes (n) of breeding birds in sage shrubland habitat in the Northern Colorado Plateau Network, 2005–2010, cont.

Species	Year	D	Confidence limit		% CV	n
			LCL	UCL		
Warbling vireo	2005	1.36	0.48	3.84	68	18
	2006	0.72	0.30	1.71	56	10
	2007	1.40	0.53	3.69	63	21
	2008	---	---	---	---	2
	2009	---	---	---	---	3
	2010	---	---	---	---	9
Western meadowlark	2005	5.23	2.86	9.56	37	133
	2006	5.92	3.72	9.42	28	159
	2007	4.99	2.62	9.50	40	130
	2008	6.92	3.45	13.87	43	169
	2009	8.30	4.14	16.62	42	196
	2010	5.71	3.20	10.21	36	148
Western tanager	2005	0.46	0.16	1.33	72	13
	2006	0.63	0.18	2.13	85	17
	2007	0.85	0.29	2.44	71	25
	2008	0.68	0.21	2.16	79	19
	2009	0.77	0.26	2.29	73	20
	2010	0.50	0.17	1.47	71	13
Yellow-rumped warbler	2005	---	---	---	---	9
	2006	1.60	0.55	4.63	71	22
	2007	1.02	0.39	2.66	63	14
	2008	1.04	0.45	2.36	53	13
	2009	---	---	---	---	8
	2010	---	---	---	---	3

Dashes indicate the sample size was insufficient for estimating density. Priority species are bolded. Sample sizes (n) indicate the number of individuals used in analyses, after truncation—not the number of individual birds actually detected.

Figure 3-4. Estimated densities and population trend of black-billed magpie in sage shrubland habitat within the NCPN, 2005–2010. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

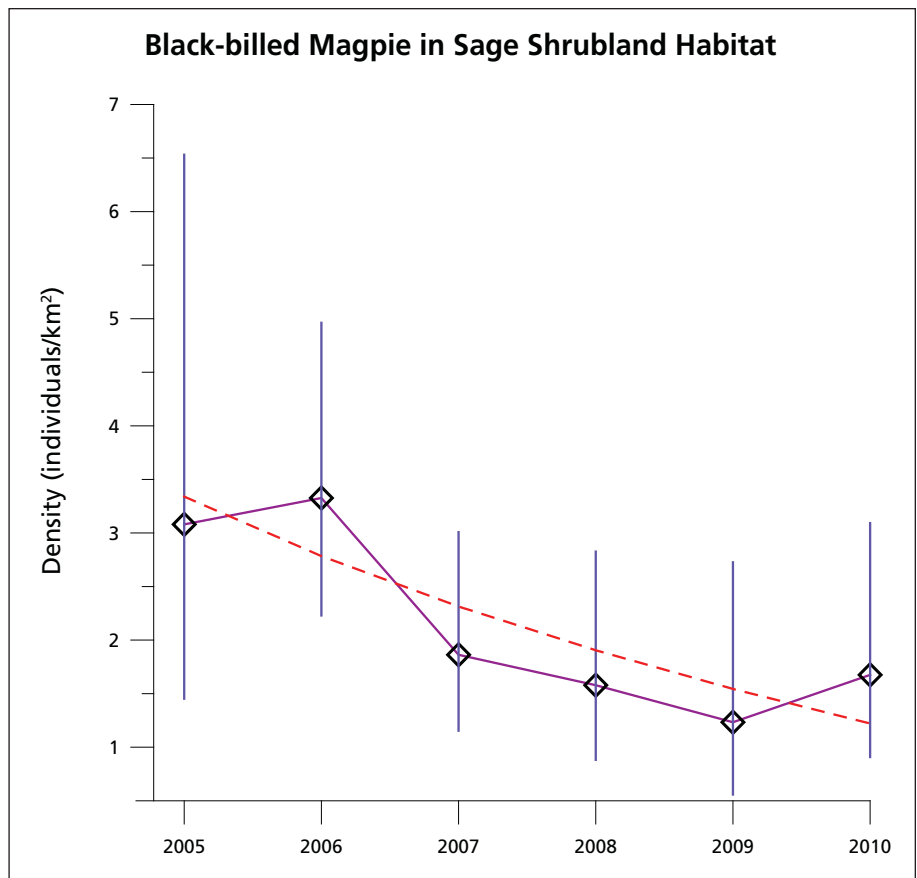
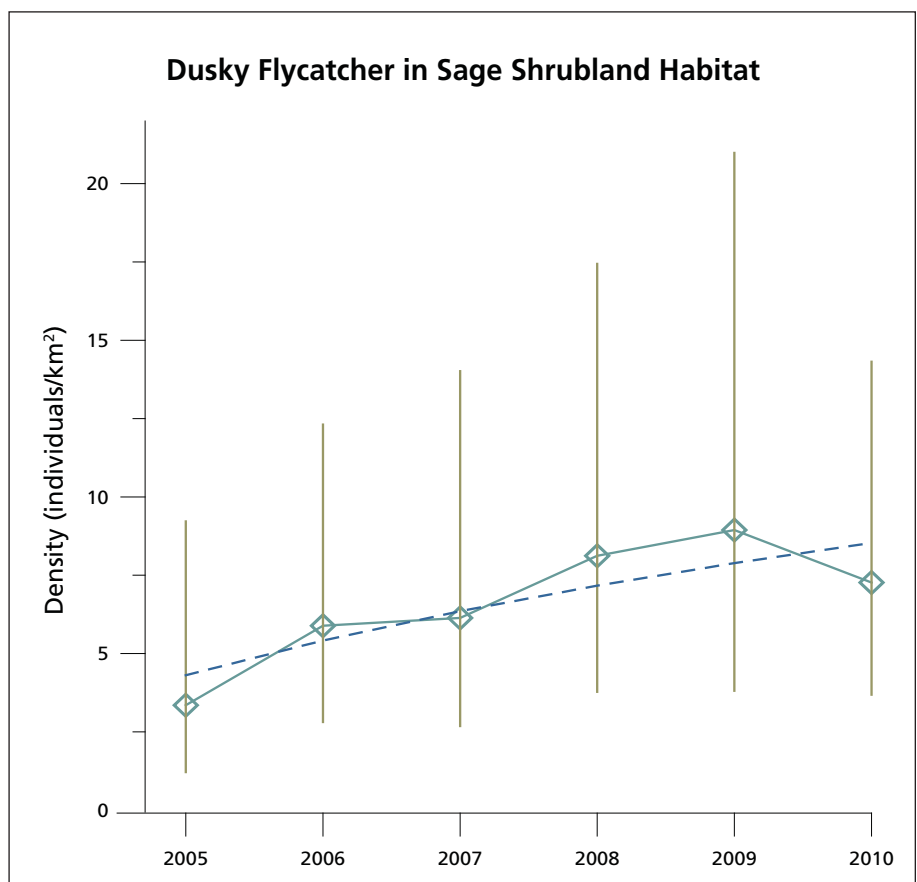


Figure 3-5. Estimated densities and population trend of dusky flycatcher in sage shrubland habitat within the NCPN, 2005–2010. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.



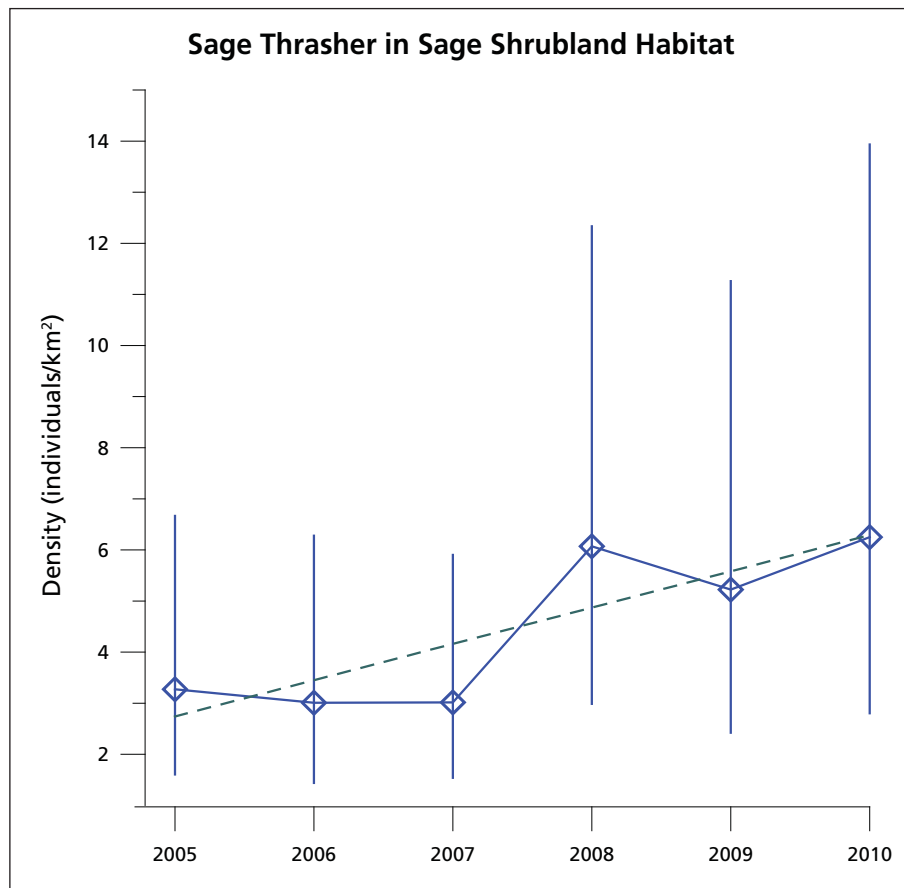


Figure 3-6. Estimated densities and population trend of sage thrasher in sage shrubland habitat within the NCPN, 2005–2010. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

4 Discussion and Recommendations

In Tables 3-3, 3-4, and 3-5, density estimates are provided for data in all years (2005–2010). These tables allow for comparison of the six years' density estimates and, more importantly, provide statistically rigorous estimates for 2005–2009. For most species, each year of additional data will improve RMBO's ability to accurately estimate densities of the species that occupy the NCPN.* The number of species with robust CVs was lower in 2010 than in other years because the overall number of individual birds detected was lower in 2010. A minimum sample size of 10 each year is required in order for density estimates to be calculated for that year.

In this report, for the first time, landbird population trend results were presented for several species of conservation concern in the NCPN. These preliminary results indicated that many sensitive species appear to have stable populations within certain NCPN habitats. In future years of monitoring, close attention should be paid to the six species with notable decreasing and increasing population trends. Bewick's wren and black-billed magpie appear to be experiencing declines. Potential explanations of Bewick's wren declines may be loss of suitable nesting habitat (cavities) and competition with other cavity nesters. Additional investigation of Bewick's wren populations is recommended, as a decline of 50% has been documented over the last six years. Observed declines in black-billed magpie may be related to the effects of West Nile Virus. Christmas Bird Count numbers for black-billed magpie have been particularly low in recent years (Beason, personal communication). Long-term monitoring will continue to be necessary for interpreting population status and trends for avian species of the NCPN.

RMBO has noted that the recorded densities for some species in NCPN habitats were substantially higher than those presented in published literature. This issue seems to apply primarily to bird species that were consistently detected at close distances (or that were difficult to detect at far distances)—typically, species that do not sing loudly or produce sounds that are not detectable from a distance (i.e., blue-gray gnatcatcher

or black-chinned hummingbird). Baltosser and Russell (2000) reported density estimates for black-chinned hummingbird ranging from 17.5 to 82.5 birds/km². In this report, density estimates for black-chinned hummingbird in low-elevation riparian habitat ranged from 156.5 in 2008 to 291.7 birds/km² in 2006. This is one facet of distance sampling that RMBO intends to investigate in the future, with the intent to develop a correction factor to adjust the estimates.

In 2007, the U.S. North American Bird Conservation Initiative (NABCI) monitoring subcommittee outlined recommendations for improving monitoring programs (U.S. NABCIC 2007). First, monitoring programs should integrate an adaptive management approach into the monitoring process to incorporate management and conservation priorities. This goal is not practical for the goals and scope of the NCPN monitoring program; however, it is hoped that trends identified in this early warning program will lead to increased research and projects on species that are experiencing declines. The second recommendation is to coordinate landbird monitoring among organizations and across spatial scales to make monitoring more efficient and effective. RMBO coordinates with a variety of federal, state, and local agencies throughout 12 different states in an effort to monitor landbird populations across a broad region using a spatially balanced study design. Monitoring at different spatial scales is important in understanding population trends (U.S. NABCIC 2007), and the NABCI report recommends using bird conservation regions (BCRs) as a starting point for integrated landbird monitoring. RMBO is now conducting monitoring at the BCR scale throughout Colorado and Wyoming, using a spatially balanced study design. In future years, it is likely that the state of Utah (BCRs 9 and 16) will be included, as well.

In December 2010, RMBO and NCPN staff met to discuss methods for improving statistical design and to review the current design, to ensure it is meeting the network's desired objectives. The spatially balanced study design is more statistically rigorous and would allow RMBO to analyze data at a variety of spatial scales. In 2010, RMBO surveyed three transects within the NCPN utilizing this study design. In larger units, such as Dinosaur National Monument and Canyonlands National Park, the NCPN may adopt this design in the sage shrubland and pinyon-juniper

*The density estimates presented in this report replace the estimates provided in the 2005–2009 reports.

ecotypes. Low-elevation riparian habitat will require special consideration, as a 16-point grid will not adequately sample this habitat. In smaller parks, or parks with substantial amounts of inaccessible terrain, comparable alternative designs will be required. Transitioning NCPN monitoring to a grid-based design would allow the network to compare density estimates of species on their lands to those on surrounding landscapes surveyed by RMBO. This can be achieved by post-stratifying the grid-based transects by primary habitat type and comparing the density estimates. Comparisons of densities may guide the NPS in making key management decisions and assessing the effectiveness of past and existing management practices.

Several new species were detected in 2010, including Eurasian collared-doves at Pipe Spring National Monument. The only other detection of this bird in the NCPN occurred in 2007: a single individual in low-elevation riparian habitat within Capitol Reef National Park. Special attention should be paid to Eurasian collared-doves as they continue to expand their range and population sizes increase (Temple 1992; Hengeveld 1993). Because these birds may compete with mourning doves, careful attention should also be paid to mourning dove populations (Romagosa and McEneaney 1999).

Due to the small sample size, it is likely that an additional 5–7 years of monitoring data will be necessary before RMBO can obtain density estimates for common species at Pipe Spring National Monument (PISP). In addition to the four point-count visits, area searches will be conducted at PISP in 2011, to detect additional species, including nocturnal landbirds, and record breeding observations.

In 2010, 41 priority species were recorded in the NCPN, according to lists provided by the Utah Department of Wildlife Resources, U.S. Fish and Wildlife Service, and Partners in Flight (Appendix B). RMBO provides this information online in the species account section of its Avian Data Center (<http://www.rmbo.org/public/monitoring/>), where users can find information on life history, distribution, density estimates, and graphical representations of density estimates for all species detected. At RMBO's online database (<http://www.rmbo.org/public/monitoring/>), land managers, as well as the general public, can view distribution maps, species counts by project, past monitoring reports, and species accounts. In addition, RMBO is a partner of the Avian Knowledge Network (AKN), whose goal is to (1) compile bird monitoring data from various contributor organizations and organize them into one format and (2) make these data available to land managers, scientists, and the public for decisionmaking, research, and educational purposes.

5 Literature Cited

- Alexander, J. D., J. L. Stevens, G. R. Geupel, and T. C. Will. 2008. Decision support tools: Bridging the gap between science and management. Pages 283–291 in *Proceedings of the Fourth International Partners in Flight Conference: Tundra to Tropics*. February 13–16, 2008, McAllen, Texas.
- American Ornithologists' Union (AOU). 2007. Checklist of North American birds. 7th edition. American Ornithologists' Union, Washington, D.C.
- Baron, J. S., S. H. Julius, J. M. West, L. A. Joyce, G. Blate, C. H. Peterson, M. Palmer, B. D. Keller, P. Kareiva, J. M. Scott, and B. Griffith. 2008. Some guidelines for helping natural resources adapt to climate change. *International Human Dimensions Programme on Global Environmental Change Update* 2:46–52.
- 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., and D. R. Anderson. 2002. *Model selection and multimodel inference: A practical information-theoretic approach*. New York: Springer-Verlag.
- Dreitz, V. J., P. M. Lukacs, and F. L. Knopf. 2006. Monitoring low density avian populations: An example using Mountain Plovers. *Condor* 108:700–706.
- Hanni, D. J., C. M. White, J. A. Blakesley, G. J. Levandoski, and J. J. Birek. 2009. Field protocol for spatially-balanced sampling of landbird populations. Unpublished report. Rocky Mountain Bird Observatory, Brighton, Colorado.
- Hengeveld, R. 1993. What to do about the North American invasion by the collared dove? *Journal of Field Ornithology* 64:477–489.
- Leukering, T., M. Carter, A. Panjabi, D. Faulkner, and R. Levad. 2005. Point transect protocol. Unpublished document. Rocky Mountain Bird Observatory, Brighton, Colorado.
- Lindenmayer, D. B., and G. E. Likens. 2009. Adaptive monitoring: A new paradigm for long-term research and monitoring. *Trends in Ecology and Evolution* 24:482–486.
- Lyons, J. E., M. C. Runge, H. P. Laskowski, and W. L. Kendall. 2008. Monitoring in the context of structured decision-making and adaptive management. *Journal of Wildlife Management* 72:1683–1692.
- Manley, P. N., W. M. Block, F. R. Thompson, G. S. Butcher, C. Paige, L. H. Suring, D. S. Winn, D. Roth, C. J. Ralph, E. Morris, C. H. Flather, and K. Byford. 1993. Guidelines for monitoring populations of neotropical migratory birds on national forest system lands. USDA Forest Service Monitoring Task Group Report, Washington, D.C.
- Marsh, D. M., and P. C. Trenham. 2008. Current trends in plant and animal population monitoring. *Conservation Biology* 22:647–655.
- Partners in Flight. 2005. Species assessment database. <http://www.rmbo.org/pif/pifdb.html>. Accessed November 1, 2010.
- Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. *Partners in Flight North American landbird conservation plan*. Cornell Lab of Ornithology, Ithaca, New York.
- Romagosa, C. M., and T. McEneaney. 1999. Eurasian collared-dove in North America and the Caribbean. *North American Birds* 53:348–353.
- Sauer, J. R. 1993. Monitoring goals and programs of the U.S. Fish and Wildlife Service. Pages 245–251 in D. M. Finch and P. W. Stangel, *Status and management of neotropical migratory birds*. Proceedings of a training workshop, September 21–25, 1993, Estes Park, Colorado. Gen. Tech. Rep. RM-229. Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Fort Collins, Colorado.
- Sauer, J. R., and M. G. Knutson. 2008. Objectives and metrics for wildlife monitoring. *Journal of Wildlife Management* 72:1663–1664.
- Temple, S. A. 1992. Exotic birds: A growing problem with no easy solution. *Auk* 109:395–397.

- Thomas, L., S. T. Buckland, E. A. Rexstad, J. L. Laake, S. Strindberg, S. L. Hedley, J. R. B. Bishop, T. A. Marques, and K. P. Burnham. 2010. Distance software: Design and analysis of distance sampling surveys for estimating population size. *Journal of Applied Ecology* 47:5–14.
- Thompson, W. L., G. C. White, and C. Gowan. 1998. *Monitoring vertebrate populations*. San Diego, Calif.: Academic Press.
- U.S. Fish and Wildlife Service (USFWS). 2008. Birds of conservation concern, 2008. Arlington, Va. <http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf>. Accessed November 1, 2010.
- . 2011. Southwest regional gap analysis project. <http://fws-nmcfwru.nmsu.edu/swregap/default.htm>.
- U.S. North American Bird Conservation Initiative Committee (U.S. NABCIC). 2009. *The state of the birds, United States of America, 2009*. U.S. Department of the Interior, Washington, D.C. http://www.stateofthebirds.org/pdf_files/State%20of%20the%20Birds_FINAL.pdf. Accessed December 1, 2010.
- . 2007. Opportunities for improving avian monitoring. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Va. <http://www.nabci-us.org/>. Accessed November 11, 2010.
- Utah Division of Wildlife Resources (UDWR). 2005. *Utah comprehensive wildlife conservation strategy*. Salt Lake City, Utah. http://wildlife.utah.gov/cwcs/10-01-21_utah_cwcs_strategy.pdf. Accessed November 1, 2010.
- Witmer, G. W. 2005. Wildlife population monitoring: Some practical considerations. *Wildlife Research* 32:259–263.

Appendix A. List of all bird species observed during surveys in the NCPN, with species totals by habitat for 2010, and yearly species totals from 2005 to 2010.

Species	# of individuals observed per habitat, 2010				# of individuals observed per year and total (all habitats), 2005–2010						
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	Total
American crow			2		10	1	2	4	2	2	21
American dipper					1	1	1	2	1		6
American goldfinch	27	4	3		10	4	9	7	8	34	72
American kestrel	2		11		10	10	11	9	9	13	62
American robin	28	17	55		100	154	144	129	64	100	691
Ash-throated flycatcher	222	130	19	13	300	412	357	357	442	384	2,252
Bank swallow	1						2	1		1	4
Barn swallow					1	2	3	1	2		9
Belted kingfisher							1				1
Bewick's wren	20	28	2		237	306	197	205	219	50	1,214
Black phoebe	6			4	10	15	28	12	32	10	107
Black-billed magpie		5	69		77	108	53	52	52	74	416
Black-capped chickadee	1				1	4	4		2	1	12
Black-chinned hummingbird	23	22	8		50	67	52	52	104	53	378
Black-chinned sparrow		4			9	6	4		12	4	35
Black-headed grosbeak	17	7	10	4	27	54	37	37	46	38	239
Black-throated gray warbler	61	341	18		393	551	455	566	627	420	3,012
Black-throated sparrow	74	83	10	16	113	171	193	151	334	183	1,145
Blue grosbeak	3				14	32	6	6	35	3	96
Blue-gray gnatcatcher	190	174	59	1	340	302	291	332	493	424	2,182
Blue-winged teal					1						1
Brewer's blackbird	2	3	24		10	48	23	10	30	29	150
Brewer's sparrow	6	6	639	1	584	635	593	535	710	652	3,709
Broad-tailed hummingbird	28	35	15		68	30	46	75	29	78	326
Brown-headed cowbird	8	7	8	4	39	70	50	47	56	27	289
Bullock's oriole	19	6	1	8	7	30	19	13	20	34	123
Bushtit		11			67	93	33	24	61	11	289
California gull					3	3					6
Canada goose	3		5		6	6	20	9	5	8	54
Canyon wren	4	3			52	103	70	36	58	7	326
Cassin's finch		3	1		4	38	14	13	2	4	75
Cassin's kingbird						1			19		20
Cedar waxwing							1	1	1		3
Chipping sparrow	40	119	113		153	152	186	213	245	272	1,221

Appendix A. List of all bird species observed during surveys in the NCPN, with species totals by habitat for 2010, and yearly species totals from 2005 to 2010, cont.

Species	# of individuals observed per habitat, 2010				# of individuals observed per year and total (all habitats), 2005–2010						
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	Total
Chukar	1	2				3	3		2	3	11
Clark's nutcracker		5	2		16	24	26	17	24	7	114
Cliff swallow			5		50	36	15	6		5	112
Common merganser					1	2	7	4	1		15
Common nighthawk	1	11	2		2	1	1	2	6	14	26
Common poorwill		1	1		1	1	1			2	5
Common raven	50	85	48	9	116	134	176	135	131	192	884
Common yellowthroat	15		1		13	30	27	9	31	16	126
Cooper's hawk	10	5			15	17	14	5	8	15	74
Cordilleran flycatcher	3				4	1	2	3	3	3	16
Dark-eyed junco		2	1		38	18	45	35	4	3	37
Downy woodpecker	1				5	11	3	7	15	1	42
Dusky flycatcher	2	21	75		51	111	98	136	108	98	602
Dusky grouse					1		1				2
Eared grebe									1		1
Eurasian collared-dove				19			1			19	20
European starling	1		6	1	9	16	8	10		8	51
Evening grosbeak							1				1
Ferruginous hawk			1							1	1
Gadwall					1	1	3				5
Gambel's quail				15	9	15		1	7	15	47
Golden eagle					7	10	4	6	1		28
Grace's warbler		12	7		15	31	39	31	26	19	161
Gray flycatcher	40	158	29		160	116	108	142	256	227	1,009
Gray vireo	7	148	9		136	128	104	150	252	164	934
Great blue heron			6		9	3	3	3	1	6	25
Great horned owl		1			2			1		1	4
Greater sage-grouse					7	2	1				10
Green-tailed towhee	4	3	213		346	462	364	302	330	220	2,024
Green-winged teal						1					1
Hairy woodpecker	8	9	4		13	21	21	16	26	21	118
Hammond's flycatcher							9	9	19		37
Hermit thrush	1	12	1		15	21	2		24	14	76
Horned lark			32		31	39	43	23	47	32	215
House finch	149	141	25	42	234	336	423	416	506	357	2,272
House sparrow				1						1	1
House wren	30	6	12		59	61	39	55	57	48	319
Indigo bunting						1			6		7
Juniper titmouse	18	166	6	2	130	112	135	156	251	192	976

Appendix A. List of all bird species observed during surveys in the NCPN, with species totals by habitat for 2010, and yearly species totals from 2005 to 2010, cont.

Species	# of individuals observed per habitat, 2010				# of individuals observed per year and total (all habitats), 2005–2010						
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	Total
Killdeer			1		4	3	2	2	5	1	17
Lark sparrow	8	20	101	1	131	146	101	50	168	130	726
Lazuli bunting	189	3	55		183	155	223	186	275	247	1,269
Lesser goldfinch	36	13		1	38	67	106	75	159	50	495
Lincoln's sparrow					1			2	1		4
Loggerhead shrike		2	2		3	1		1		4	9
Long-eared owl						2					2
Lucy's warbler	7				1		11	20	39	7	78
Macgillivray's warbler	1	1	9		3	9	3	4	7	11	37
Mallard	2				2	15	2	11	3	2	35
Mountain bluebird	3	48	93		149	134	157	111	109	144	804
Mountain chickadee		6	2		34	22	24	14	25	8	127
Mourning dove	121	197	104	6	411	536	499	393	270	428	2,537
Northern flicker	7	24	41		48	57	58	22	50	72	268
Northern goshawk								1			1
Northern harrier	2		6		2	4	5	6	2	8	27
Northern mockingbird		19	5	8		25	11	17	37	32	122
Northern rough-winged swallow	2		3	3	6	6	2	6	16	8	44
Northern shoveler							2				2
Olive-sided flycatcher					16	4	4	2	18		44
Orange-crowned warbler	1	1			2	2	2	2		2	10
Osprey					1			1			2
Peregrine falcon	2	4		1	4	5	7	10	3	7	36
Phainopepla									3		3
Pine siskin	4	11	3		4	15	4	15	15	18	71
Pinyon jay	1	141	21		75	106	123	50	79	163	596
Plumbeous vireo	88	106	22		147	165	138	131	148	216	945
Prairie falcon	1				2			2	1	1	6
Pygmy nuthatch		4	3		10	7	12	5	10	7	51
Red crossbill		2	4		1	11	4		19	6	41
Red-breasted nuthatch		1			11	5	7	1	2	1	27
Red-naped sapsucker						2		1	2		5
Red-tailed hawk	1	2	2		12	17	10	9	12	5	65
Red-winged blackbird	1			1		4	1	1	1	2	9
Ring-billed gull							2				2
Rock pigeon		2			2	5	3			2	12
Rock wren	97	78	77	4	315	403	348	303	417	256	2,042
Ruby-crowned kinglet	7	3			4	4	3	9	11	10	41

Appendix A. List of all bird species observed during surveys in the NCPN, with species totals by habitat for 2010, and yearly species totals from 2005 to 2010, cont.

Species	# of individuals observed per habitat, 2010				# of individuals observed per year and total (all habitats), 2005–2010						
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	Total
Sage sparrow			10		43	32	31	21	37	10	174
Sage thrasher			150		92	93	88	155	128	150	706
Sandhill crane						1		1	1		3
Savannah sparrow						1	1				2
Say's phoebe	42	25	21	3	101	97	63	95	121	91	568
Scott's oriole							1	5	6		12
Sharp-shinned hawk						1	1	1			3
Short-eared owl						3			1		4
Song sparrow	8	1	1		60	75	69	61	33	10	308
Spotted sandpiper	4		4		1	2	7		3	8	21
Spotted towhee	337	111	95		428	609	499	405	528	543	3,012
Steller's jay		1	8		5	5	16	9	5	9	49
Summer tanager									1		1
Swainson's thrush									1		1
Townsend's solitaire		8	4		5	6	12	6	18	12	59
Tree swallow			2		3	20	20	25	2	2	72
Turkey vulture	5	10	3		19	23	16	8	18	18	102
Veery						1					1
Vesper sparrow	3	31	565		379	492	484	473	477	599	2,904
Violet-green swallow	124	34	21	4	194	320	265	204	276	183	1,442
Virginia's warbler	32	61	27		121	109	102	154	46	120	652
Warbling vireo	22	1	9		44	58	61	51	37	32	283
Western bluebird	1	5	3		15	14	15	17	22	9	92
Western grebe						1					1
Western kingbird	3	3	5	13	2	4	1	6	24	24	61
Western meadowlark	7	21	199		227	239	182	213	276	227	1,364
Western screech-owl					1						1
Western scrub-jay	20	51	8	1	86	87	71	78	55	80	457
Western tanager	19	17	17	2	44	69	72	59	45	55	344
Western wood-pewee	17		11		40	44	64	42	56	28	274
White-breasted nuthatch	2	22	3		27	27	30	17	22	27	150
White-crowned sparrow	3					6	4	7	2	3	25
White-faced ibis					1						1
White-throated swift	103	64	16		271	286	376	200	236	183	1,552
Wild turkey	6				2	7	1	4	7	6	27
Williamson's sapsucker					1		1	1			3
Willow flycatcher					1	3	3		1		8
Wilson's warbler	6					4		3	3	6	16
Yellow warbler	238	1	8	5	157	175	155	181	273	252	1,193

Appendix A. List of all bird species observed during surveys in the NCPN, with species totals by habitat for 2010, and yearly species totals from 2005 to 2010, cont.

Species	# of individuals observed per habitat, 2010				# of individuals observed per year and total (all habitats), 2005–2010						
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	Total
Yellow-billed cuckoo					1						1
Yellow-breasted chat	78	1	10		52	57	54	48	72	89	372
Yellow-rumped warbler	57	9	3		26	65	32	49	14	69	324

Habitats: LR=Low-Elevation Riparian; PJ=Pinyon-Juniper; SA=Sage Shrubland; PISP=Pipe Spring National Monument. Priority species are bolded. Numbers do not include low-density species detections (birds that are detected between points).

Appendix B. Priority species observed on transects in the NCPN from 2005 to 2010, with conservation and management designations and species totals per habitat.

Species	UDWR ¹	Species management designation					Number of individuals observed per habitat, 2005–2010			
		USFWS ²			Partners In Flight ³		LR	PJ	SA	PISP
		BCR 10	BCR 16	Region 6	BCR 10	BCR 16				
American dipper						RS	6			
Bewick's wren				BCC			437	746	26	5
Black-billed magpie						RS	4	11	401	
Black-chinned sparrow						CC	16	18	1	
Black-throated gray warbler	Tier III					RC	458	2379	175	
Black-throated sparrow						RC	500	488	116	41
Brewer's sparrow	Tier III	X	X			CC, RC	23	69	3616	1
Broad-tailed hummingbird	Tier III					RS	84	98	144	
Canyon wren						RC	224	96	4	2
Cassin's finch		X	X	BCC		RC, CS, RS	5	43	27	
Clark's nutcracker						CS, RS	2	52	60	
Common nighthawk						RC	2	21	3	
Cordilleran flycatcher						RS	13	3		
Dusky flycatcher						CS, RS	28	175	399	
Dusky grouse						CC, RC			2	
Ferruginous hawk	Tier II	X	X	BCC		RC			1	
Gambel's quail	Tier III						1	22	2	22
Golden eagle			X	BCC		RC	3	12	13	
Grace's warbler			X			CC, RC	3	93	65	
Gray vireo	Tier III		X	BCC		CC, RC, RS	162	721	48	3
Greater sage-grouse	Tier II					CC, RC, CS, RS			10	
Green-tailed towhee						CS, RS	21	74	1929	
Hammond's flycatcher						RS		32	5	
Juniper titmouse			X			RC, RS	195	741	33	7
Lazuli bunting						RS	1,049	57	163	
Loggerhead shrike		X		BCC		RC	1	4	4	
Lucy's warbler	Tier III						78			
Mountain bluebird						RC, CS, RS	37	279	488	
Northern goshawk	Tier I					RC, RS			1	
Northern harrier						RC	5		22	
Olive-sided flycatcher		X				CC, RC	1	8	35	

Appendix B. Priority species observed on transects in the NCPN from 2005 to 2010, with conservation and management designations and species totals per habitat, cont.

Species	UDWR ¹	Species management designation					Number of individuals observed per habitat, 2005–2010			
		USFWS ²			Partners In Flight ³		LR	PJ	SA	PISP
		BCR 10	BCR 16	Region 6	BCR 10	BCR 16				
Osprey	Tier III							1	1	
Peregrine falcon	Tier III	X		BCC			20	10	3	3
Pine siskin						RC, RS	27	20	24	
Pinyon jay			X	BCC	CC	CC, RC, CS, RS	16	506	74	
Plumbeous vireo						RS	457	404	84	
Prairie falcon				BCC		RC	2		4	
Pygmy nuthatch						RC		24	27	
Red crossbill					RS			10	31	
Red-naped sapsucker					CS, RS		4		1	
Rock wren						RS	693	697	641	11
Sage sparrow	Tier III	X		BCC		RC	3		171	
Sage thrasher	Tier III	X		BCC				1	705	
Say's phoebe						RS	332	121	104	11
Short-eared owl	Tier II			BCC	CC				4	
Townsend's solitaire					RS		3	37	19	
Veery			X						1	
Violet-green swallow						RS	976	312	149	5
Virginia's warbler	Tier III					CC, RC, RS	236	249	167	
Warbling vireo						RS	196	16	71	
Western bluebird						RS	20	28	44	
White-throated swift					CC	CC, RS	871	582	92	7
Williamson's sapsucker	Tier III	X			CS, RS	CS, RS		1	2	
Willow flycatcher	Tier I	X	X	BCC	CC, RS	CC, RC	7	1		
Yellow-billed cuckoo	Tier I	X	X				1			

Habitats: LR=Low-Elevation Riparian; PJ=Pinyon-Juniper; SA=Sage Shrubland; PISP=Pipe Spring National Monument.

¹ UDWR=Utah Division of Wildlife Resources, Tier X= Utah Comprehensive Wildlife Conservation Strategy Tier X Species of Greatest Conservation Need (Utah Division of Wildlife Resources 2005)

² USFWS=U.S. Fish and Wildlife Service, BCR10=Bird Conservation Region 10 (Northern Rockies), BCR 16=Bird Conservation Region 16 (Southern Rockies/Colorado Plateau) BCC=Bird of Conservation Concern for Region 6 (Mountain-Prairie Region) (U.S. Fish and Wildlife Service 2008).

³ Partners In Flight, BCR10=Bird Conservation Region 10, BCR 16=Bird Conservation Region 16, CC=Continental Concern Species, RC=Regional Concern Species, CS=Continental Stewardship Species, RS = Regional Stewardship Species (Partners in Flight 2005).

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