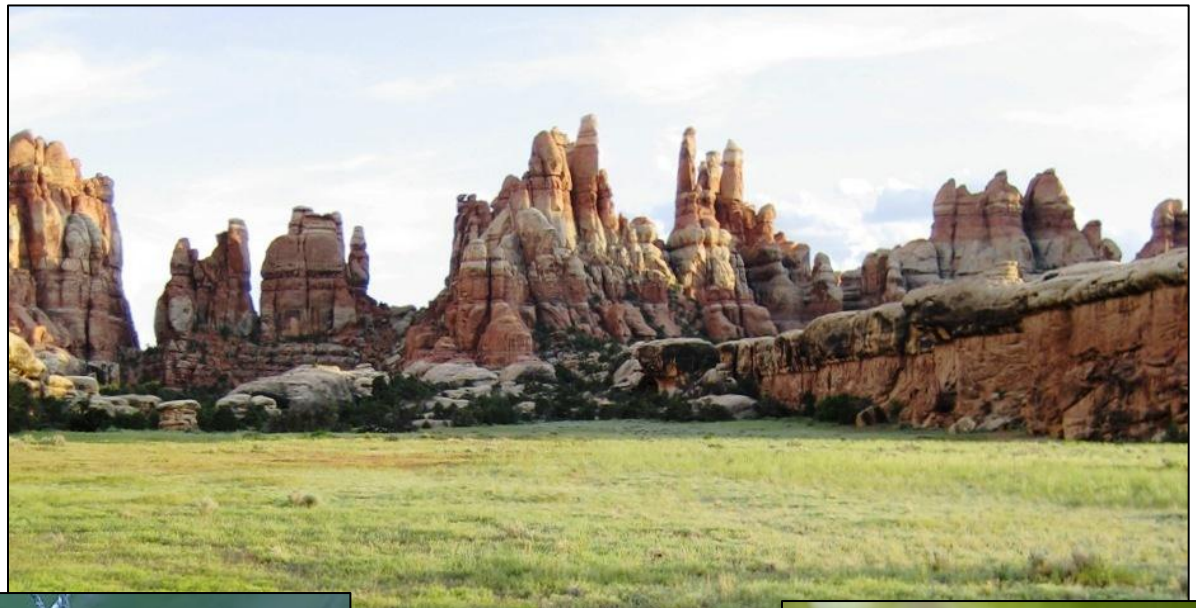
Monitoring Birds of the National Park Service, Northern Colorado Plateau Network (NCPN): 2011 Field Season Report



March 2012

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Tech. Report # SC-NPS-NCPN-11-01

ROCKY MOUNTAIN BIRD OBSERVATORY

***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.*

Suggested Citation:
Fogg, J. A. 2012. *Monitoring the Birds of the National Park Service, Northern Colorado Plateau Network: 2011 Field Season Report.* Tech. Rep. SC- NCPN-NPS-11-01. Rocky Mountain Bird Observatory, Brighton, Colorado, USA.

***Cover Photo**:* Canyonlands National Park by Jeff Birek, Lazuli Bunting by Bill Schmoker, and Black-chinned Sparrow by Gerry Dewaghe. Used with permission.

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EXECUTIVE SUMMARY

In 2011, the Rocky Mountain Bird Observatory, in cooperation with its partner, the National Park Service, completed its seventh year of a habitat-based landbird monitoring program in the Northern Colorado Plateau Network. 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 (US North American Bird Conservation Initiative Monitoring Subcommittee 2007).

We surveyed 45 transect locations within 11 National Park units, placing 15 transect locations in each of the three habitats of interest: Low-Elevation Riparian, Pinyon-Juniper, and Sage Shrubland. To increase sample size, we surveyed all transect locations twice during the breeding season. We also conducted four point counts twice and four area searches at Pipe Springs National Monument using a modified monitoring design.

This year we completed 100% of the assigned surveys with 94 transect visits between 7 May and 7 July. We recorded 9,799 birds of 115 species. We detected 3,146 birds of 85 species in Low-Elevation Riparian, 2,977 birds of 78 species in Pinyon-Juniper, and 3,676 birds of 91 species in Sage Shrubland. We detected a total of 289 birds of 33 species in Pipe Springs National Monument. We recorded one new species (Bobolink) at Dinosaur National Monument.

We pooled the 2005-2011 data to generate density estimates for species with greater than 80 independent detections across years. This year we calculated density estimates for 57 species in at least one habitat. The data yielded robust density estimates (Coefficient of Variation, CV < 50%) for 40 species in 2011. We should be able to reach our target of detecting a population change of at least 3% within 30 years for these 40 species. We recorded 44 bird species that are of conservation or management concern throughout the Northern Colorado Plateau Network. We calculated density estimates for 24 of these species.

Following recommendations by Thomas et al. (2010), we increased the minimum number of detections used to estimate densities from 60 to 80 since we now have 7 years of data. This results initially in fewer species with density estimates but will provide more reliable estimates over time.

With the NCPN program in its seventh year, we conducted a second year of trend analyses for those 25 of 44 species of conservation or management concern. Separate analyses were performed for each habitat. Significant trends were detected for 12 species. Several species differed from the 2010 trend analyses results, including Black-billed Magpie in Sage Shrubland habitat which went from a negative trend in 2010 to a quadratic trend in 2011. Bewick's Wren continues to decline in Pinyon-juniper. Long-term monitoring will be necessary for interpreting population status and trends for avian species of NCPN.

ACRONYMS

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

ACKNOWLEDGEMENTS

The National Park Service funded this project through a cooperative agreement with the Rocky Mountain Bird Observatory. This report fulfills requirements in Rocky Mountain Bird Observatory's contracts with the National Park Service, Northern Colorado Plateau Network agreement number J2118100015/RMBCP-16.

We thank Dusty Perkins of the National Park Service for logistical assistance before, during, and after the field season. We thank the superintendents, resource managers, and biologists in the individual parks for providing us with research permits, allowing us access into the backcountry of the parks, and assisting with logistics. Thank you to our 2011 crew of field biologists: Glenn Giroir, Scott Schuette and Leah Smith who spent many weeks in the field, sometimes under difficult conditions, conducting transects and collecting data. We thank our IT staff for their work on the RMBO database and data entry and management system, Jennifer Blakesley for providing her expertise in statistical analysis, Nick Van Lanen for conducting the trend analyses in program SAS and RMBO staff for their careful review of this report.

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INTRODUCTION

Program History

In 2011, Rocky Mountain Bird Observatory (RMBO), in cooperation with its partner, the National Park Service (NPS), completed the seventh 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 in 11 National Parks in Colorado, Utah and Wyoming. We also sampled Pipe Spring National Monument (PISP), Arizona for the third year using a modified monitoring design. 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 efforts to develop long-term natural resource monitoring plans for its park units. Modeled after our 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 (US North American Bird Conservation Initiative Monitoring Subcommittee 2007).

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) as well as 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, US North American Bird Conservation Initiative Committee 2009). Population monitoring helps to achieve the intent of legislation such as the Migratory Bird Treaty Act (1918), National Environmental Policy Act (1969), Endangered Species Act (1973), the National Forest Management Act (1976) and various state laws (Manley et al. 1993, Sauer 1993).

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, 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 the most important focus areas for the conservation of each species. This process applies quantitative rule sets to data on population size, distribution, trends, threats, and regional abundance of birds to rank species in terms of 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.

This RMBO landbird monitoring program is 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. We calculated an 80% probability of detecting a minimum population change rate of 3.0% per year in 30 years, with a Type I error rate of 10% to provide long-term status and trend estimates for landbirds in those habitats. After establishing this monitoring framework, we anticipate these data will prompt additional research to determine possible reasons for observed changes and enable better informed management decisions.

We maintain a high quality online database of raw and summarized data that is accessible to collaborators and the public. We 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.

METHODS

Study Area

In 2005, the NPS selected three habitats in which to implement landbird monitoring in the NCPN – Low-Elevation Riparian (LR), Pinyon-Juniper (PJ), and Sage Shrubland (SA). A panel of NPS resource managers selected these habitats because they represent distinct bird communities and are each associated with park management questions. During the spring and summer of 2005, RMBO staff established 45 transect locations (15 in each habitat, Figures 1-3). In 2009, we added four point count locations and area inventories at Pipe Springs National Monument (Figure 4).

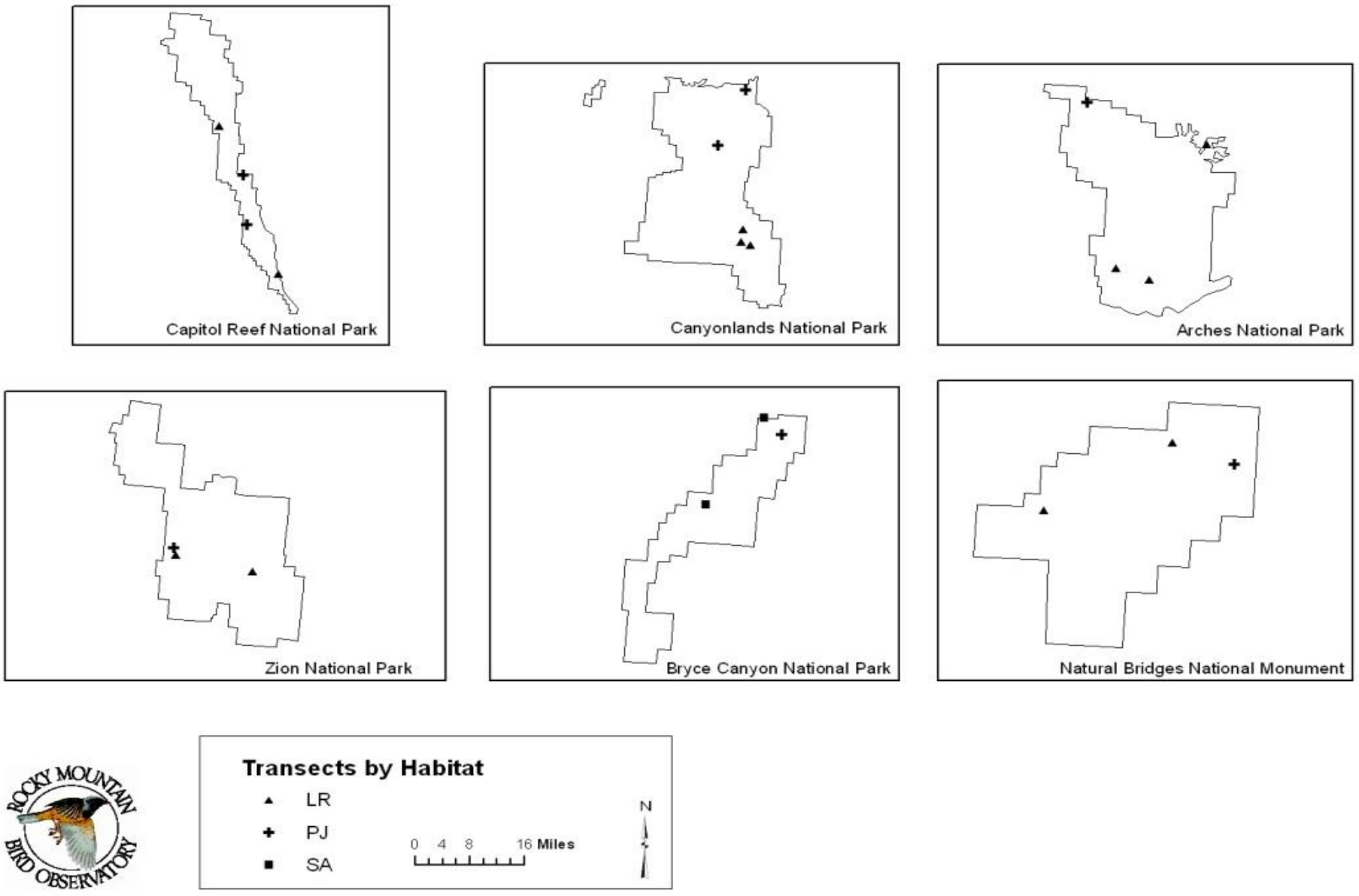

Figure 1. Utah transect locations by habitat within the Northern Colorado Plateau Network.

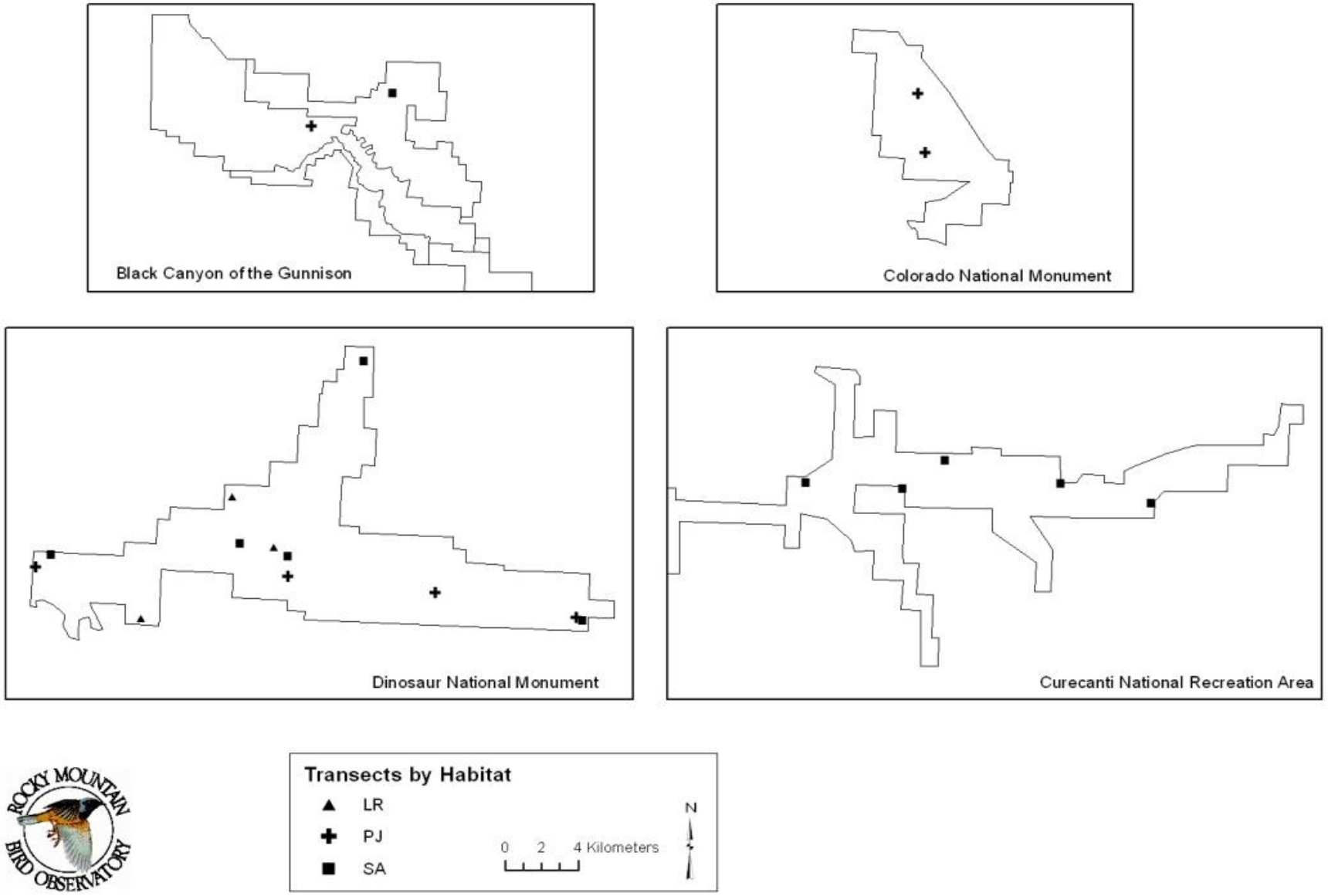

Figure 2. Colorado transect locations by habitat within the Northern Colorado Plateau Network.

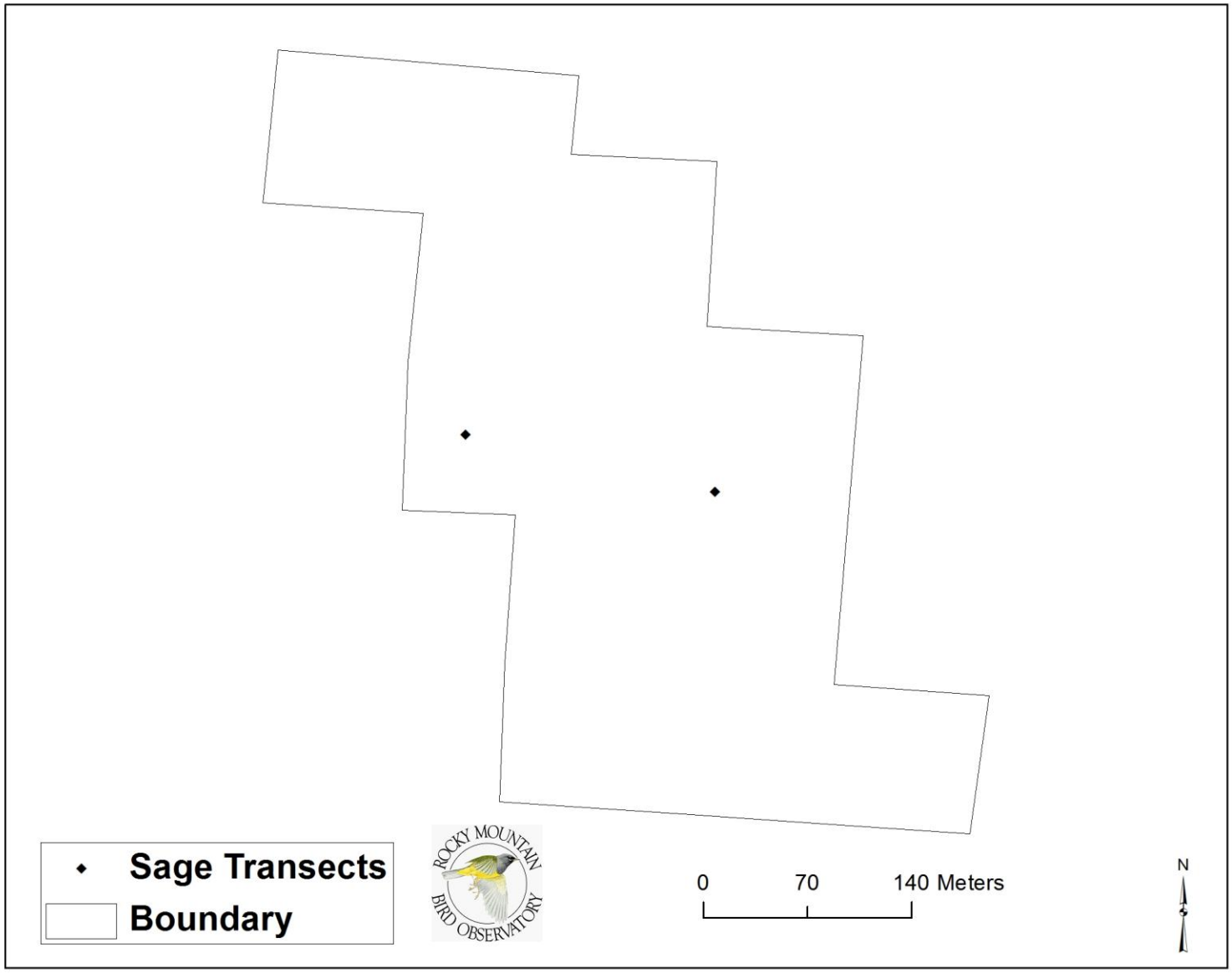

Figure 3. Fossil Butte (Wyoming) National Monument transect locations within the Northern Colorado Plateau Network.

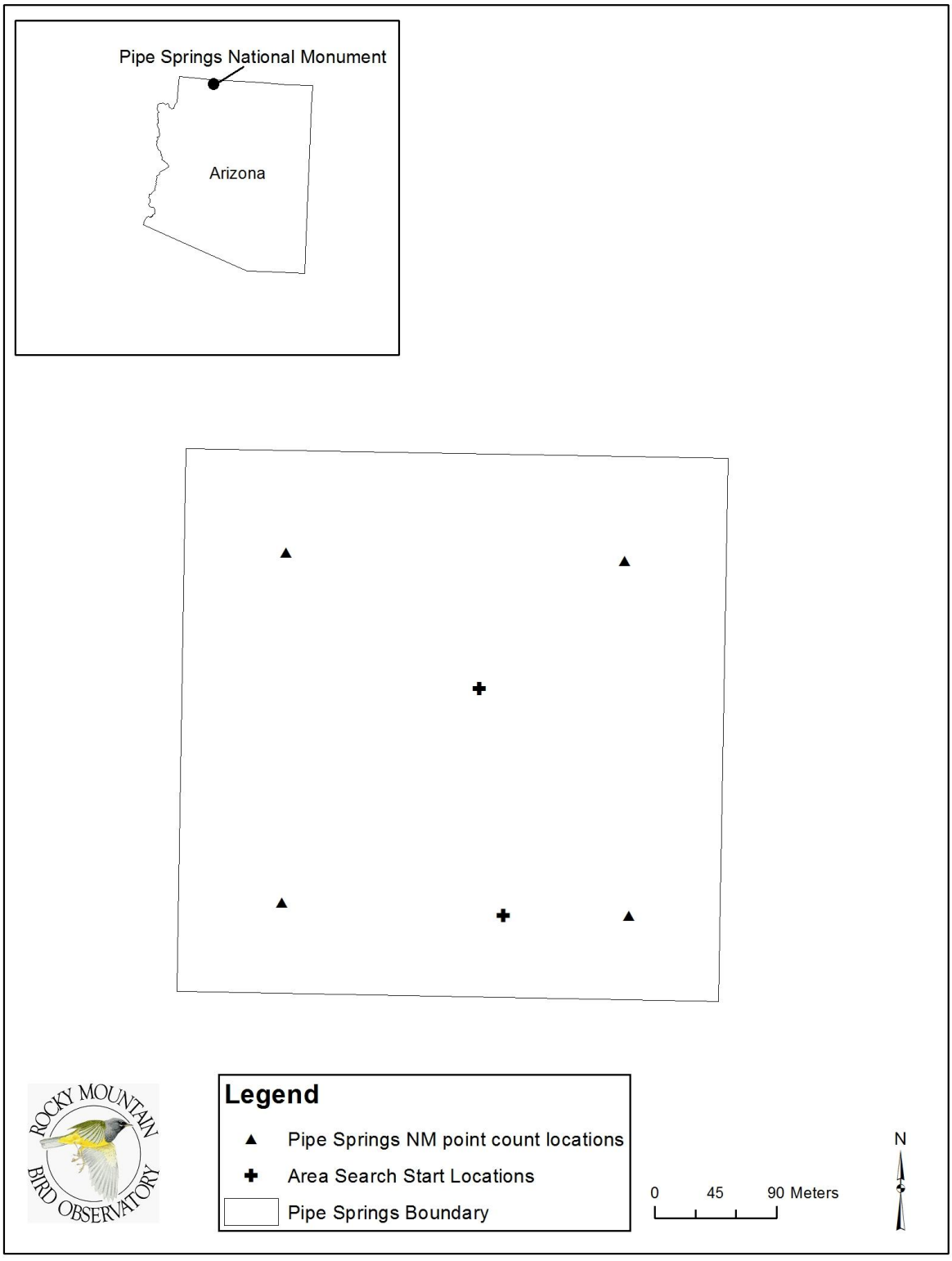

Figure 4. Pipe Springs National Monument (Arizona) survey locations within the Northern Colorado Plateau Network.

Low-Elevation Riparian (LR)
This habitat comprises mostly scattered stands of Fremont cottonwood (*Populus fremontii*) and boxelder (*Acer negundo*) along perennial streams, sometimes within deeply-cut canyons. Tamarisk (*Tamarix spp*), also known as saltcedar, is an exotic species that has invaded much of the LR 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 (PJ)
Pinyon-Juniper typically occurs at elevations just above semidesert shrubland habitat, typically above 1500m. PJ is present on most of the ridges and mesas, and is the most extensive habitat, in the NCPN. Pinyon pine (*Pinus edulis*) and juniper (*Juniperus* spp.) are the dominant species in this habitat, and depending on the site may have a significant sage component. Their relative abundance and composition vary significantly in PJ habitat.

Sage Shrubland (SA)
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*).

Pipe Springs National Monument (PISP)
There are four point count stations in a mixture of pinyon-juniper, low-elevation riparian and semidesert shrubland habitats in PISP. Semidesert shrubland habitats are dry landscapes containing shrubs, but lacking a co-dominant grass component. Dominant shrubs may include sagebrush, greasewood, barberry and saltbush. The ground cover layer is typically dominated by bare ground and rock with limited forbs and grasses present.

Field Personnel
The RMBO field staff in 2011 consisted of three experienced biologists with excellent aural and visual bird-identification skills. All three previously surveyed for RMBO in past years. Biologists completed a five day training program at the beginning of the season to ensure full understanding of the field protocol.

Site Selection
The NPS and RMBO selected survey sites LR, PJ, and SA during the winter of 2005. For PJ and SA habitat, we used GIS and the Southwest Regional Re-GAP Analysis Project (Lowry et al. 2005) to randomly select the sites from a pool of habitat "stands" that were large enough to accommodate transects. We excluded areas with >50% slope from the list of potential sites to ensure that selected stands could be accessed safely on foot. For LR survey sites, we limited our options to crossable streams excluding the Colorado, Green, Gunnison, and Virgin Rivers. Since there is a limited amount of riparian habitat, we manually selected survey locations; RMBO staff ground-proofed riparian stands and established transects in 2005. While ground-proofing, we found that a few of the stands did not actually fit the selection criteria. In these cases, we chose replacement stands following the same conditions. We have surveyed these same locations every season since 2005. Point count and area search locations at PISP were placed in each distinct habitat represented in the monument as previously described, with attention paid to ensure locations were spaced at least 250m apart. Area search start locations were selected in order to efficiently cover all areas of the monument.

Sampling Design

We sampled landbird populations in each habitat following the protocol established by Leukering (Revised 2005) and modified by Hanni et al (2011). We surveyed all transects between a half-hour before sunrise and 11 AM. We conducted up to 15 five-minute point counts at stations located at 250m intervals along each transect. In order to increase our sample size, we surveyed each of the 45 transect locations twice during the summer; each visit was on a separate day. At each point, we recorded all birds detected during the five-minute point count. For every bird detected during a point count, we recorded species, sex, horizontal distance from the observer, the minute we detected each bird, and the type of detection (e.g., call, song or visual). Observers measured horizontal 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 rare or difficult to detect species encountered while traveling between points (e.g., woodpeckers, owls, raptors). We considered all non-independent detections of birds, as part of a 'cluster' rather than as separate independent observations (i.e., flocks or pairs of conspecific birds together in close proximity).

At the start and end of each transect, we recorded time, temperature, percent cloud cover, precipitation type, and estimated the Beaufort scale wind-speed category. We measured distances between points using hand-held Global Positioning System (GPS) units. We recorded all GPS data in Universal Transverse Mercator (UTM) North American Datum 1983 (NAD 83). At each point, we recorded UTM coordinates, habitat information (within a 50m radius), and distance from a road (if within 100m). For habitat information, we recorded the structural stage as well as types, relative abundance, percent coverage, and mean height of trees, shrubs, and groundcover. If there was a distinct tree sub-canopy present, we recorded the species of trees. We recorded these data prior to beginning each point count.

At PISP, the point count portion of surveys used the above protocol. This year we further refined the monitoring at PISP to include diurnal and nocturnal area searches because the small size of the monument makes it feasible to record species that may be missed by traditional point count methods as well as breeding data of individuals. A total of four 20 minute area searches of the entire monument were conducted this year. Two diurnal area searches was conducted upon completion of the four point counts on separate dates, and two nocturnal area searches covering the same areas were conducted beginning at dusk and concluding after 20 minutes. The observer continuously walked the monument, tallying all individual birds heard and seen along with information on any breeding or flocking behavior. Start location UTM coordinates, start and end times and weather information were also recorded.

Data Analysis

Distance analysis

We used the analysis software Distance 6.0 (Thomas et al. 2010) to estimate detection probabilities using our point count data. Analysis of distance data is accomplished 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., a bird's size, color, movement, volume or frequency of song), the sampling landscape (e.g., density of vegetation), 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=0m) 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 estimated densities of species for which we obtained at least 80 independent detections within a habitat across all years. We excluded birds flying over and not using the immediate surrounding landscape and birds detected between points from analyses. We fit a half normal key function, uniform function and hazard rate key function with cosine series expansions and a hazard rate key function with simple polynomial series expansion to the distribution of distances for each species (Buckland et al. 2001). We used Akaike's Information Criterion (AIC) corrected for small sample size (AICc) and model selection theory to select the most parsimonious detection function for each species (Burnham and Anderson 2002). We estimated variance in program Distance using bootstrapping of transects within strata rather than using empirical estimates. Empirical methods 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 (A.O.U.) Check-list of North American Birds, Seventh Edition (2007).

Trend Detection

We modeled observed trends in populations of all species of conservation concern (Appendix B) in each habitat using data from all years (2005-2011). We used weighted regression and Information-Theoretic model selection (Burnham and Anderson 2002). For each species four different functions were modeled using Proc REG in program SAS (SAS Institute 2007): no trend (intercept only model), linear trend, quadratic trend, and log-linear (pseudo-threshold) trend. We used Akaike's Information Criterion (AIC) corrected for small sample size (AICc) to select the most parsimonious trend model for each species (Burnham and Anderson 2002). Input data were density estimates and their variances, with the inverse of the CV 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. Trend detection was performed in 2010 as well, but the number of detections used in analysis changed in 2011 due to new truncations used in Distance analyses.

RESULTS

In 2011, the seventh year of RMBO landbird monitoring in the NCPN, 1,233 point counts were conducted along 45 transects (all transect locations were surveyed twice) in three habitats between May 7 and July 7, 2011 (Table 1). Ninety-one percent of the point counts were completed (1233 out of 1350). Some point counts were not completed because of weather (wind, rain or heat - 76 points), poor GPS reception along the canyons of the low-elevation riparian transects (17 points), and rivers that could not be safely crossed (24 points).

Table 1. Bird sampling periods and effort in each habitat in the Northern Colorado Plateau Network, 2011.

Habitat	Dates Sampled	# Transects*	# Point Counts
Low-Elevation Riparian	May 10 - June 30	15	408
Pinyon-Juniper	May 07 - July 1	15	390
Sage Shrubland	May 14 - July 7	15	435
All habitats	**May 07– July 7**	**45**	**1,233**

*Technicians attempted to survey all transect locations twice.

Excluding between point detections of low density species, we recorded 9,799 birds of 115 species (Table 2, Appendix A). We detected 3,146 birds of 85 species in Low-Elevation Riparian, 2,977 birds of 78 species in Pinyon-Juniper, and 3,676 birds of 91 species in Sage Shrubland. One new species, a female Bobolink was recorded at Dinosaur National Monument on May 24. This bird was likely a migrant.

We detected a total of 289 birds of 33 species during surveys in Pipe Springs National Monument. We detected 119 birds of 28 species during point counts and 170 birds and five additional species that had not been previously detected with the previous monitoring efforts during the nocturnal and diurnal area searches of the monument: Black Phoebe (confirmed nesting), Bewick's Wren, Lazuli Bunting, Common Poorwill and Great Horned Owl. .

This year we calculated density estimates for 57 species in at least one habitat. These 57 species represent 50% of species detected on transects in the NCPN during 2011 and 91% of birds observed on transects during 2011. The habitat-stratified data yielded robust density estimates (CV < 50%) for 40 species.

RMBO recorded 44 bird species that are of conservation and management concern (priority species) throughout NCPN (Appendix B). We calculated density estimates for 24 of these species.

Table 2. Bird totals and averages by habitat in the Northern Colorado Plateau Network, 2011.

Habitat	# Birds Detected	Avg. # Birds per Transect	# Species Detected	Avg. # Species per Transect
Low-Elevation Riparian	3,146	206	85	30
Pinyon-Juniper	2,977	195	78	27
Sage Shrubland	3,676	241	91	27
All habitats	**9,799**	**214**	**115**	**28**

Low-Elevation Riparian (LR)
We surveyed all 15 transect locations in LR twice this year. We calculated density estimates for 37 species, of which 14 are priority species, from 2005 to 2011. We were unable to calculate density estimates for 7 of the 37 species specifically for 2011 because of small sample size. The pooled 2005-2011 data yielded robust density estimates (Coefficient of Variation, CV < 50%) for 24 species and a moderately robust estimate (CV = 50-75%) for six additional species (Table 3). We should be able to reach our target of detecting population changes of at least 3% within 30 years for these 30 species, which represent 44% of species detected and 91% of birds detected in LR.

The following 10 species had the highest estimated densities of species recorded in LR in 2011 (listed in order from highest to lowest density)

1. Blue-gray Gnatcatcher
2. Black-chinned Hummingbird
3. Spotted Towhee
4. Yellow Warbler
5. Lazuli Bunting
6. Ash-throated Flycatcher
7. Yellow-rumped Warbler
8. House Finch
9. Lesser Goldfinch
10. Chipping Sparrow

The following 18 species had higher estimated densities in LR compared to the other 2 habitats sampled in 2011 (listed in order from highest to lowest density):

1. Blue-gray Gnatcatcher
2. Black-chinned Hummingbird
3. Spotted Towhee
4. Yellow Warbler
5. Lazuli Bunting
6. Ash-throated Flycatcher
7. Yellow-rumped Warbler
8. House Finch
9. Lesser Goldfinch
10. White-throated Swift
11. House Wren
12. Song Sparrow
13. Brown-headed Cowbird
14. Yellow-breasted Chat
15. Say's Phoebe
16. Warbling Vireo
17. Common Raven
18. Western Wood-Pewee

Table 3. Estimated densities per km^2 (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 LR in the NCPN, 2005-2011. Dashes indicate the sample size was insufficient for estimating density. Priority species are bolded.

Species	Year	D	LCL	UCL	%CV	n
American Robin	2005	5.33	2.57	11.06	46	15
	2006	7.38	3.72	14.65	43	23
	2007	7.41	3.90	14.10	40	24
	2008	8.29	4.48	15.31	38	26
	2009	--	--	--	--	4
	2010	5.46	2.01	14.88	66	16
	2011	--	--	--	--	9
Ash-throated Flycatcher	2005	15.13	10.85	21.10	20	153
	2006	23.51	17.86	30.96	17	239
	2007	20.01	15.09	26.54	17	207
	2008	18.37	13.35	25.27	19	191
	2009	17.20	12.43	23.80	20	141
	2010	21.58	15.54	29.97	20	192
	2011	23.86	17.66	32.22	18	225
Bewick's Wren	2005	7.02	3.63	13.55	42	44
	2006	15.52	9.08	26.52	33	100
	2007	8.54	4.32	16.86	43	56
	2008	8.43	4.52	15.71	39	57
	2009	15.37	8.83	26.77	35	85
	2010	3.58	1.91	6.72	40	20
	2011	2.28	1.17	4.45	42	14
Black Phoebe	2005	5.00	1.59	15.73	76	10
	2006	4.45	1.37	14.44	81	10
	2007	8.58	2.62	28.12	82	19
	2008	--	--	--	--	9
	2009	8.35	3.17	21.99	64	20
	2010	--	--	--	--	2
	2011	--	--	--	--	2
Black-chinned Hummingbird	2005	149.79	94.18	238.25	29	28
	2006	185.35	107.92	318.34	34	35
	2007	113.93	68.48	189.55	32	22
	2008	116.51	70.30	193.11	31	23
	2009	119.37	69.05	206.35	34	20
	2010	74.48	43.88	126.40	33	13
	2011	97.83	58.78	162.81	32	18
Black-headed Grosbeak	2005	3.74	1.22	11.46	76	11
	2006	7.14	4.03	12.64	35	22

Species	Year	D	LCL	UCL	%CV	n
Black-headed Grosbeak cont.	2007	3.98	1.76	8.99	52	12
	2008	5.36	2.80	10.26	41	17
	2009	6.65	2.53	17.49	64	17
	2010	--	--	--	--	9
	2011	4.27	2.13	8.58	44	12
Black-throated Gray Warbler	2005	7.10	3.76	13.42	40	38
	2006	14.09	8.55	23.21	31	76
	2007	9.93	6.66	14.81	25	54
	2008	19.70	10.26	37.84	41	106
	2009	10.21	4.42	23.57	54	45
	2010	10.99	6.62	18.24	32	52
	2011	14.13	7.97	25.04	36	70
Black-throated Sparrow	2005	5.63	2.62	12.12	49	49
	2006	5.98	3.21	11.12	39	51
	2007	6.68	2.60	17.17	62	62
	2008	7.46	3.68	15.12	45	67
	2009	20.13	9.17	44.18	50	138
	2010	8.15	4.22	15.77	42	60
	2011	11.52	6.21	21.37	39	96
Blue-gray Gnatcatcher	2005	57.05	42.17	77.17	18	112
	2006	74.57	51.21	108.59	22	149
	2007	55.82	40.41	77.11	19	115
	2008	66.76	44.46	100.23	24	136
	2009	144.63	103.63	201.87	20	230
	2010	93.20	68.64	126.55	18	166
	2011	105.95	82.97	135.30	14	196
Brown-headed Cowbird	2005	--	--	--	--	7
	2006	9.37	4.82	18.24	42	24
	2007	6.51	2.84	14.88	53	17
	2008	5.44	2.62	11.30	46	14
	2009	7.76	2.96	20.34	63	15
	2010	--	--	--	--	5
	2011	9.93	4.09	24.12	58	20
Bullock's Oriole	2005	--	--	--	--	3
	2006	8.66	5.19	14.47	32	22
	2007	6.19	2.72	14.10	53	16
	2008	--	--	--	--	9
	2009	5.89	2.04	17.01	70	12
	2010	--	--	--	--	9
	2011	--	--	--	--	9
Bushtit	2005	36.32	20.12	65.59	36	17
	2006	61.16	37.77	99.03	30	55

Species	Year	D	LCL	UCL	%CV	n
Bushtit cont.	2007	8.30	3.70	18.62	52	11
	2008	--	--	--	--	5
	2009	12.89	5.99	27.74	48	14
	2010	--	--	--	--	0
	2011	--	--	--	--	0
Canyon Wren	2005	1.87	1.06	3.28	35	30
	2006	4.04	2.41	6.77	32	63
	2007	2.25	1.23	4.13	38	37
	2008	1.66	0.69	3.97	57	27
	2009	1.65	0.78	3.46	47	23
	2010	--	--	--	--	1
	2011	--	--	--	--	9
Chipping Sparrow	2005	--	--	--	--	6
	2006	--	--	--	--	8
	2007	15.51	7.67	31.34	45	29
	2008	14.88	7.22	30.66	46	28
	2009	18.91	9.12	39.21	46	24
	2010	16.69	7.62	36.55	50	28
	2011	16.99	8.82	32.70	40	21
Common Raven	2005	2.65	1.48	4.74	36	16
	2006	1.82	0.89	3.71	45	15
	2007	1.98	0.97	4.03	45	14
	2008	4.58	2.16	9.72	48	37
	2009	--	--	--	--	8
	2010	4.05	1.98	8.28	45	27
	2011	2.60	1.53	4.41	33	19
Common Yellowthroat	2005	--	--	--	--	9
	2006	13.45	5.81	31.15	54	19
	2007	14.40	5.09	40.75	69	19
	2008	--	--	--	--	4
	2009	15.14	5.72	40.04	64	18
	2010	8.17	2.61	25.63	78	10
	2011	--	--	--	--	9
Gray Vireo	2005	1.09	0.60	2.00	38	17
	2006	2.33	1.15	4.76	45	36
	2007	1.14	0.49	2.66	54	18
	2008	1.54	0.83	2.88	39	24
	2009	2.61	1.58	4.32	31	35
	2010	--	--	--	--	4
	2011	--	--	--	--	9
House Finch	2005	18.47	12.80	26.66	22	109
	2006	26.63	19.29	36.76	19	178

Species	Year	D	LCL	UCL	%CV	n
House Finch cont.	2007	27.88	19.28	40.31	22	189
	2008	28.26	20.35	39.25	19	192
	2009	31.75	18.63	54.12	32	168
	2010	18.60	12.67	27.31	23	112
	2011	22.77	16.98	30.54	18	130
House Wren	2005	11.62	5.01	26.94	54	40
	2006	11.44	4.66	28.05	58	42
	2007	8.29	3.39	20.27	58	30
	2008	12.64	5.08	31.41	59	47
	2009	13.10	5.27	32.54	59	38
	2010	9.13	2.39	34.97	95	27
	2011	13.01	5.14	32.94	59	45
Juniper Titmouse	2005	8.24	4.12	16.50	44	28
	2006	7.11	3.89	13.01	38	24
	2007	10.69	6.54	17.48	30	42
	2008	10.87	6.37	18.55	33	41
	2009	10.15	4.69	21.93	49	28
	2010	5.06	2.57	9.96	43	17
	2011	6.00	3.21	11.23	39	22
Lazuli Bunting	2005	53.78	25.90	111.71	45	151
	2006	47.95	22.74	101.11	45	132
	2007	54.71	30.19	99.13	36	159
	2008	52.33	23.57	116.17	49	148
	2009	62.24	22.60	171.42	64	149
	2010	58.74	28.01	123.18	45	144
	2011	38.18	23.76	61.35	29	101
Lesser Goldfinch	2005	12.53	5.64	27.84	51	25
	2006	23.18	12.02	44.69	41	46
	2007	42.76	22.72	80.48	40	91
	2008	29.51	12.14	71.71	57	54
	2009	40.50	20.71	79.20	42	75
	2010	14.92	7.39	30.13	45	31
	2011	17.70	8.93	35.09	43	33
Mourning Dove	2005	9.58	5.39	17.04	36	73
	2006	16.27	10.83	24.43	25	114
	2007	18.58	12.28	28.12	25	140
	2008	10.96	6.00	20.03	38	91
	2009	5.38	3.27	8.86	31	35
	2010	15.03	9.55	23.65	28	96
	2011	10.69	6.42	17.81	32	73
Plumbeous Vireo	2005	12.57	7.36	21.48	33	50
	2006	20.05	11.42	35.20	35	81

Species	Year	D	LCL	UCL	%CV	n
Plumbeous Vireo cont.	2007	15.23	8.86	26.19	34	62
	2008	10.61	6.42	17.54	31	44
	2009	18.41	10.76	31.50	33	65
	2010	19.52	11.64	32.75	32	71
	2011	8.53	4.95	14.69	34	32
Rock Wren	2005	6.26	3.58	10.95	34	75
	2006	10.44	7.00	15.56	24	104
	2007	9.85	7.15	13.58	20	135
	2008	9.48	5.06	17.79	39	80
	2009	7.62	5.28	10.99	22	93
	2010	5.06	3.24	7.91	27	57
	2011	3.61	2.39	5.46	24	97
Say's Phoebe	2005	3.41	2.22	5.26	27	41
	2006	5.10	3.00	8.68	33	61
	2007	2.99	1.91	4.67	28	37
	2008	4.23	2.25	7.97	40	51
	2009	5.28	2.73	10.23	42	51
	2010	2.41	1.29	4.52	40	25
	2011	5.75	3.35	9.85	34	64
Song Sparrow	2005	19.90	7.54	52.56	64	45
	2006	22.14	9.41	52.07	56	56
	2007	18.00	8.28	39.11	50	49
	2008	16.15	8.01	32.57	45	42
	2009	14.27	5.25	38.84	67	28
	2010	3.44	0.86	13.74	101	8
	2011	11.40	4.71	27.58	58	27
Spotted Towhee	2005	48.32	36.48	64.02	17	225
	2006	86.99	66.67	113.51	16	413
	2007	57.69	41.58	80.06	20	274
	2008	42.90	32.53	56.58	17	208
	2009	76.65	56.22	104.51	19	305
	2010	67.93	50.03	92.23	18	281
	2011	72.80	56.18	94.34	16	316
Violet-green Swallow	2005	55.02	34.00	89.03	30	82
	2006	193.15	122.24	305.21	28	198
	2007	115.76	74.53	179.81	27	122
	2008	128.42	72.37	227.87	36	108
	2009	200.53	122.79	327.48	30	138
	2010	59.18	31.43	111.41	40	87
	2011	15.27	9.55	24.41	29	52
Virginia's Warbler	2005	7.94	4.30	14.64	38	23
	2006	13.90	5.79	33.41	57	41

Species	Year	D	LCL	UCL	%CV	n
Virginia's Warbler cont.	2007	9.90	5.70	17.18	34	31
	2008	17.96	10.95	29.48	31	58
	2009	--	--	--	--	2
	2010	8.89	4.77	16.58	39	23
	2011	4.59	2.42	8.70	40	13
Warbling Vireo	2005	5.38	2.25	12.88	57	17
	2006	11.26	4.89	25.95	54	37
	2007	7.75	3.89	15.44	44	27
	2008	8.76	5.46	14.06	29	30
	2009	6.87	3.31	14.24	46	18
	2010	6.44	1.80	23.09	90	20
	2011	4.33	1.88	9.99	54	13
Western Scrub-Jay	2005	4.84	2.41	9.74	44	18
	2006	4.77	2.34	9.73	45	25
	2007	4.94	2.35	10.37	47	22
	2008	4.25	1.53	11.78	68	22
	2009	2.42	1.00	5.83	57	11
	2010	3.55	1.49	8.46	56	14
	2011	3.95	2.07	7.54	41	20
Western Wood-Pewee	2005	3.83	2.14	6.87	36	27
	2006	4.58	2.28	9.23	44	33
	2007	4.62	2.17	9.87	48	34
	2008	4.45	1.70	11.66	64	31
	2009	4.53	2.09	9.80	49	28
	2010	2.19	0.90	5.32	58	14
	2011	2.40	1.26	4.56	40	16
White-throated Swift	2005	30.65	19.94	47.13	27	103
	2006	50.83	32.29	80.03	28	127
	2007	63.27	40.59	98.62	27	190
	2008	36.61	21.29	62.96	34	86
	2009	15.56	9.10	26.61	33	73
	2010	11.22	5.87	21.43	40	50
	2011	15.25	8.44	27.56	37	46
Yellow-breasted Chat	2005	6.80	2.04	22.66	84	37
	2006	8.42	3.07	23.12	67	51
	2007	6.57	2.17	19.89	75	42
	2008	5.48	2.58	11.61	48	32
	2009	8.22	4.21	16.02	42	43
	2010	9.52	4.76	19.05	44	50
	2011	7.90	3.38	18.50	55	45
Yellow-rumped Warbler	2005	--	--	--	--	4
	2006	--	--	--	--	2

Species	Year	D	LCL	UCL	%CV	n
Yellow-rumped Warbler cont.	2007	--	--	--	--	3
	2008	--	--	--	--	8
	2009	--	--	--	--	3
	2010	27.57	15.51	49.00	36	43
	2011	23.31	8.98	60.54	62	26
Yellow Warbler	2005	62.28	31.43	123.43	41	131
	2006	64.04	31.12	131.79	44	135
	2007	52.70	24.41	113.76	47	113
	2008	67.68	34.14	134.15	41	142
	2009	129.16	61.39	271.76	45	220
	2010	98.19	54.07	178.30	36	179
	2011	68.22	36.32	128.14	38	127

Trend Detection

Rock Wren (β_{trend}=-0.46; 95% CI=-0.22,-0.71) shows evidence of significant population change over the last seven years since the confidence limits around the beta estimate do not contain zero. The best approximating model for Rock Wren was a quadratic trend (Figure 5). The best model for all other species of concern with density estimates in LR habitat was the intercept-only (constant) model, indicating no significant change in population estimates over time.

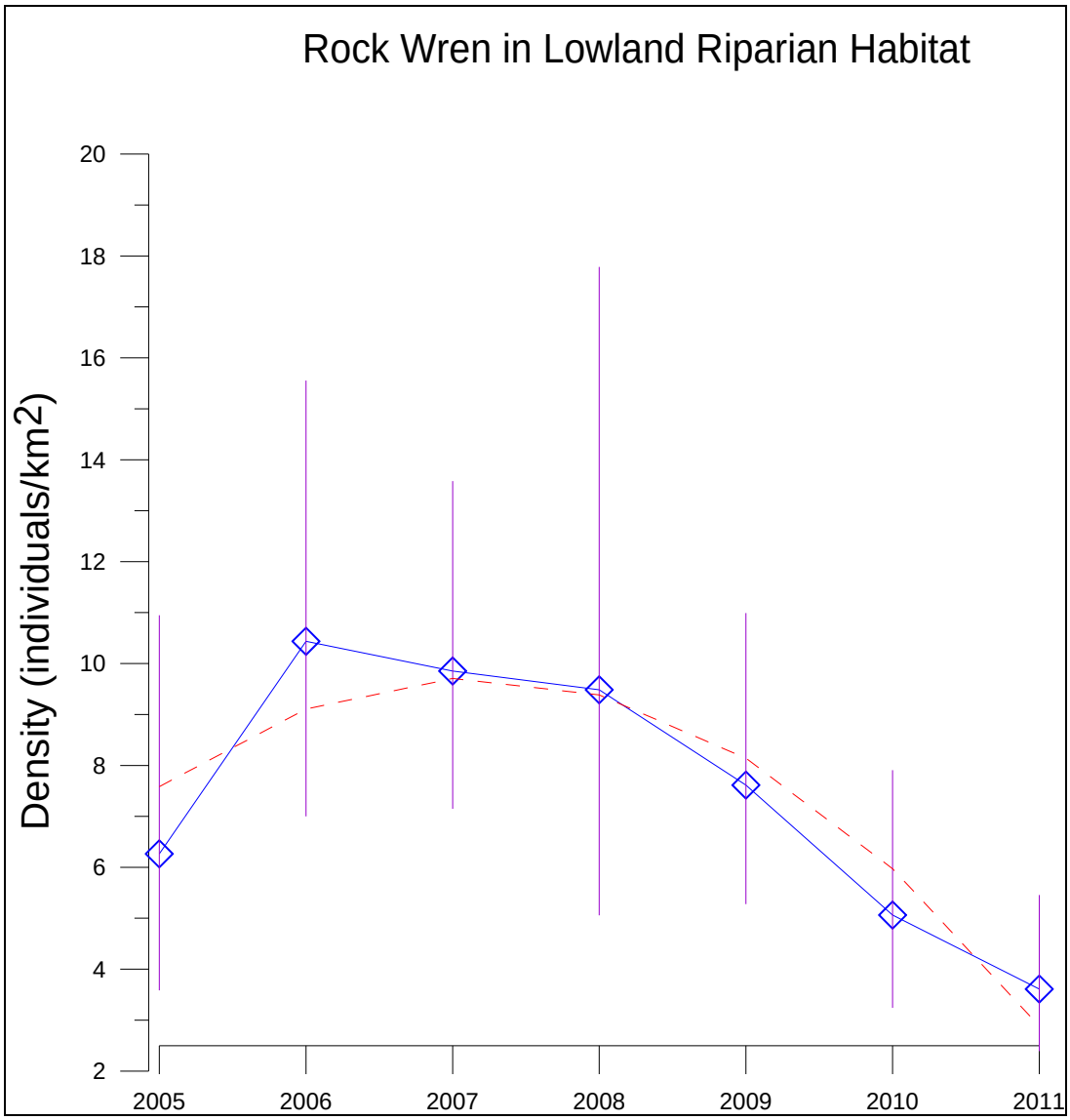

Figure 5. Estimated densities and population trend of Rock Wren in Low-elevation Riparian habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

Pinyon-Juniper (PJ)

We surveyed all 15 transect locations twice in PJ this year. We calculated density estimates for 36 species, 15 of which are priority species, from 2005 to 2011. We were unable to calculate density estimates for 3 of the 36 species specifically for 2011. The pooled 2005-2011 data yielded robust density estimates (CV < 50%) for 21 species and a moderately robust estimate (CV = 50-75%) for 9 additional species (Table 4). We should be able to reach our target of detecting population changes of at least 3% within 30 years for these 30 species, which represent 46% of species and 90% of individuals detected in PJ.

The following 10 species had the highest estimated densities of all species recorded in PJ in 2011 (listed in order from highest to lowest density):

1. Blue-gray Gnatcatcher
2. Black-throated Gray Warbler
3. Chipping Sparrow
4. Spotted Towhee
5. Juniper Titmouse
6. Gray Flycatcher
7. House Finch
8. Plumbeous Vireo
9. Virginia's Warbler
10. Violet-green Swallow

The following 15 species had higher estimated densities in PJ compared to the other 2 habitats sampled in 2011 (listed in order from highest to lowest density):

1. Black-throated Gray Warbler
2. Chipping Sparrow
3. Gray Flycatcher
4. Plumbeous Vireo
5. Virginia's Warbler
6. Gray Vireo
7. Mourning Dove
8. Mountain Chickadee
9. Western Scrub-Jay
10. Bewick's Wren
11. White-breasted Nuthatch
12. Pinyon Jay
13. Hermit Thrush
14. Grace's Warbler
15. Western Tanager

Table 4. Estimated densities per km^2 (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 PJ habitat in the NCPN, 2005-2011. Dashes indicate the sample size was insufficient for estimating density. Priority species are bolded.

Species	Year	D	LCL	UCL	%CV	n
American Robin	2005	1.82	1.00	3.32	38	26
	2006	2.67	1.17	6.07	53	37
	2007	2.65	0.86	8.21	77	35
	2008	1.91	0.61	5.97	78	25
	2009	1.13	0.37	3.45	76	14
	2010	0.87	0.32	2.33	65	12
	2011	2.78	1.34	5.75	46	33
Ash-throated Flycatcher	2005	9.94	8.38	11.80	10	121
	2006	16.44	11.33	23.87	23	125
	2007	8.78	7.33	10.53	11	117
	2008	12.03	9.92	14.58	12	116
	2009	9.65	6.94	13.43	20	104
	2010	5.54	4.17	7.37	17	82
	2011	4.79	3.92	5.85	12	83
Bewick's Wren	2005	20.15	15.49	26.22	16	134
	2006	20.09	12.60	32.04	29	134
	2007	16.67	9.89	28.09	32	112
	2008	15.84	8.62	29.11	38	100
	2009	13.41	9.36	19.21	22	79
	2010	3.40	1.86	6.21	38	22
	2011	4.36	2.52	7.57	34	26

Species	Year	D	LCL	UCL	%CV	n
Black-throated Gray Warbler	2005	99.28	57.75	170.65	34	240
	2006	95.88	68.53	134.14	20	314
	2007	94.92	65.53	137.50	22	305
	2008	66.56	46.98	94.31	21	301
	2009	111.81	72.61	172.18	27	313
	2010	53.11	39.28	71.80	18	236
	2011	46.28	32.53	65.85	22	262
Black-throated Sparrow	2005	5.38	2.66	10.90	45	45
	2006	8.87	4.16	18.88	48	70
	2007	12.27	5.14	29.32	56	99
	2008	9.58	3.60	25.49	64	73
	2009	11.33	5.89	21.79	41	80
	2010	8.45	4.69	15.23	37	67
	2011	10.53	5.21	21.29	44	74
Blue-gray Gnatcatcher	2005	74.20	51.39	107.12	22	125
	2006	56.26	34.91	90.68	30	92
	2007	76.65	53.48	109.85	22	125
	2008	64.52	42.29	98.44	26	98
	2009	148.69	115.81	190.91	15	215
	2010	85.27	60.81	119.58	21	136
	2011	91.63	71.01	118.25	16	134
Brown-headed Cowbird	2005	4.49	2.16	9.30	46	16
	2006	4.08	1.82	9.14	51	13
	2007	4.69	1.93	11.39	57	16
	2008	3.12	1.25	7.79	60	10
	2009	5.63	2.92	10.86	41	17
	2010	--	--	--	--	7
	2011	--	--	--	--	9
Bushtit	2005	96.86	55.49	169.05	34	32
	2006	62.00	39.50	97.32	27	25
	2007	36.37	19.18	68.96	40	14
	2008	--	--	--	--	7
	2009	91.55	54.39	154.10	32	36
	2010	--	--	--	--	0
	2011	--	--	--	--	1
Canyon Wren	2005	0.42	0.15	1.20	57	14
	2006	0.61	0.22	1.74	56	22
	2007	0.70	0.21	2.33	67	24
	2008	--	--	--	--	5
	2009	0.42	0.15	1.17	68	15
	2010	--	--	--	--	3

Species	Year	D	LCL	UCL	%CV	n
Canyon Wren cont.	2011	--	--	--	--	6
Chipping Sparrow	2005	21.46	13.02	35.38	31	70
	2006	16.80	10.51	26.87	29	53
	2007	24.37	14.49	40.99	32	75
	2008	29.23	18.53	46.13	28	88
	2009	53.25	29.70	95.48	36	134
	2010	31.19	18.19	53.48	34	92
	2011	36.11	25.37	51.40	22	102
Common Raven	2005	0.69	0.42	1.12	30	35
	2006	0.30	0.17	0.53	36	19
	2007	1.08	0.67	1.76	30	68
	2008	0.64	0.38	1.06	32	38
	2009	--	--	--	--	27
	2010	1.07	0.65	1.75	31	66
	2011	1.12	0.71	1.79	29	59
Dusky Flycatcher	2005	--	--	--	--	9
	2006	13.65	5.91	31.53	54	34
	2007	10.93	4.24	28.20	62	28
	2008	18.59	5.54	62.44	84	38
	2009	5.42	1.73	17.02	78	13
	2010	6.23	2.13	18.21	72	15
	2011	5.29	2.07	13.49	61	12
Grace's Warbler	2005	--	--	--	--	6
	2006	1.40	0.35	5.55	99	12
	2007	2.39	0.58	9.79	103	19
	2008	--	--	--	--	8
	2009	2.51	0.62	10.23	102	17
	2010	1.33	0.34	5.20	98	11
	2011	2.05	0.57	7.39	91	17
Gray Flycatcher	2005	24.85	16.00	38.58	27	116
	2006	26.12	16.86	40.48	27	86
	2007	24.84	13.67	45.13	37	85
	2008	37.37	22.48	62.13	31	101
	2009	34.64	21.71	55.26	29	179
	2010	23.82	17.08	33.21	20	123
	2011	15.94	10.10	25.15	28	113
Gray Vireo	2005	6.42	4.08	10.11	28	67
	2006	5.74	3.11	10.61	39	59
	2007	6.72	4.06	11.14	31	70
	2008	8.91	5.30	14.98	32	86
	2009	13.15	9.63	17.94	19	125

Species	Year	D	LCL	UCL	%CV	n
Gray Vireo cont.	2010	10.60	7.41	15.16	22	108
	2011	8.84	5.67	13.78	27	81
Hermit Thrush	2005	--	--	--	--	8
	2006	0.70	0.15	3.15	113	13
	2007	--	--	--	--	1
	2008	--	--	--	--	0
	2009	0.55	0.15	1.97	90	11
	2010	0.70	0.18	2.70	97	12
	2011	2.19	0.61	7.85	88	41
House Finch	2005	18.44	10.97	31.02	32	94
	2006	10.52	6.10	18.17	34	69
	2007	25.45	14.20	45.60	36	146
	2008	17.09	11.53	25.34	24	128
	2009	21.67	13.12	35.78	31	136
	2010	11.37	7.86	16.46	23	101
	2011	14.10	8.89	22.34	28	148
Juniper Titmouse	2005	29.71	16.56	53.30	36	79
	2006	25.99	15.37	43.95	32	76
	2007	28.46	14.97	54.08	40	82
	2008	23.82	13.07	43.41	37	89
	2009	46.65	32.86	66.23	21	199
	2010	41.45	27.38	62.74	25	141
	2011	22.41	13.25	37.92	33	112
Lark Sparrow	2005	2.49	1.08	5.75	54	20
	2006	2.21	0.54	9.00	102	17
	2007	2.11	0.79	5.66	65	19
	2008	1.57	0.62	3.98	61	13
	2009	1.96	0.85	4.53	54	17
	2010	1.97	0.60	6.42	81	17
	2011	3.50	1.44	8.51	58	27
Mountain Bluebird	2005	9.27	3.62	23.73	62	63
	2006	4.98	1.54	16.12	81	31
	2007	5.99	2.41	14.88	59	36
	2008	5.18	2.13	12.60	58	34
	2009	6.84	2.33	20.09	72	33
	2010	6.71	2.40	18.80	69	40
	2011	5.46	2.03	14.67	65	26
Mountain Chickadee	2005	4.95	2.03	12.08	58	19
	2006	--	--	--	--	9
	2007	2.75	1.10	6.87	60	10
	2008	--	--	--	--	9

Species	Year	D	LCL	UCL	%CV	n
Mountain Chickadee cont.	2009	3.85	1.36	10.91	69	13
	2010	--	--	--	--	4
	2011	8.36	3.08	22.65	66	26
Mourning Dove	2005	17.34	8.62	34.88	44	139
	2006	19.30	11.34	32.88	33	154
	2007	23.83	13.02	43.61	38	167
	2008	17.35	9.95	30.27	35	158
	2009	9.02	5.80	14.03	27	96
	2010	14.33	8.97	22.89	29	154
	2011	8.36	5.17	13.53	30	114
Pinyon Jay	2005	1.85	1.04	3.32	36	40
	2006	4.35	2.15	8.79	45	66
	2007	6.21	3.49	11.07	36	93
	2008	1.57	0.65	3.78	56	22
	2009	2.25	1.27	4.00	36	41
	2010	6.99	3.87	12.63	37	103
	2011	2.88	1.33	6.26	49	36
Plumbeous Vireo	2005	7.98	4.51	14.14	36	62
	2006	5.98	3.19	11.21	40	45
	2007	5.85	3.36	10.20	35	44
	2008	6.00	3.35	10.74	36	43
	2009	5.95	2.45	14.46	58	42
	2010	10.91	6.33	18.83	34	83
	2011	11.05	7.35	16.61	25	76
Rock Wren	2005	4.27	2.81	6.48	26	84
	2006	4.13	2.57	6.64	29	80
	2007	4.38	2.86	6.71	26	85
	2008	5.61	3.29	9.56	33	101
	2009	5.45	3.25	9.11	32	93
	2010	2.06	1.24	3.44	32	39
	2011	4.98	3.29	7.51	25	84
Say's Phoebe	2005	1.70	0.92	3.14	32	28
	2006	--	--	--	--	9
	2007	--	--	--	--	8
	2008	0.68	0.34	1.36	36	11
	2009	0.89	0.48	1.63	31	14
	2010	1.12	0.47	2.70	47	19
	2011	1.09	0.48	2.45	43	17
Spotted Towhee	2005	14.68	9.08	23.74	30	80
	2006	12.96	7.15	23.48	37	69
	2007	20.21	11.01	37.11	38	109

Species	Year	D	LCL	UCL	%CV	n
Spotted Towhee cont.	2008	9.19	4.86	17.35	40	46
	2009	19.95	10.96	36.31	37	97
	2010	13.94	7.54	25.75	39	72
	2011	24.44	13.40	44.58	37	112
Vesper Sparrow	2005	--	--	--	--	9
	2006	1.31	0.44	3.90	74	15
	2007	1.27	0.39	4.06	80	15
	2008	--	--	--	--	6
	2009	1.35	0.36	5.07	94	13
	2010	1.81	0.58	5.62	77	20
	2011	2.35	0.66	8.43	90	25
Violet-green Swallow	2005	9.21	4.74	17.91	42	32
	2006	13.62	6.49	28.59	47	48
	2007	17.64	8.32	37.38	48	58
	2008	16.24	7.83	33.67	46	40
	2009	11.76	6.74	20.53	35	31
	2010	10.61	4.66	24.15	52	29
	2011	9.04	4.94	16.54	38	21
Virginia's Warbler	2005	8.93	4.32	18.46	46	54
	2006	6.01	2.22	16.26	66	35
	2007	5.31	1.95	14.42	67	30
	2008	4.26	1.92	9.46	51	24
	2009	3.99	1.65	9.65	58	22
	2010	9.41	4.62	19.13	45	53
	2011	10.22	3.97	26.26	62	52
Western Meadowlark	2005	2.34	0.72	7.60	81	40
	2006	1.18	0.29	4.79	102	20
	2007	1.35	0.29	6.23	116	21
	2008	0.86	0.23	3.25	95	14
	2009	1.15	0.29	4.57	100	17
	2010	--	--	--	--	4
	2011	1.98	0.69	5.70	71	34
Western Scrub-Jay	2005	5.31	2.88	9.79	38	31
	2006	6.90	3.55	13.44	42	32
	2007	6.41	3.56	11.56	37	30
	2008	7.40	3.60	15.21	46	33
	2009	3.38	1.48	7.76	54	15
	2010	6.05	3.16	11.61	41	27
	2011	5.17	3.05	8.75	33	22
Western Tanager	2005	1.17	0.50	2.76	55	17
	2006	1.74	0.94	3.21	38	25

Species	Year	D	LCL	UCL	%CV	n
Western Tanager cont.	2007	2.16	1.00	4.67	49	30
	2008	1.32	0.44	3.96	75	17
	2009	--	--	--	--	8
	2010	1.21	0.41	3.58	73	17
	2011	1.59	0.65	3.91	59	21
White-breasted Nuthatch	2005	3.86	1.36	10.99	70	15
	2006	4.16	1.43	12.10	72	14
	2007	7.18	2.02	25.51	89	22
	2008	--	--	--	--	9
	2009	--	--	--	--	8
	2010	3.20	0.81	12.70	99	11
	2011	3.15	1.06	9.37	73	11
White-throated Swift	2005	18.12	7.12	46.10	62	64
	2006	25.15	7.49	84.46	85	82
	2007	25.81	10.10	65.96	62	94
	2008	22.76	6.63	78.20	87	66
	2009	9.96	3.05	32.60	82	35
	2010	7.71	2.54	23.43	75	25
	2011	9.02	4.08	19.91	51	27
Yellow-rumped Warbler	2005	1.65	0.48	5.65	86	11
	2006	3.90	1.10	13.82	89	27
	2007	1.84	0.45	7.46	102	11
	2008	2.41	0.64	9.11	95	15
	2009	--	--	--	--	1
	2010	--	--	--	--	8
	2011	4.24	2.01	8.96	47	24

Trend Detection

Six species had significant population trend detections in Pinyon-Juniper habitat. Bewick's Wren (β_{trend}=-2.75; 95% CI= -3.68, -1.81), Black-throated Gray Warbler (β_{trend}=-8.78; 95% CI= -16.07, -1.49) and White-throated Swift (β_{trend}=-2.64; 95% CI= -4.61, -0.66) show evidence of population change over the last seven years with a decreasing linear trend (Figure 6-8). Gray Vireo (β_{trend}=6.88; 95% CI=0.48, 13.29) shows evidence of population change over the last seven years with an increasing log linear trend (Figure 9). Plumbeous Vireo (β_{trend}=0.39; 95% CI= 0.15, 0.64) and Virgina's Warbler (β_{trend}=0.61; 95% CI= 0.33, 0.89) also show evidence of significant population change with a quadratic trend (Figures 9-11). The best approximating model for all other species of concern with density estimates in PJ habitat was the intercept-only (constant) model, which indicates no significant trend.

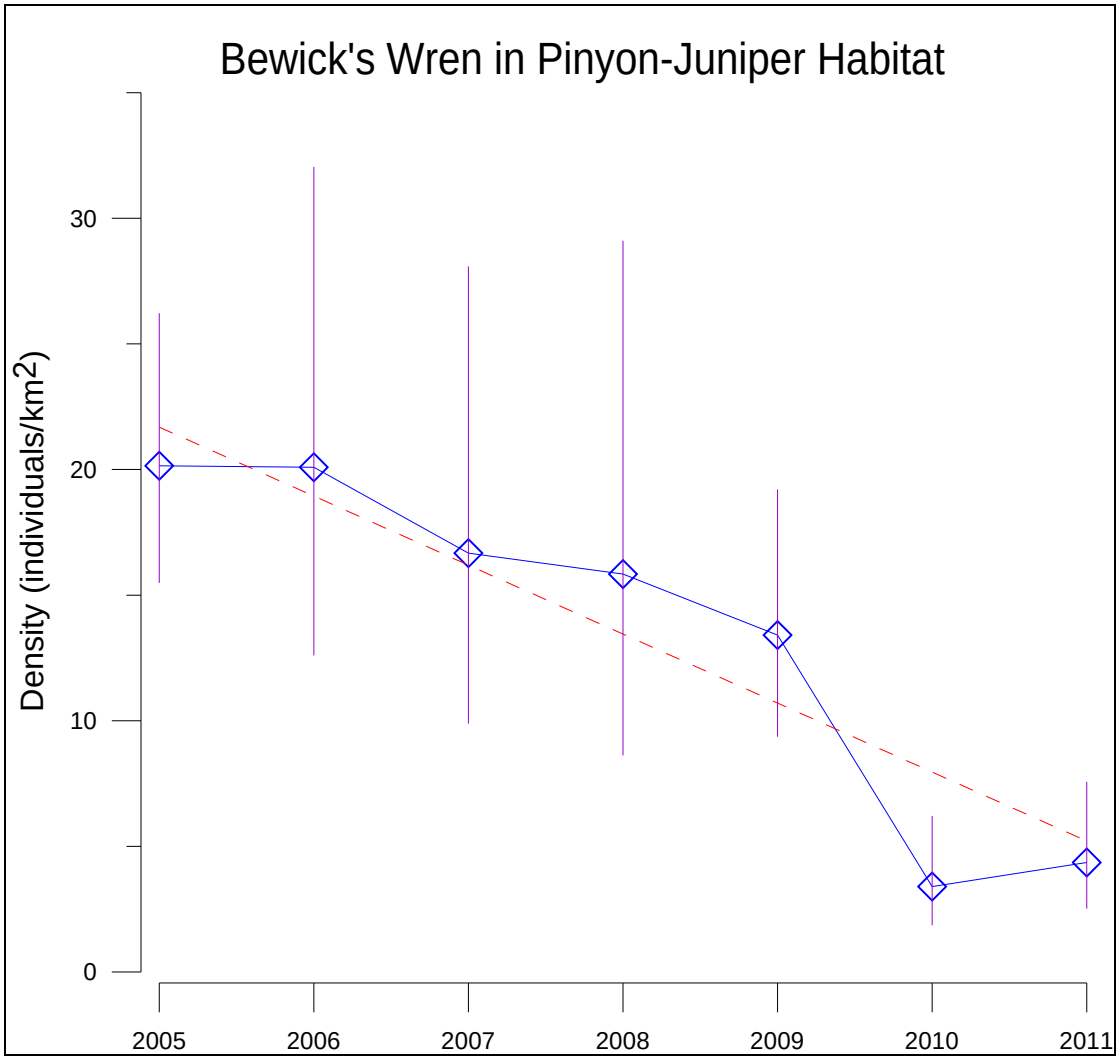

Figure 6. Estimated densities and population trend of Bewick's Wren in Pinyon-juniper habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

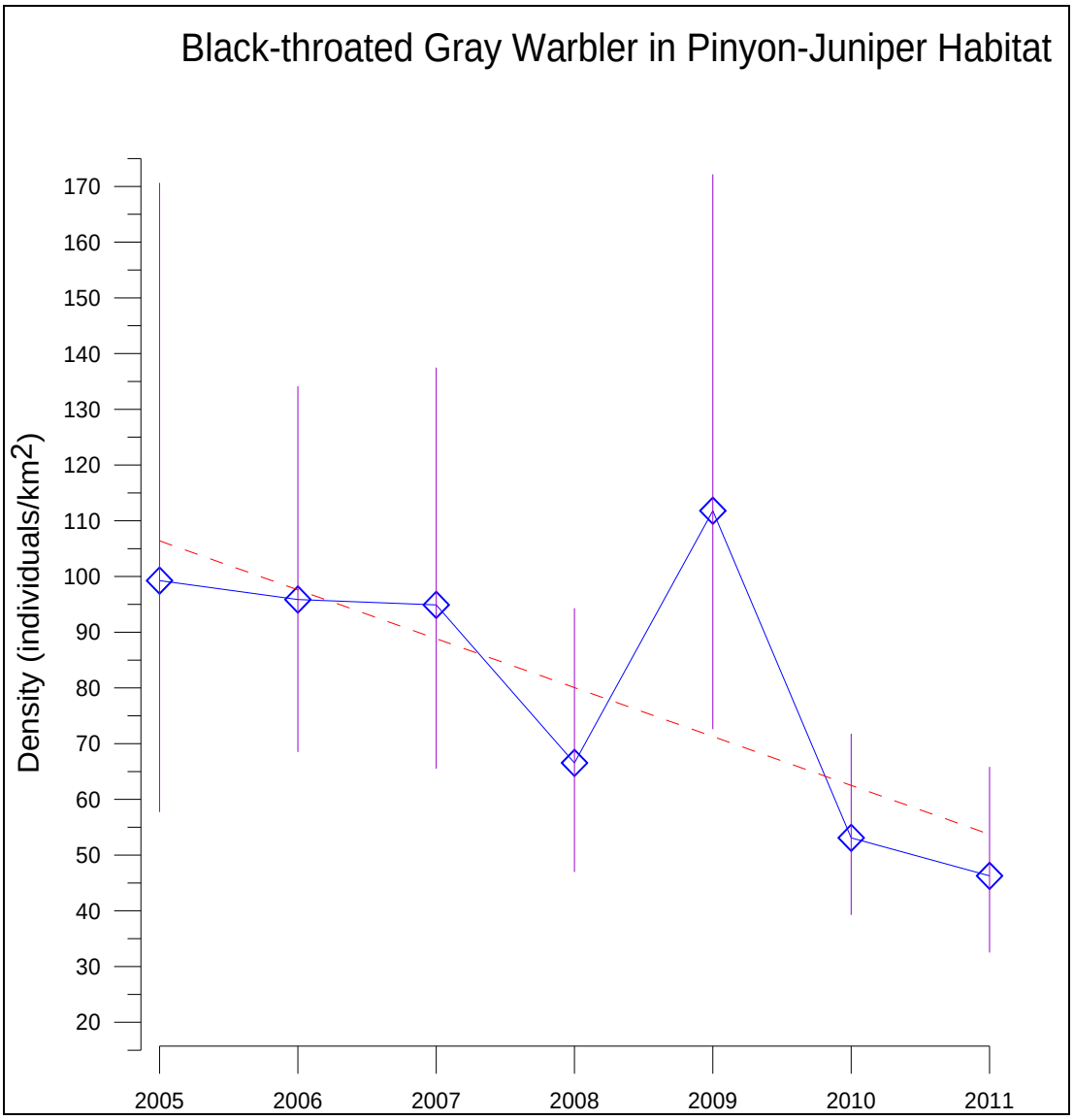

Figure 7. Estimated densities and population trend of Black-throated Gray Warbler in Pinyon-juniper habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

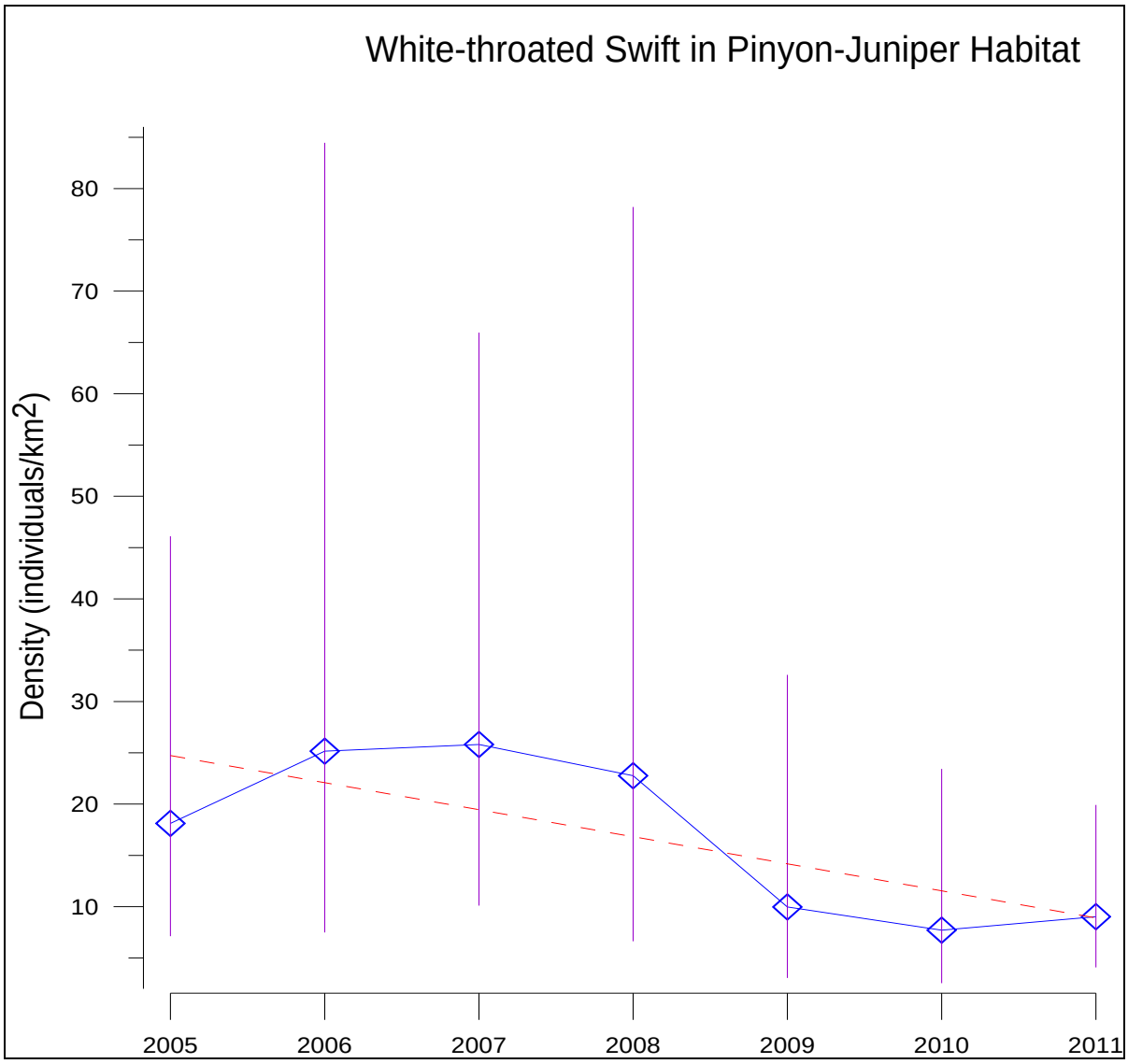

Figure 8. Estimated densities and population trend of White-throated Swift in Pinyon-juniper habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

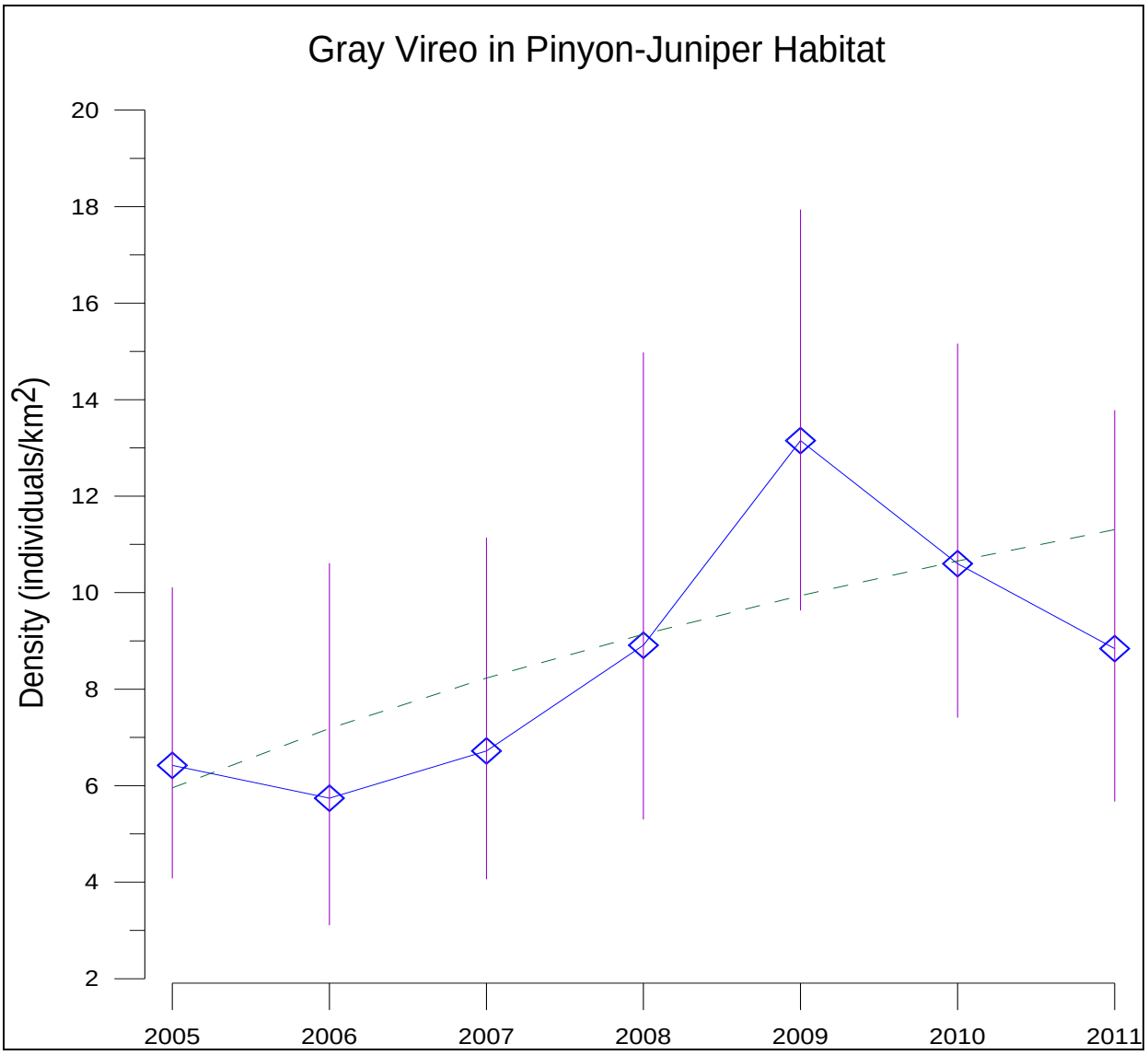

Figure 9. Estimated densities and population trend of Gray Vireo in Pinyon-juniper habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

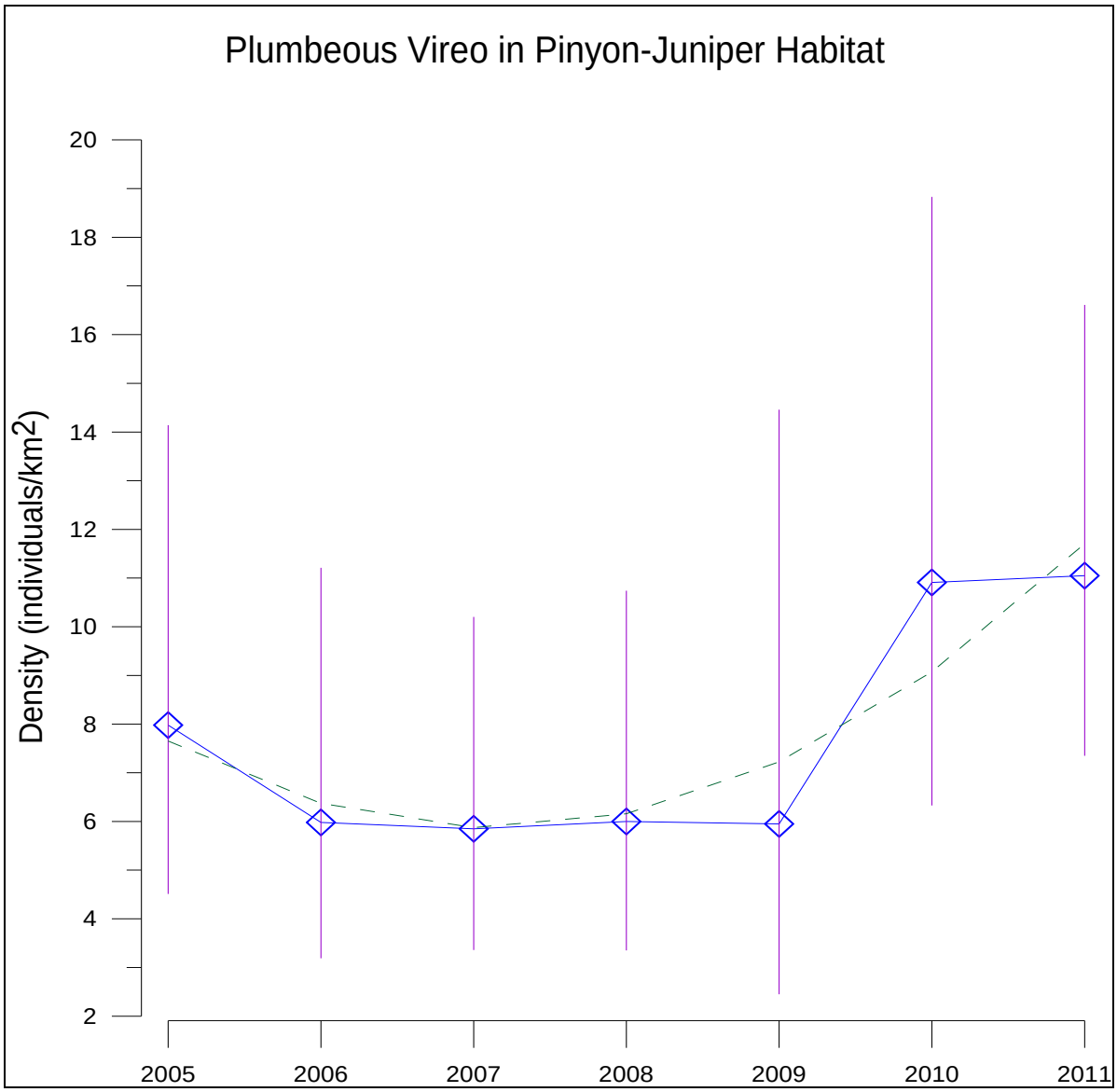

Figure 10. Estimated densities and population trend of Plumbeous Vireo in Pinyon-juniper habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

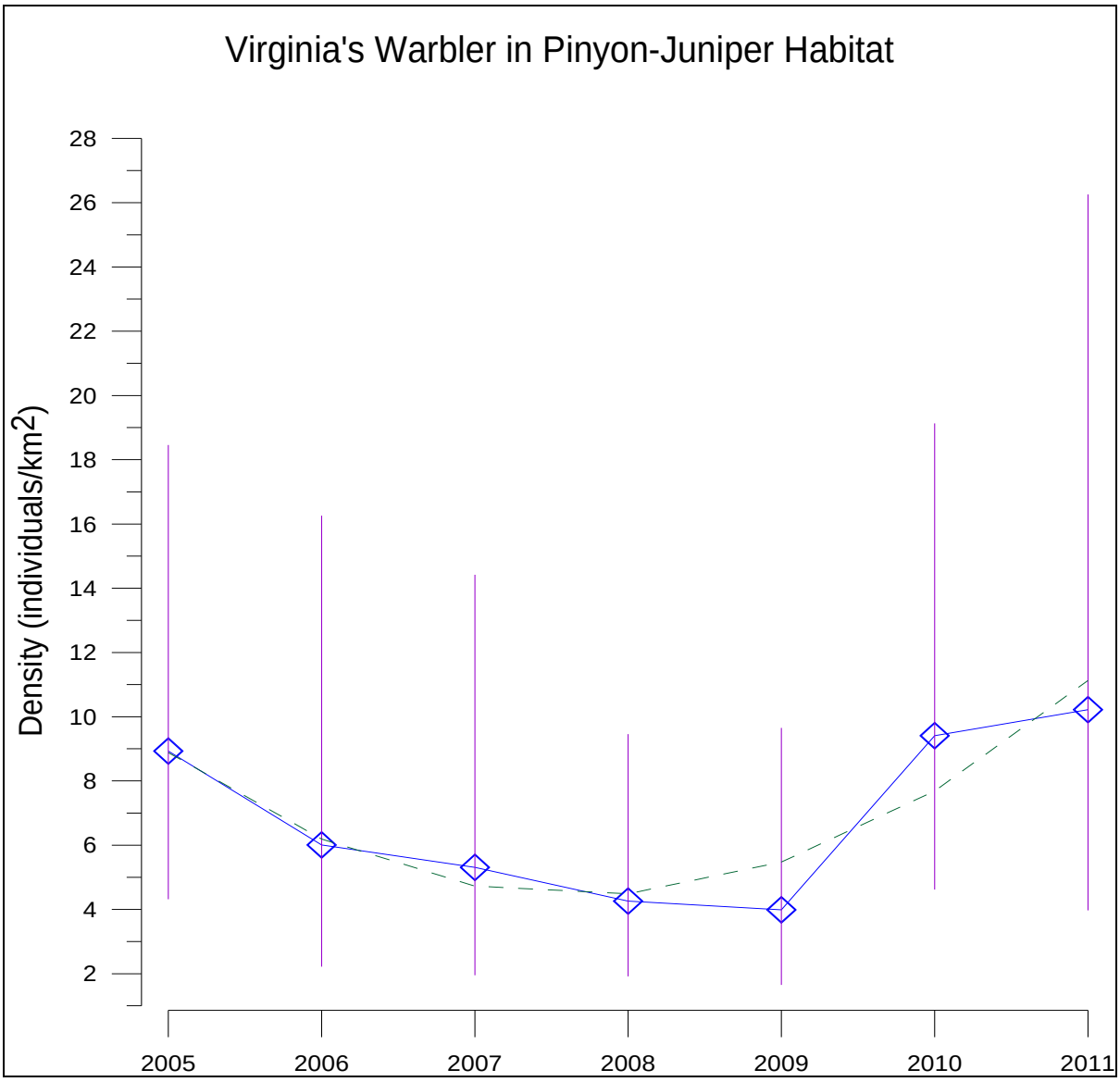

Figure 11. Estimated densities and population trend of Virginia's Warbler in Pinyon-juniper habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

Sage Shrubland (SA)

We surveyed all 15 transect locations twice in PJ this year. We calculated density estimates for 33 species, 14 of which are priority species, from 2005 to 2011. We were unable to calculate density estimates for 3 of the 33 species specifically for 2011. The pooled 2005-2011 data yielded robust density estimates (Coefficient of Variation, CV < 50%) for 21 species and a moderately robust estimate (CV = 50-75%) for 8 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 29 species, which represent 35% of species and 90% of individuals detected in SA.

The following 10 species had the highest estimated densities of all species recorded in SA in 2011 (listed in order from highest to lowest density):

1. Brewer's Sparrow
2. Vesper Sparrow
3. Violet-green Swallow
4. Green-tailed Towhee
5. Blue-gray Gnatcatcher
6. 6. Spotted Towhee
7. 7. Chipping Sparrow
8. 8. Lark Sparrow
9. 9. Mountain Bluebird
10 10. Dusky Flycatcher

The following 16 species had higher estimated densities in SA compared to the other 2 habitats sampled in 2011 (listed in order from highest to lowest density):

1. Brewer's Sparrow
2. Vesper Sparrow
3. Violet-green Swallow
4. Green-tailed Towhee
5. Lark Sparrow
6. Western Meadowlark
7. Mountain Bluebird
8. Dusky Flycatcher
9. Sage Thrasher
10. Rock Wren
11. Brewer's Blackbird
12. American Robin
13. Horned Lark
14. Black-billed Magpie
15. Northern Flicker
16. Sage Sparrow

Table 5. Estimated densities per km^2 (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 SA habitat in the NCPN, 2005-2011. Dashes indicate the sample size was insufficient for estimating density. Priority species are bolded.

Species	Year	D	LCL	UCL	%CV	n
American Robin	2005	2.14	1.22	3.74	35	36
	2006	4.07	2.11	7.87	42	71
	2007	2.82	1.42	5.60	44	50
	2008	2.17	1.27	3.70	33	36
	2009	1.72	0.89	3.33	42	28
	2010	2.64	1.43	4.91	39	46
	2011	3.27	1.89	5.66	34	58
Ash-throated Flycatcher	2005	1.04	0.46	2.35	52	12
	2006	--	--	--	--	9
	2007	1.38	0.46	4.14	74	14
	2008	0.93	0.38	2.27	58	10
	2009	--	--	--	--	2
	2010	1.07	0.47	2.45	53	11
	2011	0.92	0.39	2.15	54	10
Black-billed Magpie	2005	3.77	1.74	8.16	49	62
	2006	3.60	2.27	5.71	29	85
	2007	2.16	1.34	3.47	29	45
	2008	1.85	1.03	3.33	37	40
	2009	1.29	0.56	2.95	54	29
	2010	1.81	1.00	3.27	37	44

Species	Year	D	LCL	UCL	%CV	n
Black-billed Magpie Cont.	2011	2.29	1.18	4.43	42	50
Black-throated Gray Warbler	2005	2.71	0.74	9.83	91	25
	2006	1.76	0.46	6.65	95	17
	2007	1.48	0.43	5.11	87	14
	2008	2.52	0.50	12.69	126	24
	2009	4.18	1.47	11.82	70	38
	2010	1.74	0.61	4.99	71	17
	2011	2.33	0.55	9.85	106	22
Black-throated Sparrow	2005	0.78	0.21	2.88	92	10
	2006	2.05	0.61	6.86	84	29
	2007	1.33	0.41	4.35	81	18
	2008	--	--	--	--	3
	2009	1.86	0.46	7.44	101	23
	2010	--	--	--	--	8
	2011	--	--	--	--	7
Blue-gray Gnatcatcher	2005	9.16	4.53	18.54	45	27
	2006	5.32	3.08	9.19	34	16
	2007	3.98	1.90	8.35	46	11
	2008	14.21	8.54	23.64	32	40
	2009	13.20	6.31	27.63	47	34
	2010	13.89	8.46	22.81	31	41
	2011	10.49	5.70	19.29	38	30
Brewer's Blackbird	2005	--	--	--	--	5
	2006	6.35	3.11	12.93	45	40
	2007	2.55	1.07	6.09	55	17
	2008	--	--	--	--	8
	2009	4.56	1.61	12.87	69	25
	2010	2.64	1.38	5.04	41	18
	2011	3.57	1.29	9.88	68	22
Brewer's Sparrow	2005	104.18	70.25	154.51	24	437
	2006	81.00	49.73	131.94	30	473
	2007	68.03	44.31	104.45	26	405
	2008	57.74	38.18	87.33	25	351
	2009	102.54	66.59	157.88	25	521
	2010	73.33	54.49	98.68	18	504
	2011	63.16	35.75	111.59	34	490
Broad-tailed Hummingbird	2005	14.60	5.34	39.90	67	19
	2006	8.75	2.84	26.99	76	12
	2007	10.45	3.50	31.24	74	15
	2008	20.43	6.11	68.32	83	23
	2009	11.62	3.45	39.10	84	13

Species	Year	D	LCL	UCL	%CV	n
Broad-tailed Hummingbird Cont.	2010	--	--	--	--	9
	2011	--	--	--	--	4
Brown-headed Cowbird	2005	--	--	--	--	4
	2006	4.67	2.39	9.11	42	26
	2007	1.90	0.92	3.94	46	12
	2008	2.56	1.33	4.90	41	15
	2009	--	--	--	--	8
	2010	--	--	--	--	6
	2011	1.93	1.09	3.42	35	12
Chipping Sparrow	2005	5.67	3.07	10.45	38	29
	2006	9.15	5.11	16.37	36	50
	2007	9.38	4.38	20.10	49	46
	2008	7.53	3.24	17.49	54	38
	2009	7.72	3.80	15.67	45	38
	2010	18.76	10.14	34.71	39	93
	2011	8.99	4.96	16.32	37	44
Common Raven	2005	--	--	--	--	7
	2006	1.00	0.47	2.13	48	19
	2007	1.52	0.96	2.39	28	40
	2008	1.00	0.60	1.67	32	25
	2009	0.49	0.22	1.08	50	11
	2010	1.23	0.77	1.97	29	32
	2011	1.55	0.98	2.44	28	40
Dusky Flycatcher	2005	3.04	1.12	8.26	66	30
	2006	4.70	2.14	10.29	50	48
	2007	5.06	2.19	11.71	54	53
	2008	6.58	2.84	15.24	54	63
	2009	7.88	3.25	19.08	57	71
	2010	6.17	3.13	12.15	43	62
	2011	6.35	3.67	11.01	34	64
Gray Flycatcher	2005	1.85	1.02	3.36	37	23
	2006	--	--	--	--	8
	2007	--	--	--	--	7
	2008	1.13	0.33	3.87	86	13
	2009	2.13	0.90	5.04	56	23
	2010	1.88	0.94	3.77	44	23
	2011	1.79	0.81	3.92	50	21
Green-tailed Towhee	2005	34.51	20.83	57.17	31	266
	2006	41.66	20.15	86.14	46	387
	2007	40.31	19.58	82.98	45	283
	2008	32.75	16.93	63.36	41	227

Species	Year	D	LCL	UCL	%CV	n
Green-tailed Towhee cont.	2009	45.26	22.15	92.48	44	242
	2010	21.42	11.96	38.37	36	183
	2011	22.72	13.83	37.30	30	273
Horned Lark	2005	2.81	1.33	5.98	48	27
	2006	3.15	1.65	6.01	41	31
	2007	3.88	1.95	7.74	44	38
	2008	2.01	0.68	5.93	73	18
	2009	4.75	2.26	10.01	47	42
	2010	2.98	1.46	6.08	45	29
	2011	2.93	1.39	6.19	47	28
House Finch	2005	--	--	--	--	3
	2006	4.46	2.73	7.28	30	52
	2007	2.41	0.97	6.01	60	29
	2008	2.63	1.43	4.84	38	31
	2009	4.43	1.53	12.85	72	44
	2010	1.59	0.83	3.08	41	19
	2011	1.64	0.83	3.22	43	18
Lark Sparrow	2005	8.10	3.80	17.25	48	83
	2006	8.88	4.57	17.25	42	91
	2007	5.42	2.50	11.76	50	61
	2008	2.38	1.03	5.48	54	24
	2009	11.82	5.02	27.83	54	111
	2010	7.44	3.74	14.81	44	72
	2011	8.60	4.48	16.52	41	97
Lazuli Bunting	2005	--	--	--	--	8
	2006	--	--	--	--	6
	2007	--	--	--	--	5
	2008	--	--	--	--	0
	2009	9.33	3.30	26.40	70	74
	2010	4.97	2.33	10.61	48	43
	2011	2.38	0.98	5.77	58	20
Mountain Bluebird	2005	6.18	3.73	10.24	31	60
	2006	7.99	5.52	11.57	23	79
	2007	8.25	4.99	13.65	31	81
	2008	6.95	4.85	9.95	22	65
	2009	6.04	3.16	11.52	41	53
	2010	7.77	5.43	11.11	22	75
	2011	6.57	4.29	10.06	26	62
Mourning Dove	2005	2.44	1.37	4.34	36	55
	2006	4.41	3.03	6.42	23	101
	2007	2.70	1.45	5.01	39	63

Species	Year	D	LCL	UCL	%CV	n
Mourning Dove cont.	2008	3.10	1.51	6.36	45	69
	2009	3.11	1.65	5.85	40	61
	2010	3.74	1.99	7.01	39	89
	2011	2.42	1.56	3.74	27	56
Northern Flicker	2005	1.00	0.59	1.68	32	18
	2006	1.47	0.83	2.62	36	27
	2007	0.78	0.40	1.52	42	14
	2008	0.58	0.34	0.98	32	10
	2009	1.28	0.66	2.47	42	21
	2010	1.38	0.84	2.25	30	25
	2011	1.68	1.02	2.76	31	30
Rock Wren	2005	3.39	2.13	5.40	29	83
	2006	6.31	3.82	10.43	31	153
	2007	2.92	1.43	5.96	45	71
	2008	3.64	2.12	6.24	34	83
	2009	3.09	1.78	5.37	35	68
	2010	2.58	1.45	4.60	36	62
	2011	5.18	3.02	8.90	34	122
Sage Sparrow	2005	2.96	1.09	8.05	66	36
	2006	1.97	0.71	5.49	68	25
	2007	2.46	0.83	7.24	73	31
	2008	1.74	0.46	6.61	96	20
	2009	2.80	1.01	7.74	68	27
	2010	--	--	--	--	4
	2011	1.40	0.53	3.69	64	18
Sage Thrasher	2005	3.34	1.57	7.09	47	72
	2006	3.16	1.46	6.83	49	70
	2007	2.99	1.48	6.01	44	69
	2008	6.26	2.97	13.19	45	131
	2009	5.40	2.46	11.85	49	109
	2010	6.27	2.62	14.96	54	138
	2011	5.33	2.67	10.61	42	118
Say's Phoebe	2005	0.65	0.31	1.36	47	10
	2006	0.82	0.47	1.41	34	15
	2007	--	--	--	--	7
	2008	0.89	0.33	2.41	66	15
	2009	1.10	0.43	2.85	62	16
	2010	1.08	0.47	2.53	55	19
	2011	1.82	1.06	3.13	34	31
Spotted Towhee	2005	6.01	2.96	12.22	45	55
	2006	6.29	3.56	11.12	36	61

Species	Year	D	LCL	UCL	%CV	n
Spotted Towhee cont.	2007	5.21	2.86	9.51	38	50
	2008	7.64	4.27	13.68	36	68
	2009	4.90	2.54	9.45	41	41
	2010	8.40	4.46	15.81	40	75
	2011	10.27	5.83	18.08	35	95
Vesper Sparrow	2005	32.87	21.86	49.44	25	252
	2006	27.28	17.29	43.05	28	324
	2007	47.27	25.93	86.18	37	382
	2008	51.41	24.45	108.08	46	346
	2009	51.33	33.12	79.54	27	396
	2010	47.74	36.38	62.64	17	461
	2011	38.90	28.81	52.54	18	473
Violet-green Swallow	2005	5.40	2.75	10.62	42	14
	2006	8.52	4.05	17.91	47	26
	2007	4.04	2.11	7.74	41	13
	2008	6.29	3.33	11.91	39	13
	2009	6.57	3.04	14.19	49	19
	2010	5.18	0.70	38.31	171	15
	2011	37.18	15.38	89.90	56	22
Virginia's Warbler	2005	1.42	0.61	3.34	55	23
	2006	1.80	0.86	3.80	47	30
	2007	1.08	0.28	4.10	96	17
	2008	2.57	0.96	6.91	66	40
	2009	1.43	0.55	3.71	63	21
	2010	1.55	0.64	3.77	58	25
	2011	1.32	0.57	3.08	55	21
Warbling Vireo	2005	1.27	0.44	3.62	70	17
	2006	0.68	0.28	1.66	58	10
	2007	1.44	0.54	3.87	65	22
	2008	--	--	--	--	2
	2009	--	--	--	--	3
	2010	--	--	--	--	9
	2011	1.11	0.43	2.87	62	16
Western Meadowlark	2005	5.72	2.99	10.96	41	152
	2006	5.64	3.35	9.51	32	166
	2007	5.73	2.93	11.22	42	135
	2008	10.51	5.00	21.86	46	178
	2009	6.95	3.60	13.41	41	209
	2010	7.57	4.31	13.29	35	169
	2011	7.76	4.09	14.72	39	246
Western Tanager	2005	0.48	0.16	1.45	74	13

Species	Year	D	LCL	UCL	%CV	n
Western Tanager cont.	2006	0.69	0.20	2.47	89	17
	2007	0.90	0.31	2.60	71	25
	2008	0.73	0.23	2.30	78	19
	2009	0.79	0.27	2.26	71	20
	2010	0.52	0.18	1.49	70	13
	2011	--	--	--	--	4

Trend Detection

Five species had significant population trends in sage shrubland habitat. Black-billed Magpie (β_{trend}=0.15; 95% CI= 0.06, 0.24) and Violet-green Swallow (β_{trend}=1.76, 95% CI= 0.56, 2.97) show evidence of significant population change over the last seven years with quadratic trend (Figures 12 and 13). Dusky Flycatcher (β_{trend}=4.09; 95% CI=1.38, 6.80) and Sage Thrasher (β_{trend}=4.01, 95% CI= 1.06, 6.95) each have an increasing log linear trend (Figures 14 and 15), and Say's Phoebe (β_{trend}=0.18; 95% CI= 0.08, 0.28) has an increasing linear trend (Figure 16). The best approximating model for all other species of concern with density estimates in SA habitat was the intercept-only (constant) model, which indicates no significant trend.

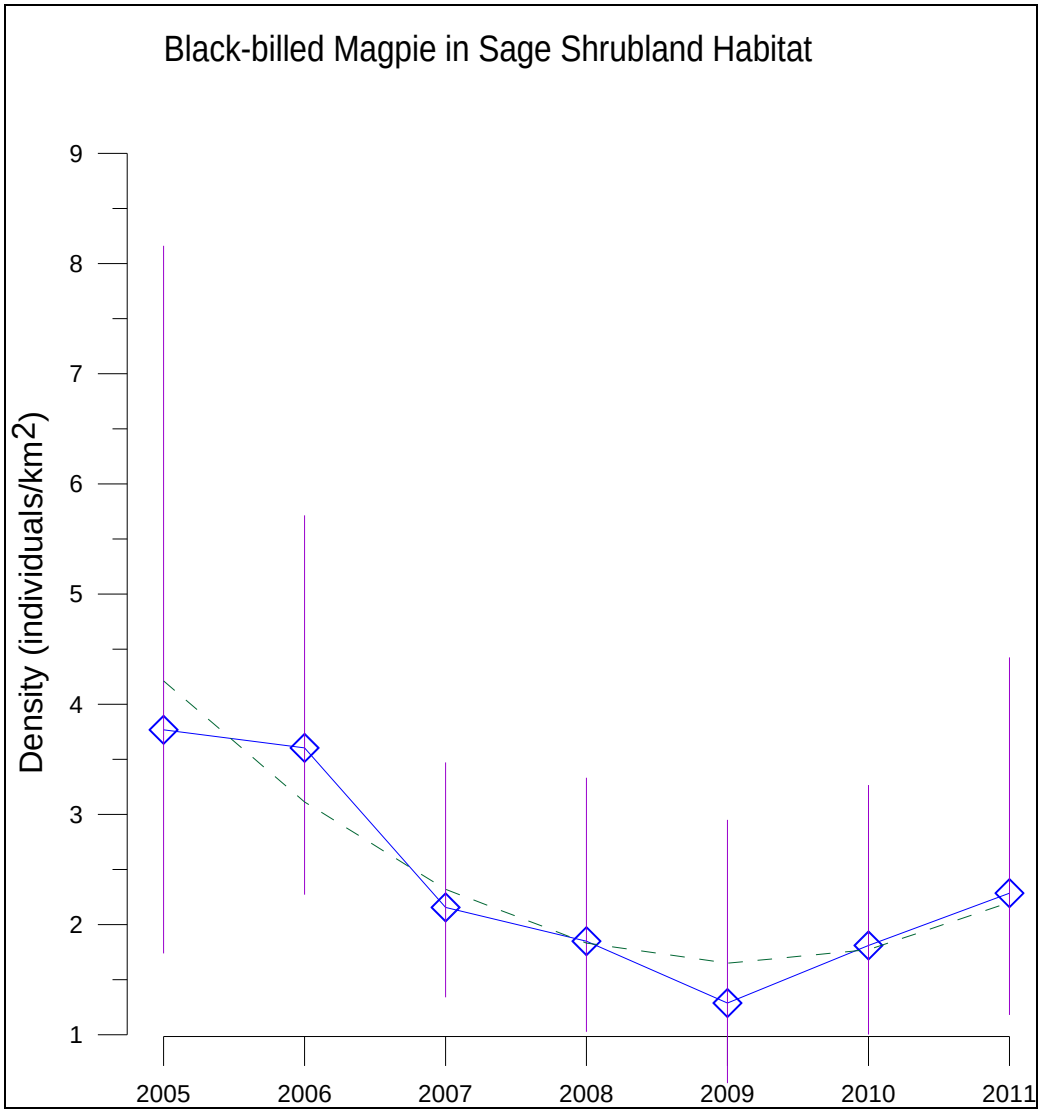

Figure 12. Estimated densities and population trend of Black-billed Magpie in sage shrubland habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

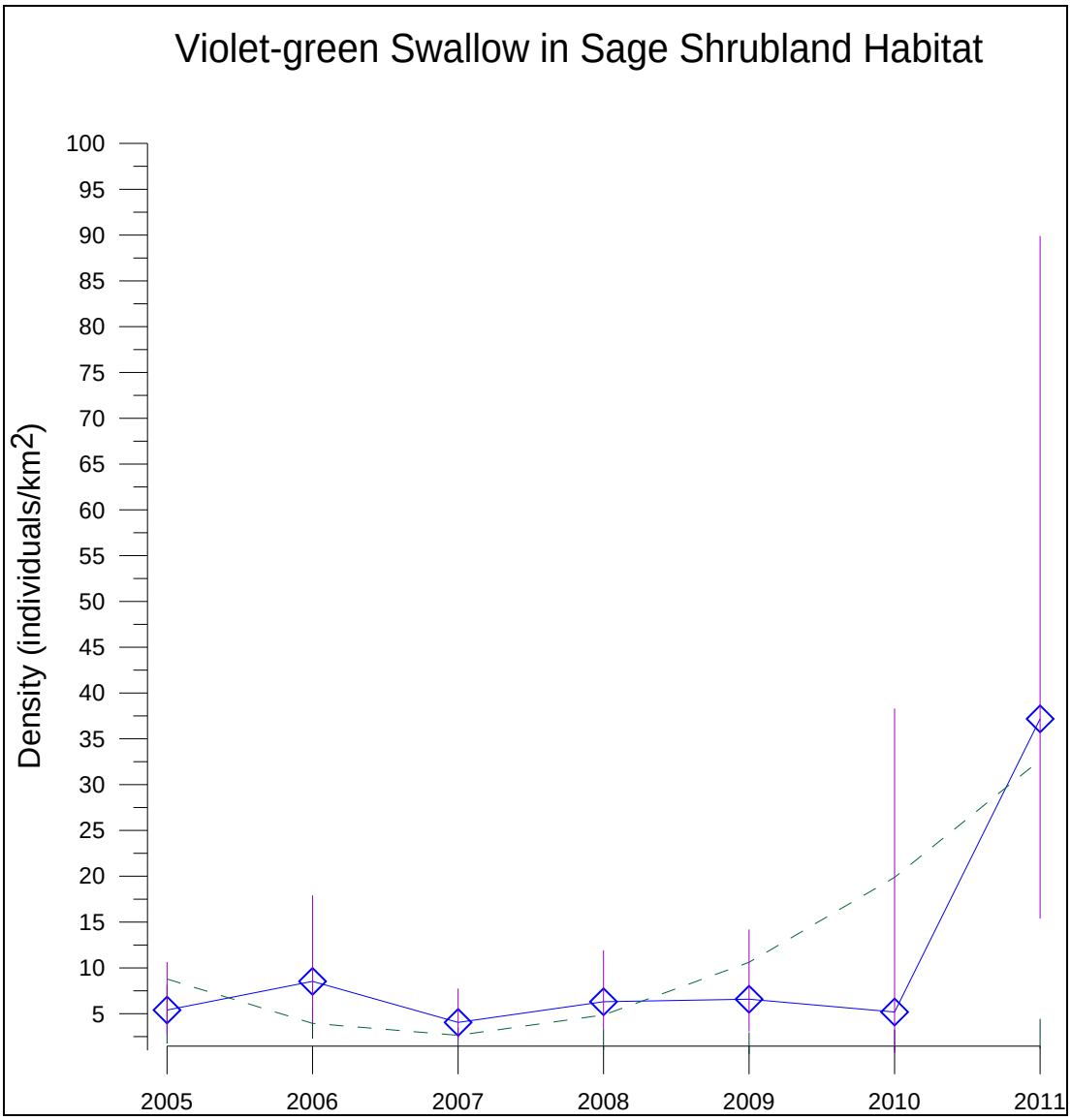

Figure 13. Estimated densities and population trend of Violet-green Swallow in sage shrubland habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

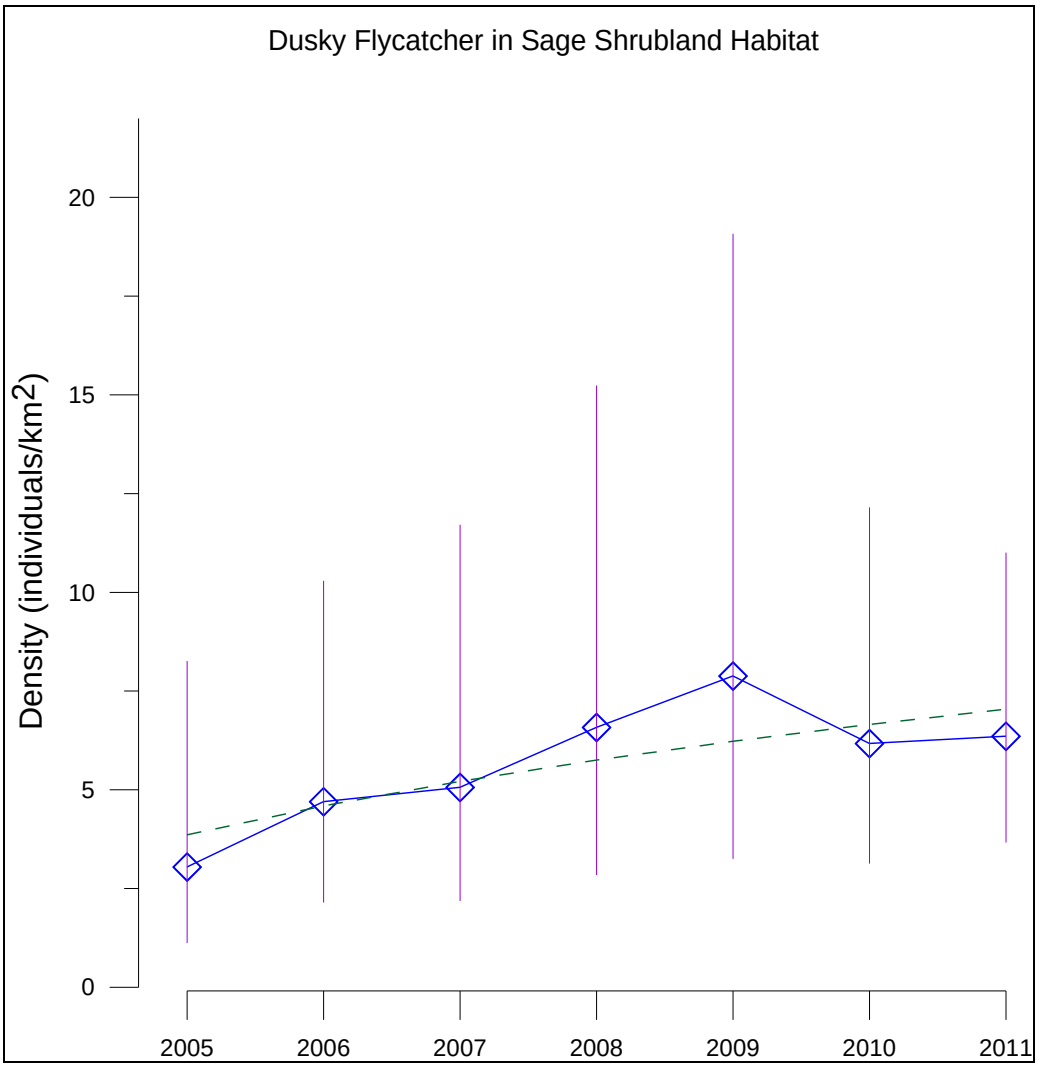

Figure 14. Estimated densities and population trend of Dusky Flycatcher in sage shrubland habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

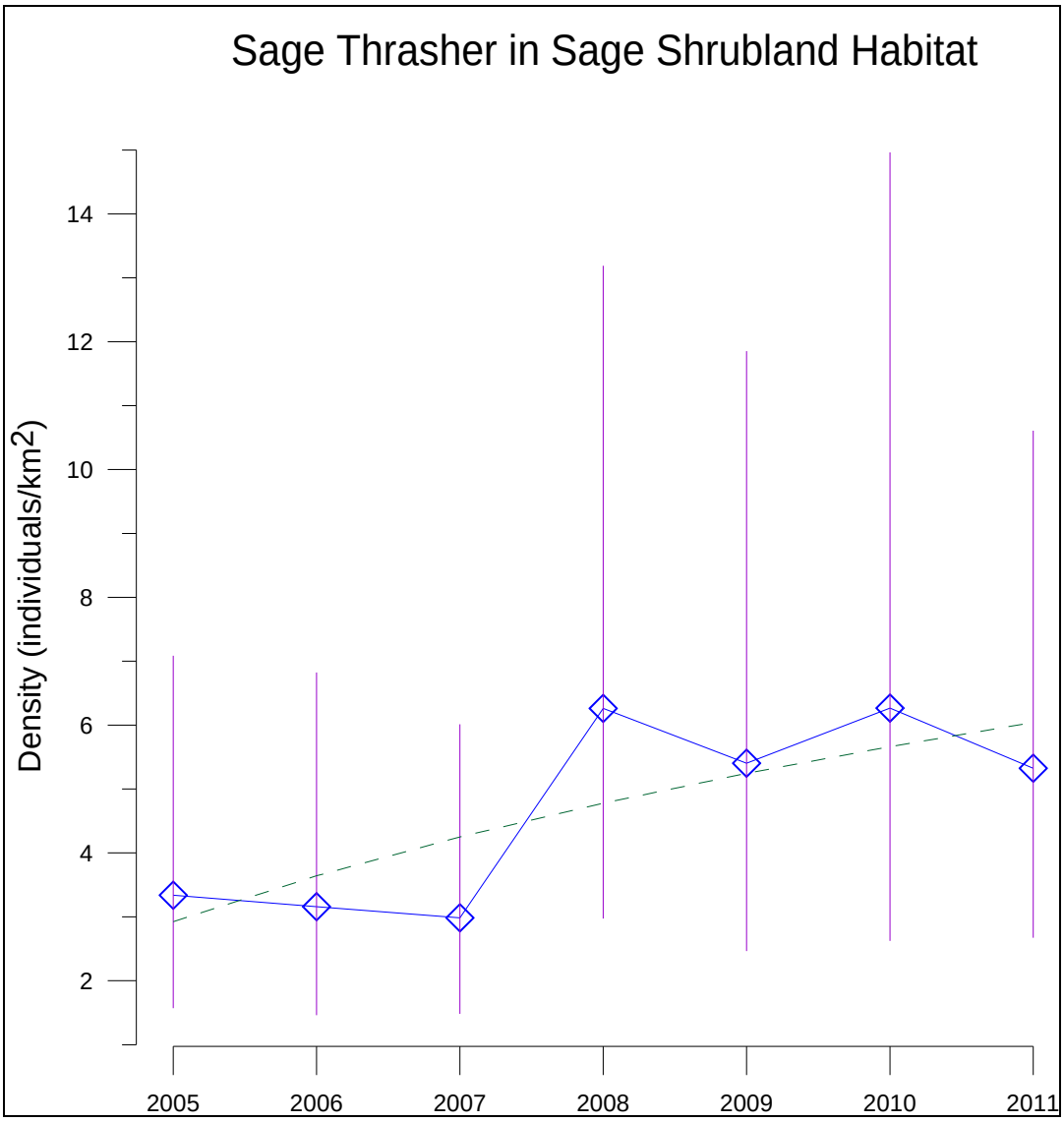

Figure 15. Estimated densities and population trend of Sage Thrasher in sage shrubland habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

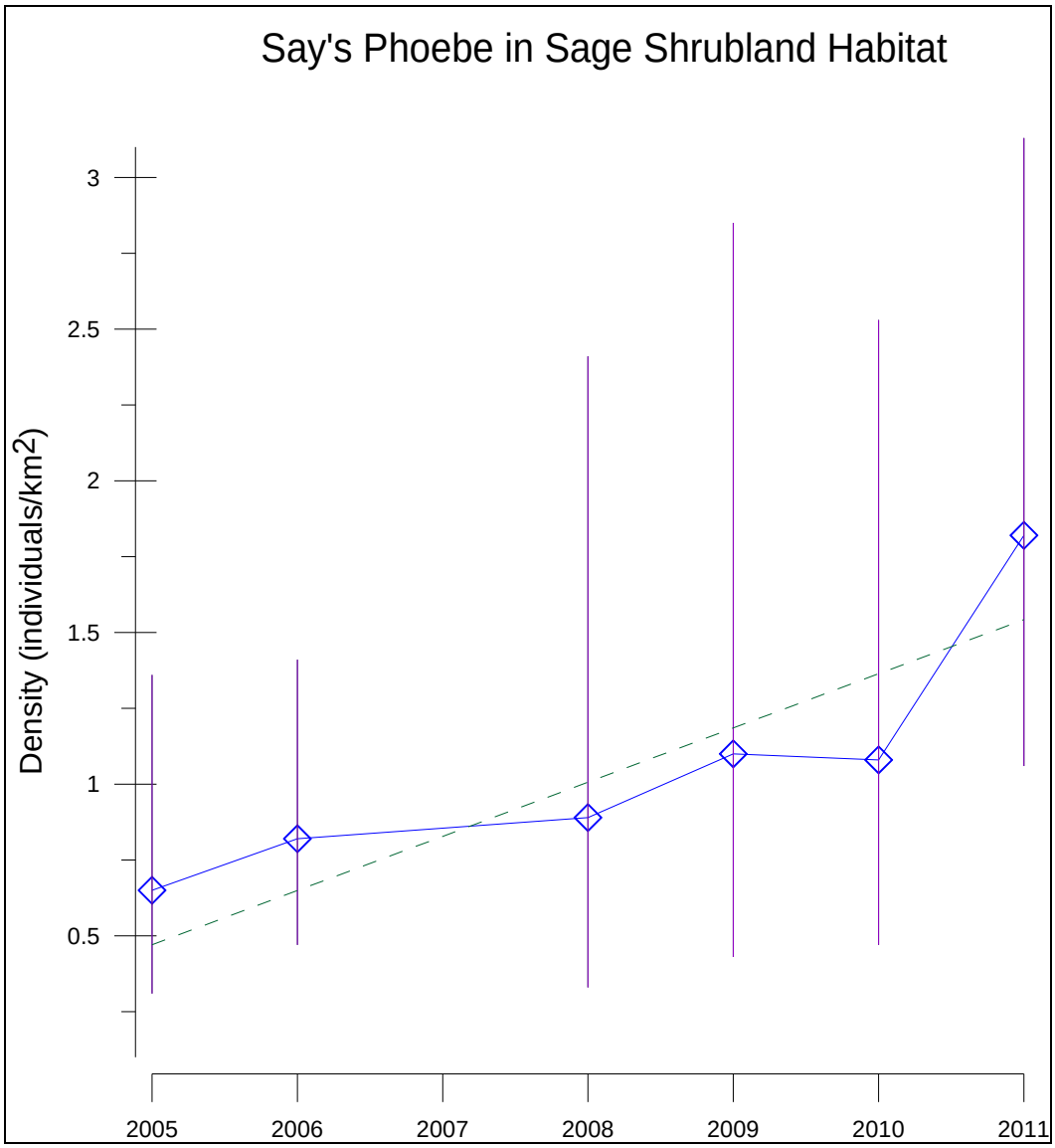

Figure 16. Estimated densities and population trend of Say's Phoebe in sage shrubland habitat within the Northern Colorado Plateau Network, 2005-2011. Error bars represent 90% confidence intervals. The dashed line represents the best estimate of observed population trend for the NCPN data.

Pipe Springs National Monument (PISP)
We detected a total of 286 birds of 36 species in PISP in 2011 (Appendix A). To date, we have detected 644 birds of 48 species. Likely due to the late migration season and the early date of the first survey visit (May 8), two new species, Black-throated Gray Warbler and Sage Thrasher, had not been previously detected in the park were found in 2011.

DISCUSSION

In Tables 3-5, we present density estimates for 2005-2011. These tables allow for comparison of the seven years' density estimates and, more importantly, provide new, more robust,

estimates for 2005 – 2010, since we pooled data across all years, increasing overall sample sizes. For most species, each year of additional data will improve our ability to accurately estimate densities of the species that occupy the NCPN. The density estimates presented in this report replace the estimates provided in the 2005 – 2010 reports. Sample sizes (n) reported in the tables indicate the number of detections used in analyses, after truncation. This year we increased our minimum post-truncation sample size from 60 to 80 detections. Initially, this method will cause us to estimate density for fewer species but will provide more reliable estimates over time. In LR, we did not include density estimates for Western Tanager (n=72). In PJ we did not include density estimates for Brewer's Sparrow (n=62), and Green-tailed Towhee (n=77), but we accrued enough detections to obtain density estimates for a new species, Hermit Thrush (n=86). In SA, we did not include density estimates for Yellow-rumped Warbler (n=79) for the first time since 2009. Species such as Yellow-rumped Warbler in SA, are on the verge of having sufficient sample sizes and will likely be included in next season's report.

The National Park Service's project objective is to determine the population status and trends of breeding landbird species in LR, PJ, and SA habitats. For the second year, we present landbird population trend results for several species of conservation concern in NCPN. The results this year used slightly different density estimates to populate trends than those used in 2010 because we had lower sample sizes which occurred because of increased truncation distances for some species. The lower sample sizes in some cases were related to increasing the minimum number of detections used for analysis from 60 to 80 this year. The trend results indicate that many sensitive species appear to have stable populations within certain habitats of NCPN. As expected we saw more species in 2011 with significant trends, particular quadratic trends, which are significant however not necessarily positive or negative.

We suggest paying close attention to the Bewick's Wren (BEWR) which continues to have a decreasing population trend. Potential explanations of BEWR declines may be loss of suitable nesting habitat (cavities) and competition with other cavity nesters. Additional investigation of BEWR populations is recommended as we document over a 50 percent decline in the last seven years. Black-billed Magpie (BBMA) had evidence of a negative population trend in 2010, but with the addition of the 2011 data now has a quadratic population trend. Species such as BBMA could reveal trends in population variability over time. Other species which we detected significant trends were Rock Wren in Low-elevation riparian, and Black-throated Gray Warbler and White-throated Swift in Pinyon-juniper. Since we did not detect significant declines in these species in 2010, we are exploring whether these are true declines, whether observer detectability is varying among years, or if these species have cyclical populations. Long-term monitoring will continue to be necessary for interpreting population status and trends for avian species of NCPN.

In 2007, the NABCI monitoring subcommittee outlined recommendations for improving monitoring programs (US North American Bird Conservation Initiative Monitoring Subcommittee 2007). The first recommendation is that bird monitoring programs should integrate an adaptive management approach into the monitoring process to incorporate management and conservation priorities. We hope that trends identified in this early-warning program will lead to increased research and projects exploring species' population declines in the Network. The second recommendation is to coordinate landbird monitoring among organizations and across spatial scales to make monitoring more efficient and effective. RMBO continues to work with a variety of federal, state, and local agencies throughout 13 different states. We monitor landbirds through a spatially-balanced study design using Bird Conservation Regions (BCRs) as our sampling frame. We anticipate post stratifying NCPN surveys in this framework by habitat and

comparing it to the NCPN results presented here. Furthermore, we can use BCR-based data from lands outside of park networks, for further comparisons. Currently we can use 2008-2011 data from Colorado and Wyoming for such comparisons and in future years, we hope to use the Utah portions of BCR 9 and BCR 16. Comparisons of densities in these areas may guide the Park Service in making key management decisions and help to assess the effectiveness of past and existing management practices.

RMBO's Avian Data Center (ADC) meets a third NABCI recommendation by providing decision support tools, such as distribution maps, species counts, monitoring reports, and species information to land managers and the public. In 2012, RMBO will release an updated version of the ADC. This will include species accounts of the 44 priority species (Appendix B) we detected during counts in 2011, as well as information on other species found in NCPN. 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 this data available to land managers, scientists, and the public for decision-making, research, and educational purposes.

In 2011, we further refined the monitoring protocol at PISP to include diurnal and nocturnal area searches. These area searches provided additional information on species occurrences, as well as migratory and breeding behavior. For example, the presence of Black Phoebe in the park was first confirmed last year when we located a Black Phoebe nest during the first area search. We counted 170 birds and 5 additional species by adding area searches in 2011: Bewick's Wren, Black Phoebe, Common Poorwill, Great Horned Owl and Lazuli Bunting. The monument's small size allows these area searches to be repeated by volunteers who come to observe birds or conduct other surveys, which can readily inform park staff management actions or habitat enhancement decisions.

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APPENDIX A

List of all bird species observed during surveys in the Northern Colorado Plateau Network, with species totals by habitat for 2011, and yearly species totals from 2005-2011. Habitats: LR=Low-Elevation Riparian; PJ=Pinyon-Juniper; SA=Sage Shrubland; PISP=Pipe Springs National Monument. Priority species are bolded.

Species	# of individuals observed per habitat, 2011				# of individuals observed per year and total (all habitats), 2005-2011							
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	2011	Total
American Crow					10	1	2	4	2	2		21
American Dipper					1	1	1	2	1			6
American Goldfinch	10				10	4	9	7	8	34	10	82
American Kestrel			17		10	10	11	9	9	13	17	79
American Robin	30	39	70	1	100	154	144	129	64	100	140	831
Ash-throated Flycatcher	257	109	10	3	300	412	357	357	442	384	379	2631
Bank Swallow							2	1		1		4
Barn Swallow			2	2	1	2	3	1	2		4	13
Belted Kingfisher							1					1
Bewick's Wren	17	33		1	237	306	197	205	219	50	51	1265
Black Phoebe	3			2	10	15	28	12	32	10	5	112
Black-billed Magpie		7	84		77	108	53	52	52	74	91	507
Black-capped Chickadee	2		1		1	4	4		2	1	3	15
Black-chinned Hummingbird	48	19	2		50	67	52	52	104	53	69	447
Black-chinned Sparrow		3			9	6	4		12	4	3	38
Black-headed Grosbeak	16	18	7		27	54	37	37	46	38	41	280
Black-throated Gray Warbler	99	379	23	5	393	551	455	566	627	420	506	3518
Black-throated Sparrow	123	93	7	12	113	171	193	151	334	183	235	1380
Blue Grosbeak	6				14	32	6	6	35	3	6	102
Blue-gray Gnatcatcher	218	180	36		340	302	291	332	493	424	434	2616
Blue-winged Teal					1							1

Species	# of individuals observed per habitat, 2011				# of individuals observed per year and total (all habitats), 2005-2011							
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	2011	Total
Bobolink	1										1	1
Brewer's Blackbird	1		33		10	48	23	10	30	29	34	184
Brewer's Sparrow	6	4	647	1	584	635	593	535	710	652	658	4367
Broad-tailed Hummingbird	11	1	10	1	68	30	46	75	29	78	23	349
Brown Creeper			1								1	1
Brown-headed Cowbird	24	23	22	11	39	70	50	47	56	27	80	369
Bullock's Oriole	12	2	8	9	7	30	19	13	20	34	31	154
Bushtit		1			67	93	33	24	61	11	1	290
California Gull					3	3						6
Canada Goose	2	4	17		6	6	20	9	5	8	23	77
Canyon Wren	12	6			52	103	70	36	58	7	18	344
Cassin's Finch		9	4		4	38	14	13	2	4	13	88
Cassin's Kingbird	1			6		1			19		7	27
Cedar Waxwing							1	1	1			3
Chipping Sparrow	43	149	76		153	152	186	213	245	272	268	1489
Chukar						3	3		2	3		11
Clark's Nutcracker		6	2		16	24	26	17	24	7	8	122
Cliff Swallow	1		15		50	36	15	6		5	16	128
Common Merganser					1	2	7	4	1			15
Common Nighthawk		2	1		2	1	1	2	6	14	3	29
Common Poorwill				1	1	1	1			2	1	6
Common Raven	64	75	55	5	116	134	176	135	131	192	199	1083
Common Yellowthroat	15	2	3		13	30	27	9	31	16	20	146
Cooper's Hawk	2		1		15	17	14	5	8	15	3	77
Cordilleran Flycatcher		1			4	1	2	3	3	3	1	17
Dark-eyed Junco		1	7		38	18	45	35	4	3	8	151

Species	# of individuals observed per habitat, 2011				# of individuals observed per year and total (all habitats), 2005-2011							
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	2011	Total
Downy Woodpecker	6				5	11	3	7	15	1	6	48
Dusky Flycatcher	3	19	77		51	111	98	136	108	98	99	701
Dusky Grouse					1		1					2
Eastern Kingbird	1										1	1
Eared Grebe									1			1
Eurasian Collared-Dove	1	1		8			1			19	10	29
European Starling			12	15	9	16	8	10		8	27	78
Evening Grosbeak	1	1					1				2	3
Ferruginous Hawk										1		1
Gadwall			2		1	1	3				2	7
Gambel's Quail				14	9	15		1	7	15	14	61
Golden Eagle					7	10	4	6	1			28
Grace's Warbler		18	15		15	31	39	31	26	19	33	194
Gray Flycatcher	8	128	22		160	116	108	142	256	227	158	1167
Gray Vireo	10	108	3		136	128	104	150	252	164	121	1055
Great Blue Heron			3		9	3	3	3	1	6	3	28
Great Horned Owl				1	2			1		1		4
Greater Sage-Grouse					7	2	1					10
Green-tailed Towhee	1	17	351		346	462	364	302	330	220	369	2393
Green-winged Teal						1						1
Hairy Woodpecker	7	4	3		13	21	21	16	26	21	14	132
Hammond's Flycatcher	1						9	9	19		1	38
Hermit Thrush		43	1		15	21	2		24	14	44	120
Horned Lark			29		31	39	43	23	47	32	29	244
House Finch	151	175	20	22	234	336	423	416	506	357	368	2640
House Sparrow				16						1	16	17

Species	# of individuals observed per habitat, 2011				# of individuals observed per year and total (all habitats), 2005-2011							
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	2011	Total
House Wren	57	11	20		59	61	39	55	57	48	88	407
Indigo Bunting						1			6			7
Juniper Titmouse	28	121	2		130	112	135	156	251	192	151	1127
Killdeer					4	3	2	2	5	1		17
Lark Bunting	1										1	1
Lark Sparrow	13	27	101	5	131	146	101	50	168	130	146	872
Lazuli Bunting	155	11	21	5	183	155	223	186	275	247	192	1461
Lesser Goldfinch	47	5	1	7	38	67	106	75	159	50	60	555
Lincoln's Sparrow					1			2	1			4
Loggerhead Shrike					3	1		1		4		9
Long-eared Owl						2						2
Lucy's Warbler	19				1		11	20	39	7	19	97
MacGillivray's Warbler					3	9	3	4	7	11		37
Mallard	2		4	1	2	15	2	11	3	2	7	42
Mountain Bluebird	10	32	77		149	134	157	111	109	144	119	923
Mountain Chickadee		27	4		34	22	24	14	25	8	31	158
Mourning Dove	91	151	72	16	411	536	499	393	270	428	330	2867
Northern Flicker	9	18	37		48	57	58	22	50	72	64	371
Northern Goshawk								1				1
Northern Harrier	1		1		2	4	5	6	2	8	2	29
Northern Mockingbird	10	7	2	5		25	11	17	37	32	24	146
Northern Rough-winged Swallow	6		1		6	6	2	6	16	8	7	51
Northern Shoveler							2					2
Olive-sided Flycatcher		2			16	4	4	2	18		2	46
Orange-crowned Warbler	1		2		2	2	2	2		2	3	13
Osprey		1			1			1			1	3

Species	# of individuals observed per habitat, 2011				# of individuals observed per year and total (all habitats), 2005-2011							
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	2011	Total
Peregrine Falcon	2	3			4	5	7	10	3	7	5	41
Phainopepla									3			3
Pine Siskin	11	22	3	25	4	15	4	15	15	18	61	132
Pinyon Jay	3	49	7		75	106	123	50	79	163	59	655
Plumbeous Vireo	57	91	10		147	165	138	131	148	216	158	1103
Prairie Falcon	2				2			2	1	1	2	8
Pygmy Nuthatch		9	15		10	7	12	5	10	7	24	75
Red Crossbill		1			1	11	4		19	6	1	42
Red-breasted Nuthatch	1		2		11	5	7	1	2	1	3	30
Red-naped Sapsucker						2		1	2			5
Red-tailed Hawk	2	3	2		12	17	10	9	12	5	7	72
Red-winged Blackbird	4		3			4	1	1	1	2	7	16
Ring-billed Gull							2					2
Rock Pigeon		1			2	5	3			2	1	13
Rock Wren	131	94	135	3	315	403	348	303	417	256	363	2405
Ruby-crowned Kinglet	2	4	1		4	4	3	9	11	10	7	48
Sage Sparrow			18		43	32	31	21	37	10	18	192
Sage Thrasher			130	1	92	93	88	155	128	150	131	837
Sandhill Crane						1		1	1			3
Savannah Sparrow						1	1					2
Say's Phoebe	72	19	32	5	101	97	63	95	121	91	128	696
Scott's Oriole							1	5	6			12
Sharp-shinned Hawk						1	1	1				3
Short-eared Owl						3			1			4
Song Sparrow	34	2	9		60	75	69	61	33	10	45	353
Spotted Sandpiper					1	2	7		3	8		21

Species	# of individuals observed per habitat, 2011				# of individuals observed per year and total (all habitats), 2005-2011							
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	2011	Total
Spotted Towhee	377	128	101	5	428	609	499	405	528	543	611	3623
Steller's Jay			3		5	5	16	9	5	9	3	52
Summer Tanager									1			1
Swainson's Thrush									1			1
Townsend's Solitaire	2	6	4		5	6	12	6	18	12	12	71
Tree Swallow	28	4	3		3	20	20	25	2	2	35	107
Turkey Vulture	2	7	3		19	23	16	8	18	18	12	114
Veery						1						1
Vesper Sparrow		25	583		379	492	484	473	477	599	608	3512
Violet-green Swallow	106	29	28	5	194	320	265	204	276	183	168	1610
Virginia's Warbler	20	56	21		121	109	102	154	46	120	97	749
Warbling Vireo	16	2	16		44	58	61	51	37	32	34	317
Western Bluebird	5	3			15	14	15	17	22	9	8	100
Western Grebe						1						1
Western Kingbird	2			13	2	4	1	6	24	24	15	76
Western Meadowlark	7	45	6		227	239	182	213	276	227	58	1422
Western Screech-Owl			1		1						1	2
Western Scrub-Jay	36	34	4		86	87	71	78	55	80	74	531
Western Tanager	13	22	1		44	69	72	59	45	55	36	380
Western Wood-Pewee	20		2		40	44	64	42	56	28	22	296
White-breasted Nuthatch	1	12	259		27	27	30	17	22	27	272	422
White-crowned Sparrow	2		7	33		6	4	7	2	3	42	64
White-faced Ibis		60	4		1						64	65
White-throated Swift	106		5		271	286	376	200	236	183	111	1663
Wild Turkey	3	1			2	7	1	4	7	6	4	31
Williamson's Sapsucker					1		1	1				3

Species	# of individuals observed per habitat, 2011				# of individuals observed per year and total (all habitats), 2005-2011							
	LR	PJ	SA	PISP	2005	2006	2007	2008	2009	2010	2011	Total
Willow Flycatcher					1	3	3		1			8
Wilson's Warbler	1		3			4		3	3	6	4	20
Yellow Warbler	178	1	9	18	157	175	155	181	273	252	206	1399
Yellow-billed Cuckoo						1						1
Yellow-breasted Chat	57		5		52	57	54	48	72	89	62	434
Yellow-rumped Warbler	30	24	14	3	26	65	32	49	14	69	71	326

APPENDIX B

Priority species observed on transects in the Northern Colorado Plateau Network from 2005-2011, with conservation and management designations and species totals per habitat. Habitats: LR=Low-Elevation Riparian; PJ=Pinyon-Juniper; SA=Sage Shrubland; PISP=Pipe Springs National Monument.

Species	Management Designations						Number of individuals observed per habitat, 2005-2011			
	UDWR[1]	USFWS[2]			Partners In Flight[3]					
		BCR 10	BCR 16	Region 6	BCR 10	BCR 16	LR	PJ	SA	PISP
American Dipper					RS		6			
Bewick's Wren				BCC			454	779	26	6
Black-billed Magpie						RS	4	18	486	
Black-chinned Sparrow						CC	16	21	1	
Black-throated Gray Warbler	Tier III					RC	558	2761	198	5
Black-throated Sparrow						RC	624	582	123	58
Bobolink	Tier II						1			
Brewer's Sparrow	Tier III	X	X		CC,RC	CC,RC	29	73	4280	2
Broad-tailed Hummingbird	Tier III					RS	96	99	155	1
Canyon Wren						RC	236	102	4	2
Cassin's Finch		X	X	BCC	RC,CS,RS	RC	7	53	32	
Clark's Nutcracker					CS,RS	CS,RS	2	58	62	
Common Nighthawk						RC	2	23	4	
Cordilleran Flycatcher						RS	13	4		
Dusky Flycatcher					CS,RS		31	195	476	
Dusky Grouse					CC,RC	CC			2	
Ferruginous Hawk	Tier II	X	X	BCC	RC	RC			1	
Gambel's Quail	Tier III						1	22	2	36
Golden Eagle			X	BCC		RC	3	12	13	
Grace's Warbler			X			CC,RC	3	111	80	

Species	Management Designations						Number of individuals observed per habitat, 2005-2011			
	UDWR[1]	USFWS[2]			Partners In Flight[3]					
		BCR 10	BCR 16	Region 6	BCR 10	BCR 16	LR	PJ	SA	PISP
Gray Vireo	Tier III		X	BCC		CC,RC,RS	172	829	51	3
Greater Sage-Grouse	Tier II				CC,RC,CS,RS	CC,RC			10	
Green-tailed Towhee						CS,RS	22	91	2291	
Hammond's Flycatcher					RS		2	32	5	
Juniper Titmouse			X			RC,RS	223	863	35	7
Lazuli Bunting					RS		1205	68	185	5
Loggerhead Shrike		X		BCC	RC	RC	1	4	4	
Lucy's Warbler	Tier III						101			
Mountain Bluebird						RC,CS,RS	47	315	583	
Northern Goshawk	Tier I				RC,RS				1	
Northern Harrier					RC		6		23	
Olive-sided Flycatcher		X			CC,RC	CC	1	10	35	
Osprey	Tier III							2	1	
Peregrine Falcon	Tier III	X		BCC			22	13	3	3
Pine Siskin						RC,RS	40	46	36	25
Pinyon Jay			X	BCC	CC	CC,RC,CS,RS	19	558	82	
Plumbeous Vireo						RS	514	495	94	
Prairie Falcon				BCC		RC	4		5	
Pygmy Nuthatch						RC		33	42	
Red Crossbill					RS			12	32	
Red-naped Sapsucker					CS,RS		4		1	
Rock Wren						RS	824	791	781	14
Sage Sparrow	Tier III	X		BCC		RC	3		189	
Sage Thrasher	Tier III	X		BCC				1	836	1
Say's Phoebe						RS	405	140	136	16

Species	Management Designations						Number of individuals observed per habitat, 2005-2011			
	UDWR[1]	USFWS[2]			Partners In Flight[3]					
		BCR 10	BCR 16	Region 6	BCR 10	BCR 16	LR	PJ	SA	PISP
Short-eared Owl	Tier II			BCC	CC				4	
Townsend's Solitaire					RS		5	43	23	
Veery			X						1	
Violet-green Swallow						RS	1093	342	178	10
Virginia's Warbler	Tier III					CC,RC,RS	256	306	189	
Warbling Vireo						RS	212	18	88	
Western Bluebird						RS	20	34	53	
White-throated Swift					CC	CC,RS	995	651	96	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			

[1] UDWR=Utah Division of Wildlife Resources, Tier I,II,III= Utah Comprehensive Wildlife Conservation Strategy Tier I,II,III Species of Greatest Conservation Need (Utah Division of Wildlife Reources 2005)

[2] USFWS=United States 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).