Monitoring Colorado's Birds:
2006 Field Season Report

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In Cooperation With:

ROCKY MOUNTAIN BIRD OBSERVATORY

The mission of the Rocky Mountain Bird Observatory (RMBO) is the conservation of birds of the Rocky Mountains, Great Plains, and Intermountain West, and the habitats on which they depend. *RMBO practices a multi-faceted approach to bird conservation that integrates scientific research and monitoring studies with education and outreach programs to bring bird conservation issues to the public and other conservation partners. RMBO works closely with state and federal natural resource agencies, private landowners, schools, and other nonprofit organizations. RMBO accomplishes its mission by working in four areas:*

Research: *RMBO studies avian responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.*

Monitoring: *RMBO monitors the distribution and abundance of birds through long-term, broad-scale monitoring programs designed to track population trends for birds of the region.*

Education: *RMBO provides active, experiential, education programs for K-12 students in order to create an awareness and appreciation for birds, with a goal of their understanding of the need for bird conservation.*

Outreach: *RMBO shares the latest information in land management and bird conservation practices with private landowners, land managers, and resource professionals at natural resource agencies. RMBO develops voluntary, working partnerships with these individuals and groups for habitat conservation throughout the Great Plains and Rocky Mountains.*

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EXECUTIVE SUMMARY

Birds are excellent indicators of environmental quality and change. In addition, they are one of the most highly visible and valued components of our native wildlife. Monitoring birds provides data needed not only to effectively manage bird populations, but also to understand the effects of human activities on ecosystem and to gauge their sustainability. Because bird communities reflect an integration of a broad array of ecosystem conditions, monitoring entire bird communities at the habitat level offers a cost-effective means for monitoring biological integrity at a variety of scales.

In 2006, Rocky Mountain Bird Observatory (RMBO), in conjunction with its funding partners, the Colorado Division of Wildlife, the U.S.D.A. Forest Service, and the Bureau of Land Management, implemented Year 9 of Monitoring Colorado's Birds (MCB), using a protocol similar to other RMBO monitoring programs as delineated by Luekering et al. (2001). RMBO has designed this program to provide statistically rigorous, long-term, trend data for populations of most diurnal, regularly breeding bird species in Colorado, including several species listed by government and non-government conservation organizations as species of concern. In the short term, this program provides information needed to effectively manage and conserve bird populations in Colorado, including the spatial distribution, abundance, and relationship to important habitat characteristics for each species. It also contributes to RMBO's broader landscape-scale breeding-bird monitoring program.

RMBO staff conducted 126 point-transect surveys (1,853 point counts) in five habitats in Colorado (high-elevation riparian, pinyon-juniper, ponderosa pine, sage shrubland, and spruce-fir) in 2006.

RMBO staff recorded a total of 161 bird species on point transects in the five habitats, many of which were observed on only a few occasions. The habitat-stratified point-transect data provided robust results (CV of ≤ 50% in at least one habitat) on 83 bird species. The 83 species should be effectively monitored under the current program in at least one of the habitats surveyed this year. Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for most of these species within 30 years or less within one or more habitat types. We estimate that a total of 263 species of birds breed in Colorado, therefore we are effectively monitoring at least 32% of all species breeding in the state just in these five habitats.

For a several other species, with one or two more seasons of data, we may be able to calculate a global detection function using data from all years and thereby generate annual density estimates in one or more habitats that could be used for population-trend monitoring. Furthermore, we started analyzing the line transect data and we will be able to effectively monitor a few additional species using these data.

ACKNOWLEDGEMENTS

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INTRODUCTION

Program History

In 1995, the Rocky Mountain Bird Observatory (RMBO), in conjunction with the Colorado Division of Wildlife (CDOW), U.S.D.A. Forest Service (USFS), Bureau of Land Management (BLM), and National Park Service (NPS), began efforts to create and conduct a Colorado-wide program to monitor breeding-bird populations, entitled Monitoring Colorado's Birds (MCB). This was one of the first attempts in the nation to develop and implement a statewide all-bird monitoring plan. In 1997, after review by statisticians and CDOW biologists, the program was structured so that count-based data were obtained for most diurnal, regularly breeding bird species in the state on a randomized and habitat-stratified basis. Using the Colorado GAP dataset, blocks of habitat (stands) large enough to support a 3.5 km MCB transect were randomly selected within the specified habitats. In 1998, we conducted a pilot year on three habitats: aspen, ponderosa pine and spruce-fir. In 1999, after a successful pilot year, the protocol was implemented in an additional 10 habitats.

Monitoring Objectives

RMBO's Habitat-based Bird Monitoring Program is designed to provide population trend or status data on most regularly occurring breeding landbird species within each program area. The specific objectives of RMBO's Habitat-based Bird Monitoring Program are:

1.) To integrate existing bird-monitoring efforts in the region to provide better information on distribution and abundance of all breeding-bird species, and especially for species of concern;
2.) to provide basic habitat-association data for most bird species to address habitat-management issues;
3.) to provide long-term trend or status data on most regularly occurring breeding species in the region, with a target of detecting a minimum rate of population change of ±3.0% per year over a maximum time period of 30 years with a statistical significance of p=0.1 and power of 0.8;
4.) to maintain a high-quality database that is accessible to all of our collaborators as well as the public on the Internet in the form of raw and summarized data; and,
5.) to generate decision-support tools, such as population-estimate models, that help guide conservation efforts and provide a better measure of our conservation success.

METHODS

Study Area

In 2006, RMBO biologists conducted 25 point-transect surveys in each of five habitats selected for state-wide monitoring: high-elevation riparian, pinyon-juniper, ponderosa pine, sage shrubland, and spruce-fir (Figure 1). We also surveyed a few additional transects in various habitats as requested by the U.S.D.A Forest Service. Herein, we report the results for the five habitats selected by the MCB steering committee for state-wide monitoring in 2006. We briefly describe each of these five habitats below.
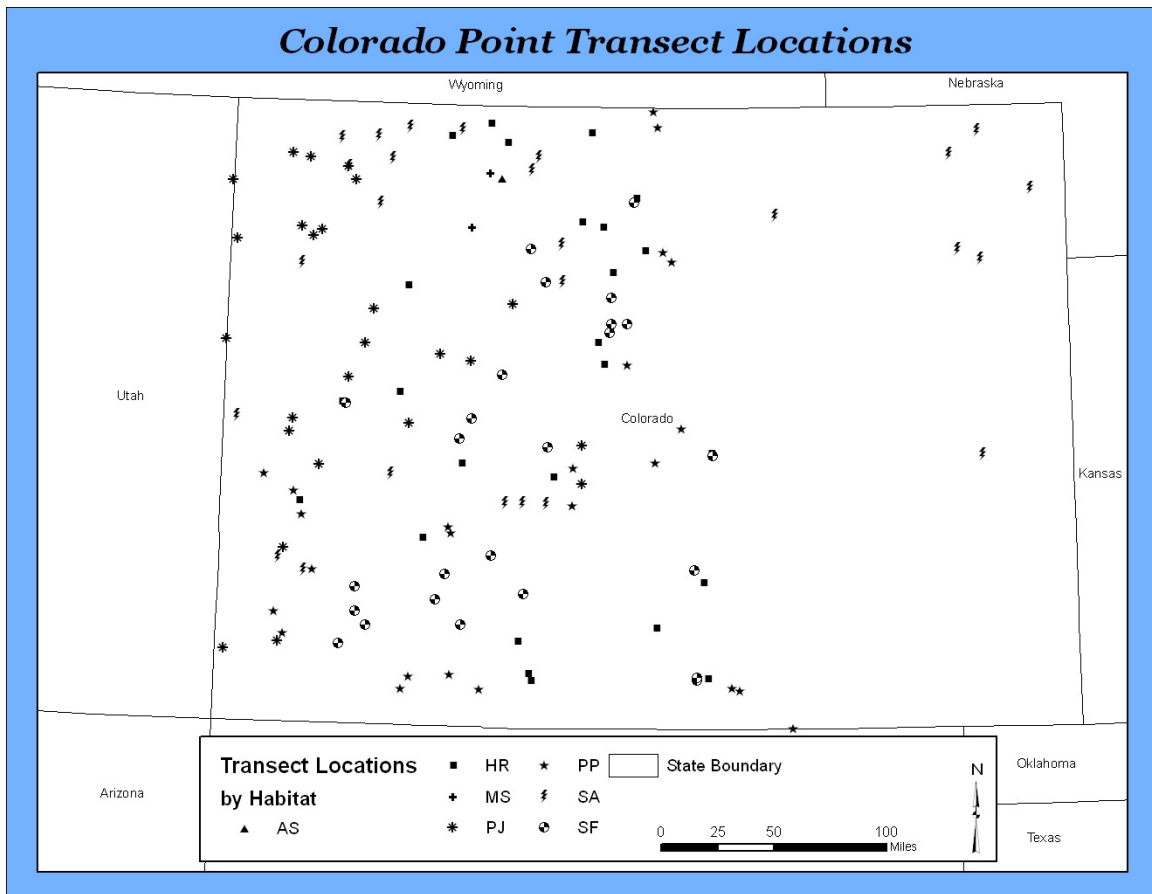
Figure 1. RMBO point-transect locations in Colorado, 2006.

The Habitats

Using the Colorado GAP dataset, we randomly selected suitable stands in each habitat in which to place transects. Stand selection followed two criteria: 1) they had to be large enough to fit 15 points spaced 250 meters apart and 2) some part of the stand had to be within one mile of a road. In previous years, we have surveyed as many as 13 habitats; however, we only surveyed five habitats in

2006 in order to research and evaluate our methods and power to detect trends using the data collected from 1998-2006.

<u>High-elevation Riparian</u>

High-elevation riparian habitat consists of mountain streams lined with willows (*Salix* sp.) and other shrubs. Several species of trees are often present on high-elevation riparian transects including, subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), and lodgepole pine (*Pinus contorta*). The three most common shrubs are willow, big sagebrush (*Artemisia tridentata*), and snowberry (*Symphoricarpos oreophilus*).

<u>Pinyon-Juniper</u>

Pinyon-juniper habitat is composed of arid forested areas dominated by pinyon pine (*Pinus edulis*) and juniper (*Juniperus* sp.). Some common shrubs on pinyon-juniper transects include big sagebrush, Gambel's oak (*Quercus gambelii*), mountain mahogany (*Cercocarpus* sp.), rabbitbrush (*Chrysothamnus* sp.), serviceberry (*Amelanchier* sp.), chokecherry (*Prunus virginiana*), and skunkbrush (*Rhus trilobata*).

<u>Ponderosa Pine</u>

Ponderosa pine habitat is composed of arid conifer stands dominated by ponderosa pine. In the overstory, the most common tree species associated with ponderosa pine are Douglas-fir and white fir (*Abies concolor*). Understory species typically include Gambel's oak, snowberry, common juniper (*Juniperus communis*), mountain mahogany, chokecherry, serviceberry, gooseberry (*Ribes* spp.), and rabbitbrush.

<u>Sage Shrubland</u>

Sage shrubland habitat is composed of open landscapes dominated by big sagebrush. Other common shrubs in this habitat are typically serviceberry and rabbitbrush.

<u>Spruce-Fir</u>

Spruce-fir habitat is composed of high-elevation coniferous trees, such as Engelmann spruce, Douglas-fir (*Psuedotsuga menziesii*), blue spruce (*Picea pungens*), and subalpine fir. Understory species typically include gooseberry, common juniper, willow, snowberry, honeysuckle (*Lonicera* sp.), and alder (*Alnus* sp).

Field Personnel

Fourteen experienced biological technicians, in addition to three of RMBO's permanent staff, all with aural and visual bird-identification skills comprised the crew that executed the field component of MCB in 2006. Most technicians brought with them considerable experience conducting bird surveys across the United States and excellent bird-identification skills. Each technician also completed a four-day training program at the beginning of the field season to

ensure full understanding of the field protocols and to practice bird identification and distance estimation in a variety of habitats.

Point-transect Protocol

RMBO staff conducted point transects in order to sample bird populations in each habitat selected for monitoring. Point transect sampling is based on distance sampling theory, which estimates detection probability as a function of the distances between the observer and the birds detected (Buckland et al. 1993) Each transect was surveyed by one observer following protocol established by Leukering (2000) and modified by Panjabi (2006). RMBO technicians conducted all transect surveys in the morning, between ½-hour before sunrise and 11 AM; most surveys were completed before 10 AM. To maximize efficiency, observers located the selected stand on the ground prior to the morning of the survey. For new transects, observers used this pre-survey visit to establish an access point for each stand, and a random distance (between 0-400 m) and bearing from the access point at which the first point count station would be located. On the morning of the survey, the observer began the point transect at the first count station and then continued along the pre-selected bearing for the fourteen remaining points, if possible. In many cases, the pre-selected bearing eventually would lead the transect out of the target habitat, or to some obstruction (e.g., cliff or private land), forcing the observer to change the bearing of the transect. When this happened, the observer back-tracked to the last point and randomly turned the transect right or left, at an angle perpendicular to the original bearing, and then alternated right or left if additional turns were necessary. In some small or linear stands (e.g., riparian sites), the size and shape of the stand determined the location and course of the transect.

Observers conducted up to 15 five-minute point counts at stations located at 250-m intervals along each point transect, recording all bird detections on standardized forms. Each one-minute interval of every point count was noted on the datasheet so that bird detections were recorded as part of a specific one-minute interval. Flyovers, birds flying over but not using the immediate surrounding landscape, were recorded but excluded from analyses of density. For each bird detected, observers recorded the species, sex, how it was detected (e.g., call, song, drumming, etc.), and distance from the observation point. Whenever possible, observers measured distances using Bushnell® Yardage Pro 500™ laser rangefinders. When it was not possible to measure the distance to a bird, observers used rangefinders to gauge distance estimates by measuring to some closer object. Observers treated the 250-m intervals between count stations as parts of a line transect, and recorded individuals of a short list of low-density species (all grouse, raptors, woodpeckers, and a few other rare or uncommon species) and measured the distance and bearing to each from where it was detected along the transect line. They also recorded bearings and distances to individuals of the same low-density species when they were detected at count stations. Birds initially detected on points that were again detected while moving between points were not included in the line-transect data.

However, birds detected between points, but then again during the subsequent point count, were removed from the line-transect data, and included only on the point count.

Beginning in 2004, we considered all non-independent detections of individual birds as part of a 'cluster' together with the first independently observed bird, rather than as a separate independent observation. This means that if the detection of an individual bird is dependent upon the previous detection of another individual, the resulting observation is recorded as one independent detection. We then record a cluster size of C, where C is the original individual detected plus the sum of any additional individuals detected as a result of the first individual.

In the years since the MCB program began, scientists have proposed several alternate methods for estimating detection probability that are based on mark-recapture theory: (1) the Removal method (Farnsworth et al. 2002), and (2) the Double-Observer method (Nichols et al. 2000). In 2006, RMBO implemented the Removal method in all habitats surveyed in the MCB program while continuing to collect distance data as in previous years. We implemented the Double-Observer method in high-elevation riparian and sage shrubland habitats, in addition to the Removal and Distance sampling methods. Results of removal and double observer methods will be presented in a separate report.

Observers recorded atmospheric data (i.e., temperature in degrees Fahrenheit, cloud cover, precipitation, and wind--Beaufort scale) and the time at the start and end of each transect. They measured distances between count stations using hand-held Garmin® E-trex™ Global Positioning System units. All GPS data were logged in Universal Transverse Mercator (UTM) North American Datum 1927. At each count station, observers recorded UTM coordinates, whether or not the station was within 100 m of a road, and vegetation data, including the structural stage and canopy closure of the forest, mean canopy height, the types and relative proportions of overstory trees, the sub-canopy volume and tree species composition, and the percent coverage and types of shrubs within a 50-m radius of the point. Observers recorded these data prior to beginning each bird count.

Data Analysis

We used program DISTANCE (Thomas et al. 2006) to generate density estimates (D) using only data collected at point transects. Results of line transect analyses and comparison of line and point transect estimates will be presented in a separate report. The notation, concepts, and analysis methods of DISTANCE were developed by Buckland et al. (1993). In DISTANCE analysis, a unique detection function is fit to each distribution of distances associated with a species in a given habitat. Because the detection function is unique to each species in each habitat, DISTANCE analysis avoids some serious problems inherent in traditional analyses of point count data (e.g., unquantifiable

differences in detectability among habitats, species, and years). DISTANCE analysis relies on three assumptions, all of which are reasonably well met by MCB: 1) all birds at distance=0 are detected, 2) distances of birds close to the point are measured accurately, and 3) birds do not move in response to the observer's presence.

In 1998-2005, we provided single-year avian density estimates in our annual reports. This year we are providing density estimates across all years of the MCB program for habitats surveyed in 2006. In the past, we were unable to estimate detection functions for very-low density species due to insufficient sample sizes. This year we fit a common detection function for low-density species across years, which allowed us to estimate annual densities of some less-common species for the first time.

In 2006, density estimates were generated for species for which there was a minimum of 100 detections over all years of the MCB project as recorded from point transects in a given habitat (not including flyovers or between-point observations, and prior to truncation or removal of outliers). Because we considered only independent detections in our analyses of density, the number of *observations* (*n*) reported for each species may be lower than the number of *individuals* (*N*) observed. This is especially true for species that tend to associate in groups (e.g., swifts, swallows, crossbills, etc.) Both numbers may be useful, especially for low-density species, and thus both are reported in the "Species Accounts" section. Note however, that in the habitat accounts in the "Results" section, the number of observations reported (*n*) reflects only the number of independent detections *used to estimate density* (i.e., after any truncation or removal of outliers), and may be less than the total number of independent detections or the total number of individuals observed. The total number of individuals recorded in each habitat for each project, including between point detections of low-density species, is provided in Appendix A.

We simulated the time to detect population trends for each bird species in each habitat for which we were able to estimate density. Time to detect trends was evaluated at the original target levels of 3% annual population change with power = 0.80 and alpha = 0.10 (Leukering et al. 2000). We used a power simulation created in Program R by Paul Lukacs of the Colorado Division of Wildlife. The simulation includes state and observation processes and uses empirical data from the MCB program as model input. The state model defines the initial population density and trend through time using estimated density and the variance of estimated density. The state model also includes the mean and variance of the trend we are hoping to detect; here we modeled an average annual change of 3%, allowing the change to vary stochastically between 1% and 5%. The observation model defines the detection process and sample size through time, using the coefficient of variation (CV) of estimated detection probability and the CV of estimated encounter rate. These are the two sources of variation that influence the variation in estimated density. We ran simulations

for 5, 10, 15, …, 40 years with 1000 replications. Although a 3% annual population change (e.g., decline) may seem small, the result of a constant 3% decline over 24 years would be a loss of one-half of a population. Note that these simulations do not evaluate whether or not a change in the population has occurred; rather, they evaluate our power to detect a trend if the trend had occurred. Also note that we would be able to detect a greater rate of population change (e.g., 5% or 10% change annually) in a much shorter amount of time.

RESULTS

RMBO staff conducted 1,853 point counts along 126 point transects in 5 habitats (Figure 2, Table 1) between 15 May and 18 July 2006. Herein, we report results for the five habitats selected by the MCB steering committee for state-wide monitoring in 2006. We also surveyed one aspen transect and two montane shrubland transects in 2006 that were selected for supplemental monitoring by the U.S.D.A. Forest Service.

Table 1. Sampling periods and effort by habitat in Colorado, summer 2006.

Habitat	Dates sampled	# point transects	# point counts
High-elevation Riparian	17 June – 15 July	26	354
Pinyon-Juniper	15 May – 24 June	25	379
Ponderosa Pine	24 May – 12 July	24	374
Sage Shrubland	17 May – 26 June	26	383
Spruce-Fir	10 June – 18 July	25	363
All Habitats	**15 May – 18 July**	**126**	**1853**

RMBO staff observed a total of 18,724 birds of 161 species on point transects. Data collected on transects enabled us to estimate densities for 83 species in at least one habitat. For several species, we are able to calculate density estimates in more than one habitat.

The total number of species detected in each habitat in 2006 ranged from 60 in spruce fir to 94 in high-elevation riparian (Table 2). While these totals communicate the magnitude of the spectrum of possible species across a range of sites within a habitat type, it should be understood that some species observed were largely peripheral to the habitat in which they were recorded. Thus, species richness measures reflect both the within- and between-habitat diversity of the sites surveyed in each habitat category.

Of the habitats surveyed in 2006, more birds were detected, and species richness (average number of species detected per point-count and per transect) was greatest in ponderosa pine (Table 2). We have provided estimates of avian species richness at both the count-level (i.e., sub-sample) and the transect (i.e., sample) level, as the count-level data are not influenced by stand size (i.e., the number of sub-samples per site), and are therefore best for direct inter-habitat comparisons, while the site-level data, which are influenced by stand size, provide a more complete picture of the bird community within a given stand of habitat. Thus, both estimates are useful from a management perspective.

Table 2. Bird totals and species richness in habitats surveyed in Colorado, summer 2006.

Habitat	# birds detected	# species detected	Avg. # birds/point	Avg.# species/ point	Avg. # species/ transect
High-elevation Riparian	4374	94	12	7.7	28
Pinyon-Juniper	3873	92	10	6.4	26
Ponderosa Pine	4277	91	12	8.3	33
Sage Shrubland	2360	67	7.2	3.6	13
Spruce-Fir	3570	60	10	6.6	22
All Habitats	**18724**	**161**	**10**	**6.5**	**24**

High-elevation Riparian

We conducted 354 point counts along 26 transects in High-elevation Riparian between 17 June and 15 July 2006 (Table 1). We detected 4,374 individual birds, with an average of 12 birds per point count (Table 2). We detected a total of 94 species with an average of 7.7 species per point count and 28 species per transect (Table 2).

The point-count transect data from High-elevation Riparian yielded robust density estimates (CV<50%) for 27 species and a moderately robust estimate (CV=50-75%) for eleven additional species (Table 3). We should be able to effectively monitor these 38 species, which represent 40% of all species detected in High-elevation Riparian.

Broad-tailed Hummingbird, Lincoln's Sparrow, Pine Siskin, White-crowned Sparrow, and Wilson's Warbler had the highest estimated densities of all species detected in High-elevation Riparian (listed in order of highest to lowest density). Fourteen species – Wilson's Snipe, Broad-tailed Hummingbird, Tree Swallow, Swainson's Thrush, Orange-crowned Warbler, MacGillivray's Warbler, Wilson's Warbler, Savannah Sparrow, Fox Sparrow, Song Sparrow, Lincoln's Sparrow, White-crowned Sparrow, Lazuli Bunting, and Red-winged Blackbird – had higher estimated densities in High-elevation Riparian relative to the other five statewide habitats surveyed.

Table 3. Estimated densities of breeding birds in High-elevation Riparian habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Wilson's Snipe	1999	0.1	100	0.01	0.3	1
	2000	0.2	75	0.1	0.5	3
	2001	0.00	--	--	--	0
	2002	0.3	48	0.1	0.7	6
	2004	0.5	46	0.3	1.1	12

Table 3 cont. Estimated densities of breeding birds in High-elevation Riparian habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Wilson's Snipe cont.	2005	1.2	58	0.5	2.9	25
	2006	0.8	73	0.3	2.3	16
Mourning Dove	1999	0.5	62	0.2	1.3	12
	2000	1.7	50	0.8	3.7	29
	2001	2.1	100	0.5	8.8	1
	2002	0.5	73	0.2	1.5	13
	2004	0.5	58	0.2	1.2	10
	2005	4.0	67	1.4	11	2
	2006	2.3	109	0.1	39	5
Broad-tailed Hummingbird	1999	136	33	79	236	20
	2000	188	32	111	319	32
	2001	136	34	78	238	24
	2002	92	40	47	178	14
	2004	177	39	94	333	33
	2005	228	33	132	394	43
	2006	214	32	127	361	36
Northern Flicker	1999	5.9	33	3.4	10	55
	2000	9.5	31	5.7	16	76
	2001	3.3	30	2.0	5.4	28
	2002	2.6	33	1.5	4.5	39
	2004	7.3	36	4.1	13	34
	2005	3.5	24	2.4	5.2	43
	2006	1.9	30	1.1	3.0	44
Western Wood-Pewee	1999	2.8	42	1.4	5.6	22
	2000	2.9	35	1.6	5.2	27
	2001	1.8	36	1.0	3.2	17
	2002	1.4	36	0.8	2.6	13
	2004	3.3	37	1.8	6.0	34
	2005	3.0	35	1.7	5.4	31
	2006	3.7	38	2.0	7.0	37
Dusky Flycatcher	1999	9.2	77	2.9	29	26
	2000	25	39	13	46	46
	2001	29	60	12	73	71
	2002	11	51	5.0	25	54
	2004	14	26	9.4	22	99
	2005	5.4	31	3.2	9.0	49
	2006	16	23	11	24	79
Cordilleran Flycatcher	1999	7.5	43	3.7	15	38
	2000	16	56	6.7	39	29
	2001	13	29	8.1	21	45
	2002	4.4	43	2.2	8.7	28
	2004	6.9	33	4.0	12	36
	2005	6.4	46	3.0	13	17
	2006	2.9	46	1.4	6.0	17
Warbling Vireo	1999	16	43	7.7	32	57
	2000	43	23	30	64	120

Table 3 cont. Estimated densities of breeding birds in High-elevation Riparian habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Warbling Vireo cont.	2001	35	23	24	51	135
	2002	15	31	8.8	24	80
	2004	20	43	10	40	64
	2005	16	30	9.8	26	90
	2006	24	23	16	34	124
Gray Jay	1999	2.4	80	0.7	8.1	6
	2000	3.5	49	1.6	7.8	7
	2001	11	77	3.3	34	16
	2002	4.4	70	1.5	13	10
	2004	1.3	59	0.5	3.3	12
	2005	6.1	129	0.9	44	2
	2006	1.7	66	0.6	4.7	6
Steller's Jay	1999	4.8	37	2.6	8.7	33
	2000	9.0	31	5.5	15	41
	2001	5.5	38	3.0	10	28
	2002	4.2	44	2.1	8.5	27
	2004	0.5	64	0.2	1.3	9
	2005	1.4	54	0.6	3.3	14
	2006	1.7	37	0.9	3.1	15
Clark's Nutcracker	1999	0.04	89	0.01	0.3	3
	2000	1.7	63	0.6	4.5	22
	2001	2.5	71	0.8	7.4	18
	2002	0.8	150	0.1	5.6	10
	2004	0.1	57	0.1	0.3	8
	2005	0.1	106	0.02	0.3	6
	2006	0.3	53	0.1	0.6	20
Black-billed Magpie	1999	1.6	61	0.6	4.1	20
	2000	1.1	57	0.5	2.7	15
	2001	0.8	101	0.2	3.5	7
	2002	0.3	105	0.1	1.1	7
	2004	0.2	89	0.1	0.9	4
	2005	2.4	143	0.4	14	8
	2006	0.2	161	0.02	1.2	2
Common Raven	1999	1.7	100	0.4	7.3	1
	2000	0.6	57	0.2	1.5	12
	2001	0.3	64	0.1	0.9	6
	2002	0.1	100	0.02	0.3	6
	2004	1.5	38	0.8	2.7	18
	2005	0.4	75	0.1	1.2	7
	2006	0.3	57	0.1	0.7	14
Tree Swallow	1999	5.2	61	2.0	14	10
	2000	6.7	48	3.1	14	15
	2001	2.1	74	0.7	6.6	5
	2002	9.9	54	4.2	23	19
	2004	5.9	49	2.7	13	13
	2005	15	44	7.3	30	35

Table 3 cont. Estimated densities of breeding birds in High-elevation Riparian habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Tree Swallow cont.	2006	20	41	10	38	35
Violet-green Swallow	1999	10	53	4.3	24	15
	2000	33	35	18	59	58
	2001	18	39	9.5	34	35
	2002	24	31	14	40	44
	2004	38	31	23	63	54
	2005	43	37	24	80	73
	2006	31	36	17	56	41
Mountain Chickadee	1999	13	43	6.6	27	33
	2000	31	24	20	46	87
	2001	15	28	9.3	24	44
	2002	28	29	17	46	70
	2004	22	22	15	31	64
	2005	14	26	9.1	21	40
	2006	27	30	16	45	82
House Wren	1999	26	34	15	45	48
	2000	22	35	12	39	47
	2001	20	39	10	37	44
	2002	14	52	6.0	32	26
	2004	7.8	40	4.1	15	18
	2005	10	40	5.2	19	24
	2006	14	38	7.7	26	32
Ruby-crowned Kinglet	1999	2.7	47	1.3	5.8	17
	2000	15	25	9.9	23	74
	2001	8.9	50	4.1	20	77
	2002	30	18	22	41	145
	2004	23	18	17	32	143
	2005	28	24	19	41	118
	2006	16	34	9.4	28	172
Mountain Bluebird	1999	**	--	--	--	2
	2000	1.5	63	0.6	4.0	9
	2001	4.3	101	1.0	19	8
	2002	3.1	59	1.2	7.7	15
	2004	0.8	68	0.3	2.3	4
	2005	0.6	84	0.2	2.3	5
	2006	3.4	54	1.5	7.9	18
Swainson's Thrush	1999	0.5	100	0.1	2.3	3
	2000	1.7	47	0.8	3.6	11
	2001	0.4	74	0.1	1.4	3
	2002	1.1	64	0.4	2.9	7
	2004	4.0	40	2.1	7.7	30
	2005	2.2	59	0.9	5.5	16
	2006	0.6	49	0.3	1.3	4
Hermit Thrush	1999	3.1	134	0.5	19	11
	2000	2.4	36	1.3	4.4	47
	2001	1.4	36	0.8	2.6	40

Table 3 cont. Estimated densities of breeding birds in High-elevation Riparian habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Hermit Thrush cont.	2002	3.7	33	2.2	6.4	78
	2004	2.5	24	1.7	3.7	68
	2005	1.5	32	0.9	2.6	37
	2006	1.4	33	0.8	2.5	63
American Robin	1999	62	37	35	112	87
	2000	47	20	34	64	165
	2001	26	24	18	39	161
	2002	60	24	41	90	162
	2004	57	25	38	86	171
	2005	53	30	33	86	220
	2006	46	20	33	64	277
Orange-crowned Warbler	1999	2.4	78	0.7	7.9	4
	2000	8.1	55	3.4	20	16
	2001	5.9	38	3.1	11	12
	2002	5.6	41	2.9	11	11
	2004	1.3	61	0.5	3.5	3
	2005	3.7	44	1.8	7.5	8
	2006	8.0	57	3.3	20	17
Yellow Warbler	1999	67	61	25	178	65
	2000	25	58	10	63	24
	2001	19	63	7.2	51	41
	2002	53	49	24	117	44
	2004	10	44	5.1	20	21
	2005	18	59	6.7	44	45
	2006	8.0	47	3.8	17	33
Yellow-rumped Warbler	1999	11	37	6.2	21	32
	2000	28	28	18	44	55
	2001	20	39	11	38	88
	2002	36	28	22	57	112
	2004	34	29	21	55	81
	2005	41	25	27	62	97
	2006	14	24	9.8	22	81
MacGillivray's Warbler	1999	61	39	32	115	53
	2000	44	43	22	87	44
	2001	58	38	32	107	61
	2002	35	49	16	77	32
	2004	20	47	9.5	43	22
	2005	38	52	17	85	42
	2006	13	50	5.9	29	13
Wilson's Warbler	1999	68	50	30	150	25
	2000	149	34	86	259	58
	2001	63	29	39	102	93
	2002	231	32	136	394	119
	2004	292	28	186	460	179
	2005	155	24	105	230	118
	2006	55	24	37	81	94

Table 3 cont. Estimated densities of breeding birds in High-elevation Riparian habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Western Tanager	1999	5.8	44	2.8	12	31
	2000	5.2	41	2.7	10	33
	2001	3.4	62	1.3	8.9	22
	2002	4.6	49	2.1	10	29
	2004	2.7	34	1.5	4.7	19
	2005	3.9	46	1.8	8.1	27
	2006	1.2	42	0.6	2.3	8
Green-tailed Towhee	1999	21	42	11	41	50
	2000	25	51	11	56	62
	2001	3.6	51	1.6	8.1	30
	2002	3.7	60	1.5	9.6	17
	2004	0.8	114	0.2	3.9	9
	2005	4.5	71	1.5	13	21
	2006	3.2	43	1.6	6.3	17
Chipping Sparrow	1999	2.2	63	0.8	5.8	6
	2000	7.5	43	3.7	15	24
	2001	5.7	51	2.5	13	19
	2002	8.3	36	4.6	15	24
	2004	9.3	40	4.9	18	33
	2005	4.2	35	2.4	7.5	15
	2006	6.7	55	2.8	16	23
Savannah Sparrow	1999	0	--	--	--	0
	2000	3.1	103	0.7	13	12
	2001	7.5	74	2.4	23	30
	2002	2.1	95	0.5	8.3	8
	2004	11	89	3.1	40	49
	2005	9.5	55	4.0	23	41
	2006	15	73	4.9	44	58
Fox Sparrow	1999	15	69	5.2	42	15
	2000	11	60	4.4	28	26
	2001	1.8	145	0.2	18	4
	2002	2.5	61	0.9	6.7	8
	2004	12	65	4.5	33	22
	2005	5.1	46	2.4	11	55
	2006	6.2	49	2.8	14	30
Song Sparrow	1999	46	43	23	94	67
	2000	42	45	21	87	72
	2001	19	42	9.5	37	33
	2002	30	54	13	72	51
	2004	19	36	10	33	36
	2005	21	35	12	37	40
	2006	36	31	22	60	65
Lincoln's Sparrow	1999	73	55	31	172	91
	2000	197	33	115	335	207
	2001	127	22	88	184	321
	2002	439	36	246	784	303

Table 3 cont. Estimated densities of breeding birds in High-elevation Riparian habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Lincoln's Sparrow cont.	2004	403	18	299	544	582
	2005	311	32	185	523	559
	2006	102	15	79	132	453
White-crowned Sparrow	1999	27	54	11	64	32
	2000	66	35	37	116	105
	2001	31	47	15	65	90
	2002	85	32	50	145	130
	2004	123	22	86	178	258
	2005	116	27	74	183	328
	2006	76	29	47	121	301
Dark-eyed Junco	1999	58	71	20	170	36
	2000	54	48	26	115	85
	2001	30	40	16	56	86
	2002	33	95	8.7	127	57
	2004	115	46	56	237	127
	2005	57	34	33	98	79
	2006	20	26	13	31	111
Lazuli Bunting	1999	2.2	80	0.7	7.3	9
	2000	7.1	71	2.4	21	10
	2001	1.6	78	0.5	5.2	6
	2002	2.0	110	0.4	9.0	5
	2004	4.1	88	1.1	15	1
	2005	11	76	3.6	36	29
	2006	5.4	62	2.1	14	22
Red-winged Blackbird	1999	2.8	74	0.9	8.9	11
	2000	3.1	65	1.1	8.4	14
	2001	0.4	100	0.1	1.8	2
	2002	6.8	67	2.4	19	23
	2004	3.1	56	1.3	7.4	14
	2005	6.1	56	2.5	15	30
	2006	3.7	85	1.0	13	16
Brown-headed Cowbird	1999	0.6	116	0.1	7.4	2
	2000	2.9	55	1.2	6.9	12
	2001	7.5	47	3.5	16	13
	2002	5.5	51	2.4	12	25
	2004	4.5	47	2.1	9.6	16
	2005	5.2	46	2.5	11	19
	2006	8.6	47	4.0	18	18
Red Crossbill	1999	0	--	--	--	0
	2000	1.1	77	0.3	3.4	8
	2001	0	--	--	--	0
	2002	4.9	47	2.3	11	23
	2004	5.9	35	3.3	10	33
	2005	0.6	75	0.2	1.8	5
	2006	1.1	51	0.5	2.5	8
Pine Siskin	1999	22	44	11	45	61

Table 3 cont. Estimated densities of breeding birds in High-elevation Riparian habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Pine Siskin cont.	2000	44	22	31	64	120
	2001	23	35	13	41	61
	2002	23	21	16	33	109
	2004	56	24	38	83	166
	2005	73	24	49	108	131
	2006	88	29	55	141	216

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

Pinyon-Juniper

We conducted 379 point counts along 25 transects in Pinyon-Juniper between 15 May and 24 June, 2006 (Table 1). We detected 3,873 individual birds, with an average of 10 birds per point transect (Table 2). We detected a total of 92 species with an average of 6.4 species per point count and 26 species per transect (Table 2).

The point transect data from Pinyon-Juniper yielded robust density estimates (CV<50%) for 23 species and a moderately robust estimate (CV=50-75%) for eight additional species (Table 4). We should be able to effectively monitor these 31 species, which represent 34% of all species detected in Pinyon-Juniper.

Chipping Sparrow, Bushtit, Blue-gray Gnatcatcher, Black-throated Gray Warbler, and Bewick's Wren had the highest estimated densities of all species detected in Pinyon-Juniper (listed in order of highest to lowest density). Eighteen species – Mourning Dove, Gray Flycatcher, Ash-throated Flycatcher, Gray Vireo, Western Scrub-Jay, Pinyon Jay, Black-billed Magpie, Common Raven, Juniper Titmouse, Bushtit, Rock Wren, Bewick's Wren, Blue-gray Gnatcatcher, Mountain Bluebird, Black-throated Gray Warbler, Brewer's Sparrow, Vesper Sparrow, and House Finch – had higher estimated densities in Pinyon-Juniper relative to the other five statewide habitats surveyed.

Table 4. Estimated densities of breeding birds in Pinyon-Juniper habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Mourning Dove	1999	10	26	6.9	16	81
	2000	13	25	9.0	20	103
	2001	4.2	27	2.7	6.4	31
	2002	8.8	27	5.6	14	66
	2003	3.5	40	1.8	6.7	26
	2004	17	26	11	27	100

Table 4 cont. Estimated densities of breeding birds in Pinyon-Juniper habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Mourning Dove cont.	2005	14	28	8.8	22	99
	2006	33	20	24	46	202
Broad-tailed Hummingbird	1999	49	30	30	80	19
	2000	55	32	32	92	21
	2001	53	34	30	93	20
	2002	44	38	24	81	17
	2003	8.0	58	3.2	20	3
	2004	86	36	48	153	30
	2005	89	45	43	185	33
	2006	55	35	31	99	18
Gray Flycatcher	1999	26	21	18	37	145
	2000	81	20	58	114	126
	2001	53	23	36	78	141
	2002	36	24	24	53	153
	2003	27	36	15	48	73
	2004	68	28	43	107	166
	2005	44	22	31	64	146
	2006	54	21	38	76	186
Dusky Flycatcher	1999	11	34	6.1	19	33
	2000	14	35	7.7	25	42
	2001	19	46	8.9	39	55
	2002	8.8	36	4.9	16	27
	2003	3.0	69	1.0	8.7	9
	2004	13	45	6.4	28	37
	2005	6.1	44	3.0	13	18
	2006	5.8	61	2.2	15	15
Ash-throated Flycatcher	1999	3.5	33	2.0	5.9	43
	2000	1.4	31	0.9	2.4	29
	2001	5.5	24	3.7	8.2	71
	2002	7.6	30	4.6	13	66
	2003	5.7	43	2.8	11	52
	2004	20	26	13	31	89
	2005	17	24	11	25	110
	2006	17	24	12	25	136
Gray Vireo	1999	0.8	54	0.3	1.9	5
	2000	0.3	72	0.1	1.0	2
	2001	1.0	72	0.3	3.0	6
	2002	0.8	54	0.3	1.9	5
	2003	1.5	83	0.4	5.0	9
	2004	5.5	53	2.4	13	31
	2005	1.7	62	0.6	4.4	10
	2006	4.2	67	1.5	12	22
Plumbeous Vireo	1999	4.9	28	3.1	7.8	34
	2000	8.4	20	6.0	12	58
	2001	10	20	7.5	15	70
	2002	8.2	19	6.0	11	57

Table 4 cont. Estimated densities of breeding birds in Pinyon-Juniper habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Plumbeous Vireo cont.	2003	5.6	36	3.1	10	38
	2004	14	18	11	19	86
	2005	10	22	6.9	14	65
	2006	9.5	26	6.1	15	54
Western Scrub-Jay	1999	24	50	11	53	47
	2000	26	52	11	58	49
	2001	18	52	8.0	40	31
	2002	16	53	7.1	37	31
	2003	9.2	59	3.7	23	17
	2004	9.2	57	3.8	22	16
	2005	15	53	6.5	34	24
	2006	17	50	8.0	38	27
Pinyon Jay	1999	3.5	38	1.9	6.6	52
	2000	4.5	34	2.6	7.8	38
	2001	4.8	36	2.7	8.6	50
	2002	5.9	59	2.4	15	30
	2003	2.3	56	1.0	5.6	36
	2004	5.3	42	2.7	10	37
	2005	7.8	55	3.3	18	36
	2006	1.9	56	0.8	4.5	29
Black-billed Magpie	1999	1.9	36	1.1	3.4	55
	2000	0.7	43	0.3	1.3	19
	2001	0.7	41	0.4	1.3	19
	2002	0.7	37	0.4	1.3	25
	2003	0.3	48	0.1	0.6	7
	2004	1.5	46	0.7	3.1	38
	2005	1.0	35	0.6	1.8	27
	2006	1.4	51	0.6	3.1	23
Common Raven	1999	0.5	41	0.3	1.0	26
	2000	1.1	35	0.6	1.9	40
	2001	0.7	36	0.4	1.3	43
	2002	0.3	31	0.2	0.5	43
	2003	0.3	42	0.1	0.5	24
	2004	0.9	27	0.6	1.4	42
	2005	0.9	34	0.6	1.6	66
	2006	1.8	30	1.1	2.9	69
Violet-green Swallow	1999	13	37	7.2	23	24
	2000	14	36	8.0	26	26
	2001	19	32	11	33	31
	2002	18	44	9.0	37	20
	2003	7.9	58	3.2	20	13
	2004	26	35	14	45	19
	2005	24	42	12	47	26
	2006	15	48	7.0	32	14
Mountain Chickadee	1999	9.7	38	5.2	18	24
	2000	27	24	19	41	67

Table 4 cont. Estimated densities of breeding birds in Pinyon-Juniper habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Mountain Chickadee cont.	2001	8.8	30	5.4	14	19
	2002	12	44	5.7	24	29
	2003	5.0	50	2.2	11	12
	2004	11	36	6.0	19	24
	2005	17	40	8.7	32	39
	2006	21	47	9.7	45	41
Juniper Titmouse	1999	12	27	7.9	19	36
	2000	19	30	11	30	54
	2001	25	27	16	39	69
	2002	18	30	11	29	52
	2003	9.5	42	4.8	19	27
	2004	17	25	11	26	44
	2005	12	29	7.6	19	29
	2006	19	29	12	31	43
Bushtit	1999	50	31	30	83	31
	2000	69	28	43	109	40
	2001	20	53	8.7	47	6
	2002	40	40	21	77	23
	2003	28	47	13	60	9
	2004	61	55	26	146	13
	2005	61	41	32	119	31
	2006	132	43	66	264	24
Rock Wren	1999	4.7	38	2.5	8.9	67
	2000	3.9	33	2.2	6.7	54
	2001	1.5	54	0.7	3.7	21
	2002	2.1	36	1.1	3.7	28
	2003	1.5	37	0.8	2.7	20
	2004	4.2	29	2.6	6.7	53
	2005	2.3	44	1.1	4.7	31
	2006	5.3	44	2.6	11	61
Bewick's Wren	1999	25	33	15	44	175
	2000	58	28	36	92	160
	2001	16	31	9.4	26	115
	2002	16	42	8.2	32	80
	2003	15	37	8.0	27	85
	2004	46	28	29	73	161
	2005	18	31	11	30	121
	2006	67	29	42	108	229
Blue-gray Gnatcatcher	1999	62	18	46	84	108
	2000	65	19	47	90	112
	2001	45	25	30	69	76
	2002	65	22	45	94	111
	2003	15	35	8.4	26	25
	2004	78	20	56	108	110
	2005	64	14	50	81	102
	2006	96	16	74	125	134

Table 4 cont. Estimated densities of breeding birds in Pinyon-Juniper habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Mountain Bluebird	1999	13	33	7.7	22	70
	2000	28	25	18.8	42	83
	2001	5.7	34	3.2	10	55
	2002	22	29	14	35	105
	2003	7.9	48	3.7	17	63
	2004	51	29	32	81	152
	2005	30	27	19	47	109
	2006	40	29	25	64	142
American Robin	1999	11	80	3.5	36	64
	2000	4.0	39	2.1	7.4	27
	2001	2.8	46	1.3	5.8	47
	2002	6.2	40	3.2	12	59
	2003	1.4	63	0.5	3.7	20
	2004	9.4	35	5.4	16	52
	2005	8.0	50	3.7	18	44
	2006	14	46	6.6	28	60
Virginia's Warbler	1999	44	33	26	75	107
	2000	26	29	16	42	63
	2001	29	38	15	54	68
	2002	17	27	11	27	42
	2003	4.6	83	1.4	16	11
	2004	31	33	18	54	69
	2005	18	49	8.2	40	42
	2006	30	58	12	76	60
Black-throated Gray Warbler	1999	55	21	39	78	160
	2000	85	19	62	117	181
	2001	42	16	33	55	202
	2002	66	20	48	92	163
	2003	32	38	17	59	64
	2004	55	19	40	75	199
	2005	64	19	47	87	201
	2006	84	22	58	122	222
Green-tailed Towhee	1999	17	31	10	28	98
	2000	21	30	13	34	118
	2001	6.9	42	3.5	14	38
	2002	4.0	36	2.2	7.2	23
	2003	1.4	62	0.5	3.8	8
	2004	20	29	12	33	103
	2005	13	30	8.0	21	71
	2006	9.0	32	5.3	15	43
Spotted Towhee	1999	41	32	25	69	215
	2000	52	27	33	82	202
	2001	21	29	13	34	186
	2002	51	36	29	91	125
	2003	6.7	51	3.0	15	37
	2004	51	32	30	85	139

Table 4 cont. Estimated densities of breeding birds in Pinyon-Juniper habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Spotted Towhee cont.	2005	39	31	23	65	149
	2006	27	34	15	47	136
Chipping Sparrow	1999	73	23	50	107	179
	2000	133	16	102	173	262
	2001	35	18	26	47	162
	2002	41	20	29	57	137
	2003	10	43	5.3	21	60
	2004	110	33	64	189	170
	2005	85	43	43	169	191
	2006	136	18	101	182	217
Brewer's Sparrow	1999	4.4	31	2.6	7.3	38
	2000	2.2	48	1.0	4.8	19
	2001	6.1	63	2.3	16	50
	2002	3.0	36	1.7	5.4	26
	2003	2.3	57	0.9	5.6	19
	2004	7.4	45	3.6	15	45
	2005	2.9	33	1.7	5.0	22
	2006	8.4	41	4.3	17	57
Vesper's Sparrow	1999	4.2	41	2.2	8.1	28
	2000	7.0	34	4.0	12	46
	2001	3.6	38	1.9	6.7	23
	2002	5.3	37	2.9	9.6	35
	2003	1.9	46	0.9	3.9	12
	2004	5.3	43	2.7	11	32
	2005	3.6	45	1.7	7.6	23
	2006	9.7	29	6.0	16	53
Black-headed Grosbeak	1999	3.1	43	1.5	6.2	25
	2000	7.2	41	3.7	14	57
	2001	1.6	60	0.6	4.0	12
	2002	2.5	55	1.0	6.0	20
	2003	1.2	56	0.5	2.8	9
	2004	4.3	45	2.1	8.9	31
	2005	3.9	52	1.7	9.0	30
	2006	4.0	55	1.7	9.7	27
Western Meadowlark	1999	0.7	35	0.4	1.2	56
	2000	3.7	27	2.4	5.8	42
	2001	0.8	47	0.4	1.6	32
	2002	0.4	39	0.2	0.8	37
	2003	0.5	58	0.2	1.2	26
	2004	1.7	46	0.8	3.6	48
	2005	1.1	34	0.6	1.9	49
	2006	0.6	65	0.2	1.6	33
Brown-headed Cowbird	1999	11	28	6.7	17	50
	2000	10	25	6.7	15	47
	2001	11	23	7.3	16	47
	2002	8.8	32	5.2	15	41

Table 4 cont. Estimated densities of breeding birds in Pinyon-Juniper habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Brown-headed Cowbird cont.	2003	2.2	46	1.1	4.6	8
	2004	14	28	8.6	22	49
	2005	11	33	6.5	19	46
	2006	13	26	8.7	20	48
House Finch	1999	11	36	6.3	20	80
	2000	9.8	32	5.8	17	68
	2001	5.3	45	2.5	11	35
	2002	7.7	37	4.2	14	51
	2003	2.4	59	1.0	6.1	18
	2004	12	27	8.0	19	68
	2005	8.7	39	4.6	16	54
	2006	22	24	14	32	104

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

Ponderosa Pine

We conducted 374 point counts along 24 transects in Ponderosa Pine between 24 May and 12 July, 2006 (Table 1). We detected 4,277 individual birds, with an average of 12 birds per point count (Table 2). We detected a total of 91 species with an average of 8.3 species per point count and 33 species per transect (Table 2).

The point-count transect data from Ponderosa Pine yielded robust density estimates (CV<50%) for 41 species and a moderately robust estimate (CV=50-75%) for seven additional species (Table 5). We should be able to effectively monitor these 48 species, which represent 53% of all species detected in Ponderosa Pine.

Mountain Chickadee, Broad-tailed Hummingbird, Dark-eyed Junco, Pygmy Nuthatch, and Violet-green Swallow had the highest estimated densities of all species detected in Ponderosa Pine (listed in order of highest to lowest density). Twenty-eight species – Common Nighthawk, Williamson's Sapsucker, Red-naped Sapsucker, Northern Flicker, Olive-sided Flycatcher, Western Wood-Pewee, Hammond's Flycatcher, Dusky Flycatcher, Plumbeous Vireo, Warbling Vireo, Steller's Jay, American Crow, Violet-green Swallow, Mountain Chickadee, White-breasted Nuthatch, Pygmy Nuthatch, House Wren, Western Bluebird, Townsend's Solitaire, Virginia's Warbler, Grace's Warbler, Western Tanager, Green-tailed Towhee, Spotted Towhee, Chipping Sparrow, Black-headed Grosbeak, Brown-headed Cowbird, and Cassin's Finch, – had higher estimated densities in Ponderosa Pine relative to the other five statewide habitats surveyed.

Table 5. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Mourning Dove	1998	3.0	36	1.7	5.4	26
	1999	3.1	52	1.4	7.0	20
	2000	8.6	28	5.4	14	89
	2001	2.9	35	1.6	5.1	36
	2002	6.1	48	2.8	13	69
	2004	10	22	7.0	14	120
	2005	1.9	37	1.1	3.5	44
	2006	16	21	11	23	173
Common Nighthawk	1998	1.1	52	0.5	2.4	8
	1999	1.0	61	0.4	2.7	8
	2000	1.1	79	0.3	3.6	7
	2001	0.9	50	0.4	2.0	7
	2002	1.2	49	0.5	2.5	7
	2004	0.4	59	0.2	1.1	3
	2005	3.1	44	1.5	6.2	22
	2006	1.6	48	0.8	3.6	10
Broad-tailed Hummingbird	1998	88	23	61	129	71
	1999	29	30	18	47	51
	2000	30	32	18	50	45
	2001	41	31	24	69	48
	2002	46	45	22	96	42
	2004	44	35	25	78	49
	2005	164	31	98	274	70
	2006	149	33	87	256	47
Williamson's Sapsucker	1998	14	37	7.9	26	38
	1999	12	35	6.6	20	31
	2000	8.5	43	4.3	17	19
	2001	22	97	5.2	96	8
	2002	13	41	6.7	25	27
	2004	14	35	7.8	24	32
	2005	8.4	38	4.6	15	21
	2006	10	42	5.0	19	21
Red-naped Sapsucker	1998	6.2	59	2.5	16	12
	1999	3.6	65	1.3	9.8	7
	2000	3.7	69	1.3	11	6
	2001	3.7	71	1.3	11	7
	2002	3.3	63	1.3	8.6	5
	2004	0.6	110	0.1	2.6	1
	2005	3.3	69	1.2	9.3	6
	2006	4.6	68	1.6	13	7
Hairy Woodpecker	1998	7.6	51	3.3	17	27
	1999	1.6	43	0.8	3.3	17
	2000	5.1	44	2.5	10	16
	2001	3.5	32	2.1	5.8	24
	2002	5.3	53	2.3	12	16
	2004	4.6	30	2.8	7.6	26

Table 5 cont. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Hairy Woodpecker cont.	2005	13	42	6.5	25	19
	2006	3.6	32	2.1	6.1	20
Northern Flicker	1998	8.4	16	6.4	11	72
	1999	6.0	23	4.1	8.7	75
	2000	6.9	20	4.9	9.6	67
	2001	9.0	34	5.2	16	69
	2002	1.6	32	1.0	2.8	30
	2004	4.0	25	2.7	6.1	47
	2005	4.6	25	3.4	6.9	60
	2006	9.9	25	6.6	15	102
Olive-sided Flycatcher	1998	1.3	30	0.8	2.1	19
	1999	0.5	42	0.3	1.1	8
	2000	0.8	40	0.4	1.6	10
	2001	0.8	42	0.4	1.5	11
	2002	0.3	74	0.1	0.8	3
	2004	0.8	42	0.4	1.5	10
	2005	0.8	54	0.3	1.9	11
	2006	1.5	46	0.7	3.2	18
Western Wood-Pewee	1998	14	27	9.0	22	101
	1999	6.6	27	4.2	10	85
	2000	8.9	30	5.4	15	71
	2001	13	43	6.4	25	184
	2002	8.3	31	5.0	14	148
	2004	20	20	14	28	175
	2005	13	23	9.1	19	159
	2006	24	19	17	33	178
Hammond's Flycatcher	1998	3.2	45	1.6	6.6	13
	1999	2.5	61	1.0	6.3	10
	2000	2.7	54	1.1	6.3	9
	2001	0.5	70	0.2	1.4	2
	2002	3.4	57	1.4	8.5	11
	2004	2.5	46	1.2	5.3	9
	2005	2.4	45	1.1	4.9	8
	2006	16	26	11	26	54
Dusky Flycatcher	1998	32	21	23	45	113
	1999	38	23	26	56	136
	2000	35	26	23	54	104
	2001	26	29	16	42	91
	2002	27	28	17	43	73
	2004	16	36	9.1	29	51
	2005	26	23	17	38	85
	2006	25	44	12	51	69
Cordilleran Flycatcher	1998	3.0	35	1.7	5.2	16
	1999	2.2	51	1.0	5.0	12
	2000	1.1	52	0.5	2.5	5
	2001	3.9	39	2.1	7.4	21

Table 5 cont. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Cordilleran Flycatcher cont.	2002	1.9	54	0.8	4.5	8
	2004	1.3	61	0.5	3.3	6
	2005	0.8	78	0.2	2.5	4
	2006	1.2	54	0.5	2.8	5
Plumbeous Vireo	1998	6.0	33	3.5	10	41
	1999	5.6	33	3.2	9.7	38
	2000	11	32	6.4	19	62
	2001	11	24	7.5	17	76
	2002	13	25	8.8	20	71
	2004	7.3	25	4.9	11	44
	2005	11	29	6.7	17	65
	2006	11	27	7.1	17	60
Warbling Vireo	1998	26	20	18	37	157
	1999	20	22	13	29	130
	2000	26	21	18	36	116
	2001	20	48	9.5	43	150
	2002	18	23	13	27	114
	2004	15	31	9.1	25	77
	2005	15	28	9.6	24	138
	2006	40	23	27	58	201
Steller's Jay	1998	21	22	15	30	122
	1999	11	18	8.0	14	108
	2000	12	21	8.9	18	82
	2001	12	19	8.5	16	123
	2002	3.9	27	2.5	6.0	49
	2004	8.1	24	5.5	12	72
	2005	16	19	12	22	100
	2006	10	23	7.0	15	66
Clark's Nutcracker	1998	2.1	25	1.4	3.2	48
	1999	0.8	35	0.4	1.4	18
	2000	0.9	45	0.4	1.9	17
	2001	0.6	38	0.3	1.1	13
	2002	1.1	46	0.5	2.3	19
	2004	2.0	37	1.1	3.8	29
	2005	0.7	28	0.4	1.1	13
	2006	1.3	37	0.7	2.4	24
American Crow	1998	0.4	63	0.1	1.0	13
	1999	0.1	81	0.0	0.4	4
	2000	0.3	61	0.1	0.7	8
	2001	0.4	36	0.2	0.6	12
	2002	0.4	85	0.1	1.3	10
	2004	0.5	56	0.2	1.2	11
	2005	0.3	71	0.1	0.8	9
	2006	0.4	93	0.1	1.4	10
Common Raven	1998	0.2	46	0.1	0.5	12
	1999	0.5	24	0.3	0.7	27

Table 5 cont. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Common Raven cont.	2000	0.4	37	0.2	0.7	17
	2001	0.5	25	0.4	0.8	30
	2002	0.7	29	0.4	1.1	28
	2004	0.7	21	0.5	1.0	33
	2005	0.9	23	0.6	1.3	43
	2006	0.5	27	0.3	0.8	21
Violet-green Swallow	1998	23	26	15	36	79
	1999	9.4	28	5.9	15	32
	2000	24	29	15	40	69
	2001	20	23	13	29	54
	2002	26	28	17	42	62
	2004	49	23	33	72	85
	2005	38	27	25	60	76
	2006	61	19	45	83	137
Mountain Chickadee	1998	62	25	41	93	162
	1999	34	22	24	49	170
	2000	48	30	30	78	172
	2001	29	28	18	46	132
	2002	24	69	8.7	69	72
	2004	76	35	43	134	120
	2005	24	23	17	35	127
	2006	190	64	73	502	119
Red-breasted Nuthatch	1998	2.1	36	1.2	3.8	20
	1999	4.1	30	2.5	6.8	39
	2000	3.2	58	1.3	8.0	25
	2001	1.7	54	0.7	4.0	16
	2002	1.2	45	0.6	2.5	8
	2004	2.9	40	1.5	5.5	21
	2005	2.9	43	1.4	5.7	25
	2006	0.5	47	0.3	1.1	4
White-breasted Nuthatch	1998	16	23	11	23	62
	1999	11	27	7.1	17	66
	2000	22	23	15	32	97
	2001	12	24	8.4	18	90
	2002	7	32	4.4	12	46
	2004	18	21	13	25	68
	2005	16	33	9.1	27	76
	2006	29	37	16	54	77
Pygmy Nuthatch	1998	34	49	16	74	80
	1999	14	31	8.3	23	51
	2000	33	27	21	51	86
	2001	14	26	9.4	22	80
	2002	11	30	6.5	17	76
	2004	40	47	19	83	106
	2005	20	27	13	31	68
	2006	72	39	38	135	136

Table 5 cont. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Brown Creeper	1998	6.7	32	3.9	11	13
	1999	8.2	29	5.1	13	16
	2000	7.4	31	4.4	12	12
	2001	3.1	41	1.6	6.1	6
	2002	0.7	100	0.2	2.7	1
	2004	7.6	49	3.4	17	12
	2005	2.2	60	0.9	5.7	4
	2006	7.8	47	3.6	17	12
Rock Wren	1998	0.8	47	0.4	1.6	13
	1999	0.1	71	0.04	0.4	2
	2000	0.3	79	0.1	0.9	4
	2001	0.6	56	0.3	1.4	10
	2002	0.8	61	0.3	2.0	9
	2004	0.7	66	0.3	2.1	11
	2005	0.3	61	0.1	0.8	5
	2006	1.5	58	0.6	3.7	20
House Wren	1998	32	23	22	48	93
	1999	10	25	6.8	16	48
	2000	24	24	16	35	70
	2001	7.9	68	2.8	22	64
	2002	13	28	7.9	20	70
	2004	14	29	8.5	22	65
	2005	19	25	13	29	105
	2006	48	30	30	78	126
Ruby-crowned Kinglet	1998	6.9	29	4.2	11	90
	1999	3.5	37	1.9	6.4	46
	2000	2.9	41	1.5	5.7	32
	2001	3.8	48	1.7	8.1	49
	2002	3.8	47	1.5	6.9	33
	2004	3.5	46	1.7	7.5	41
	2005	4.8	37	2.6	8.7	59
	2006	4.6	49	2.1	10	48
Blue-gray Gnatcatcher	1998	4.8	101	1.2	20	5
	1999	4.8	101	1.2	20	5
	2000	12	91	3.0	43	10
	2001	4.8	83	1.4	16	5
	2002	9.8	100	2.3	41	8
	2004	6.5	84	1.9	23	5
	2005	11	67	4.0	31	11
	2006	17	63	6.3	45	14
Western Bluebird	1998	20	45	10	42	26
	1999	12	47	5.9	26	21
	2000	23	45	11	47	34
	2001	4.8	35	2.7	8.5	28
	2002	6.4	50	2.9	14	26
	2004	23	31	14	38	53

Table 5 cont. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Western Bluebird cont.	2005	23	24	15	34	76
	2006	28	37	15	50	50
Mountain Bluebird	1998	17	42	8.6	33	40
	1999	5.5	43	2.7	11	13
	2000	6.6	64	2.4	18	13
	2001	5.1	54	2.2	12	11
	2002	7.2	46	3.4	15	15
	2004	13	34	7.5	23	27
	2005	24	37	13	44	51
	2006	27	42	13	53	48
Townsend's Solitaire	1998	11	23	7.8	16	81
	1999	7.9	20	5.7	11	57
	2000	4.2	28	2.6	6.6	25
	2001	12	21	8.3	17	82
	2002	8.1	27	5.2	13	46
	2004	6.8	23	4.7	10	44
	2005	8.4	21	5.9	12	56
	2006	7.5	23	5.1	11	42
Hermit Thrush	1998	7.6	32	4.5	13	111
	1999	1.9	32	1.1	3.1	53
	2000	5.9	25	4.0	8.9	95
	2001	3.1	37	1.7	5.6	66
	2002	1.8	28	1.1	2.9	60
	2004	4.6	25	3.0	7.0	92
	2005	3.4	25	2.2	5.1	120
	2006	2.6	32	1.6	4.4	93
American Robin	1998	68	15	53	87	273
	1999	17	16	13	22	152
	2000	37	15	29	48	197
	2001	24	17	18	32	213
	2002	18	18	14	25	146
	2004	22	19	16	31	154
	2005	25	17	19	34	164
	2006	44	19	33	60	208
Orange-crowned Warbler	1998	6.5	36	3.6	12	28
	1999	15	45	7.5	32	67
	2000	18	31	11	31	66
	2001	6.3	34	3.6	11	27
	2002	4.4	52	1.9	10	15
	2004	4.2	43	2.1	8.4	16
	2005	5.7	49	2.6	12	23
	2006	7.5	44	3.7	15	26
Virginia's Warbler	1998	6.9	30	4.2	11	30
	1999	17	38	9.4	32	76
	2000	18	30	11	30	65
	2001	8.1	28	5.1	13	35

Table 5 cont. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Virginia's Warbler cont.	2002	3.2	53	1.4	7.5	11
	2004	9.4	29	5.8	15	36
	2005	14	30	8.8	24	57
	2006	30	30	18	50	105
Yellow-rumped Warbler	1998	47	24	31	70	182
	1999	39	17	30	52	218
	2000	23	44	12	46	159
	2001	33	26	22	50	209
	2002	38	29	24	62	107
	2004	34	29	21	55	160
	2005	28	26	18	42	115
	2006	40	20	29	56	189
Grace's Warbler	1998	4.5	46	2.1	9.4	22
	1999	8.3	38	4.5	15	41
	2000	7.0	55	2.9	17	29
	2001	8.2	43	4.1	16	40
	2002	11	39	6.0	21	43
	2004	3.9	46	1.8	8.3	17
	2005	13	33	7.7	23	60
	2006	22	45	11	46	87
MacGillivray's Warbler	1998	2.5	48	1.2	5.3	13
	1999	1.3	64	0.5	3.6	7
	2000	1.6	61	0.6	4.1	7
	2001	1.7	53	0.7	4.0	9
	2002	1.9	60	0.8	4.9	8
	2004	0.0	--	--	--	0
	2005	2.2	52	1.0	5.1	11
	2006	2.9	69	1.0	8.3	12
Western Tanager	1998	26	20	19	36	176
	1999	22	23	15	33	125
	2000	16	19	12	22	88
	2001	15	23	10	22	134
	2002	12	23	8.3	18	98
	2004	29	24	19	43	138
	2005	20	24	13	30	170
	2006	30	25	20	46	125
Green-tailed Towhee	1998	38	27	25	60	186
	1999	13	44	6.4	25	101
	2000	24	33	14	40	135
	2001	10	31	6.4	17	73
	2002	18	26	12	28	112
	2004	13	46	6.3	27	82
	2005	19	27	12	29	111
	2006	15	31	8.6	24	87
Spotted Towhee	1998	12	57	5.0	30	36
	1999	9.2	48	4.3	20	42

Table 5 cont. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Spotted Towhee cont.	2000	27	44	14	56	95
	2001	4.7	43	2.3	9.3	45
	2002	9.2	61	3.6	24	19
	2004	4.3	45	2.1	9.0	38
	2005	6.4	42	3.2	13	53
	2006	37	44	18	76	86
Chipping Sparrow	1998	29	18	21	39	108
	1999	24	22	17	35	90
	2000	30	21	21	42	93
	2001	25	15	19	32	93
	2002	19	20	14	27	57
	2004	36	16	27	47	113
	2005	33	21	23	47	115
	2006	43	17	32	56	124
Vesper Sparrow	1998	2.3	66	0.8	6.2	27
	1999	1.2	77	0.4	3.7	14
	2000	0.9	49	0.4	2.0	9
	2001	1.5	42	0.8	3.0	18
	2002	1.6	45	0.8	3.3	14
	2004	1.8	50	0.8	4.0	19
	2005	1.4	41	0.7	2.7	16
	2006	3.3	43	1.7	6.7	32
Dark-eyed Junco	1998	123	17	93	164	226
	1999	83	17	62	109	152
	2000	118	19	86	161	181
	2001	68	19	50	93	116
	2002	81	23	56	119	116
	2004	98	20	70	137	139
	2005	102	19	74	140	171
	2006	123	16	93	161	179
Black-headed Grosbeak	1998	2.7	45	1.3	5.5	25
	1999	3.1	32	1.8	5.1	29
	2000	1.6	41	0.8	3.2	13
	2001	2.1	36	1.2	3.9	20
	2002	1.5	54	0.6	3.5	11
	2004	3.5	36	1.9	6.3	29
	2005	2.9	46	1.4	6.1	26
	2006	6.0	27	3.8	9.3	45
Brown-headed Cowbird	1998	17	33	9.9	29	44
	1999	6.8	34	3.9	12	39
	2000	13	44	6.3	26	29
	2001	5.5	40	2.9	10	37
	2002	5.0	38	2.7	9.3	31
	2004	5.2	45	2.5	11	18
	2005	7.2	33	4.2	12	30
	2006	32	33	18	55	59

Table 5 cont. Estimated densities of breeding birds in Ponderosa Pine habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Cassin's Finch	1998	1.7	48	0.8	3.7	6
	1999	6.5	34	3.7	11	23
	2000	5.8	49	2.6	13	17
	2001	5.4	50	2.4	12	19
	2002	1.8	55	0.8	4.3	5
	2004	3.5	68	1.3	9.9	8
	2005	11	38	5.7	20	31
	2006	6.4	40	3.3	12	17
Red Crossbill	1998	0.6	56	0.3	1.5	9
	1999	0.6	49	0.3	1.4	9
	2000	1.5	36	0.8	2.8	18
	2001	1.6	37	0.9	2.9	17
	2002	2.0	43	1.0	4.0	17
	2004	4.5	43	2.3	9.1	28
	2005	3.3	66	1.2	9.1	12
	2006	7.8	35	4.4	14	67
Pine Siskin	1998	53	34	31	92	95
	1999	12	50	5.6	27	52
	2000	8.1	45	3.9	17	42
	2001	92	122	19	456	54
	2002	13	39	7.2	25	43
	2004	59	176	7.9	444	29
	2005	78	26	50	118	118
	2006	21	54	8.9	48	64

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

Sage Shrubland

We conducted 383 point counts along 26 transects in Sage Shrubland between 17 May and 26 June, 2006 (Table 1). We detected 2,360 individual birds, with an average of 7.2 birds per point count (Table 2). We detected a total of 67 species with an average of 3.6 species per point count and 13 species per transect (Table 2). A few species that are commonly detected each year in Sage Shrubland habitat were removed from analyses due to observer identification error.

The point-count transect data from Sage Shrubland yielded robust density estimates (CV<50%) for eight species (Table 6). We should be able to effectively monitor these eight species, which represent 12% of all species detected in Sage Shrubland.

Horned Lark, Lark Bunting, Western Meadowlark, Mountain Bluebird, and Mourning Dove had the highest estimated densities of all species detected in Sage Shrubland (listed in order of highest to lowest density). Three species – Horned Lark, Lark Bunting, and Western Meadowlark – had higher estimated densities in Sage Shrubland relative to the other five statewide habitats surveyed.

Table 6. Estimated densities of breeding birds in Sage Shrubland habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Mourning Dove	1999	3.0	44	2.0	4.7	58
	2000	2.0	32	1.2	3.4	33
	2001	2.3	51	1.2	4.4	37
	2002	4.2	39	2.7	6.6	100
	2003	9.9	47	5.9	17	78
	2004	6.0	93	3.6	9.9	71
	2005	5.2	65	3.2	8.3	134
	2006	2.7	41	1.6	4.5	50
Black-billed Magpie	1999	0.5	30	0.3	0.8	20
	2000	0.7	22	0.4	1.4	24
	2001	0.6	30	0.3	1.2	22
	2002	0.4	31	0.2	0.8	16
	2003	0.7	29	0.4	1.3	30
	2004	0.5	32	0.3	0.9	20
	2005	0.9	29	0.4	1.9	39
	2006	1.3	27	0.6	2.5	50
Common Raven	1999	0.06	29	0.03	0.1	10
	2000	0.2	21	0.1	0.5	30
	2001	0.5	16	0.1	2.2	12
	2002	0.2	51	0.09	0.4	22
	2003	0.3	32	0.2	0.5	47
	2004	0.1	31	0.08	0.2	22
	2005	0.2	32	0.1	0.3	27
	2006	0.4	29	0.2	0.5	54
Horned Lark	1999	15	33	8.7	26	164
	2000	26	26	14	50	112
	2001	133	36	81	218	271
	2002	11	36	6.9	18	168
	2003	28	35	18	46	267
	2004	35	44	21	61	181
	2005	25	37	15	41	221
	2006	26	31	17	40	217
Mountain Bluebird	1999	0.8	32	0.4	1.5	11
	2000	2.6	23	1.3	5.1	27
	2001	1.1	33	0.6	2.1	14
	2002	0.8	35	0.4	1.6	10
	2003	2.4	38	1.5	3.8	33
	2004	1.6	33	0.8	3.4	21
	2005	1.5	32	0.8	2.9	21

Table 6. Estimated densities of breeding birds in Sage Shrubland habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Mountain Bluebird cont.	2006	3.4	28	1.2	9.9	38
Lark Bunting	1999	27	28	13	56	258
	2000	8.5	20	2.5	29	61
	2001	29	27	14	60	271
	2002	15	29	6.9	35	139
	2003	15	28	6.8	35	141
	2004	12	28	3.7	37	89
	2005	7.1	28	2.9	18	68
	2006	24	26	12	48	186
Red-winged Blackbird	1999	1.2	41	0.6	2.4	28
	2000	0.7	25	0.3	1.7	12
	2001	1.6	37	0.7	3.9	30
	2002	1.6	49	0.6	4.2	15
	2003	2.3	66	1.1	4.9	39
	2004	1.4	47	0.5	3.8	17
	2005	0.6	42	0.3	1.2	14
	2006	1.2	38	0.6	2.3	24
Western Meadowlark	1999	9.2	46	6.3	14	229
	2000	13	26	8.2	21	198
	2001	14	37	8.7	21	220
	2002	11	51	7.3	16	272
	2003	12	43	7.9	17	370
	2004	14	39	9.1	20	359
	2005	21	34	15	30	544
	2006	21	30	14	30	378

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

Spruce-Fir

We conducted 363 point counts along 25 transects in Spruce-Fir between 10 June and 18 July, 2006 (Table 1). We detected 3,570 individual birds, with an average of 10 birds per point count (Table 2). We detected a total of 60 species with an average of 6.6 species per point count and 22 species per transect (Table 2).

The point-count transect data from Spruce-Fir yielded robust density estimates (CV<50%) for 26 species and a moderately robust estimate (CV=50-75%) for six additional species (Table 7). We should be able to effectively monitor these 32 species, which represent 53% of all species detected in Spruce-Fir.

Dark-eyed Junco, Pine Siskin, Mountain Chickadee, Yellow-rumped Warbler, and Ruby-crowned Kinglet had the highest estimated densities of all species detected in Spruce-Fir (listed in order of highest to lowest density). Sixteen species –

Hairy Woodpecker, American Three-toed Woodpecker, Cordilleran Flycatcher, Gray Jay, Clark's Nutcracker, Red-breasted Nuthatch, Brown Creeper, Golden-crowned Kinglet, Ruby-crowned Kinglet, Hermit Thrush, American Robin, Yellow-rumped Warbler, Dark-eyed Junco, Pine Grosbeak, Red Crossbill, and Pine Siskin – had higher estimated densities in Spruce-Fir relative to the other five statewide habitats surveyed.

Table 7. Estimated densities of breeding birds in Spruce-Fir habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Broad-tailed Hummingbird	1998	1.3	101	0.3	5.6	2
	1999	1.5	101	0.4	6.2	2
	2000	7.8	89	2.1	29	8
	2001	4.5	59	1.8	11	4
	2002	13	71	4.3	39	6
	2004	172	41	90	328	57
	2005	12	47	5.6	25	16
	2006	23	51	10	53	27
Williamson's Sapsucker	1998	1.8	71	0.6	5.2	4
	1999	2.0	70	0.7	5.8	4
	2000	0.0	--	--	--	0
	2001	3.0	57	1.2	7.4	6
	2002	2.1	70	0.7	5.9	4
	2004	4.0	62	1.5	10	8
	2005	9.2	62	3.5	24	19
	2006	2.2	69	0.8	6.2	4
Hairy Woodpecker	1998	4.9	39	2.6	9.2	19
	1999	2.3	42	1.2	4.5	8
	2000	2.6	49	1.2	5.7	7
	2001	4.9	39	2.6	9.1	17
	2002	3.8	49	1.8	8.3	13
	2004	7.8	46	3.8	16	29
	2005	7.2	34	4.2	12	26
	2006	5.2	35	3.0	9.2	17
American Three-toed Woodpecker	1998	1.1	52	0.5	2.4	6
	1999	1.6	54	0.7	3.7	8
	2000	1.5	66	0.6	4.2	6
	2001	1.8	60	0.7	4.5	8
	2002	4.0	41	2.1	7.7	20
	2004	4.6	47	2.2	9.7	26
	2005	2.8	49	1.3	6.1	15
	2006	2.1	46	1.0	4.4	10
Northern Flicker	1998	0.9	39	0.5	1.7	10
	1999	2.9	26	1.9	4.4	28
	2000	3.1	40	1.6	6.0	23
	2001	2.9	29	1.8	4.6	28
	2002	2.7	34	1.6	4.8	25
	2004	1.7	33	1.0	2.9	19

Table 7. Estimated densities of breeding birds in Spruce-Fir habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Northern Flicker cont.	2005	2.9	26	1.9	4.4	29
	2006	3.5	33	2.0	6.1	31
Olive-sided Flycatcher	1998	1.3	38	0.7	2.4	9
	1999	0.6	51	0.3	1.4	4
	2000	1.4	52	0.6	3.3	7
	2001	1.0	53	0.4	2.2	6
	2002	0.8	53	0.4	1.9	5
	2004	1.4	54	0.6	3.3	10
	2005	0.5	76	0.2	1.4	3
	2006	1.4	48	0.6	2.9	8
Hammond's Flycatcher	1998	5.6	43	2.8	11	14
	1999	2.3	60	0.9	5.8	5
	2000	5.8	45	2.8	12	10
	2001	0.5	99	0.1	1.8	1
	2002	1.4	74	0.5	4.3	3
	2004	6.3	58	2.5	16	16
	2005	5.6	42	2.9	11	13
	2006	1.5	56	0.6	3.5	3
Cordilleran Flycatcher	1998	2.0	75	0.6	6.1	3
	1999	13	39	6.9	25	18
	2000	4.7	66	1.7	13	5
	2001	13	39	7.1	25	19
	2002	3.7	43	1.8	7.5	5
	2004	7.6	38	4.1	14	12
	2005	4.9	42	2.5	9.7	7
	2006	12	53	5.1	27	15
Warbling Vireo	1998	3.9	34	2.3	6.8	20
	1999	8.3	33	4.8	14	38
	2000	5.1	52	2.2	12	18
	2001	8.8	39	4.6	17	39
	2002	5.6	30	3.4	9.2	25
	2004	4.4	43	2.2	8.8	23
	2005	5.9	34	3.4	10	28
	2006	9.4	43	4.7	19	40
Gray Jay	1998	49	27	31	76	70
	1999	31	25	21	47	40
	2000	49	26	32	77	49
	2001	22	28	14	36	26
	2002	35	26	23	54	42
	2004	45	24	31	67	60
	2005	21	27	13	33	23
	2006	29	26	19	45	34
Steller's Jay	1998	5.7	42	2.9	11	39
	1999	5.4	32	3.2	9.2	33
	2000	3.0	61	1.1	7.9	14
	2001	8.7	32	5.2	15	52

Table 7 cont. Estimated densities of breeding birds in Spruce-Fir habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Steller's Jay cont.	2002	6.7	27	4.3	10	38
	2004	4.9	34	2.8	8.6	28
	2005	4.7	28	3.0	7.6	29
	2006	3.7	39	2.0	7.0	21
Clark's Nutcracker	1998	4.4	26	2.9	6.9	48
	1999	2.5	34	1.4	4.3	24
	2000	4.3	41	2.2	8.4	32
	2001	3.7	41	1.9	7.3	35
	2002	3.1	39	1.6	5.8	29
	2004	2.7	27	1.7	4.2	26
	2005	1.3	33	0.7	2.2	13
	2006	3.4	35	1.9	6.2	30
Common Raven	1998	1.1	60	0.4	2.7	24
	1999	0.2	73	0.1	0.6	4
	2000	0.5	64	0.2	1.2	7
	2001	0.5	59	0.2	1.2	8
	2002	1.2	78	0.4	4.1	7
	2004	0.7	44	0.3	1.4	13
	2005	0.5	59	0.2	1.3	7
	2006	0.7	58	0.3	1.7	11
Mountain Chickadee	1998	73	20	53	102	201
	1999	64	18	48	87	149
	2000	80	21	56	113	158
	2001	88	18	65	119	230
	2002	73	19	54	99	199
	2004	130	15	101	168	243
	2005	84	18	63	114	166
	2006	156	25	103	235	273
Red-breasted Nuthatch	1998	3.4	39	1.8	6.6	16
	1999	8.4	26	5.5	13	35
	2000	13	34	7.6	24	43
	2001	11	32	6.5	19	46
	2002	8.1	29	5.0	13	33
	2004	28	22	20	40	114
	2005	6.0	22	4.2	8.7	26
	2006	14	28	8.8	22	54
Brown Creeper	1998	33	28	21	53	28
	1999	35	31	21	57	26
	2000	38	34	22	66	22
	2001	19	43	9.4	37	14
	2002	6.8	53	2.9	16	5
	2004	30	36	17	54	21
	2005	21	37	11	37	16
	2006	19	44	9.2	38	13
Golden-crowned Kinglet	1998	71	18	52	95	78
	1999	43	31	26	72	43

Table 7. Estimated densities of breeding birds in Spruce-Fir habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Golden-crowned Kinglet cont.	2000	109	19	79	150	83
	2001	32	29	20	52	32
	2002	21	49	9.3	46	20
	2004	27	32	16	45	23
	2005	37	26	24	57	38
	2006	41	29	25	67	38
Ruby-crowned Kinglet	1998	38	17	28	50	265
	1999	35	22	24	50	215
	2000	29	21	20	41	166
	2001	34	12	28	42	269
	2002	52	20	37	72	244
	2004	79	16	61	102	330
	2005	61	15	48	78	309
	2006	47	16	36	62	337
Townsend's Solitaire	1998	3.4	47	1.6	7.2	15
	1999	5.3	37	2.9	9.6	21
	2000	2.6	42	1.3	5.1	8
	2001	2.8	62	1.1	7.2	11
	2002	2.1	46	1.0	4.3	8
	2004	4.4	38	2.4	8.1	18
	2005	2.2	44	1.1	4.4	8
	2006	5.4	38	3.0	9.9	20
Hermit Thrush	1998	17	21	12	24	282
	1999	15	23	10	22	220
	2000	19	22	13	27	216
	2001	20	21	14	28	288
	2002	18	22	13	26	266
	2004	12	21	8.6	17	202
	2005	20	18	15	26	303
	2006	21	19	15	29	290
American Robin	1998	62	22	44	89	147
	1999	16	26	11	25	74
	2000	55	18	41	74	110
	2001	23	24	16	34	122
	2002	22	23	15	32	105
	2004	70	21	50	100	124
	2005	50	27	32	77	152
	2006	47	23	32	69	172
Yellow-rumped Warbler	1998	84	13	68	104	341
	1999	56	17	43	74	208
	2000	56	15	44	72	199
	2001	65	15	50	83	317
	2002	70	25	46	105	188
	2004	93	15	72	120	223
	2005	76	16	58	100	230
	2006	105	19	77	143	307

Table 7. Estimated densities of breeding birds in Spruce-Fir habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
Wilson's Warbler	1998	16	58	6.3	39	10
	1999	19	52	8.5	44	11
	2000	6.8	77	2.1	22	3
	2001	14	65	5.1	39	8
	2002	14	71	4.9	42	8
	2004	22	68	7.6	61	13
	2005	12	74	3.8	36	7
	2006	28	45	14	58	15
Western Tanager	1998	2.9	48	1.4	6.4	13
	1999	4.3	42	2.2	8.5	17
	2000	3.6	77	1.1	12	11
	2001	14	55	5.9	34	56
	2002	11	39	6.0	21	44
	2004	11	45	5.2	22	49
	2005	7.7	41	4.0	15	31
	2006	12	36	6.6	22	44
Green-tailed Towhee	1998	0.3	101	0.1	1.4	3
	1999	0.2	101	0.1	1.0	2
	2000	0.2	101	0.04	0.7	1
	2001	1.2	71	0.4	3.6	10
	2002	2.0	56	0.8	4.9	16
	2004	1.0	51	0.4	2.2	8
	2005	1.2	41	0.6	2.3	10
	2006	2.0	58	0.8	4.9	15
Chipping Sparrow	1998	4.5	62	1.7	12	16
	1999	1.9	64	0.7	5.1	6
	2000	4.5	54	1.9	11	11
	2001	10	33	6.0	18	33
	2002	12	45	5.8	25	36
	2004	11	37	6.0	20	37
	2005	10	39	5.4	19	33
	2006	27	33	16	46	80
Lincoln's Sparrow	1998	14	38	7.4	26	44
	1999	7.6	49	3.5	17	24
	2000	13	39	6.8	24	35
	2001	10	30	6.1	16	50
	2002	5.8	33	3.4	9.9	37
	2004	21	40	11	39	68
	2005	10	34	5.9	18	62
	2006	11	33	6.5	19	69
White-crowned Sparrow	1998	7.4	37	4.1	14	43
	1999	2.7	38	1.4	5.0	14
	2000	5.2	36	2.9	9.6	21
	2001	13	36	7.0	23	66
	2002	8.1	40	4.2	16	39
	2004	11	25	7.5	17	64

Table 7 cont. Estimated densities of breeding birds in Spruce-Fir habitat in Colorado, 1999-2006[1].

Species	Year	D	%CV	90% LCL	90% UCL	n
White-crowned Sparrow cont.	2005	8.9	36	4.9	16	46
	2006	19	26	12	30	94
Dark-eyed Junco	1998	163	23	112	239	210
	1999	62	25	42	93	165
	2000	99	15	77	128	239
	2001	83	26	54	127	230
	2002	102	24	69	151	202
	2004	121	13	97	150	317
	2005	80	17	60	106	263
	2006	285	82	87	931	327
Pine Grosbeak	1998	16	25	11	25	54
	1999	8.0	29	5.0	13	24
	2000	11	28	7.1	18	26
	2001	4.4	36	2.4	7.9	13
	2002	5.8	38	3.1	11	17
	2004	11	29	7.1	19	34
	2005	5.8	35	3.2	10	17
	2006	13	30	7.6	21	33
Cassin's Finch	1998	2.2	64	0.8	5.9	11
	1999	1.8	40	0.9	3.4	8
	2000	2.1	55	0.9	5.0	7
	2001	3.6	37	2.0	6.6	15
	2002	2.1	79	0.6	6.7	6
	2004	3.9	47	1.9	8.4	16
	2005	2.0	70	0.7	5.8	5
	2006	4.1	38	2.2	7.6	17
Red Crossbill	1998	3.0	48	1.4	6.5	11
	1999	2.8	54	1.2	6.5	9
	2000	6.8	48	3.1	15	17
	2001	5.2	58	2.1	13	9
	2002	6.9	57	2.8	17	11
	2004	96	35	55	167	96
	2005	14	36	7.7	25	34
	2006	23	31	14	39	68
Pine Siskin	1998	57	22	40	83	181
	1999	34	50	15	74	59
	2000	59	17	45	79	146
	2001	37	23	25	54	124
	2002	82	29	51	131	80
	2004	227	22	157	328	249
	2005	104	19	76	142	156
	2006	238	18	178	320	229

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

DISCUSSION AND RECOMMENDATIONS

Prospects for Population Monitoring

The habitat-stratified point transects produced excellent results with low coefficients of variation ($\leq$ 50%) for 83 bird species in at least one habitat surveyed in 2006, including several Species of Greatest Conservation Need as noted in Colorado's Comprehensive Wildlife Conservation Strategy (CDOW 2005). Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for many of these species within 30 years in at least one habitat. We estimate that a total of 263 species of birds breed in Colorado, therefore we are effectively monitoring at least 32% of all species breeding in the state just in these five habitats.

For a several other species, with one or two more seasons of data, we may be able to calculate a global detection function using data from all years and thereby generate annual density estimates in one or more habitats that could be used for population-trend monitoring. Furthermore, we started analyzing the line transect data and we will be able to effectively monitor a few additional species using these data.

The 83 species, for which we have enough data to monitor their populations in at least one habitat, represent about 52% of *all species* observed in the five habitats surveyed in 2006, but they represent the majority of all *individual birds* observed. The other 48% of species fall into one of the following categories below:

1) Low-density, highly localized species (e.g., Lewis's Woodpecker);
2) Low-density, widespread species (e.g., Northern Goshawk);
3) Irregular species (e.g., Dickcissel);
4) Vagrant species (e.g. Northern Parula);
5) Species that occur mainly outside of Colorado in other habitats (e.g., McCown's Longspur);
6) Nocturnal species (e.g., Flammulated Owl);
7) Wetland-obligate species (e.g. American White Pelican); and
8) Species that are most readily detectable prior to late May (e.g. Greater Sage-Grouse).

Species in the aforementioned groups, except vagrant species, could be monitored through additional effort using one or more of the following survey techniques:

1) Additional point transects in existing habitats;
2) Census of small, localized populations;
3) Census of birds at nesting sites (e.g., colonies, eyries, etc);
4) Species-specific call-response surveys;
5) Nocturnal surveys;
6) Wetland surveys; and

7) Early-season (i.e., winter/spring) surveys.

For species with large home ranges and high nest-site fidelity, such as Golden Eagle and Prairie Falcon, monitoring could be achieved by locating active nests and visiting a subset during the spring and summer as necessary to evaluate the outcome of each. Nests would first be located by consulting with local biologists, birders, and other experts, and then as part of the field effort, additional suitable habitat could be searched to locate previously unrecorded nests. Ultimately, the majority of active nests would be included in the monitoring scheme and a random subset would be visited each year to check for occupancy and outcome.

For some low-density but widespread species, such as Northern Goshawk, a brief call-response survey could be used to detect the presence of this or other similar species across the areas already covered by the habitat-stratified point transects. A high-powered, yet easily portable playback system would be required for each observer, but otherwise, relatively few additional expenses would be incurred. RMBO successfully implemented such a study in 2006 for the USFS in several National Forests throughout Colorado, Wyoming, and the Black Hills.

Because of the already extensive point-transect effort undertaken each year, implementing additional field techniques to target other high-priority species can be done cost-effectively. Rocky Mountain Bird Observatory is open to discussing these options with our Colorado partners.

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APPENDIX A. SPECIES ACCOUNTS

In this section we present one-page accounts for each bird species detected in 2006 that is of management interest, as designated by either the U.S. Forest Service, the U.S. Fish and Wildlife Service, the Colorado Division of Wildlife, or Partners In Flight. Each of these organizations has a stake in maintaining healthy populations of birds in Colorado. For the U.S. Forest Service, we include designations for Region 2 Sensitive Species (R2SS). For the U.S. Fish and Wildlife Service, we include designations for Birds of Conservation Concern for Bird Conservation Region 17 (BCR17; USFWS 2002). For the Colorado Division of Wildlife, we include designations for State Threatened or Endangered Species and Species of Greatest Conservation Need. For Partners In Flight we include designations from the Partners In Flight Species Assessment Database for Bird Conservation Region 16 and 18 (PIF Species Assessment Database 2005), and the Colorado Partners In Flight Bird Conservation Plan.

The geographic distribution maps in the following accounts depict the locations and relative abundance of species of management interest that were detected on point transects in 2006. The relative abundance scale used in the maps is based on the number of points *along each transect* where the species was detected. It should also be noted that the location of the dots do not indicate the precise location of the point at which the species was observed, but rather the access point of the transect on which the species was observed. It is important to keep in mind that the maps only reflect the abundance and distribution of the species across the sites we surveyed, and should not necessarily be construed to suggest anything about the areas not surveyed.

In each table we provide two numbers pertaining to the number of observations for each species: *N, the number of individuals observed,* and *n, the number of independent observations for each species*. These numbers may be different as often several individuals are detected in a single observation, as when birds are in a flock. It should also be noted that the number of individuals observed (N) includes flyovers and between point detections. This explains why the total number of birds in Appendix A is greater than the totals in Table 2.

Greater Sage-Grouse
(*Centrocercus urophasianus*)

BLM Sensitive Species
State Special Concern - T & E Species List
CDOW - Species of Greatest Conservation Need
USFS Region 2 Sensitive Species
PIF Species of Continental and Regional Concern – BCR 16
CO-PIF Physiographic Regions 62 and 87 Priority Species

The Greater Sage-Grouse is found in large, contiguous stands of sagebrush with a grass component (Kingery 1998). In 2006, we detected five Greater Sage-Grouse in sage shrubland habitat on MCB transects. We detected two Greater Sage-Grouse on one transect, SA07, where we also observed two birds in 2005.

This monitoring project does not target the Greater Sage-Grouse or any gallinaceous birds, all of which are game species in Colorado, whose populations are monitored by the CDOW. Although we do regularly detect this species on point transects, it is usually between point counts during the line transect portion of the survey. Using the line transect data, however, we may be able to improve our power to detect a trend for this species in at least sage shrubland and grassland habitats.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Greater Sage-Grouse on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
SA	ID	--	--	--	--	5

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
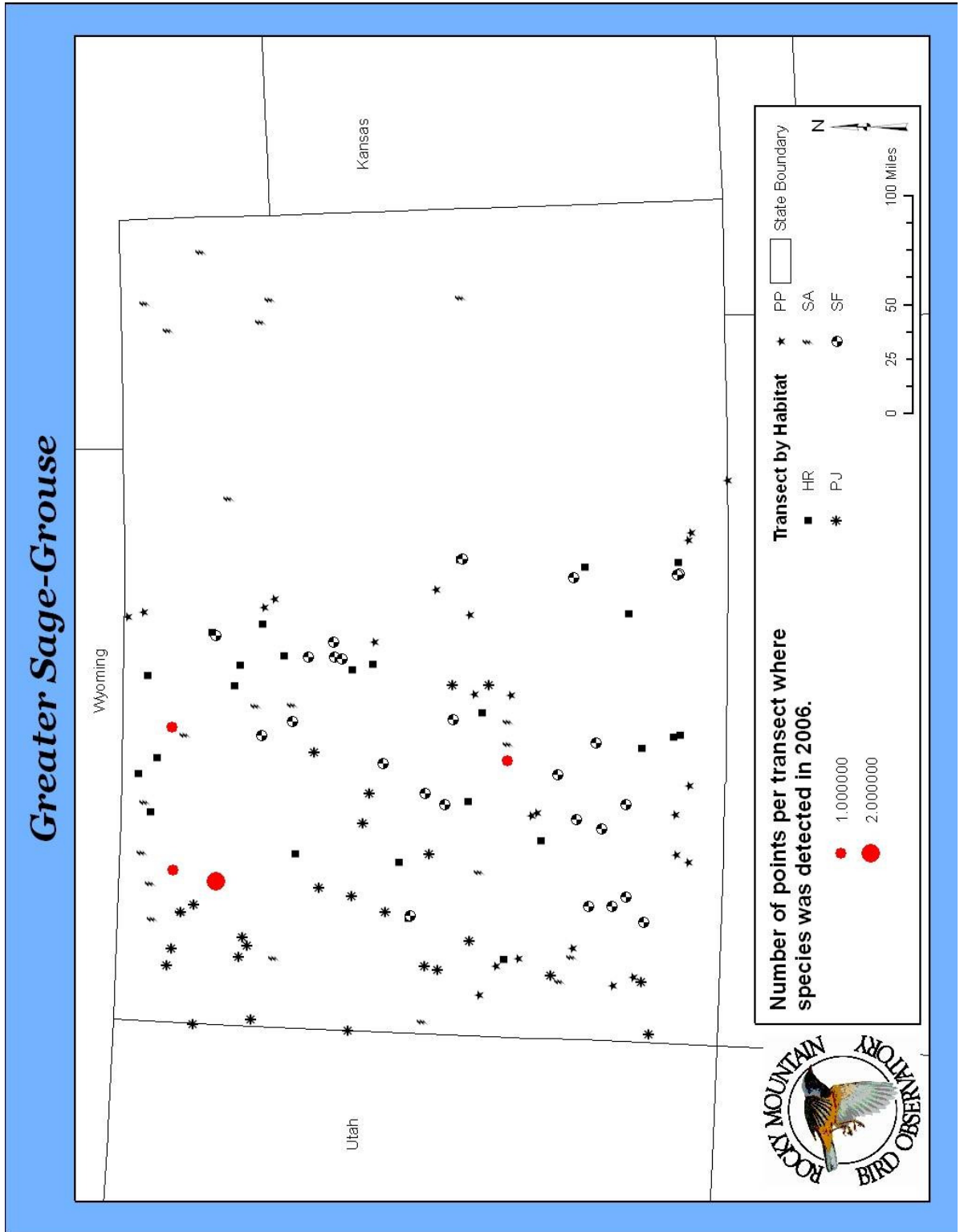
RMBO point-transect locations and detections of Greater Sage-Grouse on transects in Colorado, 2006.

Dusky Grouse
(Dendragapus obscurus)
CDOW - Species of Greatest Conservation Need
PIF Species of Continental Concern – BCR 16
CO-PIF Physiographic Region 62 Priority Species

The Dusky Grouse can usually be found in coniferous forests or shrubby lowlands in summer, with some individuals moving to higher elevations in the fall and winter (Righter et al. 2004). In 2006, we detected seven Dusky Grouse in two habitats on MCB transects. We detected Dusky Grouse on three spruce-fir transects in 2006 – SF10, SF21, and SF26 – where we also detected the species in previous years. Similarly, we detected one Dusky Grouse on a ponderosa pine transects, PP11, in 2006 where we also detected the species in 1998, 2000, 2004 and 2005.

The Dusky Grouse is often detected along transects and less frequently at point-count stations. The number of detections of Dusky Grouse is too few to effectively monitor this species under MCB in any one habitat or across habitats. Using the line transect data, however, and all of the detections across years, we may be able to improve our power to detect a trend for this species in a few habitats.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Dusky Grouse on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PP	ID	--	--	--	--	1
SF	ID	--	--	--	--	6

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
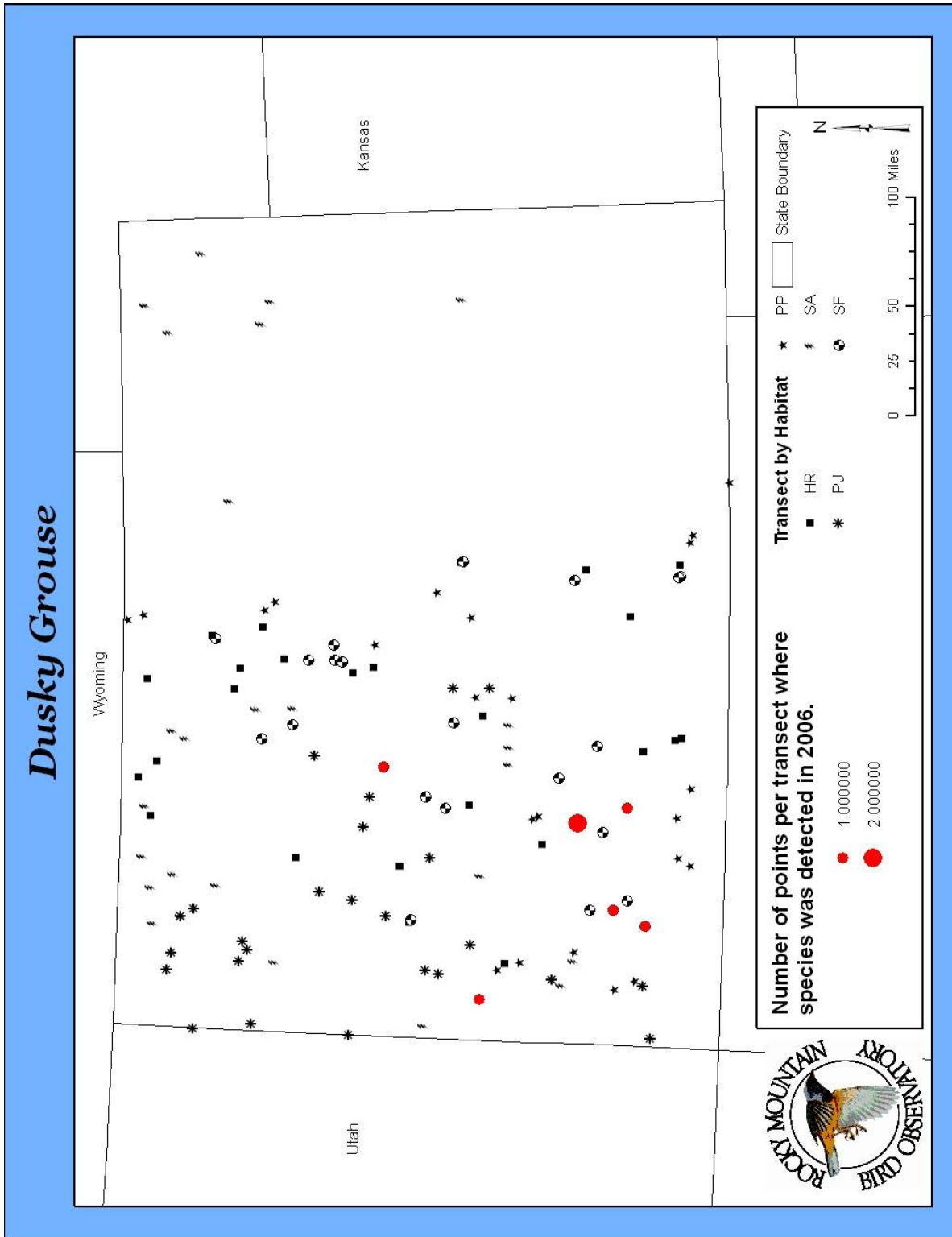
RMBO point-transect locations and detections of Dusky Grouse on transects in Colorado, 2006.

Northern Goshawk
(Accipiter gentilis)
BLM Sensitive Species
CDOW - Species of Greatest Conservation Need
USFS Region 2 Sensitive Species

Northern Goshawks are believed to inhabit primarily mature, old-growth forests and require large blocks of forest for nesting and foraging (Audubon 2002). In 2006, we detected five Northern Goshawks in two habitats on MCB transects. We detected one Northern Goshawk on a ponderosa pine transects (PP06) in 2006, where we also detected the species in 1999.

Data from all of the habitat-based point transects will likely not be sufficient to track population trends of Northern Goshawks over time. However, RMBO implemented a pilot study in 2006 that used a call-playback technique developed by the USFS to monitor the Northern Goshawk. This study was conducted in several National Forests throughout Colorado, Wyoming, and the Black Hills. Effective monitoring will likely require such intensive and focused efforts, implemented region-wide.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Northern Goshawk on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	ID	--	--	--	--	1
PP	ID	--	--	--	--	4

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
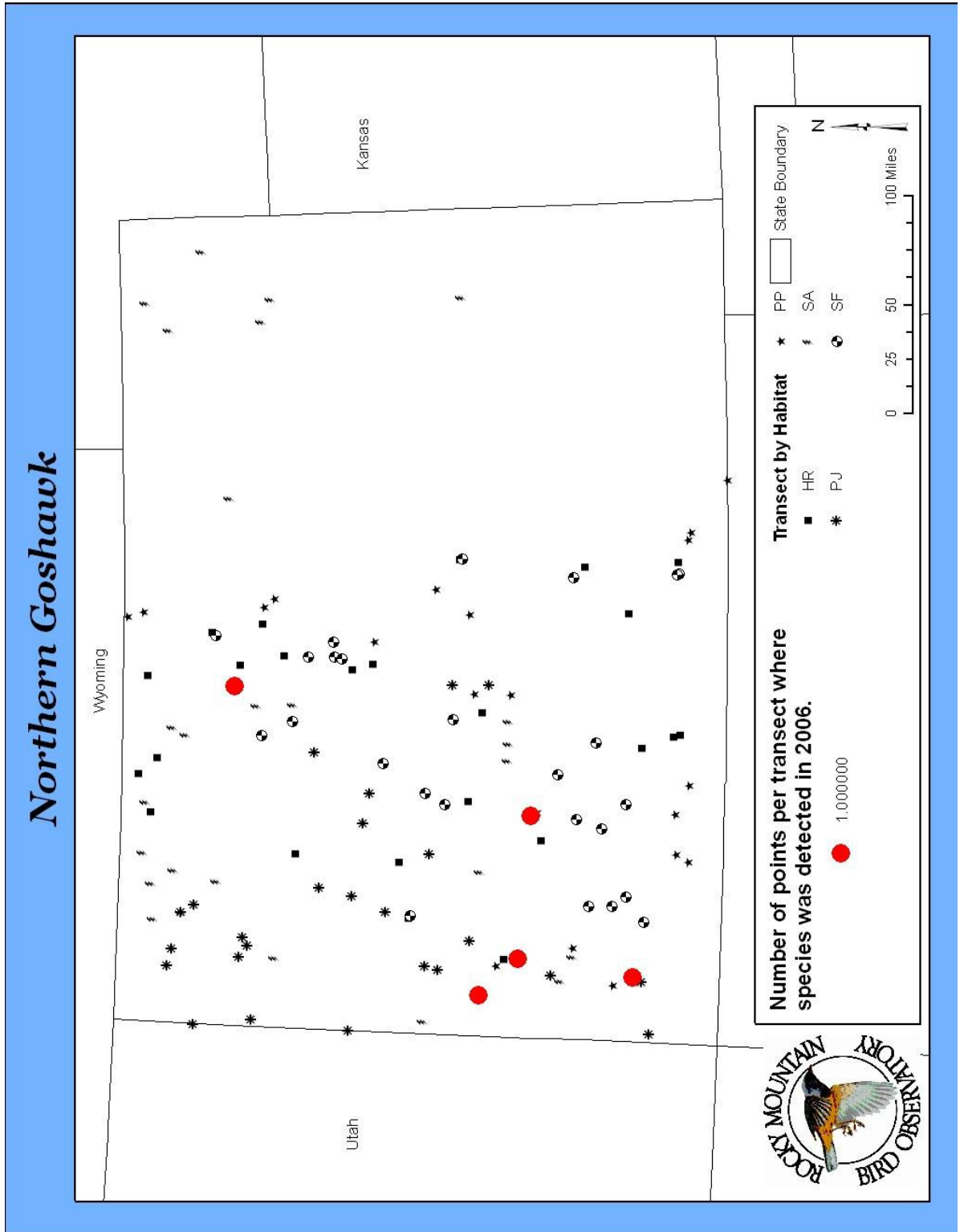
Northern Goshawk

RMBO point-transect locations and detections of Northern Goshawks on transects in Colorado, 2006.

Swainson's Hawk
(Buteo swainsoni)
CDOW - Species of Greatest Conservation Need
PIF Species of Continental and Regional Concern – BCR 16
PIF Regional Stewardship Species and Continental Concern – BCR 18
CO-PIF Physiographic Region 36 Priority Species
USFWS Bird of Conservation Concern – BCR 16 and Nationally

In Colorado, Swainson's Hawks nest primarily in the eastern prairies but also in shrublands and agricultural areas throughout the state. Interestingly, there are several pairs of this species nesting at high elevation on the Grand Mesa in western Colorado (Righter et al. 2004). In 2006, we detected seven Swainson's Hawks in two habitats on MCB transects. All three of the sage transects where we detected Swainson's Hawks in 2006 – SA01, SA04, and SA09 – we also detected the species in previous years.

The Swainson's Hawk, like other raptor species, is difficult to monitor under MCB using the point-transect protocol, because of its low density and large territory size. However, using data from all years, especially in grassland habitat, we may be able to calculate a global detection function for this species and thereby generate annual density estimates that can be used for population-trend monitoring.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Swainson's Hawk on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	ID	--	--	--	--	2
SA	ID	--	--	--	--	5

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
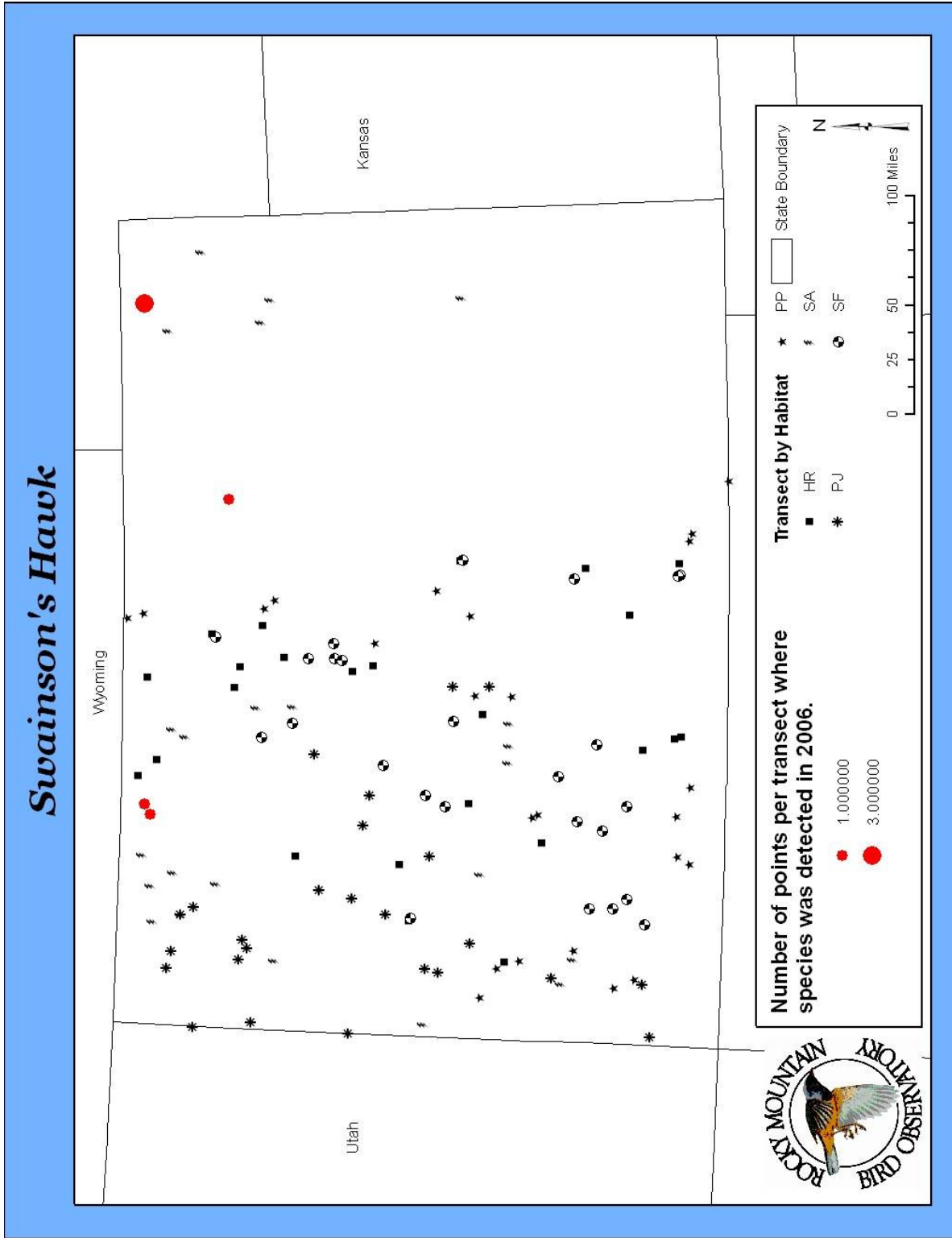
RMBO point-transect locations and detections of Swainson's Hawks on transects in Colorado, 2006.

Ferruginous Hawk
(Buteo regalis)
BLM Sensitive Species
State Special Concern - T & E Species List
CDOW - Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 16
PIF Regional Stewardship Species and Regional Concern – BCR 18
CO-PIF Physiographic Region 36 Priority Species
USFS Region 2 Sensitive Species
USFWS Bird of Conservation Concern – BCR 16, 18 and Nationally

In Colorado, Ferruginous Hawks most commonly nest in the eastern prairies but also in semidesert shrubland, and rarely in pinyon-juniper habitat in the western part of the state. In 2006, we detected one Ferruginous Hawk on a sage shrubland transect, SA06.

The Ferruginous Hawk, like other raptor species, is difficult to monitor under MCB using the point-transect protocol, because of its low density and large territory size. However, using data from all years, we may be able to calculate a global detection function for this species and thereby generate annual density estimates in grassland and semi-desert shrubland habitats that can be used for population-trend monitoring. Adding transects, especially in grassland and semi-desert shrubland, may also yield better information for the Ferruginous Hawk..

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Ferruginous Hawk on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
SA	ID	--	--	--	--	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
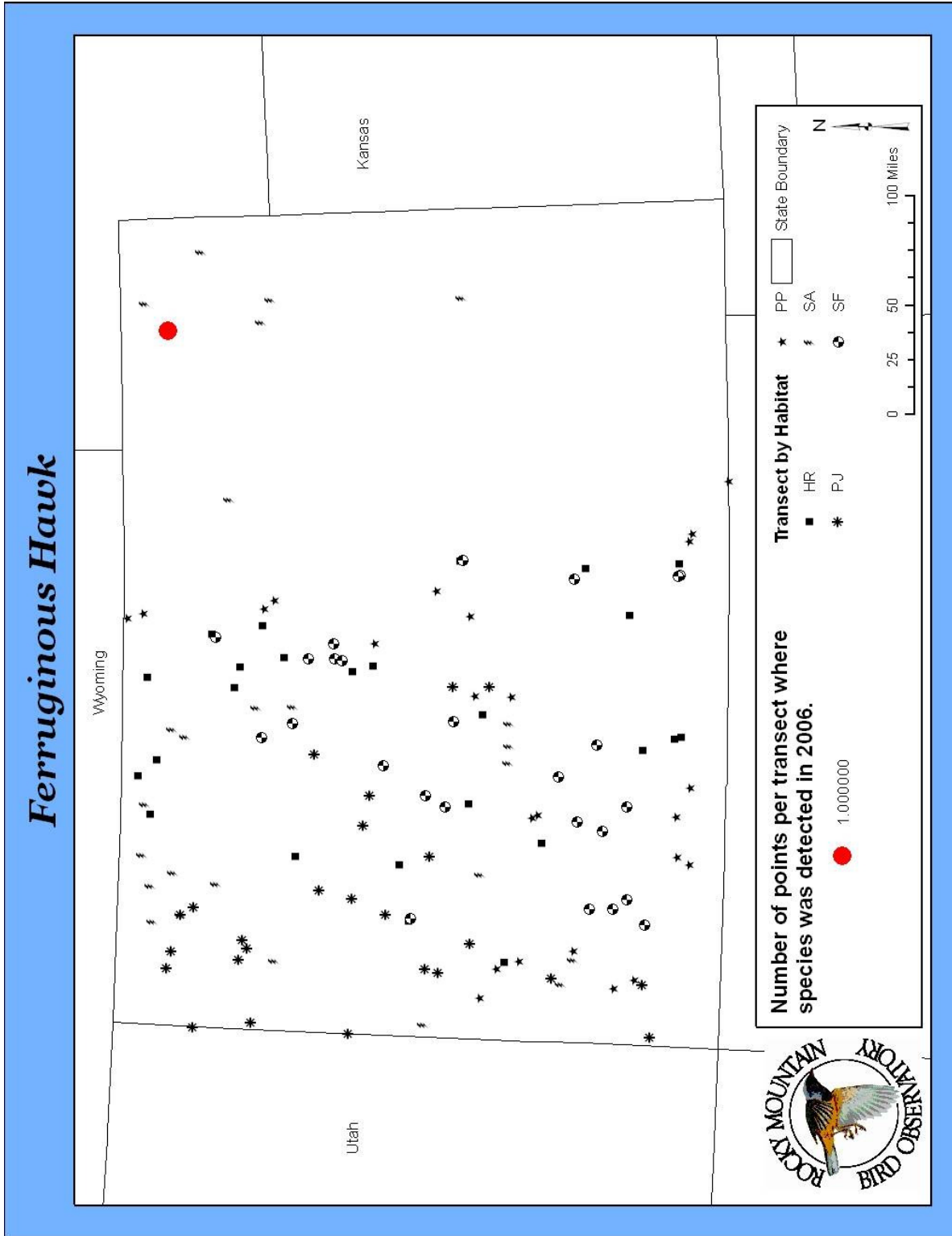
RMBO point-transect locations and detections of Ferruginous Hawk on transects in Colorado, 2006.

Golden Eagle
(Aquila chrysaetos)
CDOW - Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 16
USFWS Bird of Conservation Concern – BCR 16

Golden Eagles inhabit a wide variety of habitats, with most nesting on cliffs, but some nest in trees. Because of their size, Golden Eagles need vast expanses of hunting space, usually over open habitats including grassland, sagebrush, farmlands, and even tundra. In 2006, we detected five Golden Eagles in three habitats on MCB transects. We detected Golden Eagles on two transects in 2006, PJ22 and SA30, where we also detected the species in previous years.

The Golden Eagle, like other raptor species, is difficult to monitor under MCB using the point-transect protocol, because of its low density and large territory size. However, using data from all years, we may be able to calculate a global detection function for this species and thereby generate annual density estimates in several habitats that can be used for population-trend monitoring. Adding transects, especially in grassland and shrubsteppe habitat, may also yield better information for the Golden Eagle and allow us to detect trends sooner. Adding transects in certain habitats may improve our ability to monitor this species; however, effective monitoring will likely best be accomplished through locating and monitoring nests of this species in Colorado. Such an effort could be incorporated into the MCB special-species program in a cost-effective manner, especially if combined with similar efforts for other raptor species (e.g., Prairie Falcon).

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Golden Eagle on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	ID	--	--	--	--	1
PJ	ID	--	--	--	--	3
SA	ID	--	--	--	--	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
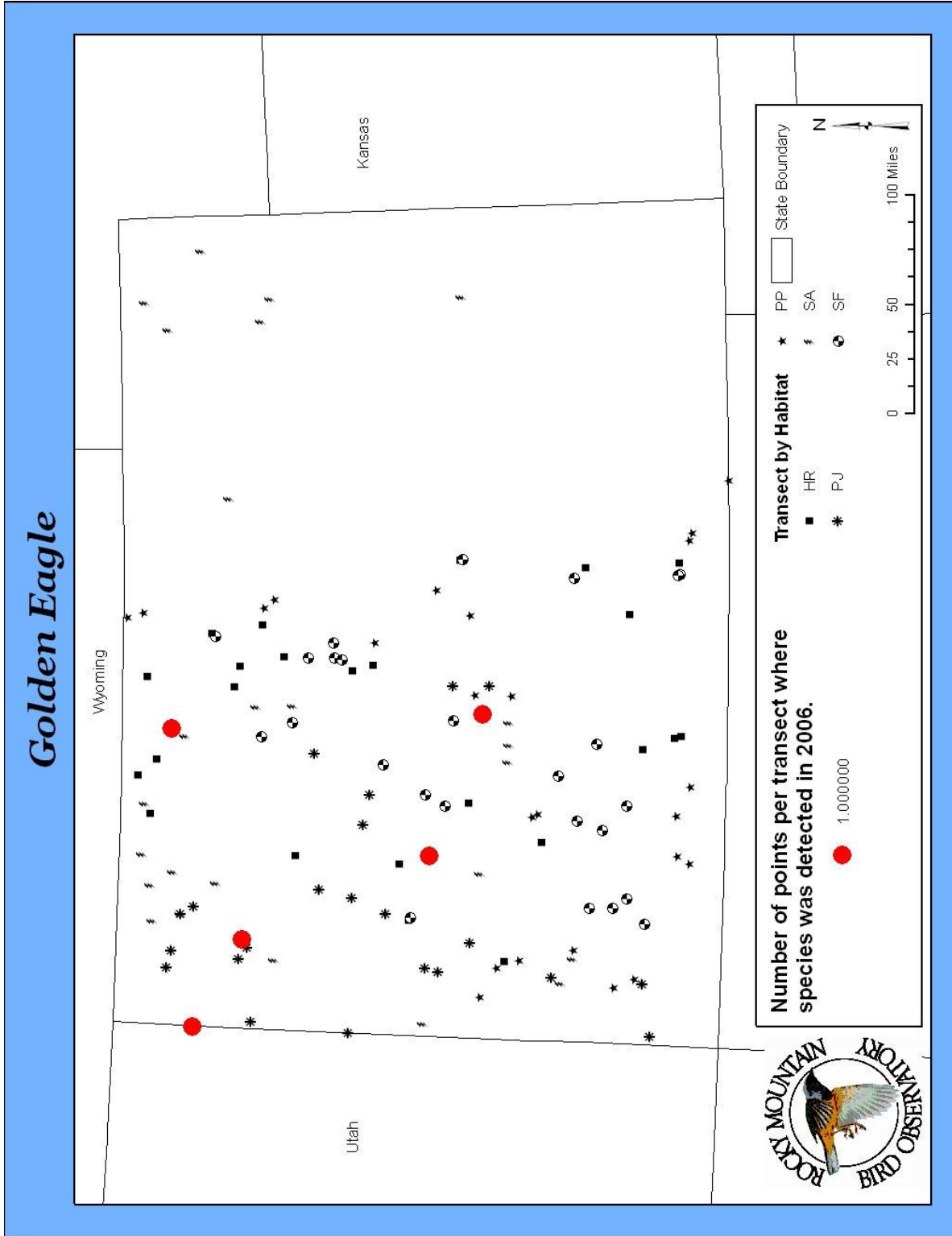
Golden Eagle

RMBO point-transect locations and detections of Golden Eagles on transects in Colorado, 2006.

Peregrine Falcon
(Falco peregrinus)
State Special Concern - T & E Species List
CDOW - Species of Greatest Conservation Need
CO-PIF Physiographic Regions 62 & 87 Priority Species
USFS Region 2 Sensitive Species
USFWS Bird of Conservation Concern - BCR 16, 18 and Nationally

Peregrine Falcons usually nest on ledges of high cliffs. They need vast expanses of hunting space, usually near water. In 2006, we detected three Peregrine Falcons in two habitats on MCB transects.

The Peregrine Falcon, like other raptor species, is difficult to monitor under MCB using the point-transect protocol, because of its low density and large territory size. Alternatively, locating and monitoring Peregrine Falcon nests could be incorporated into a special species program in a cost-effective manner, especially if combined with similar efforts for other cliff-nesting species (e.g., Prairie Falcon).

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Peregrine Falcon on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PJ	ID	--	--	--	--	1
PP	ID	--	--	--	--	2

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
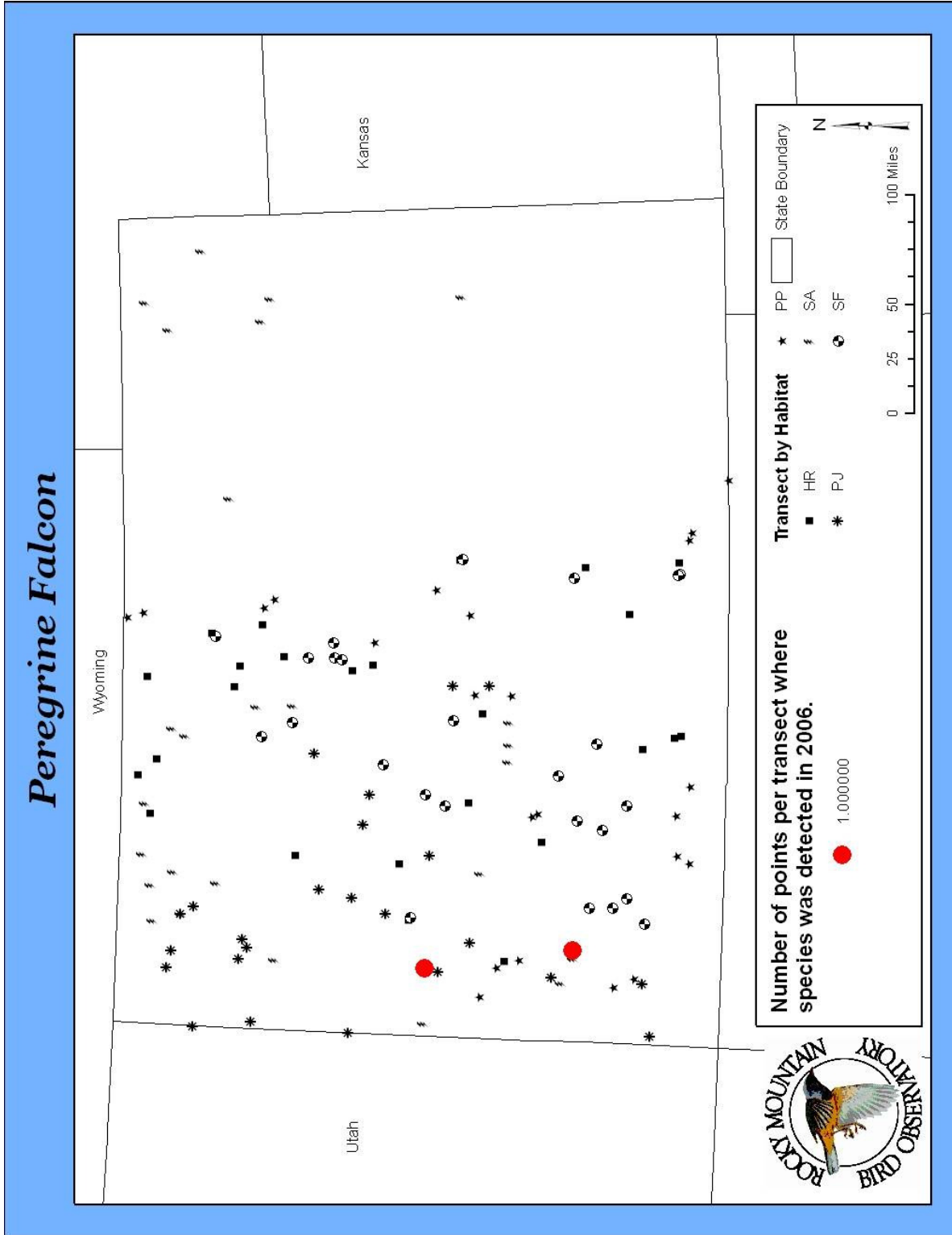
Peregrine Falcon

RMBO point-transect locations and detections of Peregrine Falcons on transects in Colorado, 2006.

Prairie Falcon
(Falco mexicanus)
CDOW - Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 16 & 18
CO-PIF Physiographic Region 36 Priority Species
USFWS Bird of Conservation Concern – BCR 16, 18 and Nationally

Prairie Falcons inhabit grasslands, shrubsteppe, and other open country, including alpine tundra throughout Colorado. This species will use a variety of landscapes provided suitable cliffs and rock outcrops are available for nesting, and open country is available for hunting. In 2006, we detected one Prairie Falcon on a ponderosa pine transect, PP15. We also detected one Prairie Falcon on this transect in 1998.

The Prairie Falcon, like other raptor species, is difficult to monitor under MCB using the point-transect protocol, because of its low density and large territory size. Therefore, it is unlikely that we will be able to effectively monitor Prairie Falcons in any individual habitat or across habitats under MCB. Effective monitoring will likely best be accomplished through locating and monitoring nests of this species in Colorado. Such an effort could be incorporated into the MCB special-species program in a cost-effective manner, especially if combined with similar efforts for other cliff-nesting species (e.g., Peregrine Falcon).

Total number of independent detections, number of individuals, and habitat-specific density estimates for Prairie Falcon on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PP	ID	--	--	--	--	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
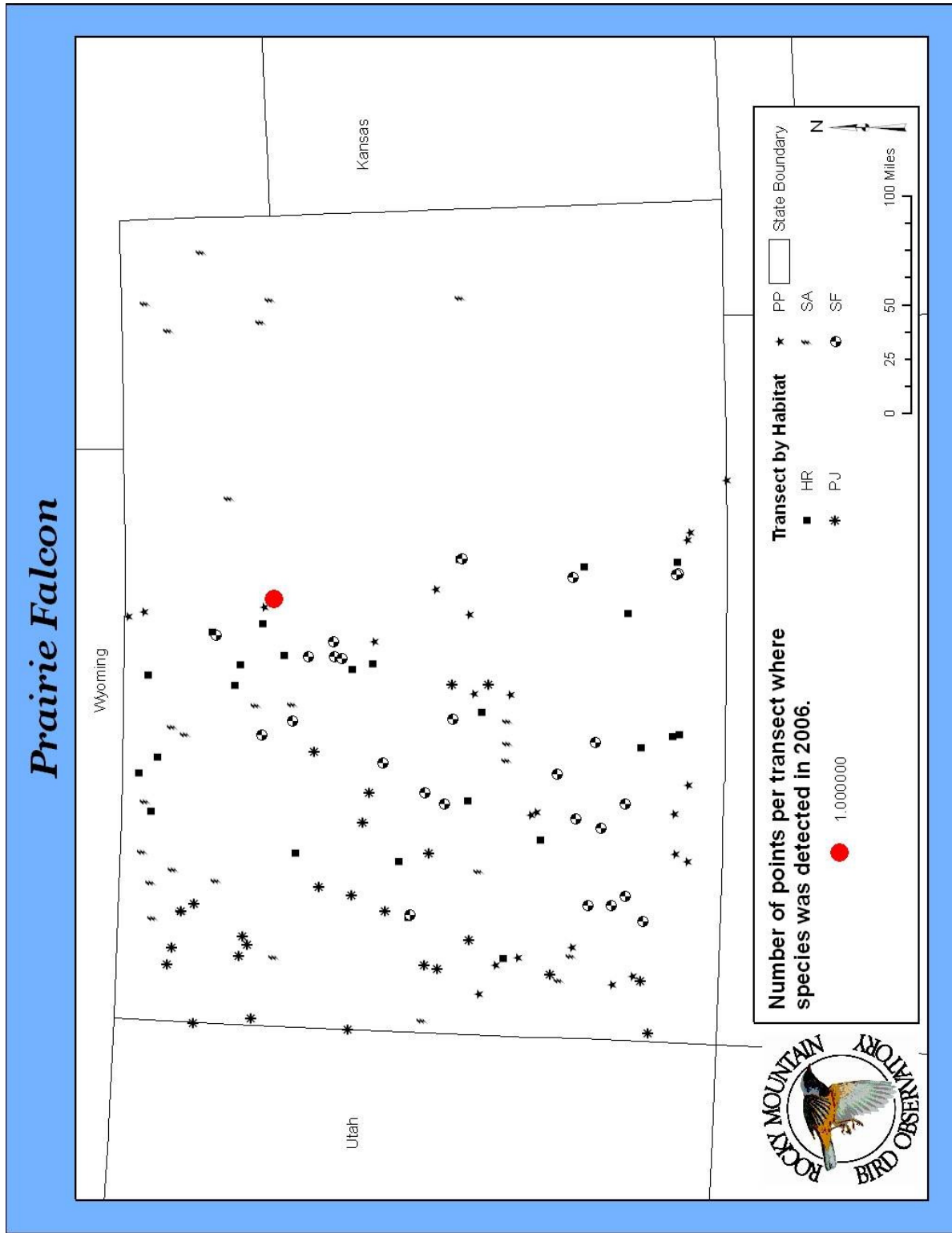
Prairie Falcon

RMBO point-transect locations and detections of Prairie Falcons on transects in Colorado, 2006.

Band-tailed Pigeon
(Patagioenas fasciata)
CDOW - Species of Greatest Conservation Need
PIF Species of Continental Concern – BCR 16
CO-PIF Physiographic Regions 62 & 87 Priority Species

The Band-tailed Pigeon nests in coniferous forests of all elevations, usually placing its territories near water. It feeds primarily on wild nuts such as pinyon pine nuts or acorns of Gambel's oak. In 2006, we detected three Band-tailed Pigeons on one ponderosa pine transect, PP02.

With the current level of effort, it is unlikely we will be able to monitor this species through point transects under MCB. However, using data from all years, we may be able to calculate a global detection function for this species and thereby generate annual density estimates in at least mixed conifer habitat that can be used for population-trend monitoring. Adding transects, especially in mixed conifer habitat, may improve our ability to monitor the Band-tailed Pigeon.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Band-tailed Pigeon on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PP	ID	--	--	--	--	3

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
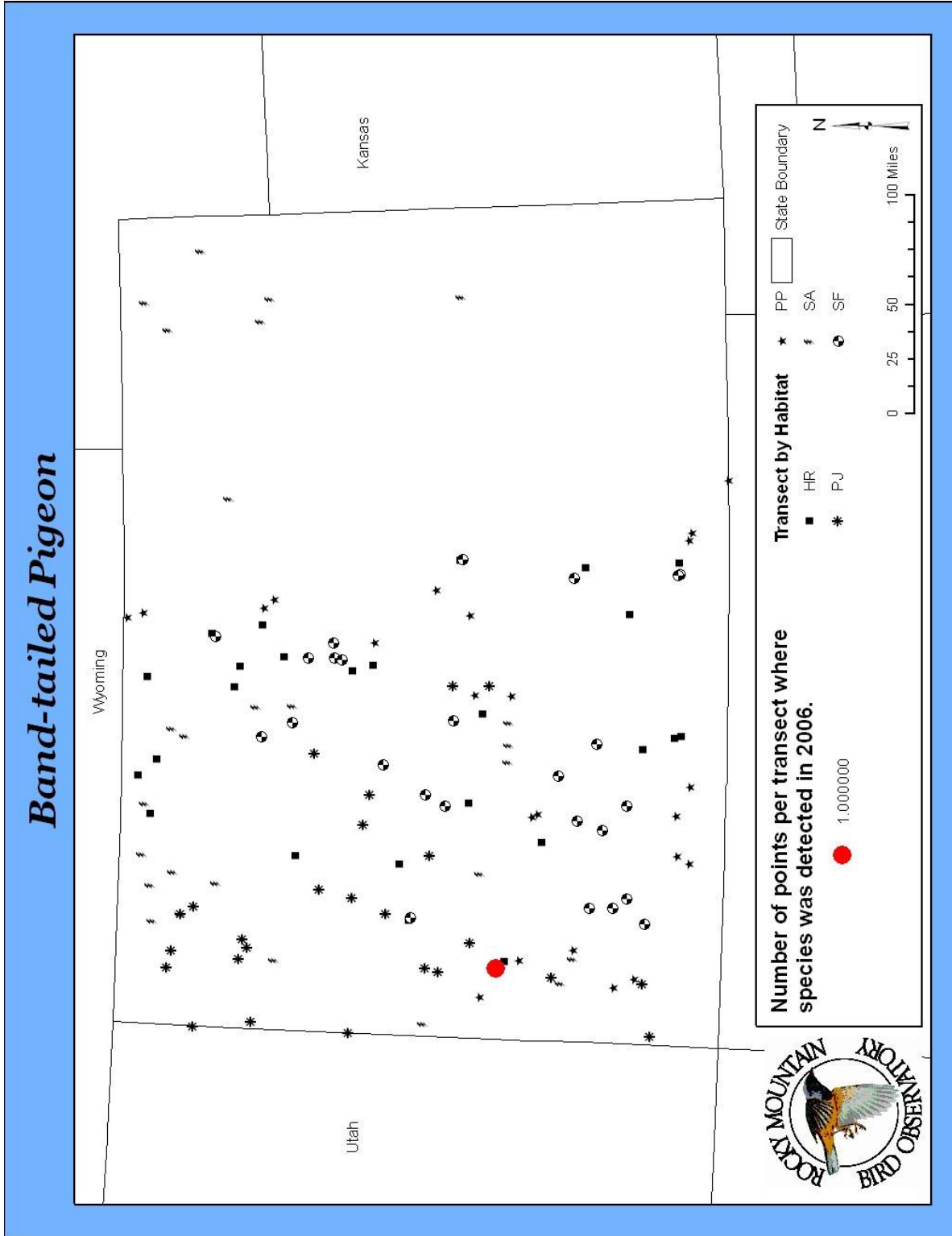
Band-tailed Pigeon

RMBO point-transect locations and detections of Band-tailed Pigeons on transects in Colorado, 2006.

Common Nighthawk
(Chordeiles minor)
PIF Species of Regional Concern – BCR 16 & 18

Common Nighthawks lay their eggs in a scrape on bare ground in any open habitat. In 2006, we recorded 21 Common Nighthawks in two habitats on MCB transects.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Common Nighthawk within 35 years in ponderosa pine habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Common Nighthawk on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PP	1.64	48	0.75	3.55	10	17
SA	ID	--	--	--	--	4

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
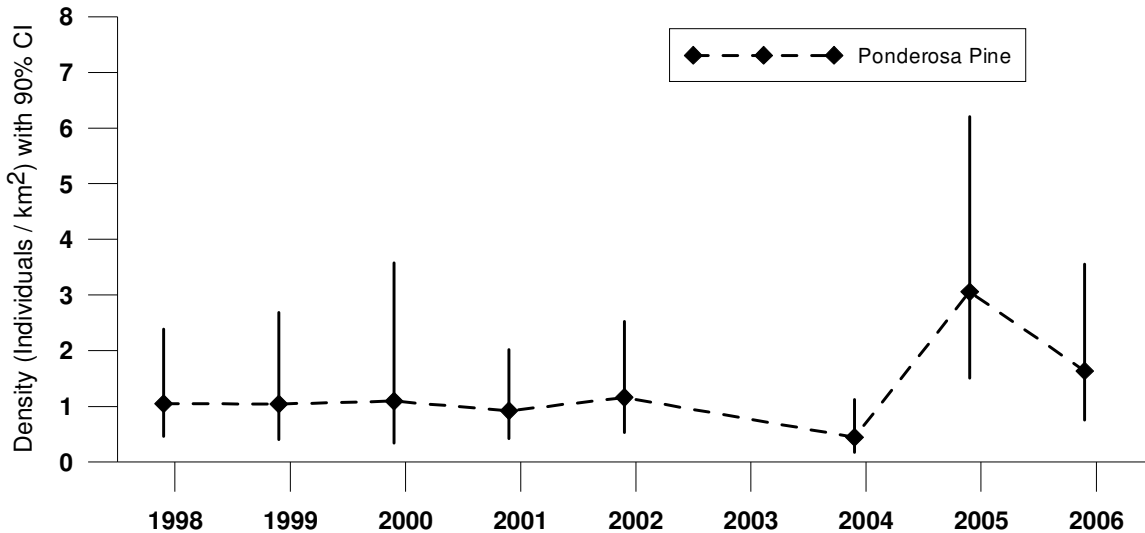
Estimated density of the Common Nighthawk (with 90% confidence intervals) on MCB transects 1998-2006.
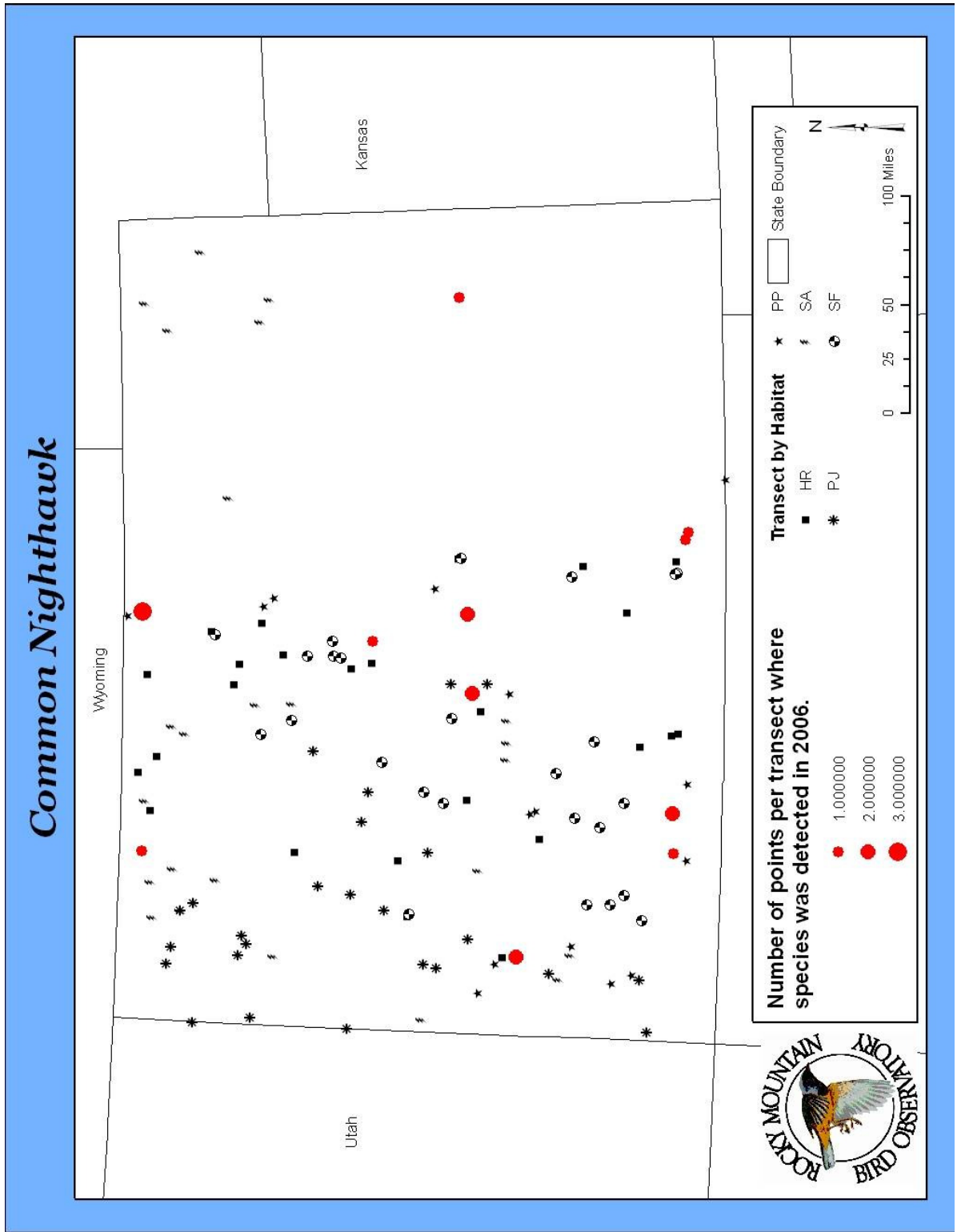
Common Nighthawk

RMBO point-transect locations and detections of Common Nighthawks on transects in Colorado, 2006.

Black-chinned Hummingbird
(Archilochus alexandri)
CDOW – Species of Greatest Conservation Need
CO-PIF Physiographic Region 87 Priority Species

The Black-chinned Hummingbird breeds most frequently in pinyon-juniper, but is also found in low- and mid-elevation riparian habitat, Gambel's oak shrubland, and in urban areas. This species ranges all of the way from the southern border to the northern border on the west side of Colorado, and has a much more limited range on the east side of the state. In 2006, we detected 12 Black-chinned Hummingbirds in two habitats on MCB transects. Detections of Black-chinned Hummingbirds in sage shrubland habitat were unreliable due to observer error.

In a few more seasons, using data from all years, we may be able to calculate a global detection function for the Black-chinned Hummingbird and thereby generate annual density estimates in at least pinyon-juniper habitat that can be used for population-trend monitoring. Adding transects, especially in pinyon-juniper habitat, may improve our ability to monitor this species.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Black-chinned Hummingbird on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	ID	--	--	--	--	1
PJ	ID	--	--	--	--	11
SA	--	--	--	--	--	**

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data unreliable due to observer error.
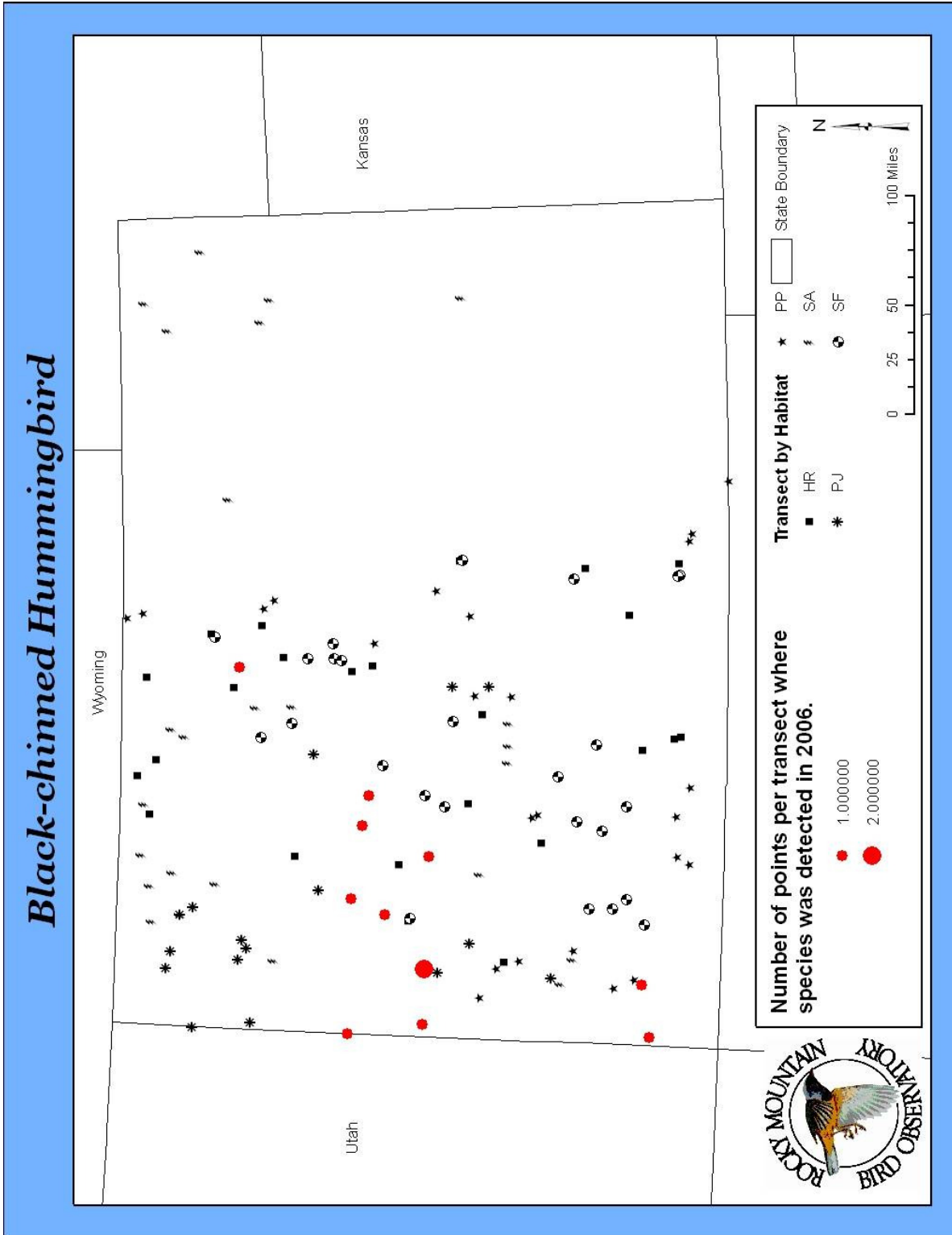
RMBO point-transect locations and detections of Black-chinned Hummingbirds on transects in Colorado, 2006.

Broad-tailed Hummingbird
(*Selasphorus platycercus*)
CDOW – Species of Greatest Conservation Need
PIF Regional Stewardship Species – BCR 16
CO-PIF Physiographic Region 62 Priority Species

The Broad-tailed Hummingbird is the most abundant hummingbird species in Colorado and breeds in ponderosa pine, mixed conifer, spruce-fir, and mid- to high-elevation riparian habitats. The most limiting requirement for this hummingbird is an abundance of flowering plants from which to gather nectar. We detected 266 Broad-tailed Hummingbirds in four habitats on MCB transects in 2006.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Broad-tailed Hummingbird within 25 years in high-elevation riparian habitat, in 30 years in pinyon-juniper and ponderosa pine habitats, and more than 40 years in spruce-fir habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Broad-tailed Hummingbird on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	214	127	361	32	36	153
PJ	149	87	256	33	47	24
PP	55	31	99	35	18	53
SF	23	10	53	51	27	36

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
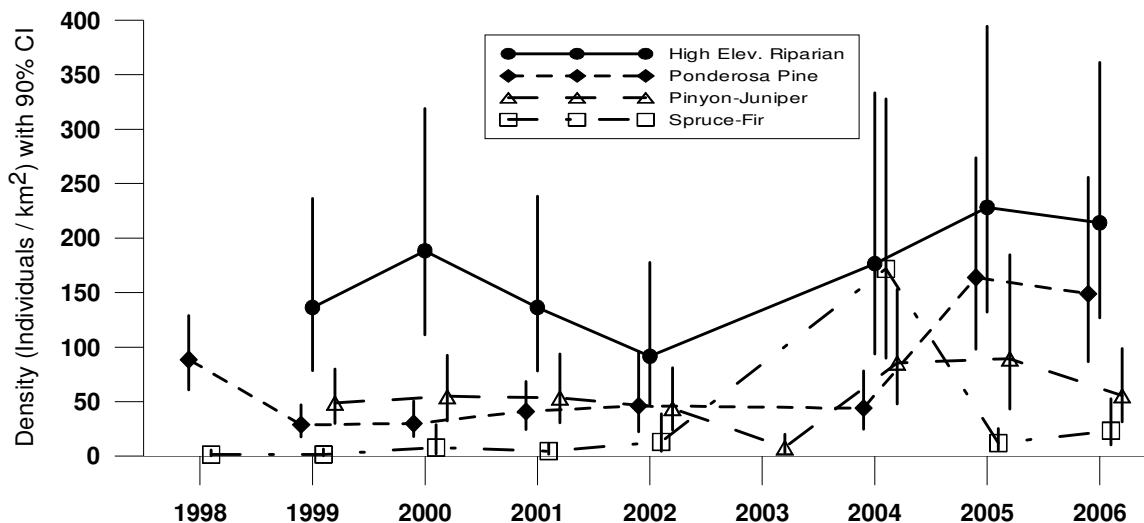
Estimated density of the Broad-tailed Hummingbird (with 90% confidence intervals) on MCB transects 1998-2006.

Broad-tailed Hummingbird
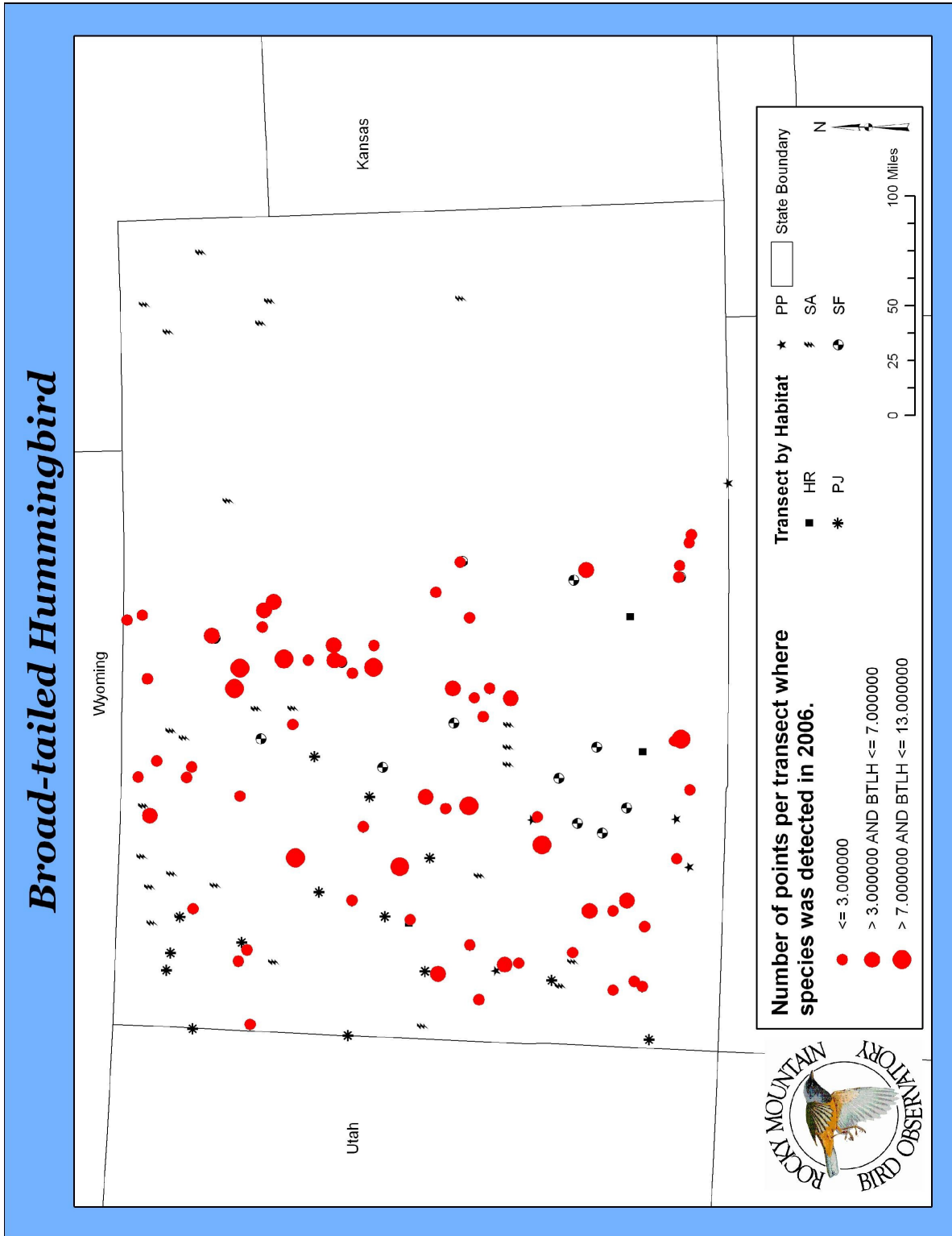
RMBO point-transect locations and detections of Broad-tailed Hummingbirds on transects in Colorado, 2006.

Rufous Hummingbird
(*Selasphorus rufus*)
CDOW – Species of Greatest Conservation Need
USFWS Bird of Conservation Concern - Nationally

Rufous Hummingbirds do not breed in Colorado, but we do detect them on high-elevation transects towards the end of the season when they are migrating south. Data collected on transects could possibly prove interesting and indicate how well of a breeding season this species had in their northern breeding grounds. In 2006, we detected two Rufous Hummingbirds on spruce-fir transects, SF08 and SF13. We also detected Rufous Hummingbird on SF08 in 2004 and 2005.

Given its breeding range and rarity in Colorado during summer, it is unlikely we will be able to monitor the Rufous Hummingbird through point transects under MCB.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Rufous Hummingbird on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
SF	ID	--	--	--	--	2

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.

Rufous Hummingbird
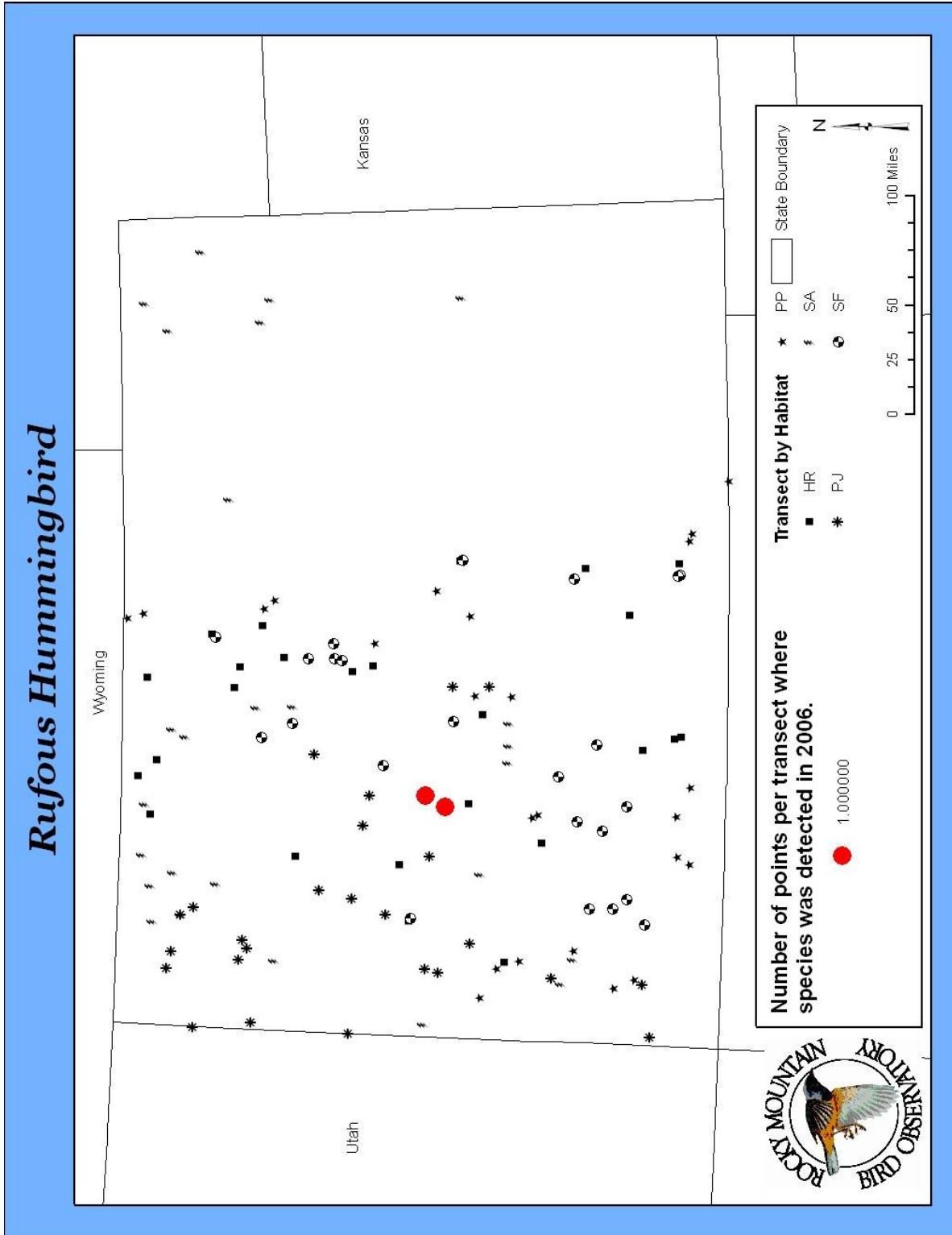
RMBO point-transect locations and detections of Rufous Hummingbirds on transects in Colorado, 2006.

Williamson's Sapsucker
(*Sphyrapicus thyroideus*)
CDOW - Species of Greatest Conservation Need
PIF Continental and Regional Stewardship Species – BCR 16
CO-PIF Physiographic Region 62 Priority Species
USFWS Bird of Conservation Concern – BCR 16 and Nationally

The Williamson's Sapsucker nests in a variety of habitats, but prefers mid-elevation coniferous forests. It also occasionally breeds in stands of pure aspen. In 2006, we detected 52 Williamson's Sapsuckers in three habitats on MCB transects and provide a density estimate for two habitats.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Williamson's Sapsucker within 30 years in ponderosa pine habitat and more than 40 years in spruce-fir habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Williamson's Sapsucker on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	ID	--	--	--	--	8
PP	9.9	5.0	19	42	21	34
SF	2.2	0.8	6.2	69	4	10

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
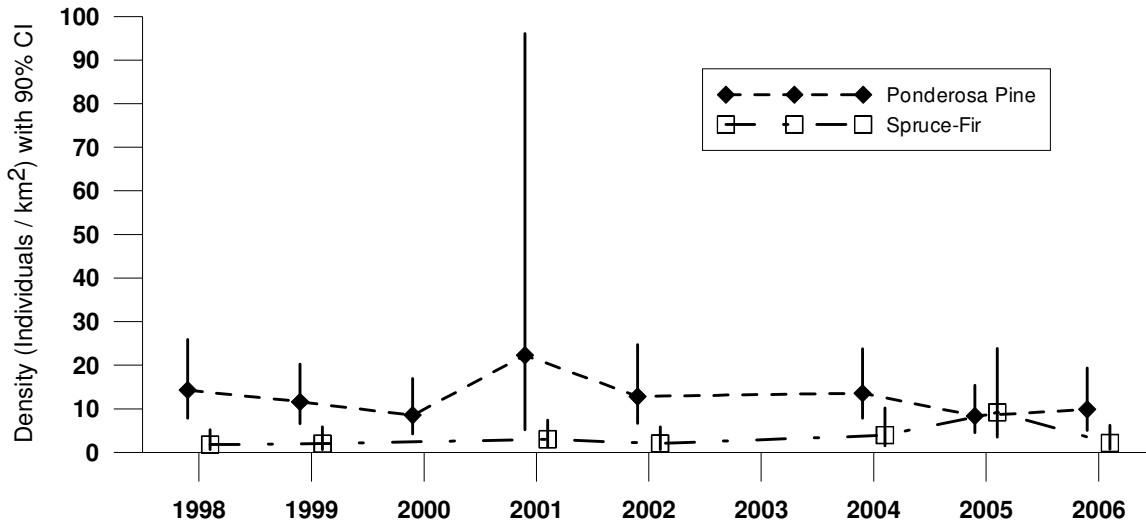
Estimated density of the Williamson's Sapsucker (with 90% confidence intervals) on MCB transects 1998-2006.

Williamson's Sapsucker
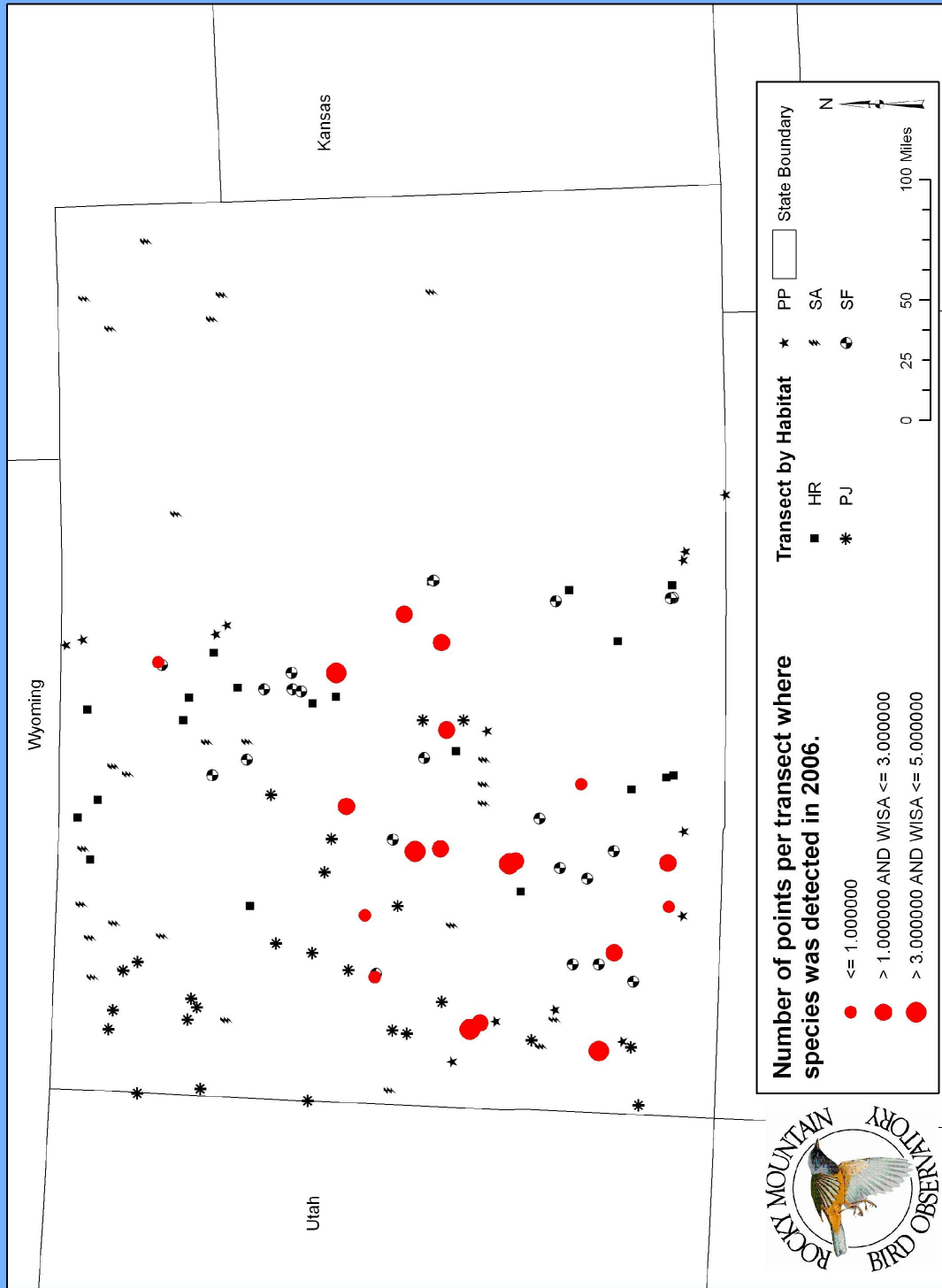
RMBO point-transect locations and detections of Williamson's Sapsucker on transects in Colorado, 2006.

Red-naped Sapsucker
(*Sphyrapicus nuchalis*)
CDOW - Species of Greatest Conservation Need
CO-PIF Physiographic Region 62 Priority Species
USFWS Bird of Conservation Concern - Nationally

The Red-naped Sapsucker primarily nests in aspen and occasionally in other high-elevation forested habitats. During the breeding season, it is frequently encountered foraging in shrubby areas, especially willow carrs. In 2006, we detected 59 Red-naped Sapsuckers in three habitats on MCB transects and calculated density estimates in two habitats.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Red-naped Sapsucker in more than 40 years in high-elevation riparian and ponderosa pine habitats using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Red-naped Sapsucker on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	15	6.7	32	48	24	41
PP	4.6	1.6	13	68	7	11
SF	ID	--	--	--	--	7

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
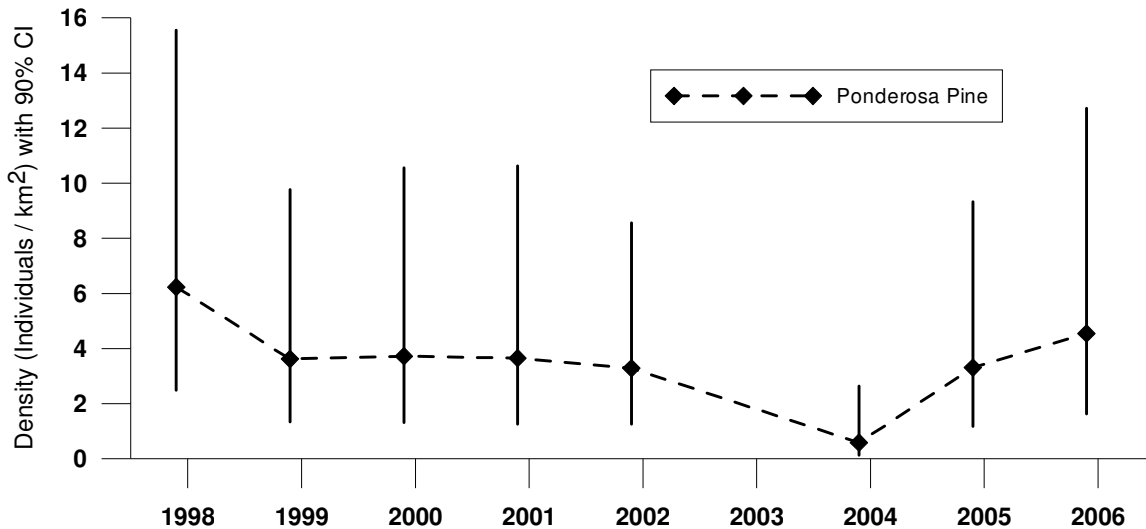
Estimated density of the Red-naped Sapsucker (with 90% confidence intervals) on MCB transects 1998-2006.

Red-naped Sapsucker
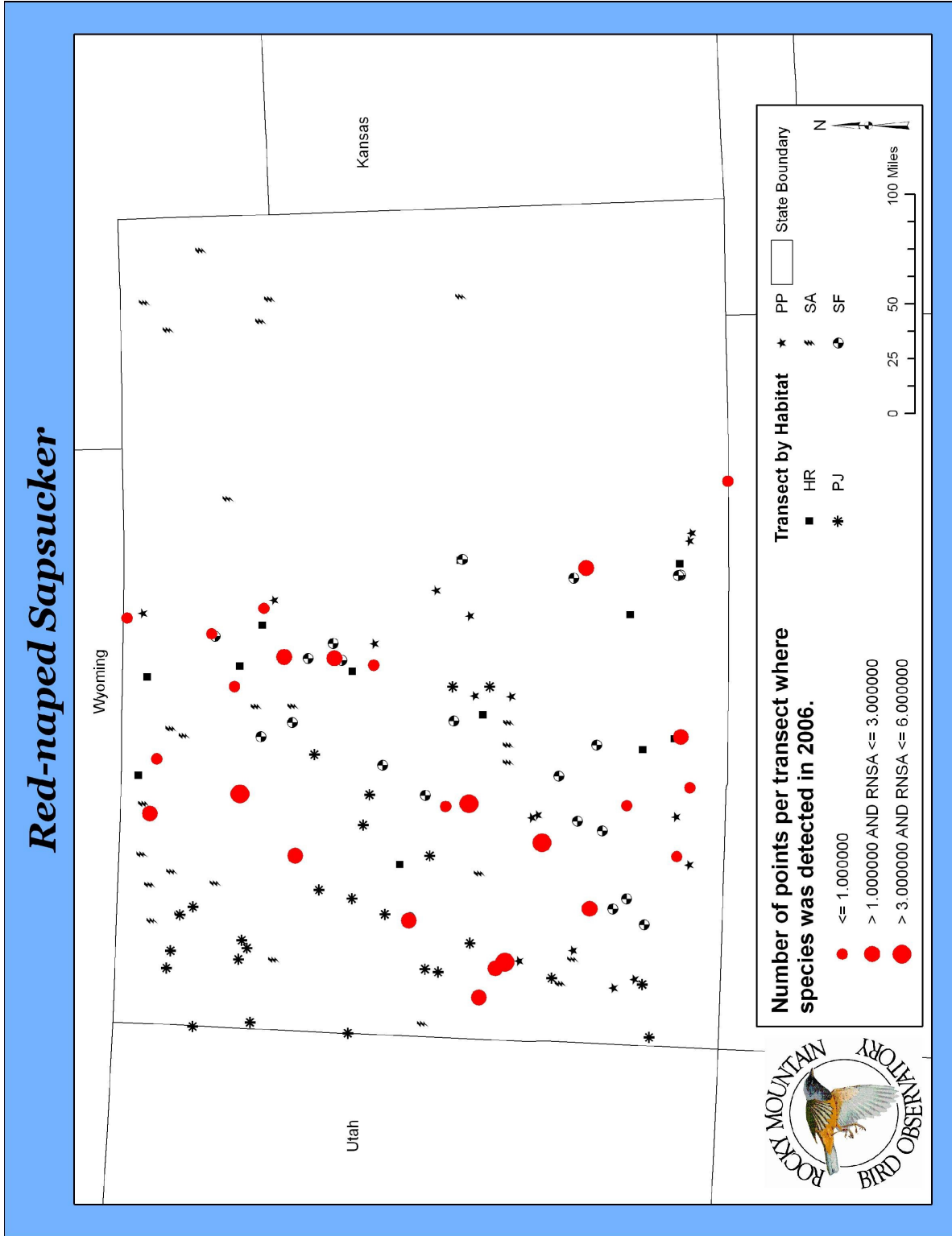
RMBO point-transect locations and detections of Red-naped Sapsucker on transects in Colorado, 2006.

American Three-toed Woodpecker
(Picoides tridactylus)
CDOW – Species of Greatest Conservation Need
USFS Region 2 Sensitive Species

The American Three-toed Woodpecker is found primarily in spruce-fir habitat, and also in mixed conifer, ponderosa pine, and aspen habitats. It is especially abundant in areas with insect outbreaks, including post-fire bark beetle invasions. We detected 28 American Three-toed Woodpeckers in three habitats on MCB transects in 2006.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the American Three-toed Woodpecker within 35 years in spruce-fir habitat using point transect data

Total number of independent detections, number of individuals, and habitat-specific density estimates for the American Three-toed Woodpecker on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
MC	ID	--	--	--	--	4
PP	ID	--	--	--	--	4
SF	2.1	1.0	4.4	46	10	20

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
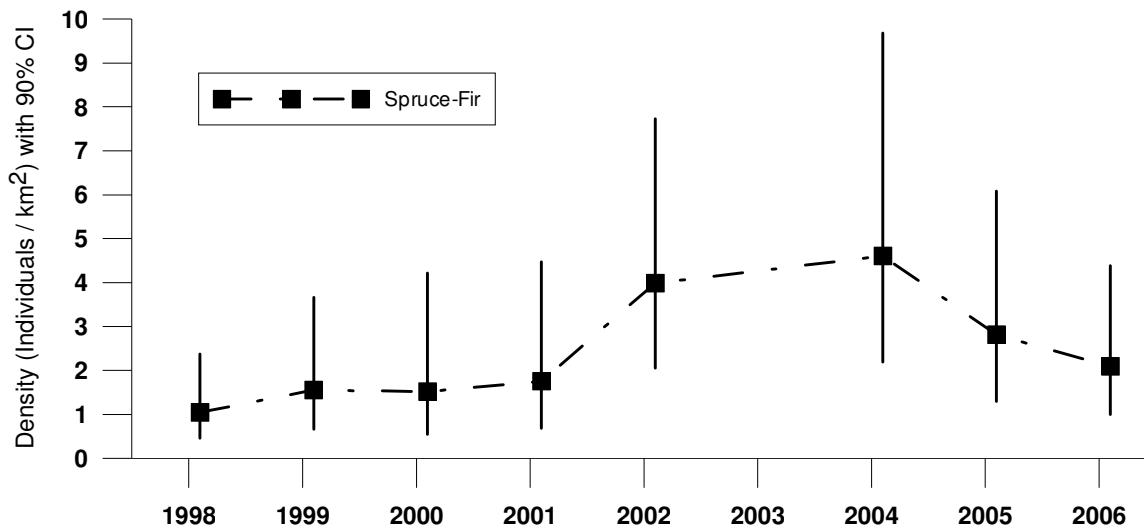
Estimated density of the American Three-toed Woodpecker (with 90% confidence intervals) on MCB transects 1998-2006.

American Three-toed Woodpecker
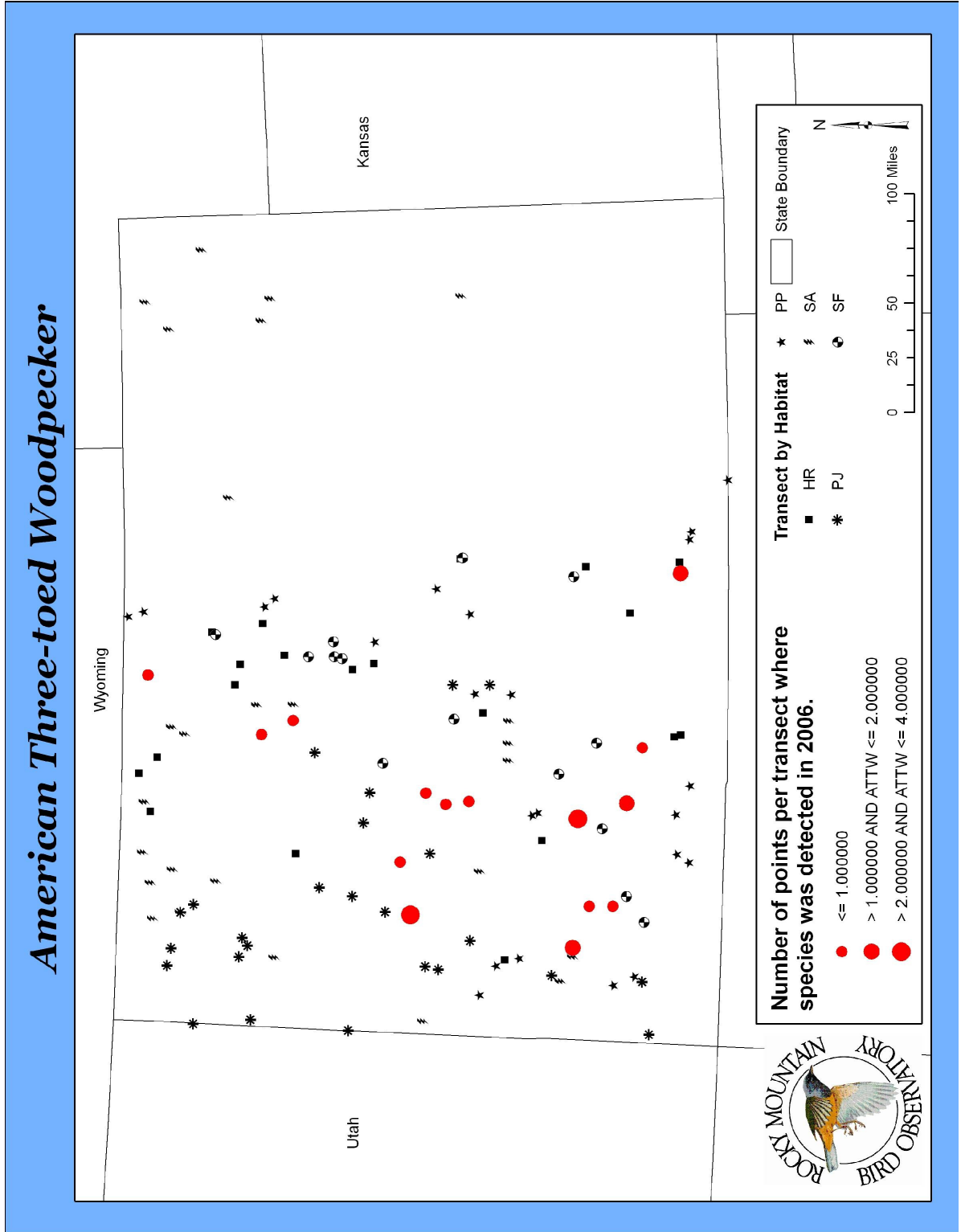
RMBO point-transect locations and detections of American Three-toed Woodpeckers on transects in Colorado, 2006.

Olive-sided Flycatcher
(*Contopus cooperi*)
CDOW - Species of Greatest Conservation Need
PIF Species of Continental Concern – BCR 16
CO-PIF Physiographic Region 62 Priority Species
USFS Region 2 Sensitive Species
USFWS Bird of Conservation Concern - Nationally

Olive-sided Flycatchers occur throughout the Rocky Mountain region, but are never abundant. On rare occasions the species will utilize low-elevation pinyon-juniper stands for nesting, but prefers high-elevation coniferous forests. In 2006, we detected 50 Olive-sided Flycatchers in three habitats on MCB transects.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Olive-sided Flycatcher within 30 years in ponderosa pine habitat, within 35 years in spruce-fir habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Olive-sided Flycatcher on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	ID	--	--	--	--	12
PP	1.5	0.7	3.2	46	18	27
SF	1.4	0.6	2.9	48	8	11

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
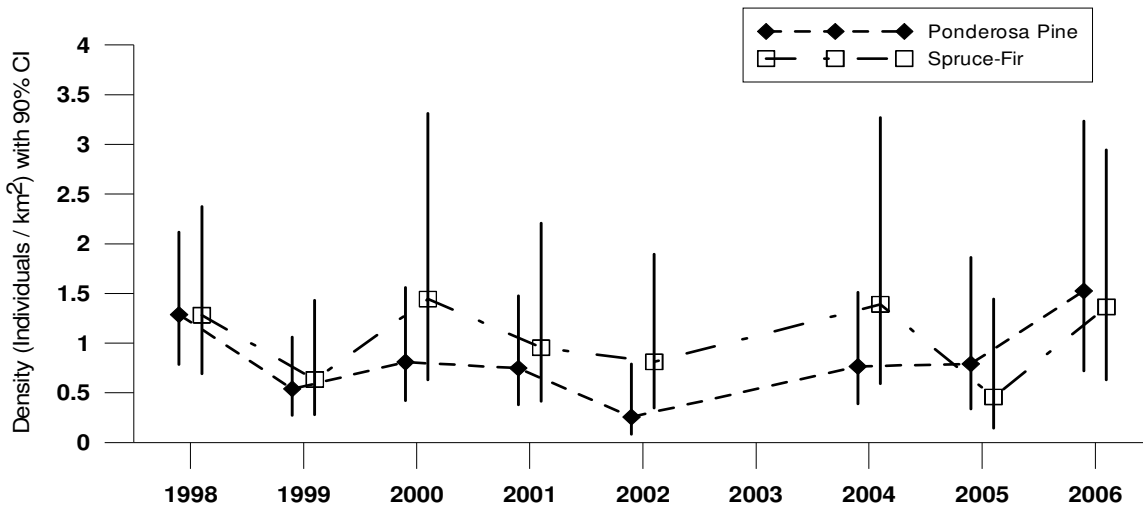
Estimated density of the Olive-sided Flycatcher (with 90% confidence intervals) on MCB transects 1998-2006.

Olive-sided Flycatcher
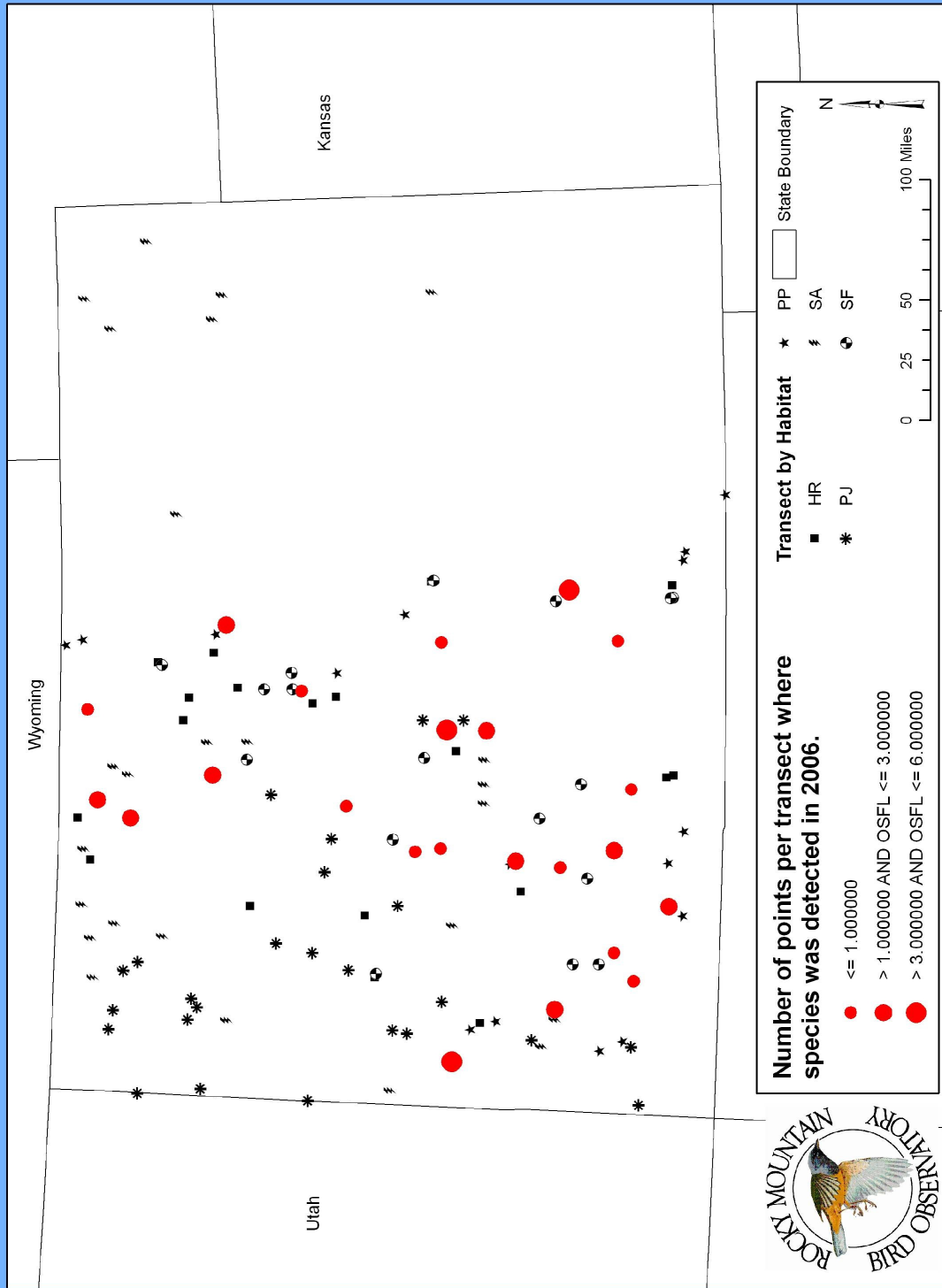
RMBO point-transect locations and detections of Olive-sided Flycatchers on transects in Colorado, 2006.

Willow Flycatcher
(*Empidonax traillii*)
Federally and State Endangered Species Lists
CDOW – Species of Greatest Conservation Need
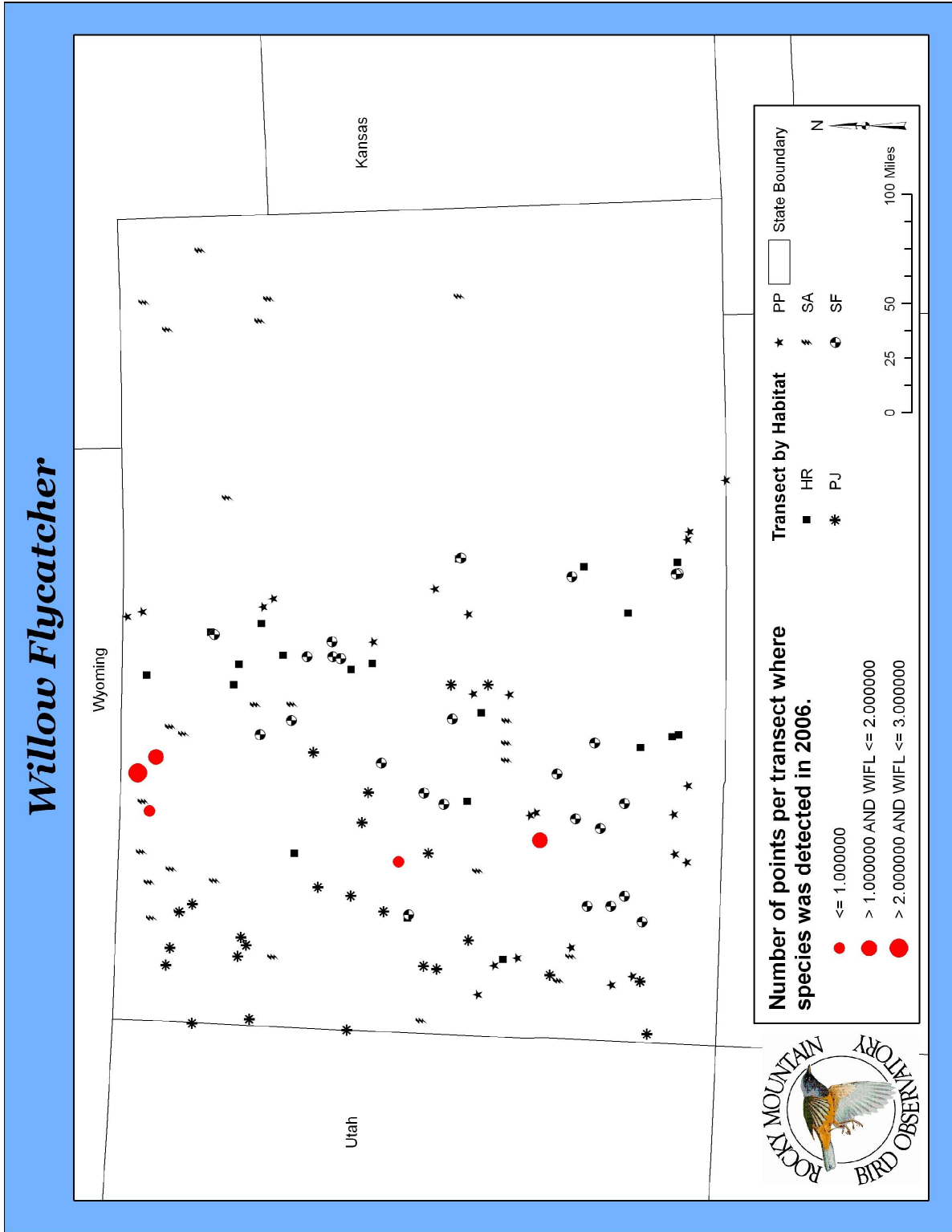PIF Species of Continental and Regional Concern – BCR 16

The southwestern subspecies of Willow Flycatcher (*E.t. extimus*) is a Federally listed Endangered Species. It is possible that this subspecies breeds in the San Luis Valley and several locations on the west slope of Colorado. The main reason for the precipitous decline of this subspecies is the loss of riparian habitat and increased cowbird parasitism. Willow Flycatchers can be found wherever there are thick willow stands growing in riparian areas at both low and high elevations in Colorado. In 2006, we detected 12 Willow Flycatchers in high-elevation riparian habitat.

In a few more seasons, using data from all years, we may be able to calculate a global detection function for Willow Flycatcher and thereby generate annual density estimates in at high-elevation riparian habitat that can be used for population-trend monitoring.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Willow Flycatcher on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	ID	--	--	--	--	12

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.

Willow Flycatcher

Number of points per transect where species was detected in 2006.

● <= 1.000000

● > 1.000000 AND WIFL <= 2.000000

● > 2.000000 AND WIFL <= 3.000000

Transect by Habitat

■ HR ★ PP ☐ State Boundary

✳ PJ ⚡ SA

◐ SF

0 25 50 100 Miles

N

RMBO point-transect locations and detections of Willow Flycatchers on transects in Colorado, 2006.

Wyoming

Kansas

Utah

Gray Flycatcher
(Empidonax wrightii)
CDOW – Species of Greatest Conservation Need
CO-PIF Physiographic Region 87 Priority Species

The Gray Flycatcher is a pinyon-juniper specialist that is rarely found in other habitats. This species is considered vulnerable because of the fact that it relies almost exclusively on pinyon-juniper habitat. We recorded 208 Gray Flycatchers in pinyon-juniper habitat on MCB transects in 2006.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Gray Flycatcher within 20 years in pinyon-juniper habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Gray Flycatcher on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
PJ	54	38	76	21	186	208

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
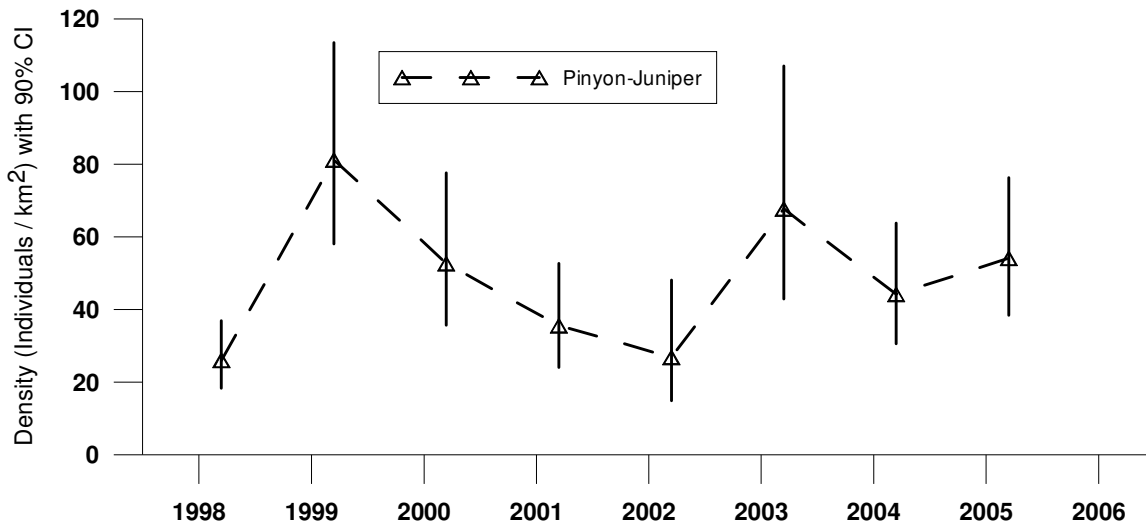
Estimated density of the Gray Flycatcher (with 90% confidence intervals) on MCB transects 1998-2006.
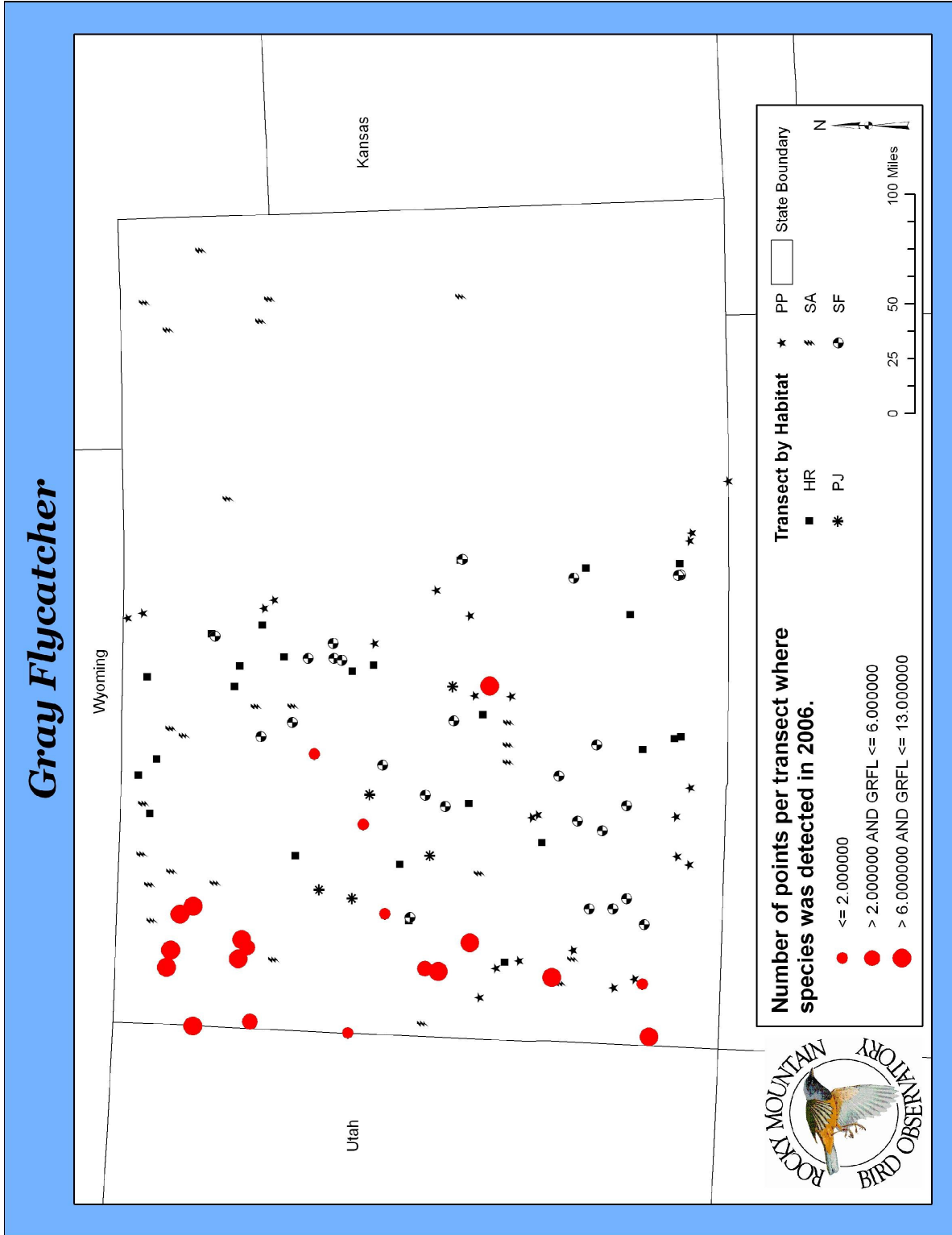
Gray Flycatcher

RMBO point-transect locations and detections of Gray Flycatchers on transects in Colorado, 2006.

Dusky Flycatcher
(Empidonax oberholseri)
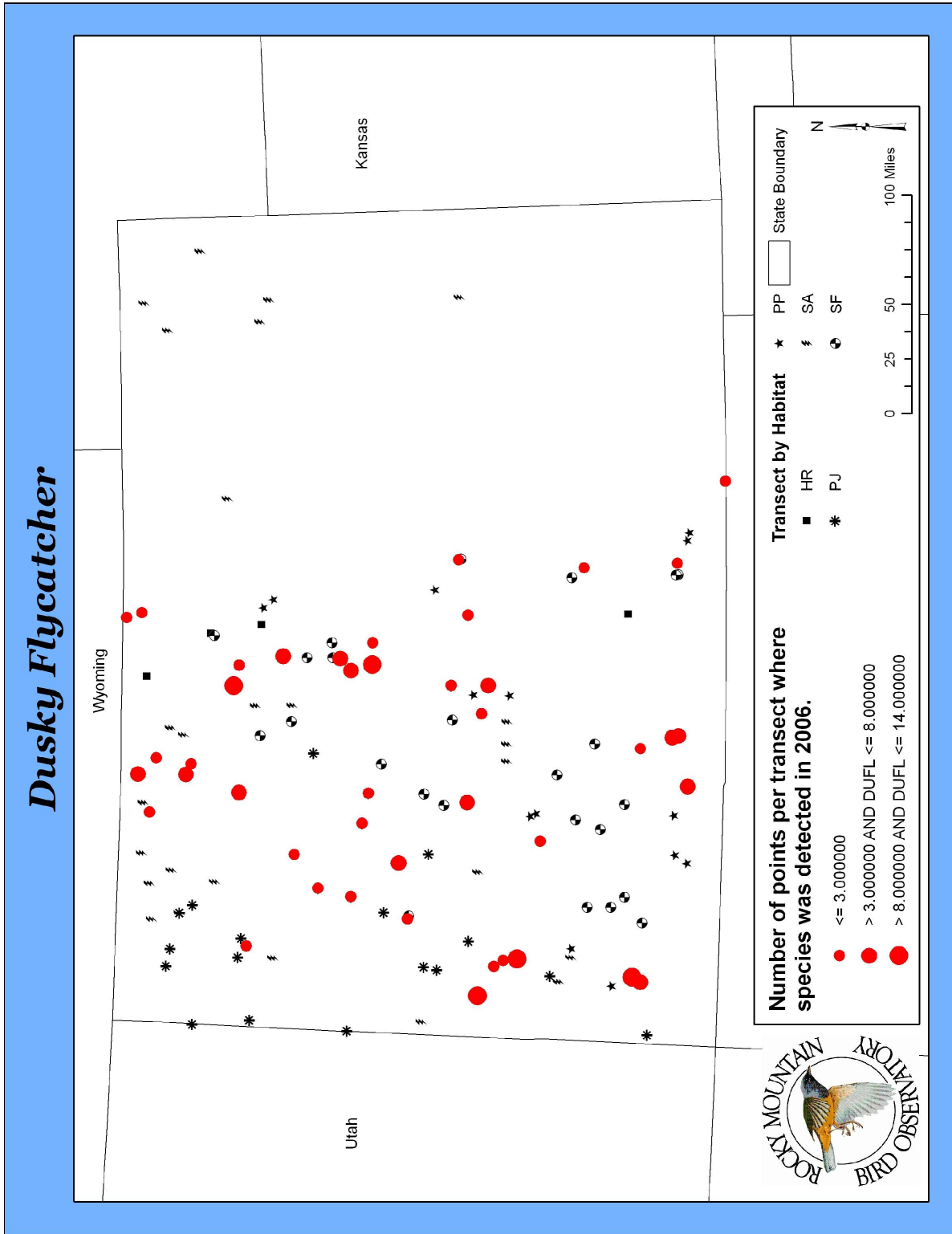CDOW – Species of Greatest Conservation Need

The Dusky Flycatcher uses a variety of habitats, including oak shrubland, willow riparian, aspen groves, coniferous forests and open brushy areas (Kingery 1998). We recorded 189 Dusky Flycatchers and calculated density estimates in three habitats on the MCB project in 2006.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Dusky Flycatcher within 25 years in ponderosa pine habitat and in 35 years in high-elevation riparian and pinyon-juniper habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Dusky Flycatcher on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	16	11	24	23	79	96
PJ	5.8	2.2	15	61	15	20
PP	25	12	51	44	69	73

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
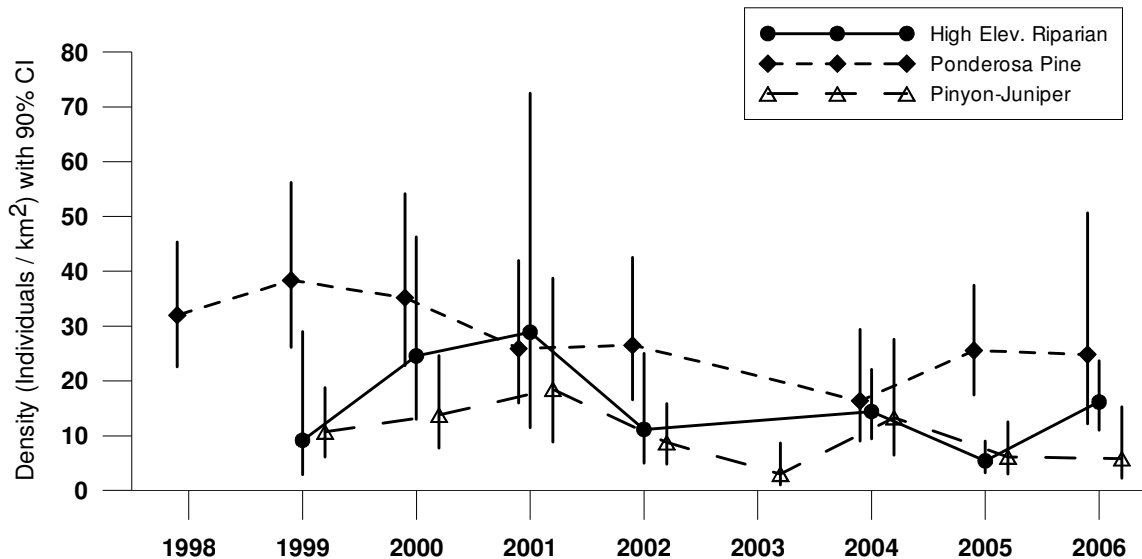
Estimated density of Dusky Flycatcher (with 90% confidence intervals) on MCB transects 1998-2006.

Dusky Flycatcher

RMBO point-transect locations and detections of Dusky Flycatchers on transects in Colorado, 2006.

Cordilleran Flycatcher
(Empidonax occidentalis)
CDOW – Species of Greatest Conservation Need
PIF Regional Stewardship Species – BCR 16
CO-PIF Physiographic Region 87 Priority Species

The Cordilleran Flycatcher nests in forested areas where cliffs or rocky ledges are present and is often found in riparian areas with many vertical surfaces. Sometimes, it is even found in arroyos in pinyon-juniper stands that have some element of deciduous vegetation. In 2006, we recorded 67 Cordilleran Flycatchers in three habitats on MCB transects.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Cordilleran Flycatcher within 35 years in high-elevation riparian, ponderosa pine, and spruce-fir habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Cordilleran Flycatcher on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	2.9	1.4	6.0	46	17	26
PP	1.2	0.5	2.8	54	5	11
SF	12	5.1	27	53	15	30

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
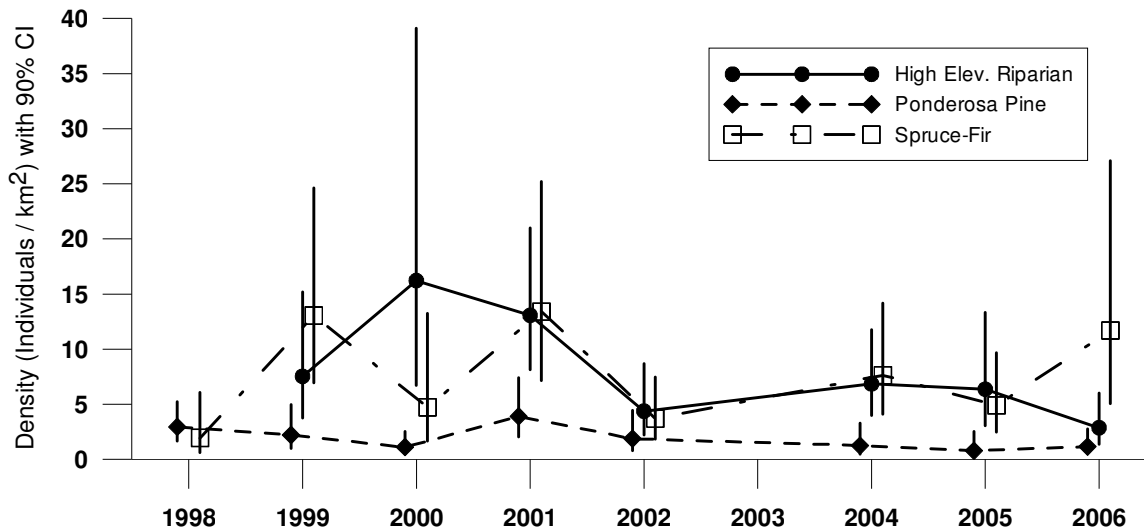
Estimated density of the Cordilleran Flycatcher (with 90% confidence intervals) on MCB transects 1998-2006.

Cordilleran Flycatcher
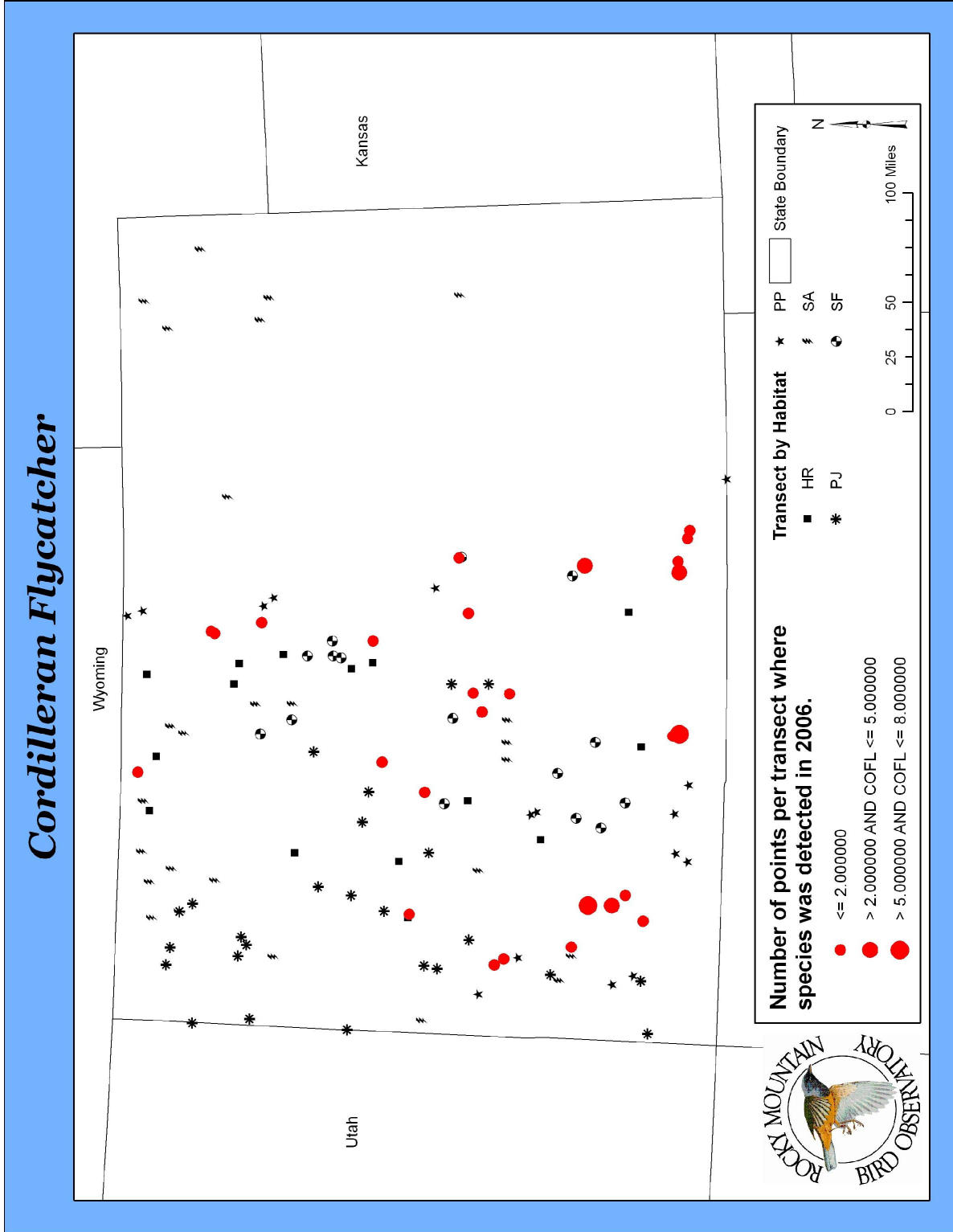
RMBO point-transect locations and detections of Cordilleran Flycatchers on transects in Colorado, 2006.

Say's Phoebe
(*Sayornis saya*)
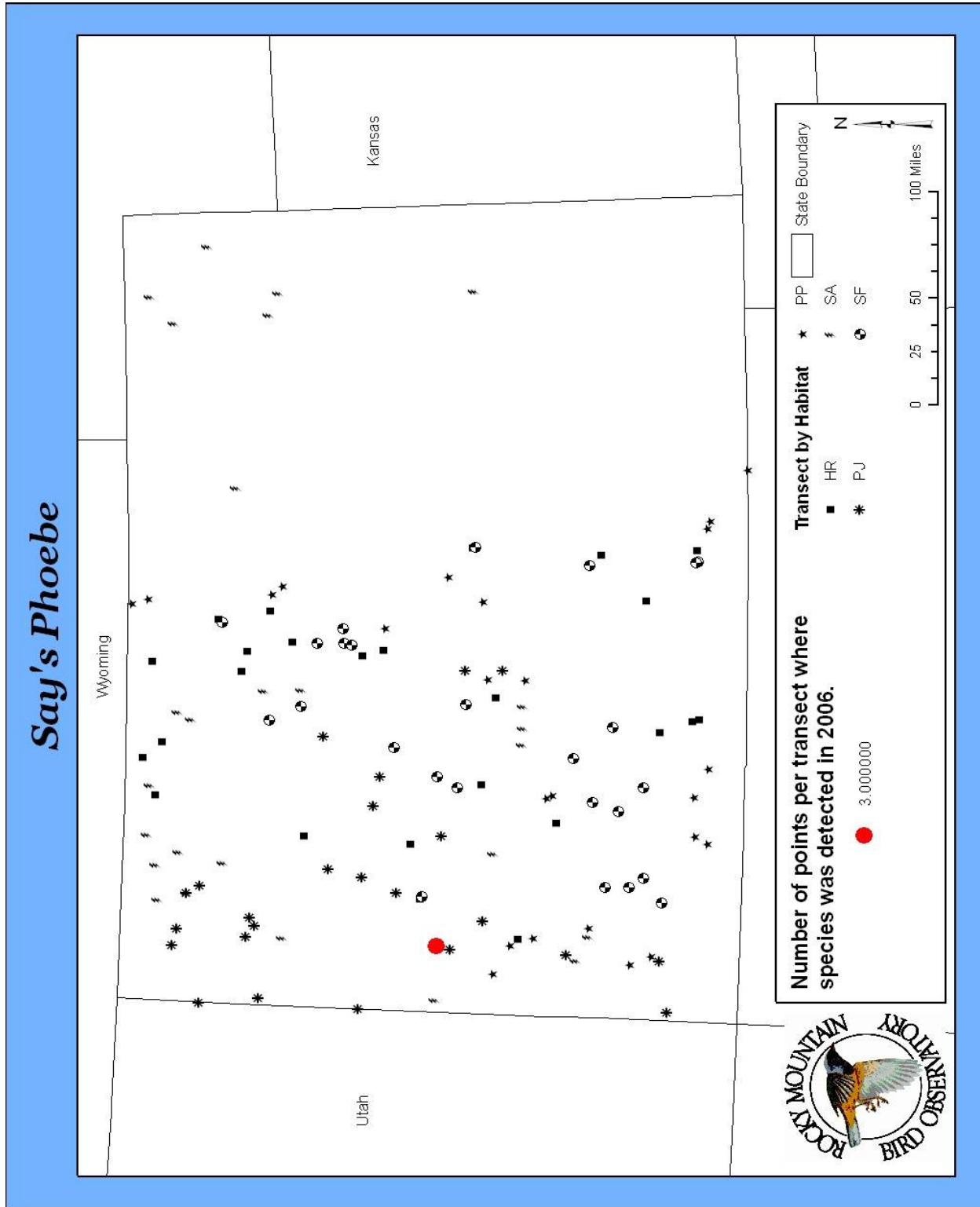PIF Regional Stewardship Species – BCR 16 & 18

The Say's Phoebe nests most frequently in rocky areas where there are niches to hide its nest, as well as in barns or other human structures. This species arrives on its breeding grounds earlier that most other migrants and as a result we may miss the period when it is most actively singing. In 2006, we detected three Say's Phoebes on one pinyon-juniper transect, PJ19. We also detected Say's Phoebes on this transect in 1999, 2000, 2001, 2002 and 2005.

Say's Phoebes are detected most frequently on grassland transects that were not surveyed in 2006. We anticipate we will be able to effectively monitor this species in grassland habitat.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Say's Phoebe on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
PJ	ID	--	--	--	--	3

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.

Say's Phoebe

RMBO point-transect locations and detections Say's Phoebes on transects in Colorado, 2006.

Gray Vireo
(*Vireo vicinior*)
CDOW - Species of Greatest Conservation Need
PIF Species of Continental and Regional Concern – BCR 16
PIF Regional Stewardship Species – BCR 16
CO-PIF Physiographic Region 87 Priority Species
USFWS Bird of Conservation Concern – BCR 16 and Nationally

The Gray Vireo nests exclusively in pinyon-juniper habitat with abundant shrubs. It is believed to nest only in low-elevation pinyon-juniper, which may explain why it is not encountered more frequently on MCB transects. In 2006, we detected 25 Gray Vireos in pinyon-juniper habitat on MCB transects.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Gray Vireo within 40 years in pinyon-juniper habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Gray Vireo on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
PJ	4.2	1.5	12	67	22	25

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
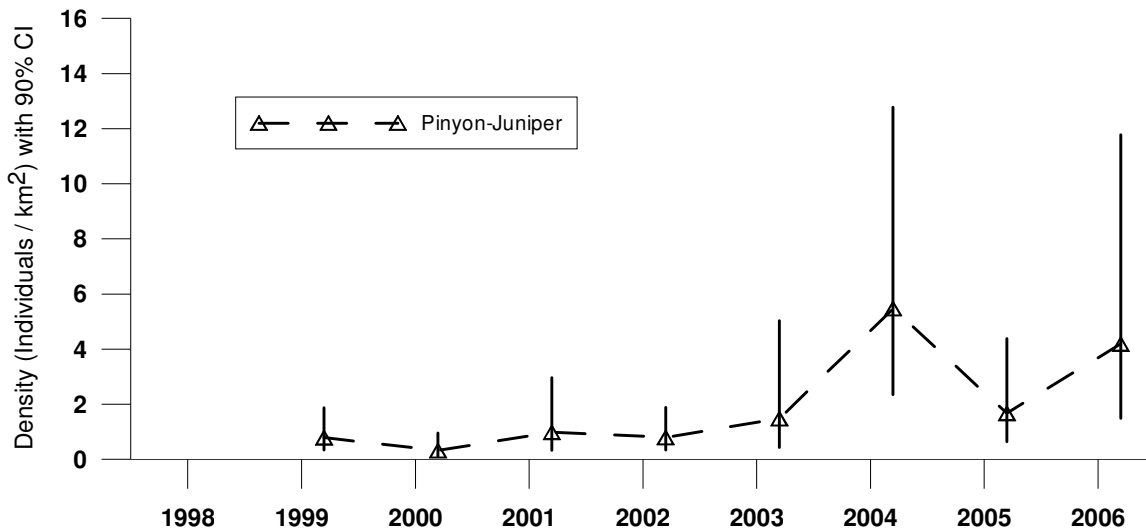
Estimated density of the Gray Vireo (with 90% confidence intervals) on MCB transects 1999-2006.
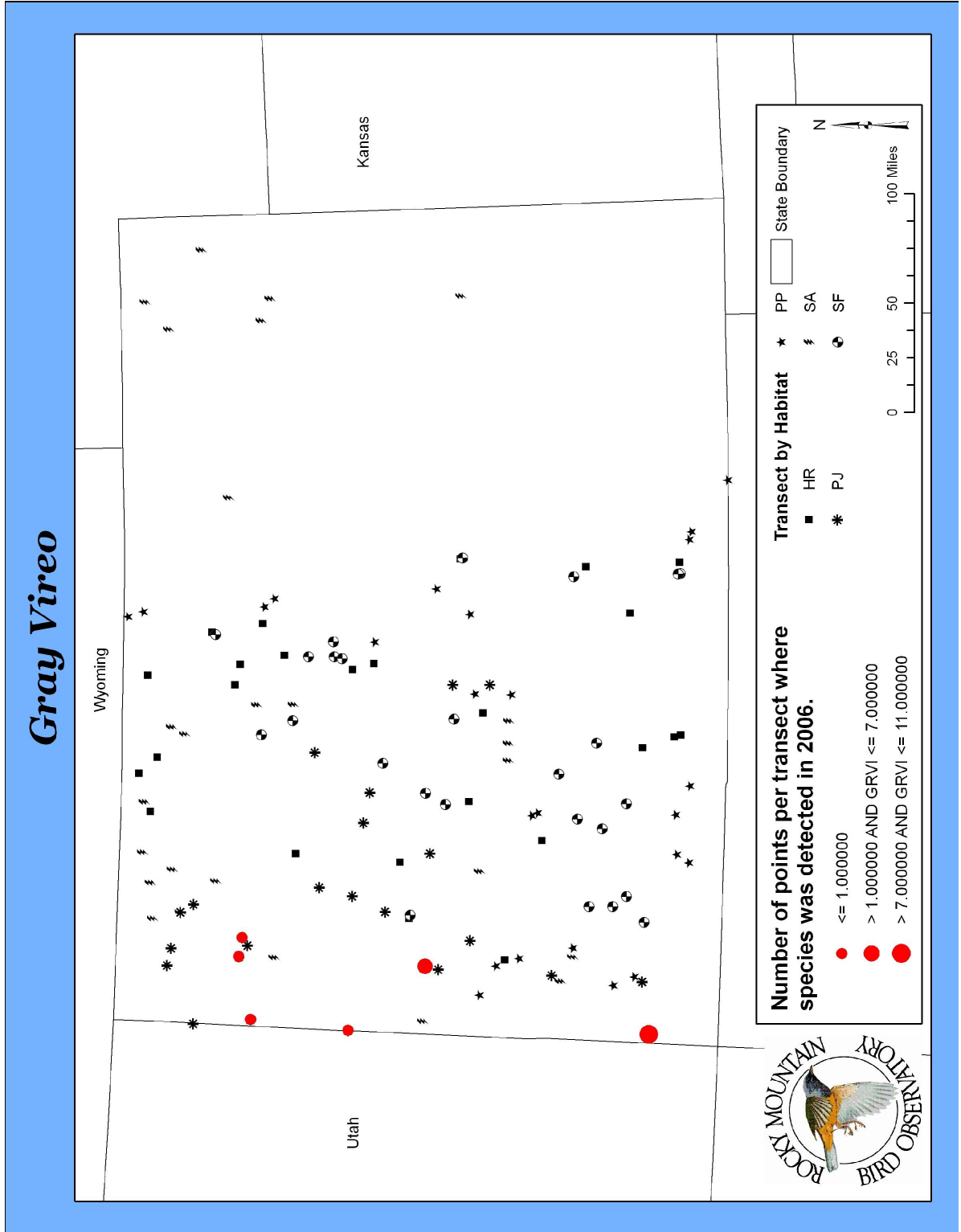
Gray Vireo

RMBO point-transect locations and detections of Gray Vireos on transects in Colorado, 2006.

Plumbeous Vireo
(*Vireo plumbeous*)
PIF Regional Stewardship Species – BCR 16

The Plumbeous Vireo nests in a variety of habitats, including pinyon-juniper, ponderosa pine, and cottonwood galleries in riparian habitat. Its range rarely overlaps with Gray Vireos, as it prefers higher elevations. In 2006, we detected 144 Plumbeous Vireos in four habitats on MCB transects.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Plumbeous Vireo within 20 years in pinyon-juniper habitat and within 25 years in ponderosa pine habitat.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Plumbeous Vireo on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	ID	--	--	--	--	1
PJ	9.5	6.1	15	26	54	66
PP	11	7.1	17	27	60	75
SF	ID	--	--	--	--	2

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
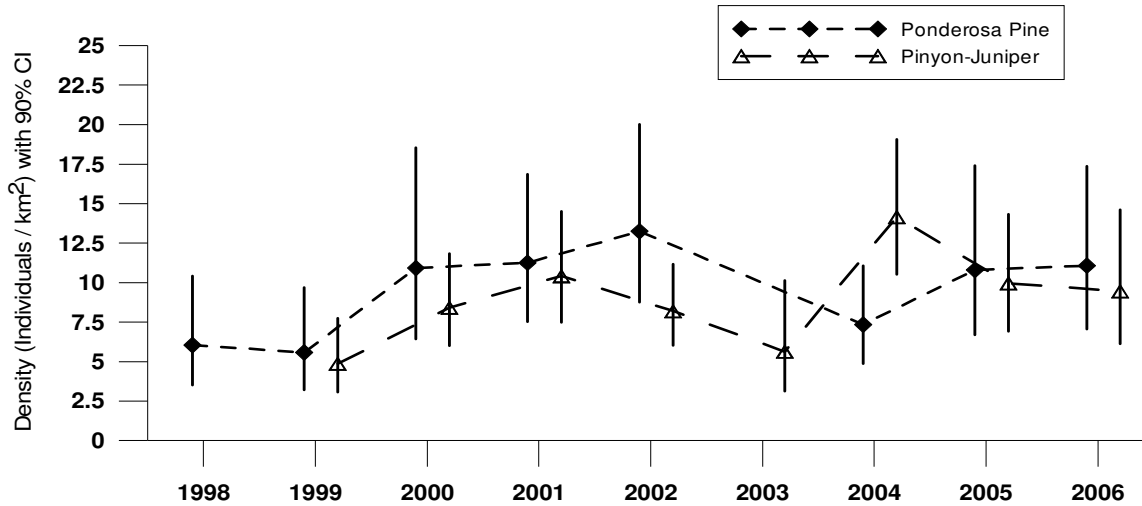
Estimated density of the Plumbeous Vireo (with 90% confidence intervals) on MCB transects 1998-2006.
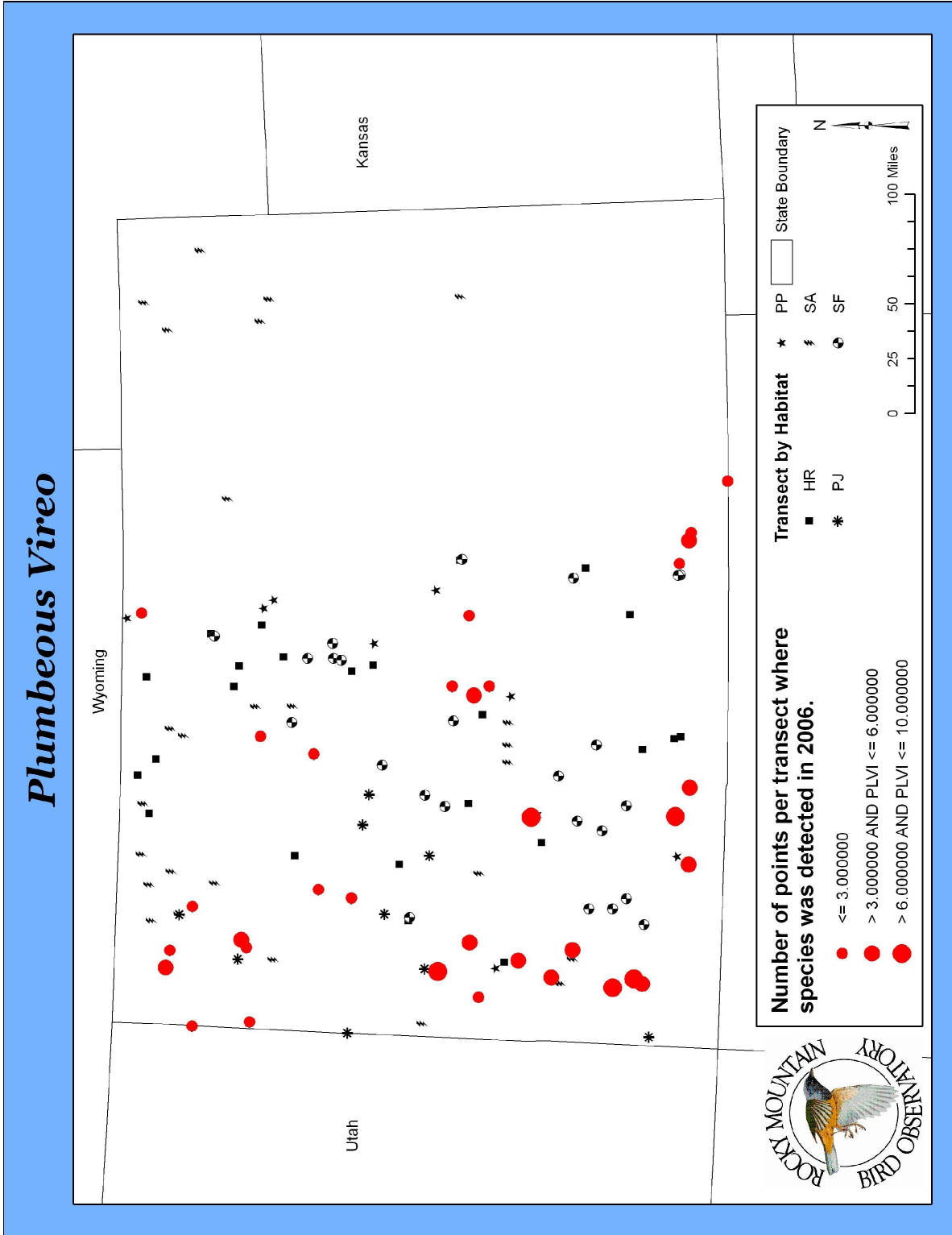
Plumbeous Vireo

RMBO point-transect locations and detections of Plumbeous Vireos on transects in Colorado, 2006.

Warbling Vireo
## (*Vireo gilvus*)
PIF Regional Stewardship Species – BCR 16

The Warbling Vireo nests in any area with deciduous trees or tall deciduous shrubs. In 2006, we detected 474 Warbling Vireos in four habitats on MCB transects and calculated density estimates in three habitats.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Warbling Vireo within 25 years in high-elevation riparian and ponderosa pine habitats and within 30 years in spruce-fir habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Warbling Vireo on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	24	16	34	23	124	194
PJ	ID	--	--	--	--	6
PP	40	27	58	23	201	230
SF	9.4	4.7	19	43	40	44

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
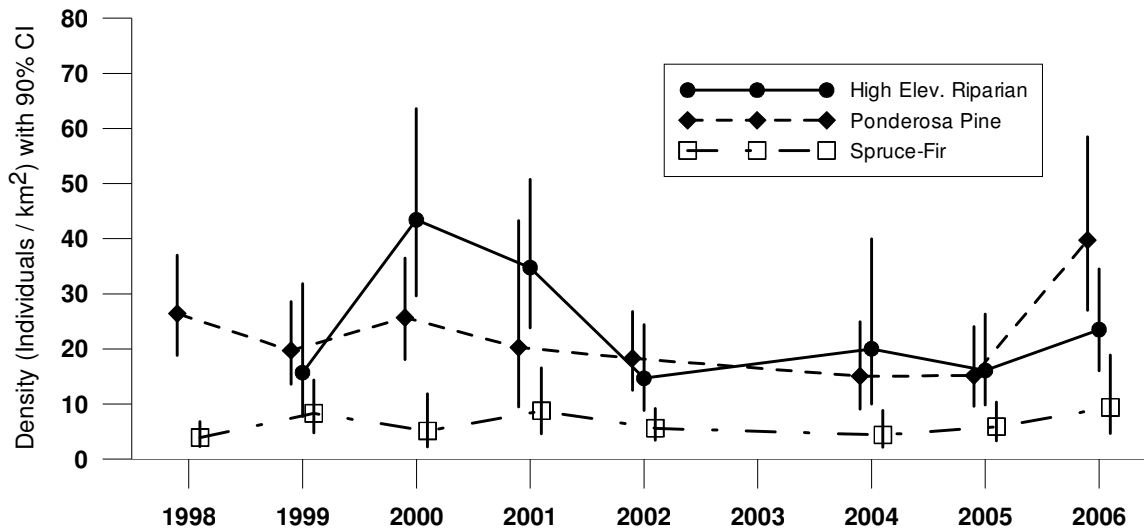
Estimated density of the Warbling Vireo (with 90% confidence intervals) on MCB transects 1998-2006.
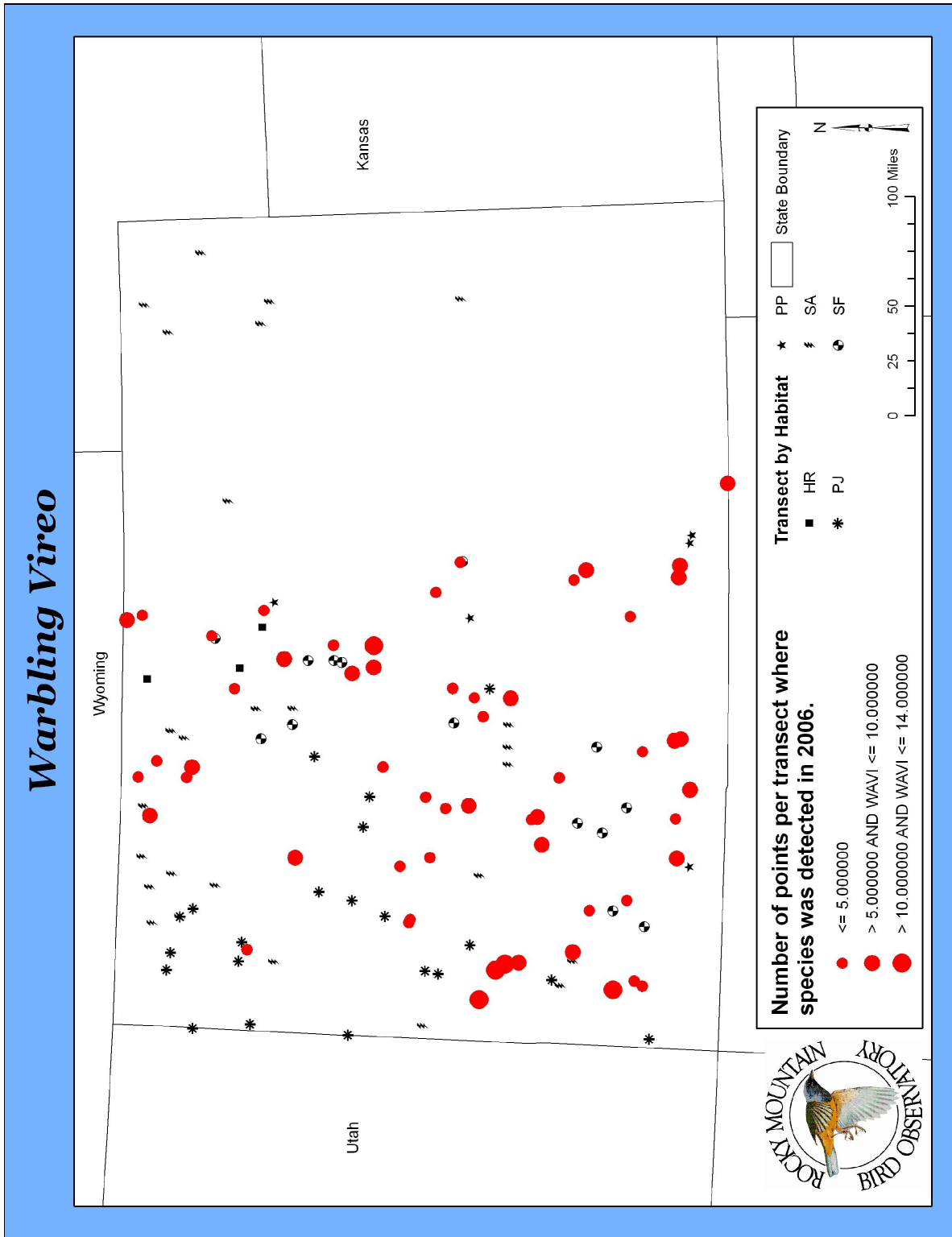
Warbling Vireo

RMBO point-transect locations and detections of Warbling Vireos on transects in Colorado, 2006.

Pinyon Jay
(*Gymnorhinus cyanocephalus*)
CDOW - Species of Greatest Conservation Need
PIF Species of Continental and Regional Concern – BCR 16
PIF Continental and Regional Stewardship Species – BCR 16
PIF Species of Continental Concern – BCR 18
CO-PIF Physiographic Region 87 Priority Species
USFWS Bird of Conservation Concern – BCR 16

The Pinyon Jay is rarely found in habitats other than pinyon-juniper, where the species is important to the overall health of pinyon pines as birds cache large amounts of seeds. Pinyon Jays frequently travel in large flocks and it is unusual to observe a single individual. In 2006, we detected 151 Pinyon Jays in two habitats and calculated a density estimate for pinyon-juniper on MCB.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Pinyon Jay within 30 years in pinyon-juniper habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Pinyon Jay on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
PJ	1.9	0.8	4.5	56	29	145
PP	ID	--	--	--	--	6

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
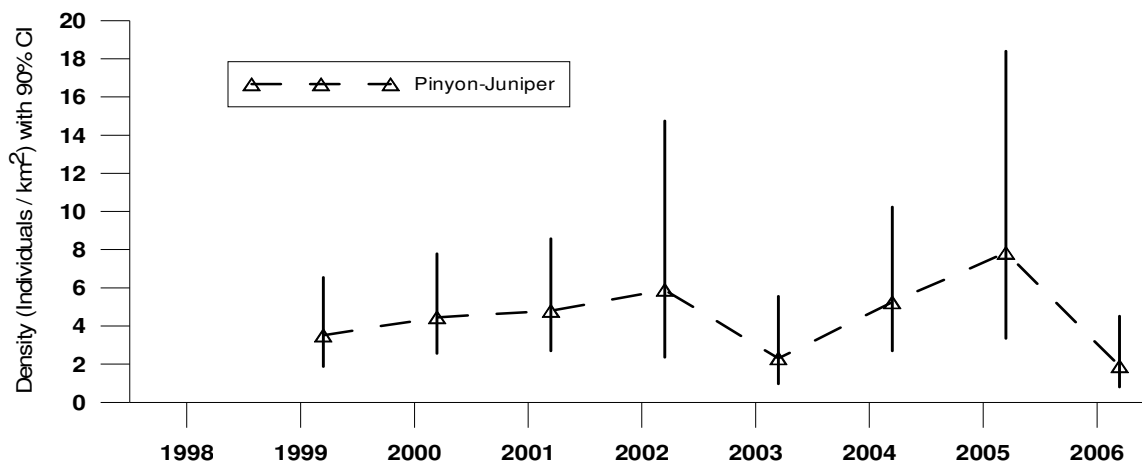
Estimated density of the Pinyon Jay (with 90% confidence intervals) on MCB transects 1999-2006.
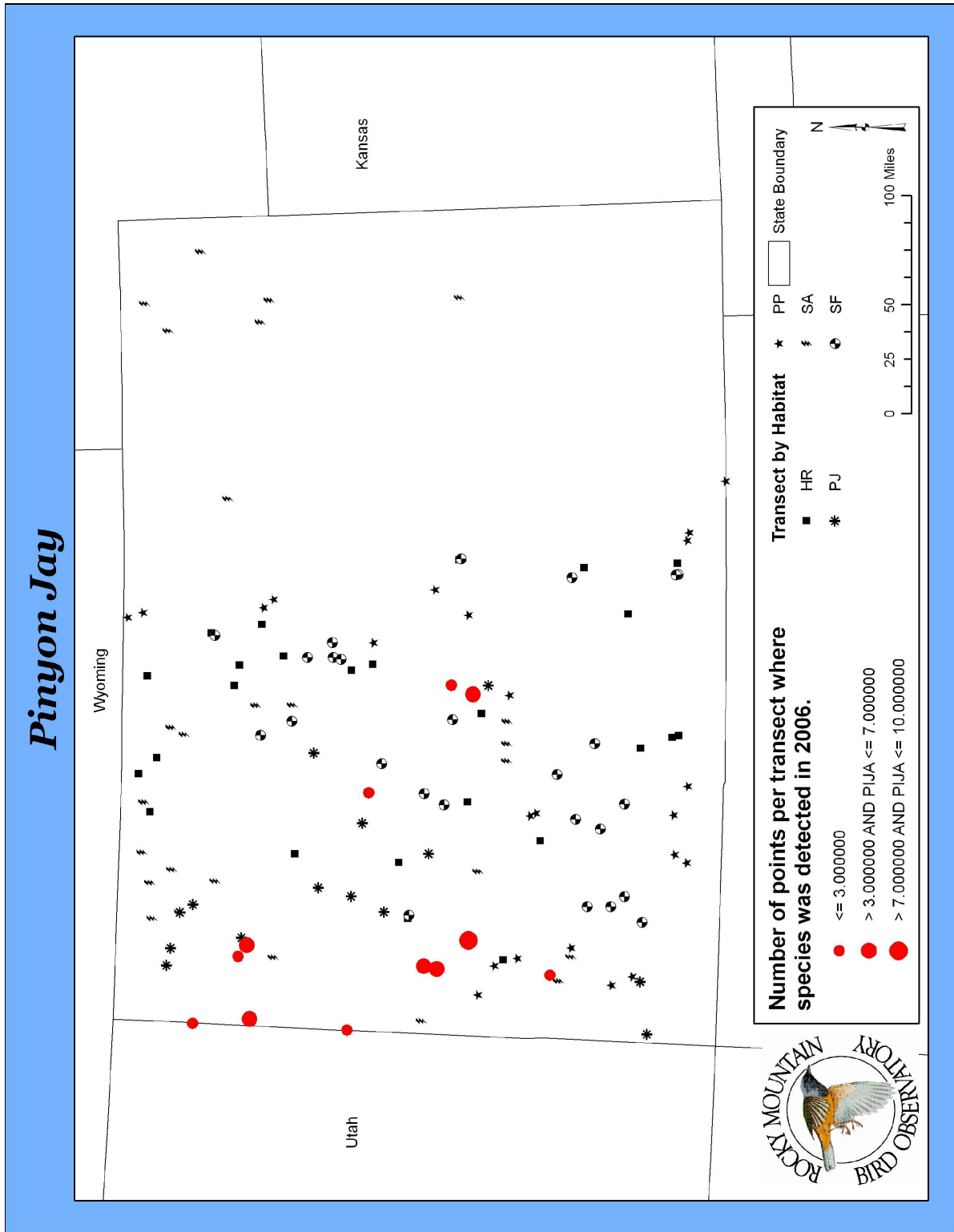
Pinyon Jay

RMBO point-transect locations and detections of Pinyon Jays on transects in Colorado, 2006.

Clark's Nutcracker
(*Nucifraga Columbiana*)
PIF Continental and Regional Stewardship Species – BCR 16

The Clark's Nutcracker nests in all coniferous habitats, but when not nesting, it travels widely in search of food. In 2006, we detected 163 Clark's Nutcrackers in five habitats and calculated density estimates in high-elevation riparian, ponderosa pine, and spruce-fir habitats on MCB transects.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Clark's Nutcracker within 25 years in ponderosa pine and spruce-fir habitats, and more than 40 years in high-elevation riparian habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Clark's Nutcracker on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	0.3	0.1	0.6	53	20	34
PJ	ID	--	--	--	--	13
PP	1.3	0.7	2.4	37	24	43
SA	ID	--	--	--	--	5
SF	3.4	1.9	6.2	35	30	68

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
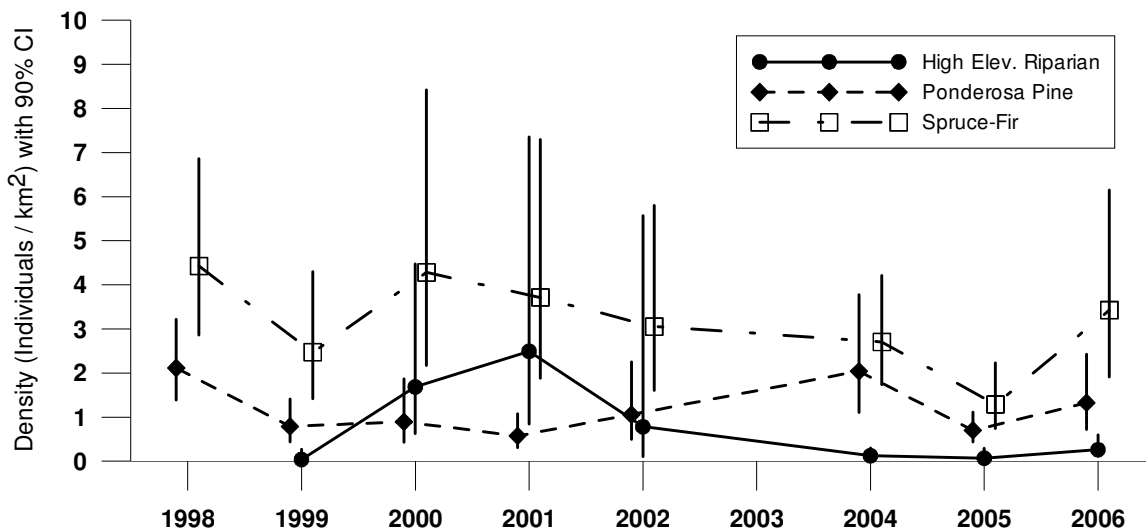
Estimated density of the Clark's Nutcracker (with 90% confidence intervals) on MCB transects 1998-2006.

Clark's Nutcracker

Number of points per transect where species was detected in 2006.

<= 2.000000

> 2.000000 AND CLNU <= 5.000000

> 5.000000 AND CLNU <= 7.000000

Transect by Habitat
- ★ PP
- ■ HR
- ✳ PJ
- ⚡ SA
- ◉ SF

☐ State Boundary

N

0   25   50   100 Miles

Kansas

Wyoming

Utah

RMBO point-transect locations and detections of Clark's Nutcrackers on transects in Colorado, 2006.

Black-billed Magpie
(*Pica hudsonia*)
PIF Regional Stewardship Species – BCR 16

The Black-billed Magpie requires a supply of mud, which it uses to construct large nests that will last for years. Abandoned nests are often used by other species, including Great Horned and Long-eared Owls (Righter et al. 2004). In 2006, we detected 99 Black-billed Magpies in five habitats on MCB transects.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Black-billed Magpie within 30 years in pinyon-juniper and sage shrubland habitats, and more than 40 years in high-elevation riparian using point transect data.
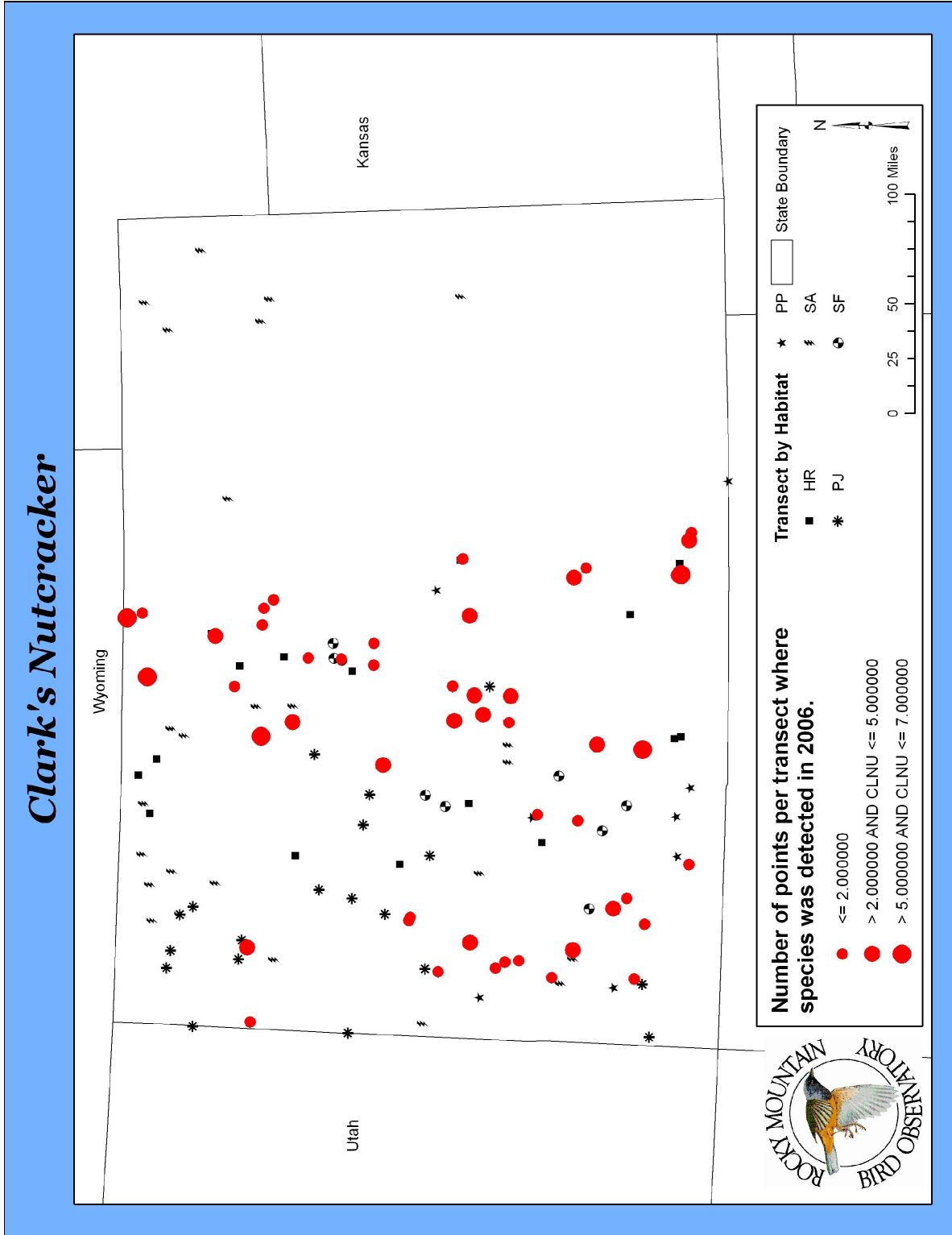
Total number of independent detections, number of individuals, and habitat-specific density estimates for the Black-billed Magpie on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	0.16	0.02	1.20	161	2	2
PJ	1.4	0.6	3.1	51	23	37
PP	ID	--	--	--	--	5
SA	1.3	0.6	2.5	26.7	50	54
SF	ID	--	--	--	--	1

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
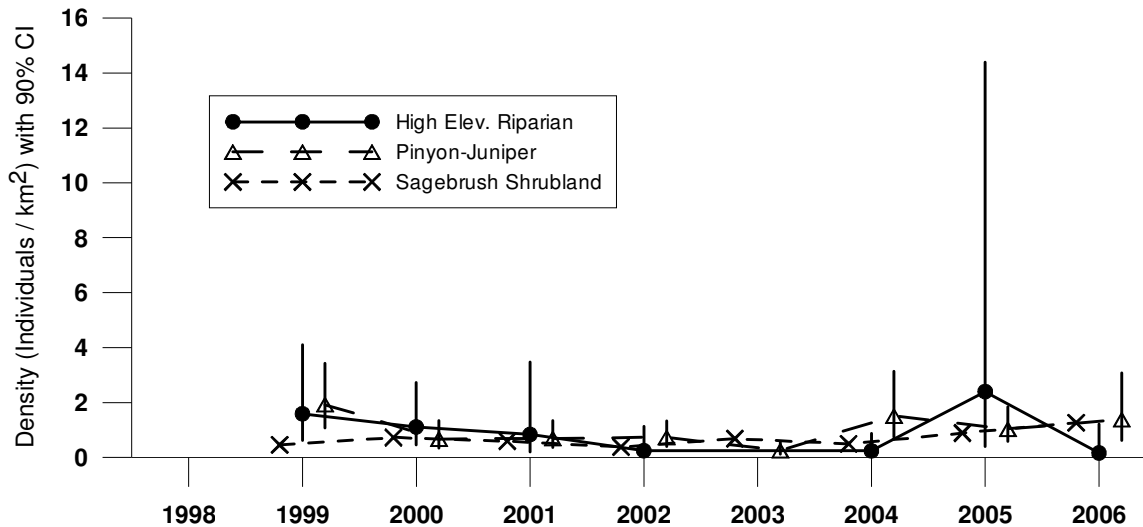
Estimated density of the Black-billed Magpie (with 90% confidence intervals) on MCB transects 1999-2006.

Black-billed Magpie
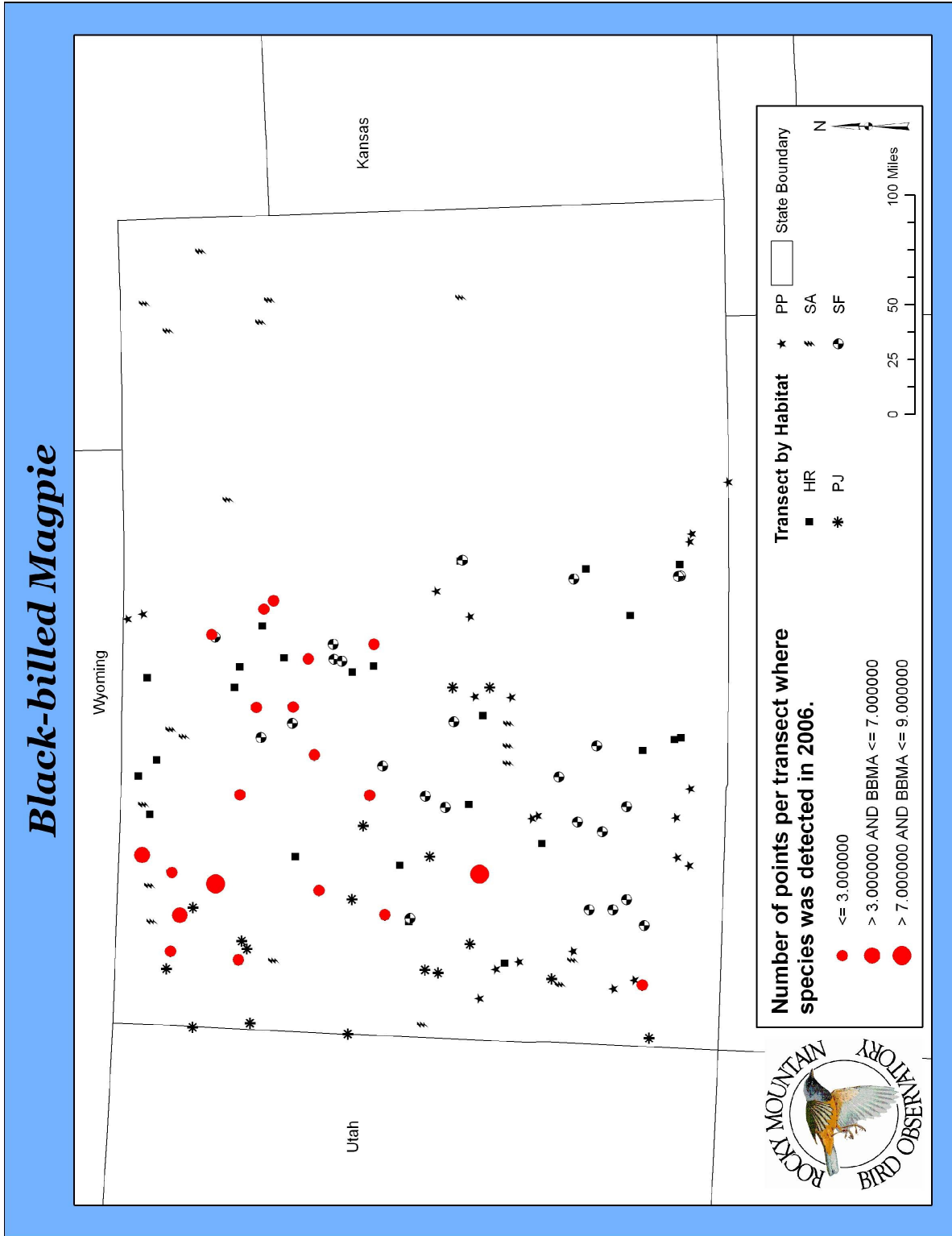
RMBO point-transect locations and detections of Black-billed Magpies on transects in Colorado, 2006.

Violet-green Swallow
(*Tachycineta thalassina*)
PIF Regional Stewardship Species – BCR 16
CO-PIF Physiographic Region 62 Priority Species

The Violet-green Swallow often nests on cliffs, sometimes near White-throated Swifts. It will also nest with Tree Swallows in aspen stands or in ponderosa pine snags. We detected 317 Violet-green Swallows in five habitats on MCB transects and calculated density estimates for three habitats in 2006. Detections of Violet-green Swallows in sage shrubland habitat were unreliable due to observer error.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Violet-green Swallow within 20 years in ponderosa pine habitat and within 30 years in high-elevation riparian and pinyon-juniper habitats using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Violet-green Swallow on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	31	17	56	36	41	90
PJ	15	7	32	48	14	43
PP	30	18	50	30	105	176
SA	--	--	--	--	--	**
SF	ID	--	--	--	--	8

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data not reliable due to observer error.
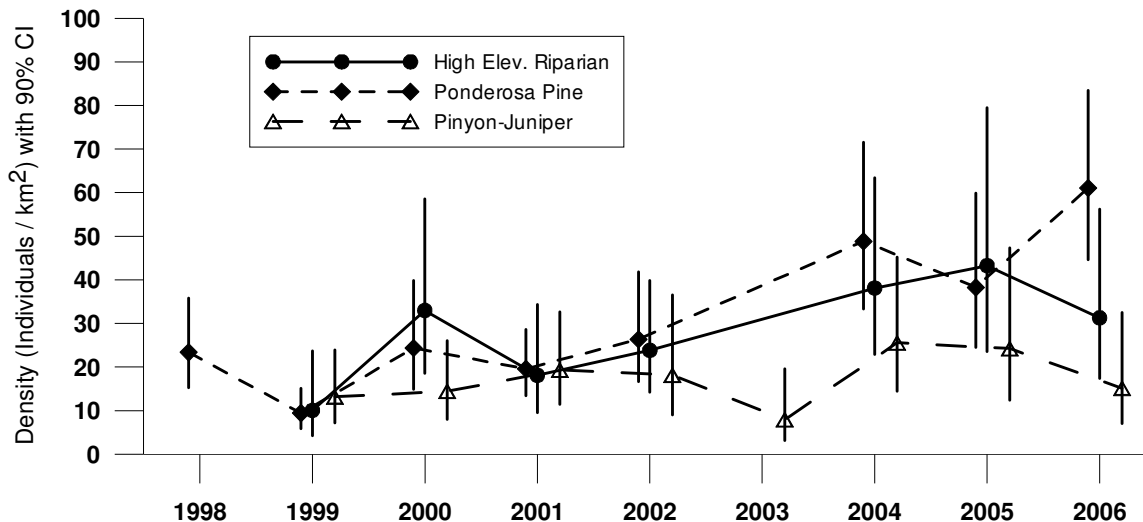
Estimated density of the Violet-green Swallow (with 90% confidence intervals) on MCB transects 1998-2006.

Violet-green Swallow
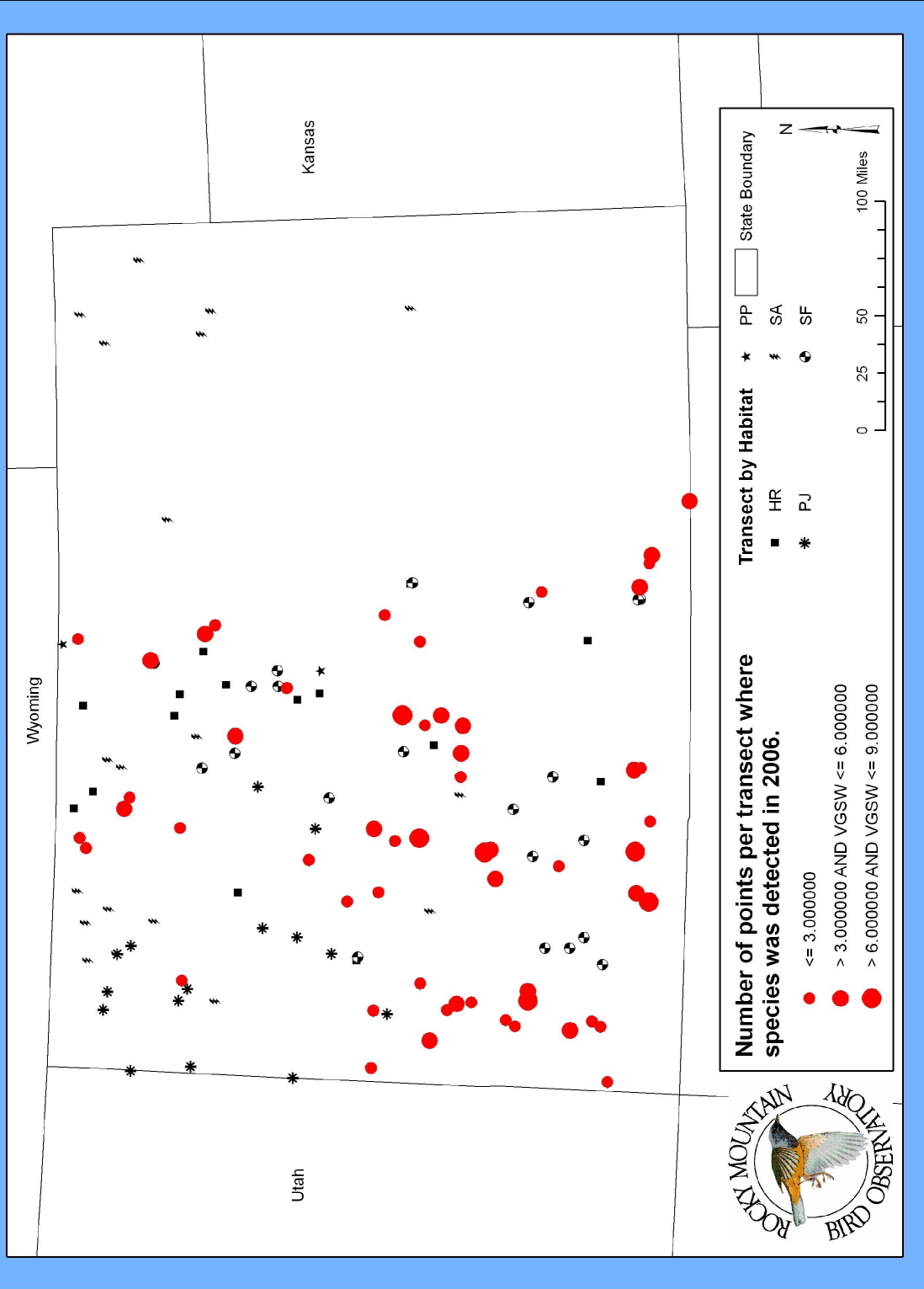
RMBO point-transect locations and detections of Violet-green Swallows on transects in Colorado, 2006.

Juniper Titmouse
(Baeolophus ridgwayi)
CDOW - Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 16
PIF Regional Stewardship Species
CO-PIF Physiographic Region 87 Priority Species

The Juniper Titmouse is a pinyon-juniper specialist, rarely found in other habitats. Juniper Titmice nest in natural cavities or cavities excavated by other species. We detected 48 Juniper Titmice in pinyon-juniper habitat on MCB transects in 2006.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Juniper Titmouse within 25 years in pinyon-juniper habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Juniper Titmouse on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
PJ	19	12	31	29	43	48

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
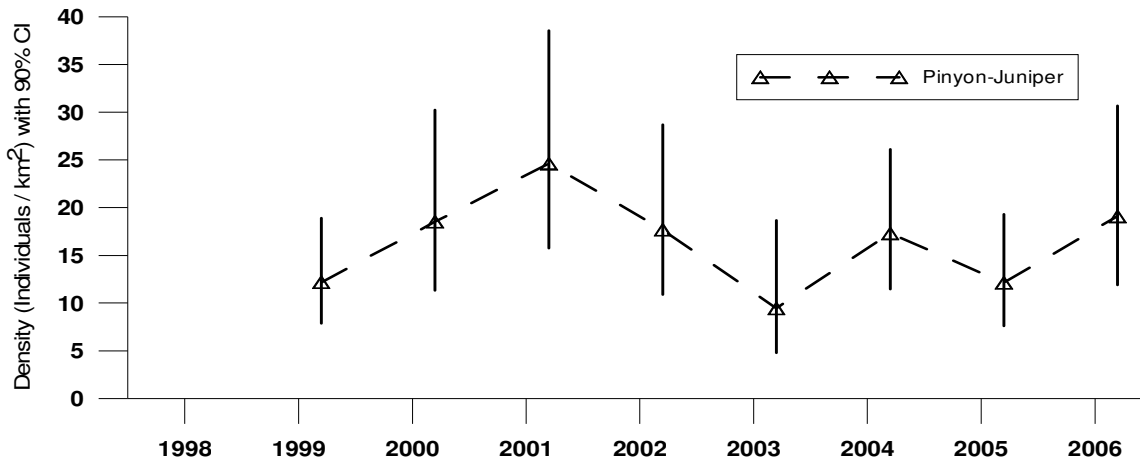
Estimated density of the Juniper Titmouse (with 90% confidence intervals) on MCB transects 1999-2006.

Juniper Titmouse

Kansas

Wyoming

Utah

Number of points per transect where species was detected in 2006.

● <= 1.000000
● > 1.000000 AND JUTI <= 3.000000
● > 3.000000 AND JUTI <= 6.000000

Transect by Habitat
★ PP
■ HR
✹ SA
✳ PJ
◕ SF
☐ State Boundary

N

0   25   50   100 Miles

RMBO point-transect locations and detections of Juniper Titmice on transects in Colorado, 2006.

Pygmy Nuthatch
(*Sitta pygmaea*)
CDOW – Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 16

The Pygmy Nuthatch is found primarily in ponderosa pine habitat, where it commonly nests in ponderosa pine snags. In 2006, we detected 150 Pygmy Nuthatches in two habitats and were able to calculate a density estimate in ponderosa pine habitat on MCB.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Pygmy Nuthatch within 30 years in ponderosa pine habitat using point transect data.
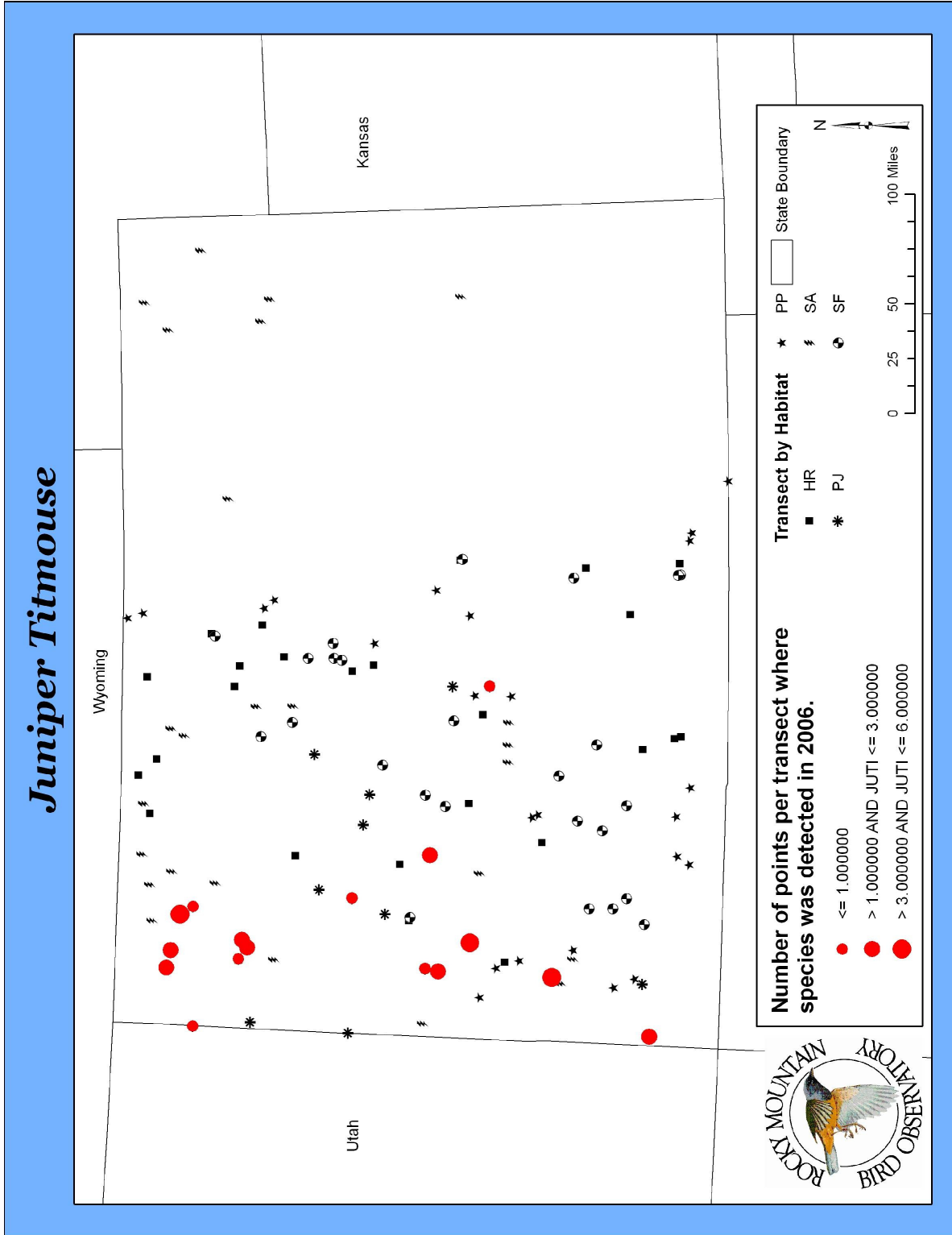
Total number of independent detections, number of individuals, and habitat-specific density estimates for the Pygmy Nuthatch on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	ID	--	--	--	--	3
PP	72	38	135	39	136	147

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
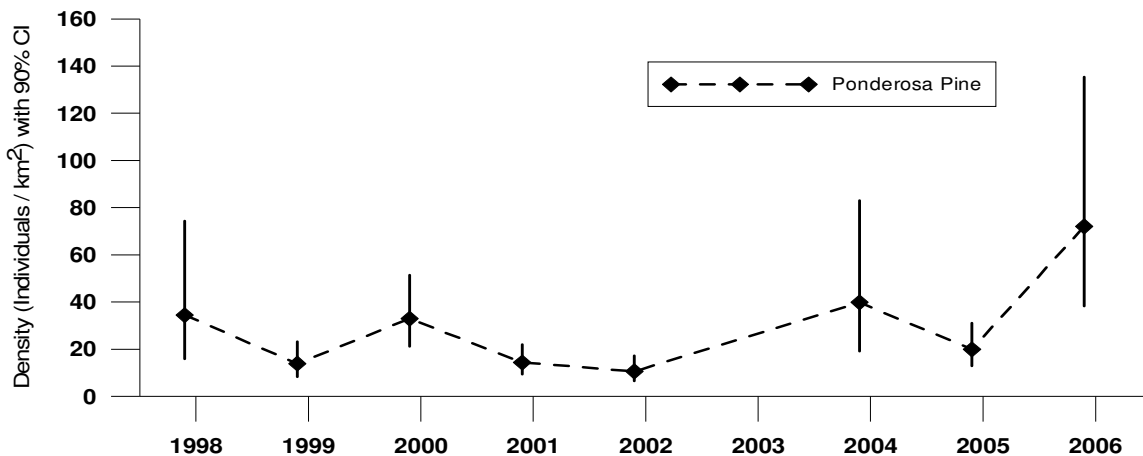
Estimated density of the Pygmy Nuthatch (with 90% confidence intervals) on MCB transects 1998-2006.
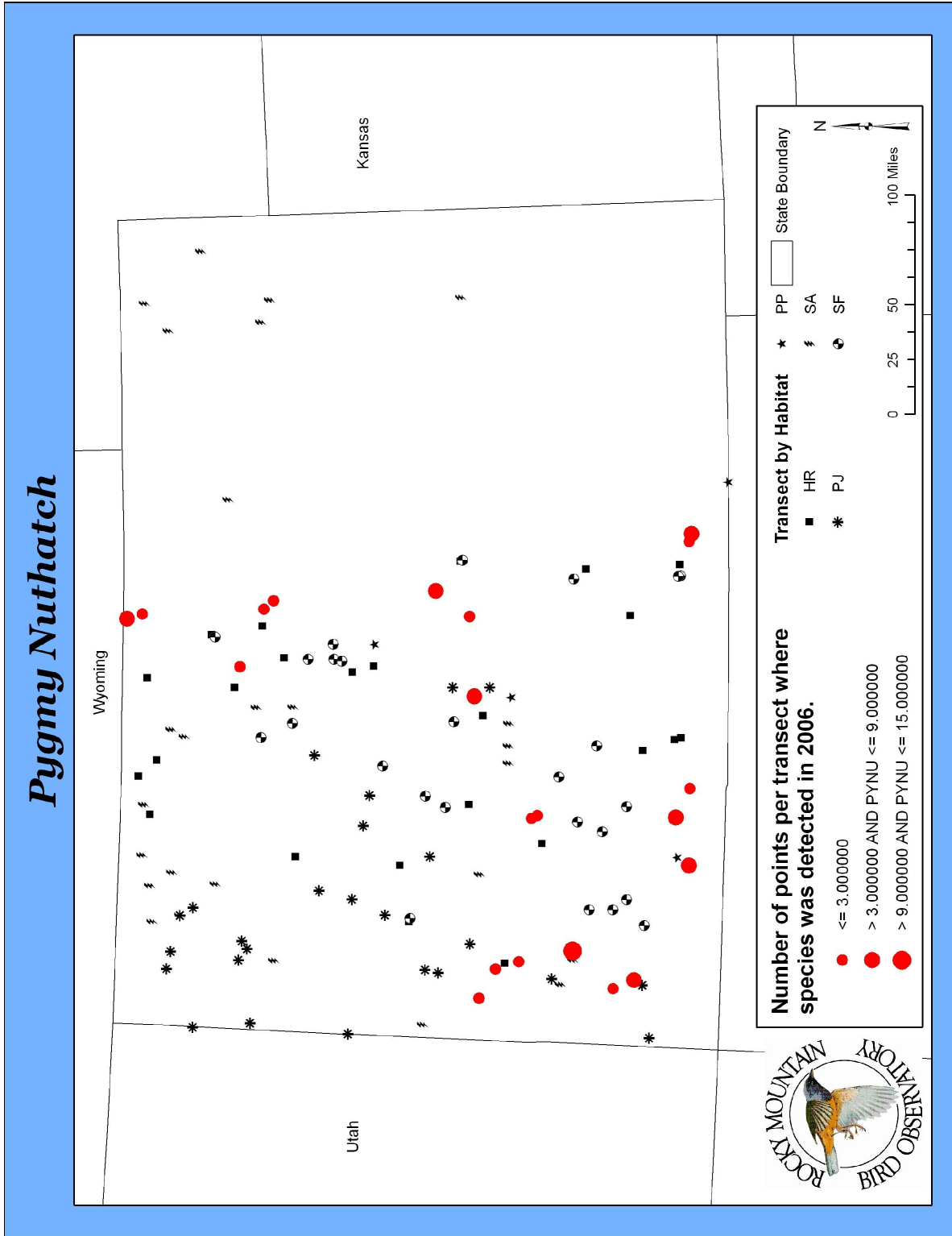
Pygmy Nuthatch

RMBO point-transect locations and detections of Pygmy Nuthatches on transects in Colorado, 2006.

Rock Wren
(Salpinctes obsoletus)
PIF Regional Stewardship Species – BCR 16

The Rock Wren is found in arid or semi-arid habitat, in rocky canyons, on rock slides and boulder-strewn slopes, and in arroyos with sparse vegetation. In 2006, we detected 104 Rock Wrens in three habitats on MCB transects and were able to calculate a density estimate in pinyon-juniper and ponderosa pine habitats. Detections of Rock Wren in sage shrubland habitat were unreliable due to observer error.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Rock Wren within 30 years in pinyon-juniper habitat and within 40 years in ponderosa pine habitat.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Rock Wren on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	ID	--	--	--	--	8
PJ	5.3	2.6	10.8	44	61	76
PP	1.5	0.6	3.7	58	20	20
SA	--	--	--	--	--	**

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data not reliable due to observer error.
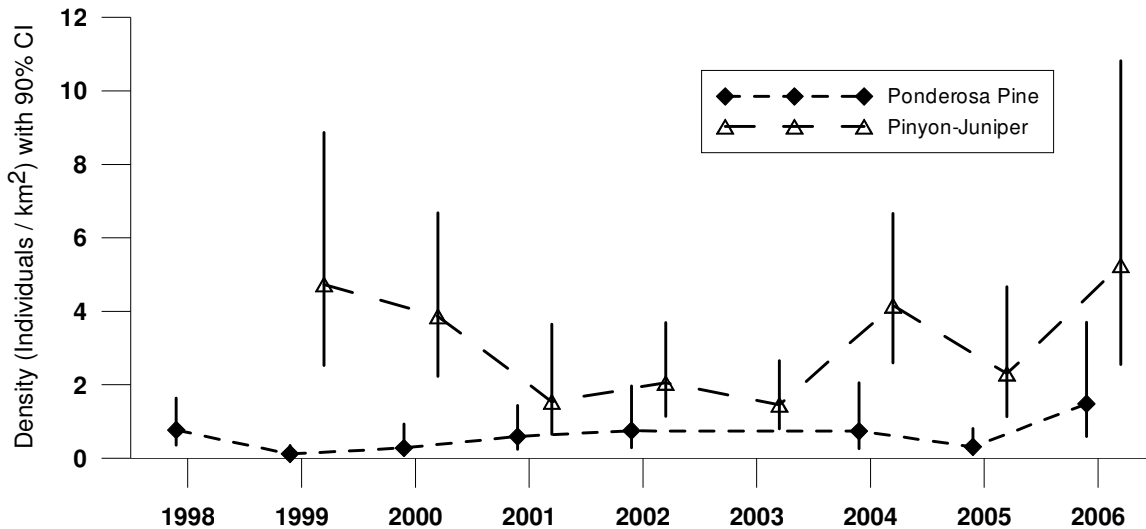
Estimated density of the Rock Wren (with 90% confidence intervals) on MCB transects 1998-2006.
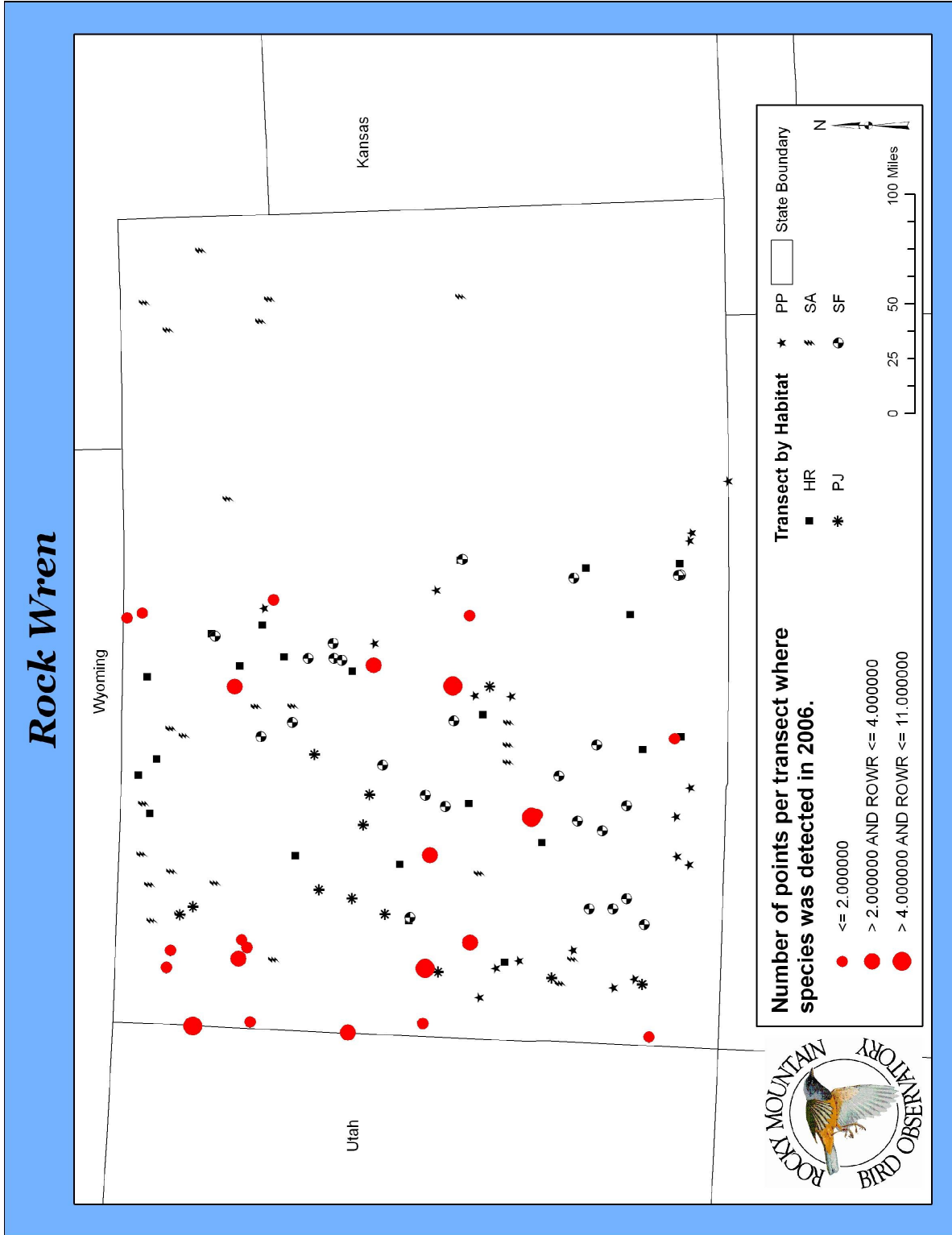
Rock Wren

RMBO point-transect locations and detections of Rock Wrens on transects in Colorado, 2006.

Canyon Wren
(*Catherpes mexicanus*)
PIF Species of Regional Concern – BCR 16

The Canyon Wren breeds in rocky areas with plenty of vertical surfaces with crevices in which to nest and search for prey. In 2006, we detected 15 Canyon Wrens in pinyon-juniper habitat on MCB transects. Detections were insufficient to calculate a density estimate for any of the habitats that we surveyed in 2006. We detect the species every year in low numbers in several habitats on the MCB project.

The Canyon Wren is probably too rare and localized in Colorado to be adequately monitored by point transects in any habitat. However, in a few more seasons, using data from all years, we may be able to calculate a global detection function for this species and thereby generate annual density estimates in at least pinyon-juniper habitat that can be used for population-trend monitoring. Adding transects, especially in pinyon-juniper habitat, may improve our ability to monitor the Canyon Wren.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Canyon Wren on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PJ	ID	--	--	--	--	15

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.

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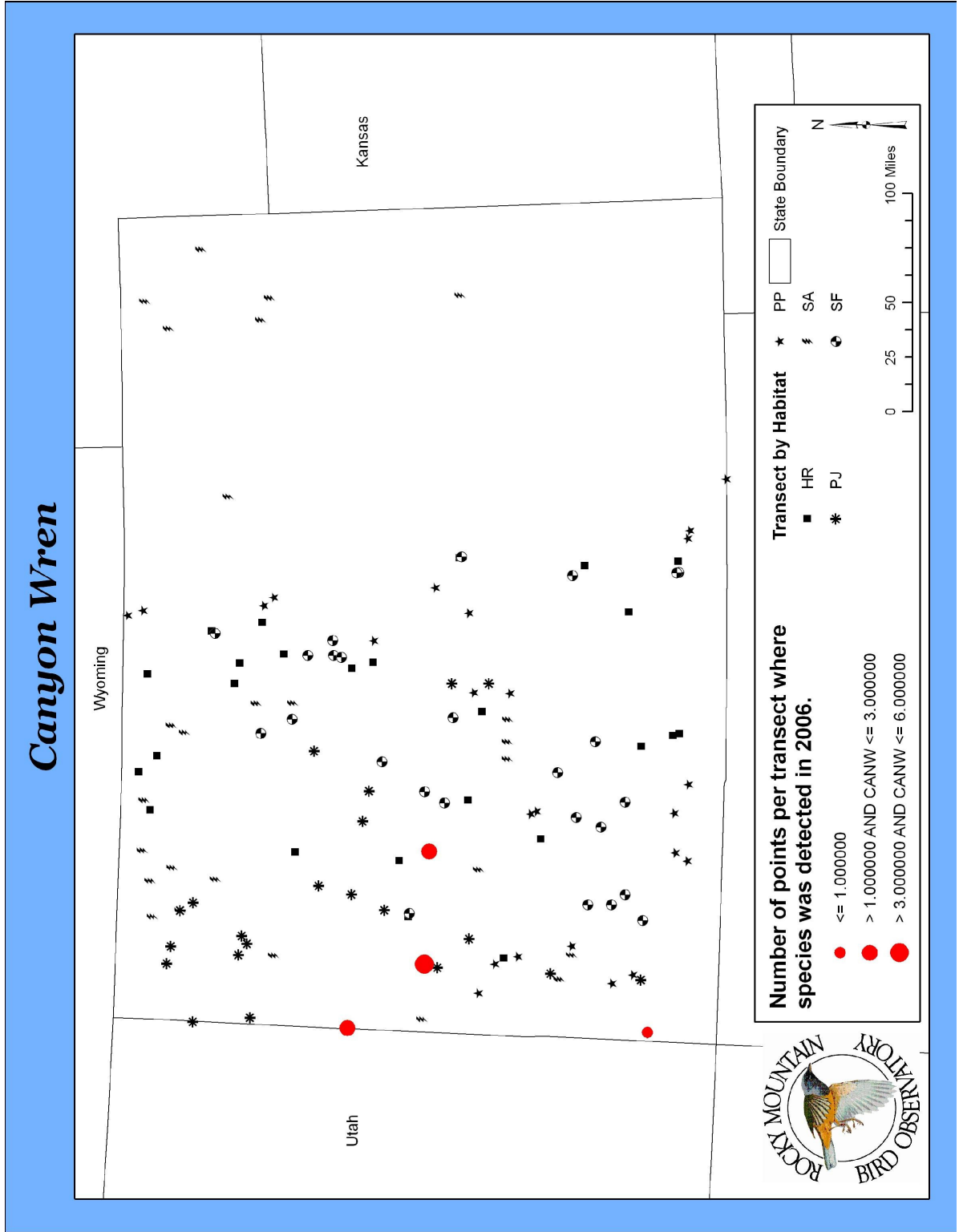
Canyon Wren

RMBO point-transect locations and detections of Canyon Wrens on transects in Colorado, 2006.

Western Bluebird
(Sialia mexicana)
PIF Regional Stewardship Species – BCR 16
CO-PIF Physiographic Region 87 Priority Species

The Western Bluebird is a cavity-nester that prefers ponderosa pine, but will also nest in pinyon-juniper habitat. In 2006, we detected 59 Western Bluebirds in three habitats on MCB transects. We were able to calculate a density for ponderosa pine habitat.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Western Bluebird within 30 years in ponderosa pine habitat.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Western Bluebird on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PJ	ID	--	--	--	--	2
PP	28	15	50	37	50	56
SA	ID	--	--	--	--	1

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
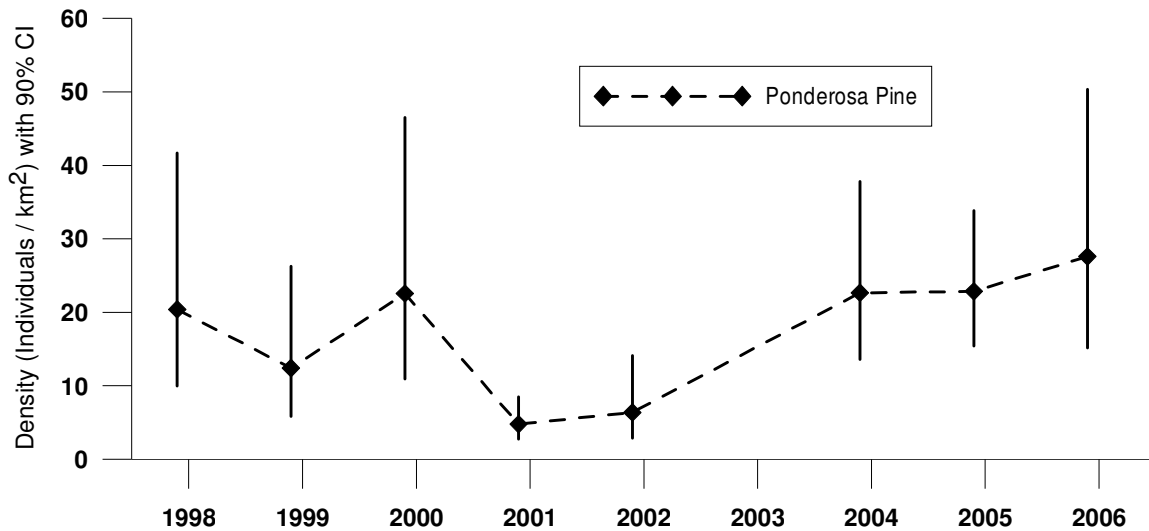
Estimated density of the Western Bluebird (with 90% confidence intervals) on MCB transects 1998-2006

Western Bluebird

Kansas

Wyoming

Utah

Number of points per transect where species was detected in 2006.

<= 2.000000
> 2.000000 AND WEBL <= 4.000000
> 4.000000 AND WEBL <= 6.000000

Transect by Habitat

HR   PP   State Boundary
PJ   SA
      SF

0   25   50   100 Miles

N

RMBO point-transect locations and detections of Western Bluebirds on transects in Colorado, 2006.

Mountain Bluebird
(*Sialia currocoides*)
PIF Species of Regional Concern – BCR 16
PIF Continental and Regional Stewardship Species – BCR 16

Mountain Bluebirds are secondary cavity nesters that rely largely on cavities excavated by woodpeckers for nest sites. We detected 297 Mountain Bluebirds in five habitats and calculated density estimates in three habitats on the MCB monitoring project in 2006.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Mountain Bluebird within 25 years in pinyon-juniper habitat, within 30 years in sage shrubland habitat, within 35 years in ponderosa pine habitat, and within 40 years in high-elevation riparian habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Mountain Bluebird on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	3.4	1.5	7.9	54	18	29
PJ	40	25	64	29	142	160
PP	27	13	53	42	48	61
SA	3.4	1.2	9.9	28.0	38	45
SF	ID	--	--	--	--	2

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data not reliable due to observer error.
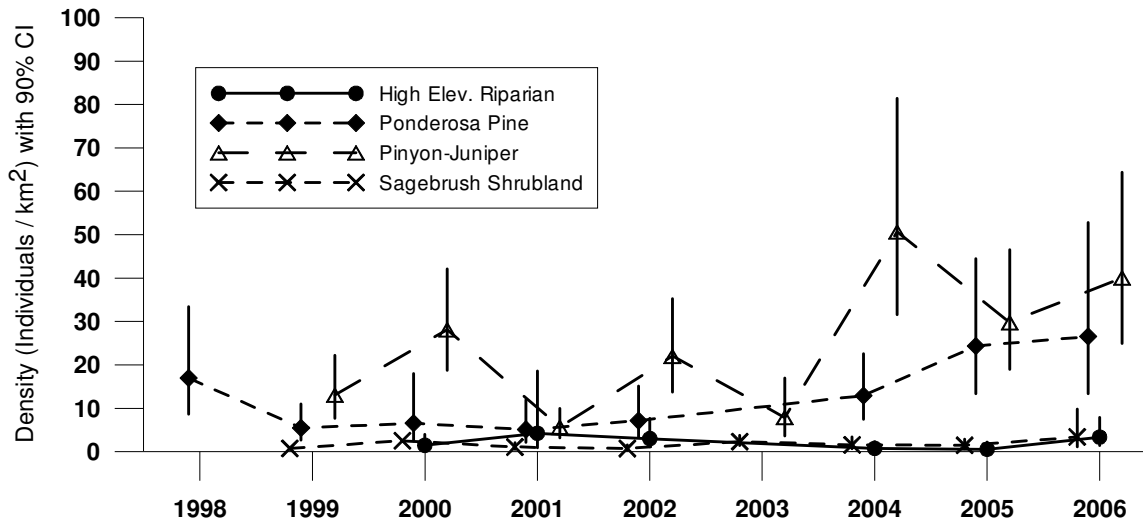
Estimated density of the Mountain Bluebird (with 90% confidence intervals) on MCB transects 1998-2006.
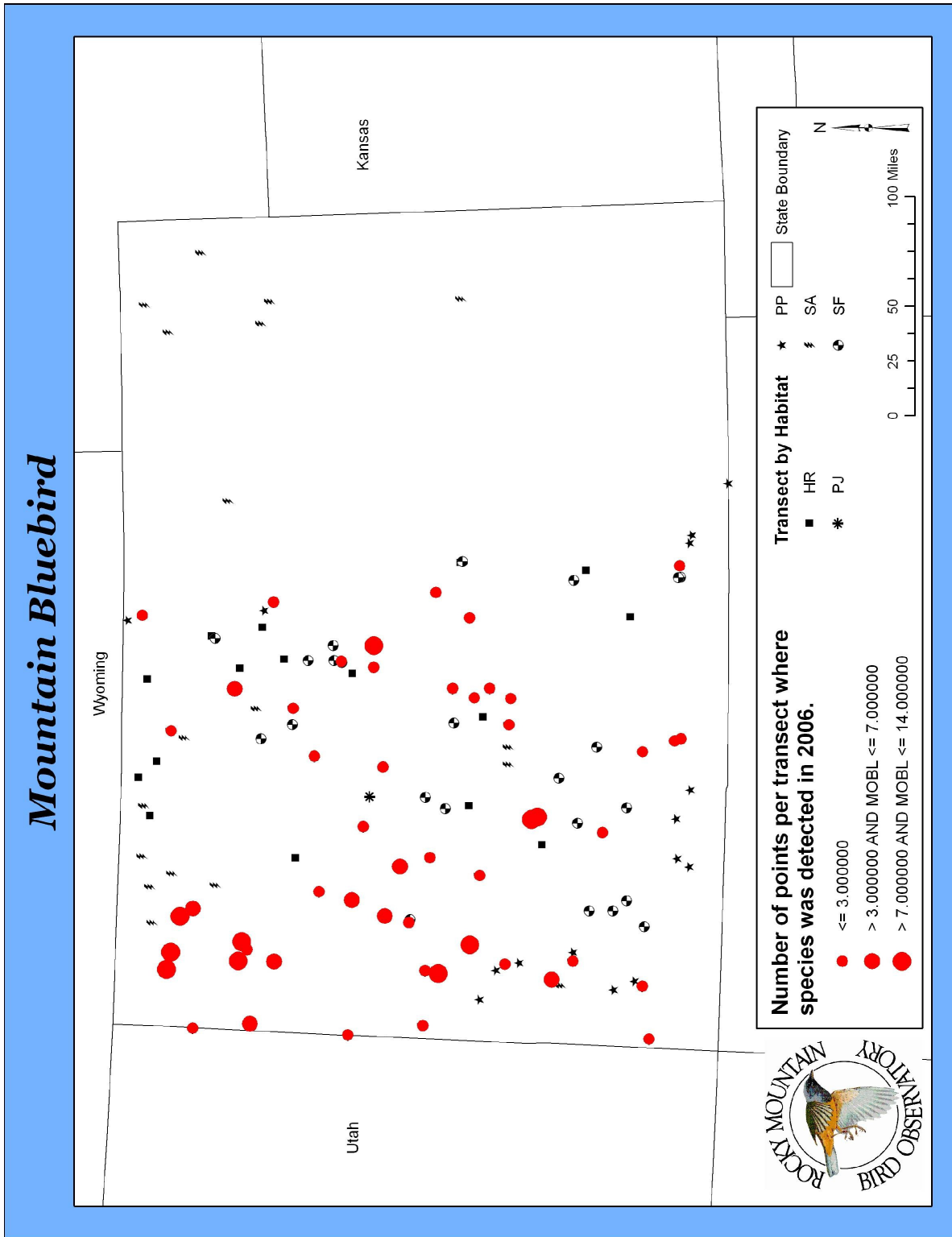
Mountain Bluebird

RMBO point-transect locations and detections of Mountain Bluebirds on transects in Colorado, 2006.

Virginia's Warbler
(*Vermivora virginiae*)
CDOW – Species of Greatest Conservation Need
PIF Species of Continental and Regional Concern – BCR 16
PIF Regional Stewardship Species – BCR 16
CO-PIF Physiographic Regions 62 & 87 Priority Species
USFWS Bird of Conservation Concern – BCR 16

The Virginia's Warbler is most often found in habitats with a Gambel's oak component, from ponderosa pine forests to pinyon-juniper woodlands. In 2006, we detected 188 Virginia's Warblers in two habitats on MCB transects. We were able to calculate a density estimate for this species in pinyon-juniper and ponderosa pine habitats.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for Virginia's Warbler within 35 years in pinyon-juniper habitat and within 30 years in ponderosa pine habitat using point transect data.
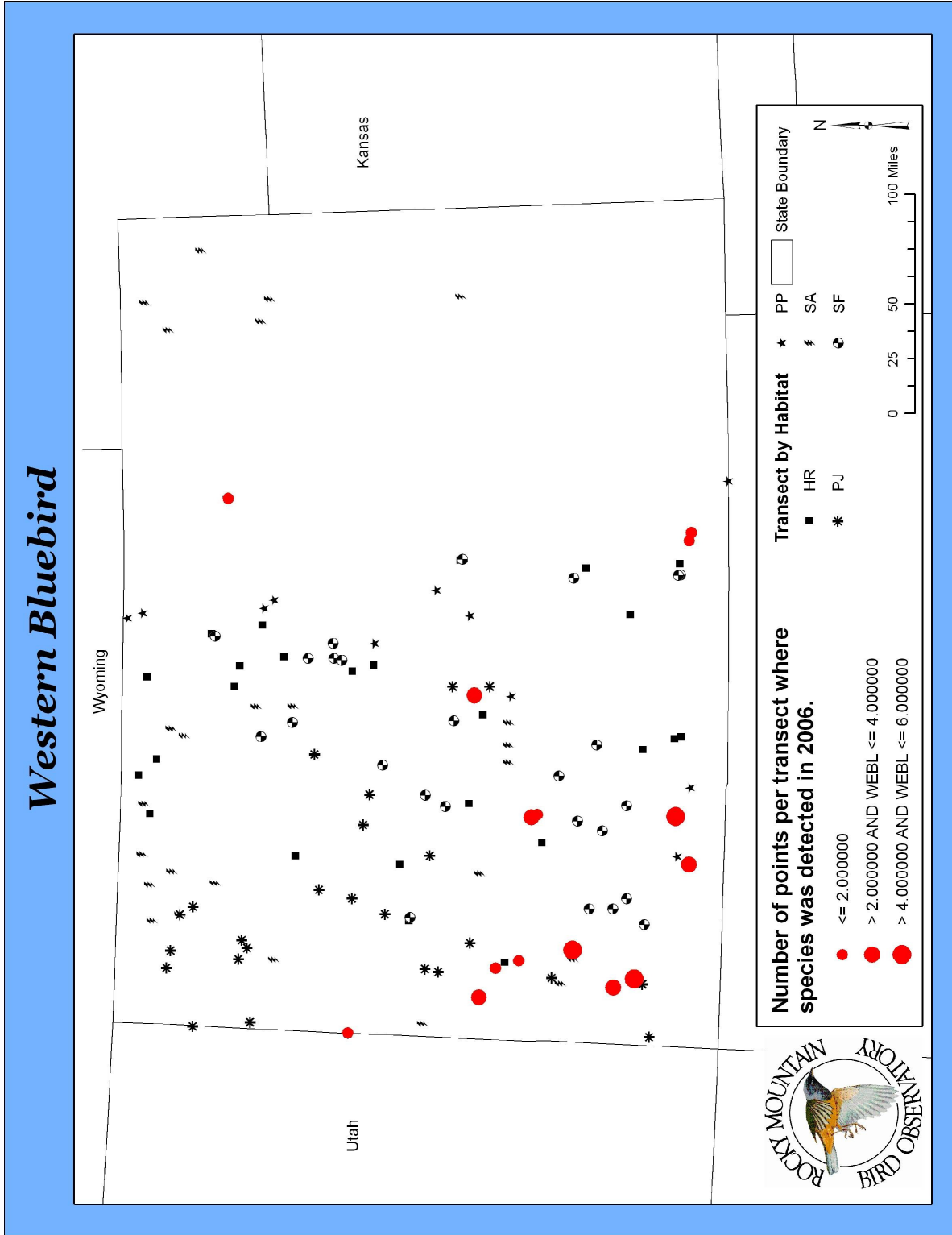
Total number of independent detections, number of individuals, and habitat-specific density estimates for the Virginia's Warbler on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PJ	30	12	76	58	60	64
PP	30	18	50	30	105	124

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
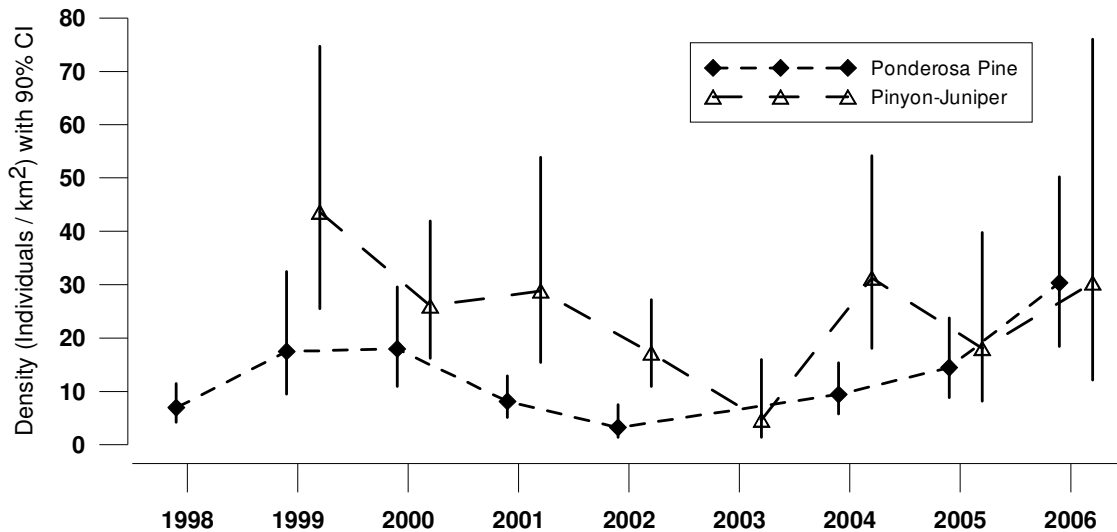
Estimated density of the Virginia's Warbler (with 90% confidence intervals) on MCB transects 1998-2006
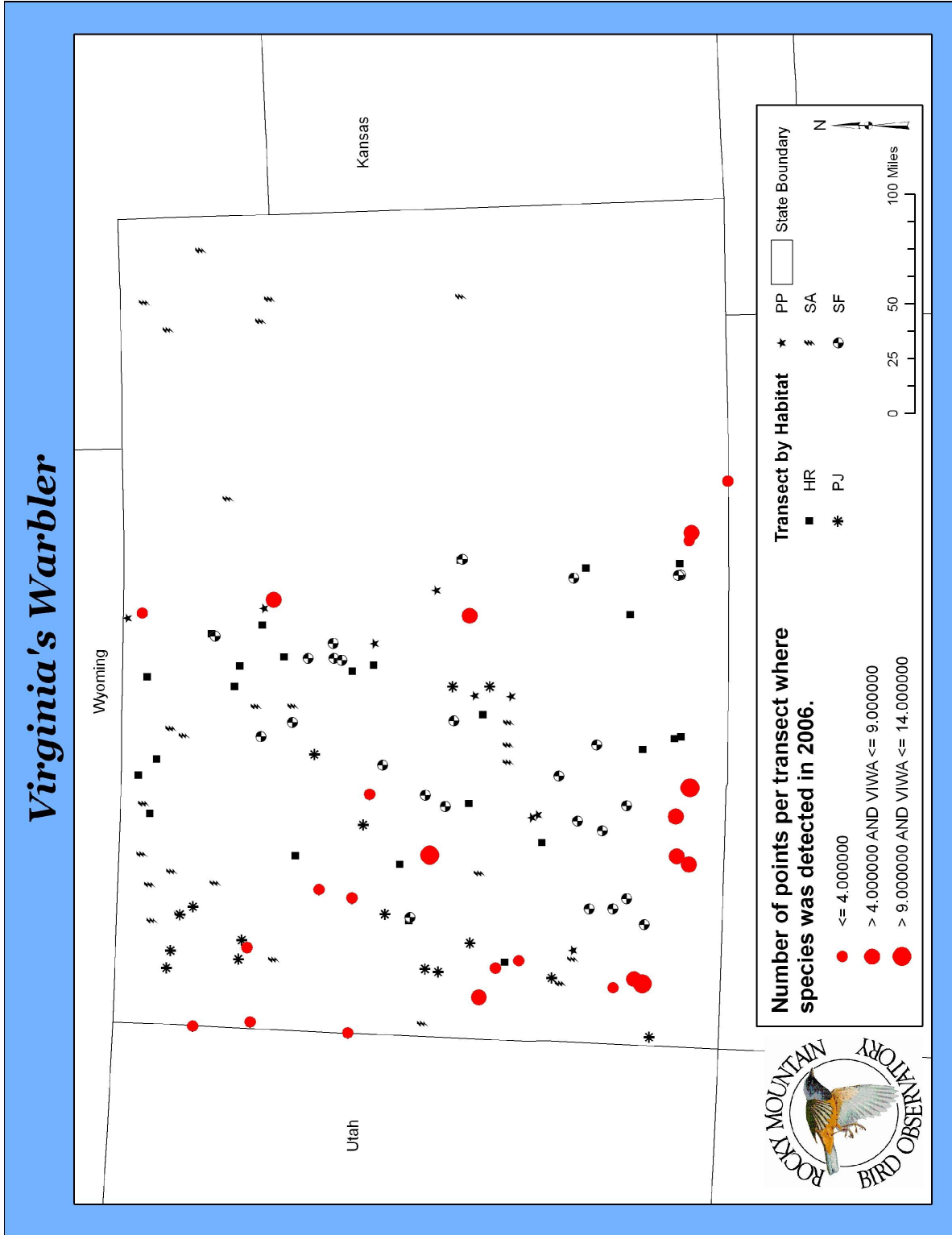
Virginia's Warbler

RMBO point-transect locations and detections of Virginia's Warblers on transects in Colorado, 2006.

Yellow Warbler
(*Dendroica petechia*)
PIF Species of Regional Concern – BCR 18

The Yellow Warbler breeds in areas where deciduous shrubs and trees are dominant and where there is a high insect abundance. This species will also nest in aspen stands with a multi-layered understory. In 2006, we detected 49 Yellow Warblers in two habitats on MCB transects and were able to calculate a density estimate in high-elevation riparian habitat.

Power simulation indicated that it would take more than 40 years to detect a 3% average annual population change with 80% power for the Yellow Warbler within high-elevation riparian habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Yellow Warbler on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	8.0	3.8	17	47	33	47
PJ	ID	--	--	--	--	2

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
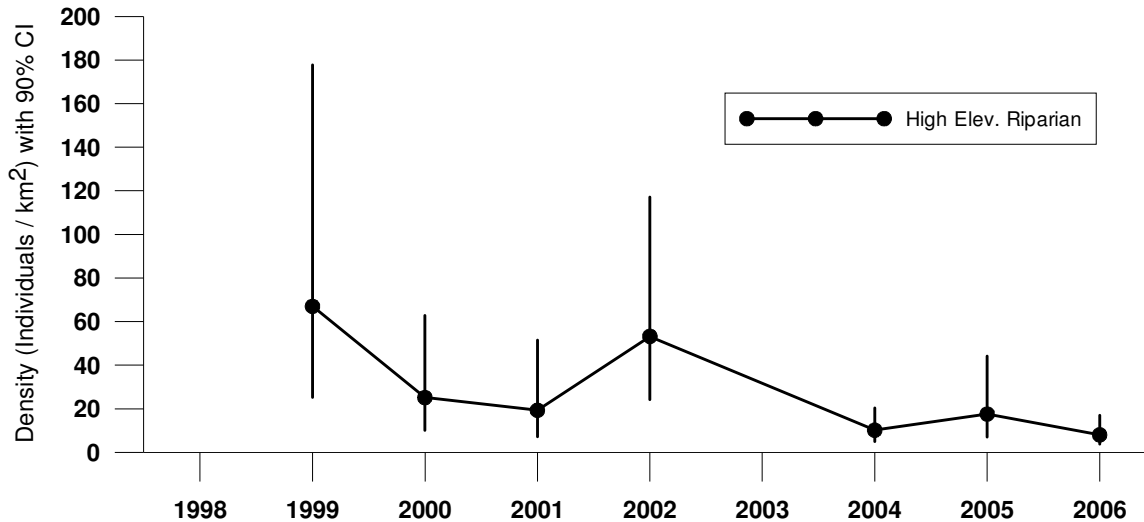
Estimated density of the Yellow Warbler (with 90% confidence intervals) on MCB transects 1998-2006
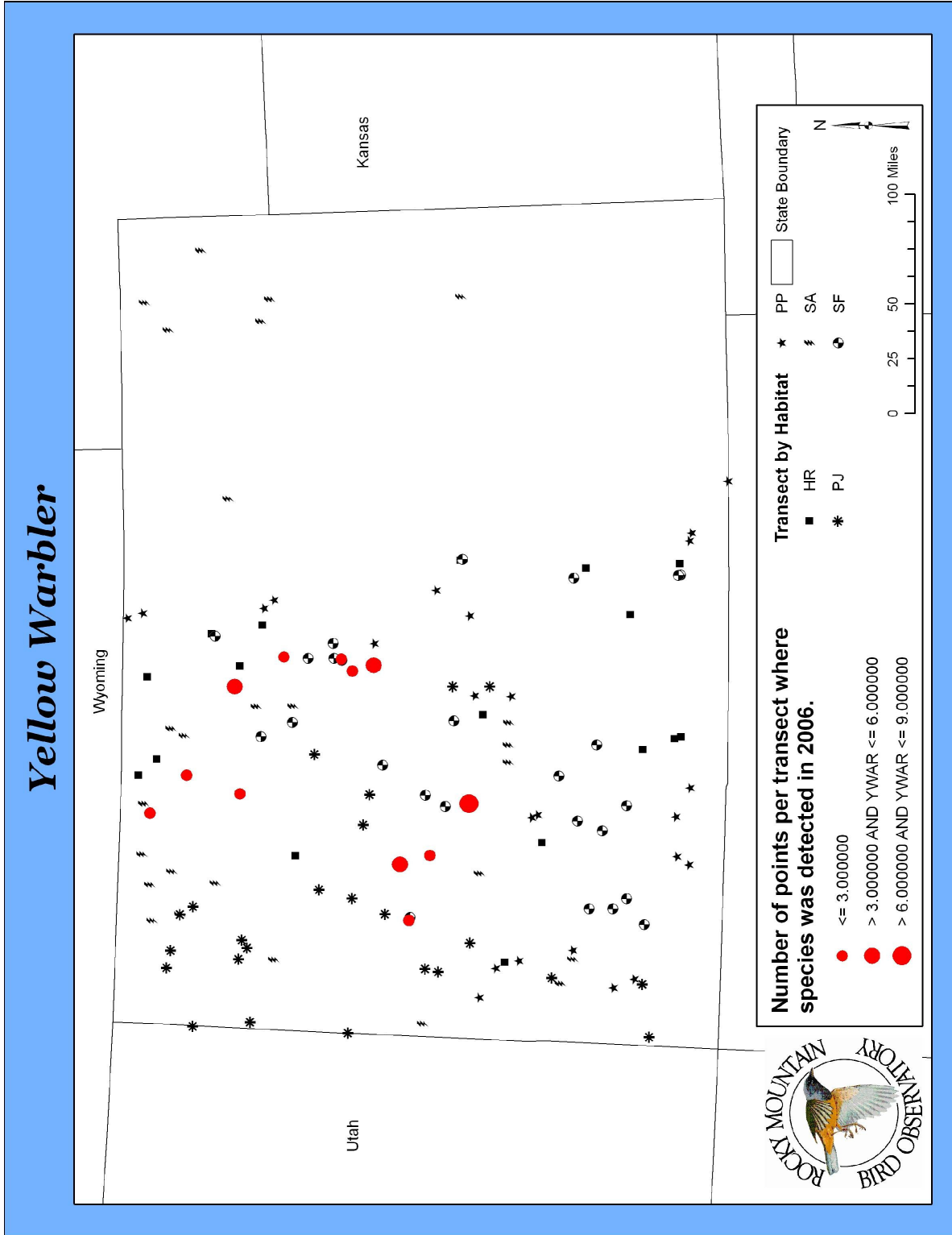
Yellow Warbler

RMBO point-transect locations and detections of Yellow Warblers on transects in Colorado, 2006.

Black-throated Gray Warbler
(*Dendroica nigrescens*)
CDOW - Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 16
CO-PIF Physiographic Region 87 Priority Species
USFWS Bird of Conservation Concern – BCR 16

The Black-throated Gray Warbler prefers large stands of pinyon-dominated woodland. Very rarely is this species found outside of pinyon-juniper habitat in summer. In 2006, we detected 231 Black-throated Gray Warblers in pinyon-juniper habitat on MCB transects and were able to calculate a density estimate in pinyon-juniper habitat. Detections of Black-throated Gray Warblers in sage shrubland habitat were unreliable due to observer error. As in previous years, the Black-throated Gray Warbler was one of the most abundant species in pinyon-juniper habitat

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Black-throated Gray Warbler within 20 years in pinyon-juniper habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Black-throated Gray Warbler on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PJ	62	44	88	17	205	231
SA	--	--	--	--	--	**

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** - data unreliable due to observer error.

Estimated density of the Black-throated Gray Warbler (with 90% confidence intervals) on MCB transects 1998-2006
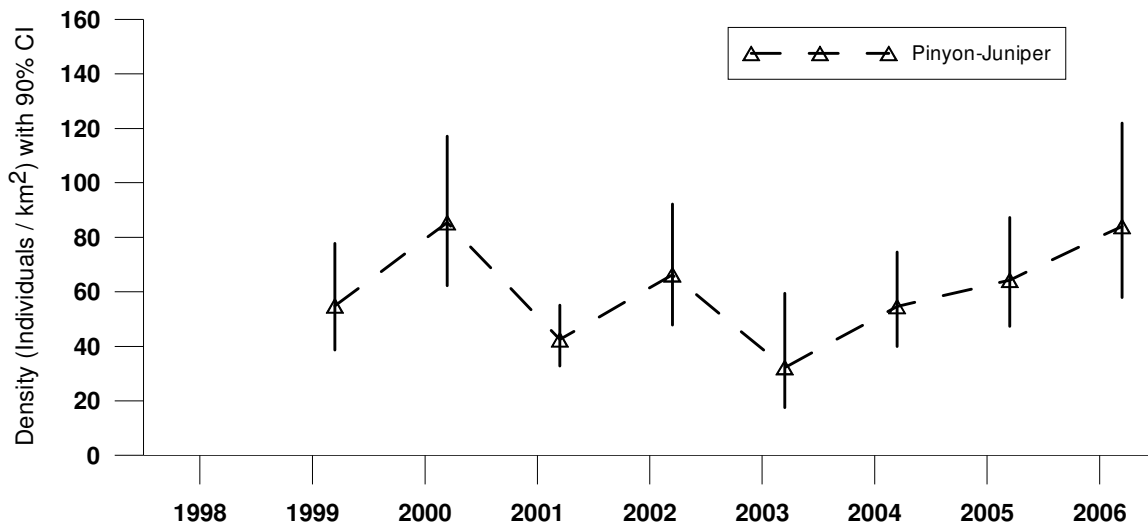
Black-throated Gray Warbler
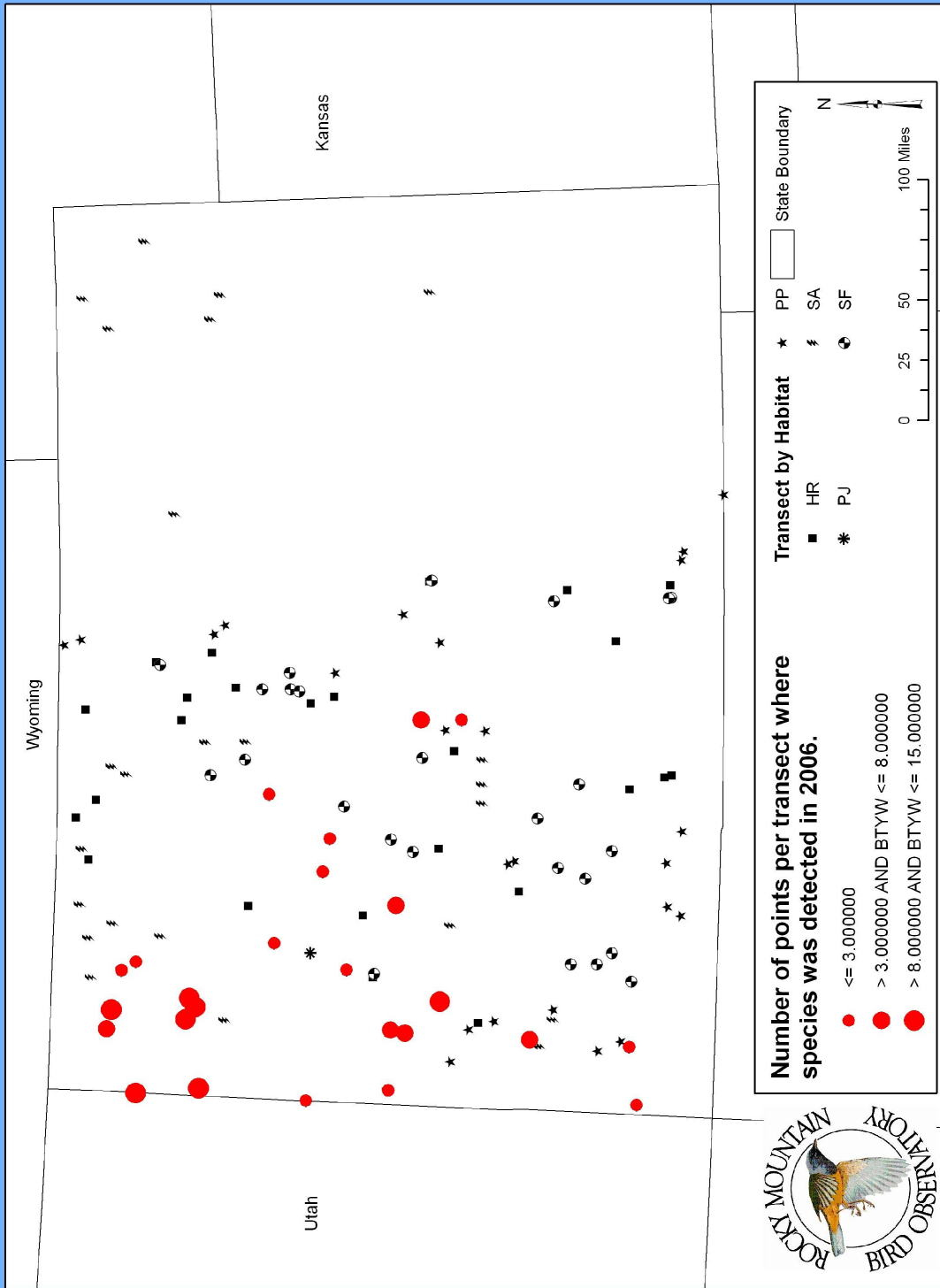
RMBO point-transect locations and detections of Black-throated Gray Warblers on transects in Colorado, 2006.

Grace's Warbler
(*Dendroica graciae*)
CDOW – Species of Greatest Conservation Need
PIF Species of Continental and Regional Concern – BCR 16
CO-PIF Physiographic Regions 62 & 87 Priority Species
USFWS Bird of Conservation Concern – BCR 16 and Nationally

The Grace's Warbler breeds in older, mature ponderosa pine stands often with an understory of Gambel's oak. In 2006, we detected 99 Grace's Warblers in ponderosa pine habitat on MCB transects. We were able to calculate a density estimate in ponderosa pine habitat.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Grace's Warbler within 35 years in ponderosa pine habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Grace's Warbler on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PP	22	10	46	45	87	99

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
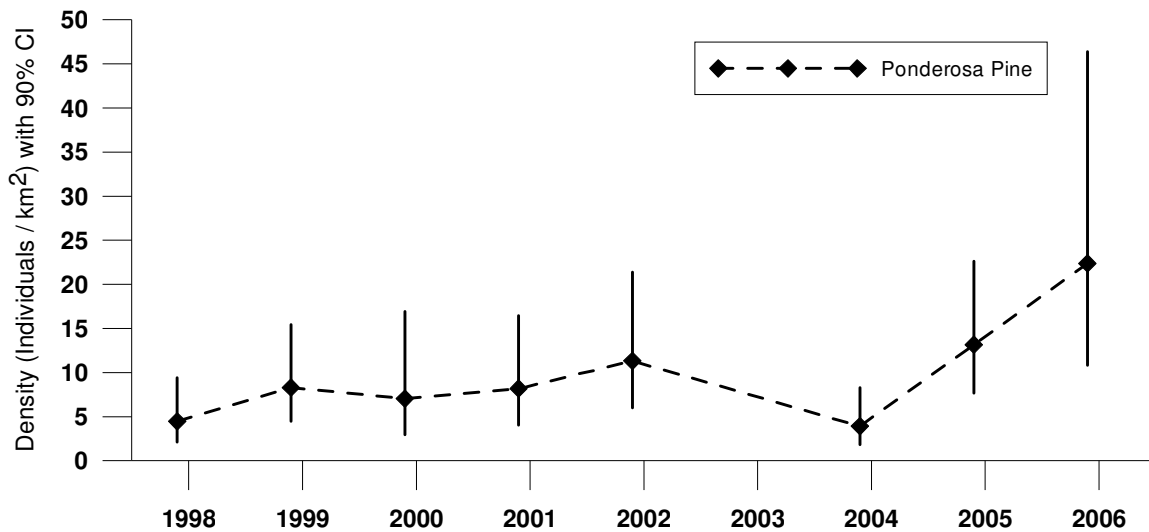
Estimated density of the Grace's Warbler (with 90% confidence intervals) on MCB transects 1998-2006

Grace's Warbler

Number of points per transect where species was detected in 2006.

<= 2.000000
> 2.000000 AND GRWA <= 4.000000
> 4.000000 AND GRWA <= 14.000000

Transect by Habitat

HR PP
PJ SA
SF

State Boundary

N

0 25 50 100 Miles

Kansas

Wyoming

Utah

RMBO point-transect locations and detections of Grace's Warblers on transects in Colorado, 2006.

Green-tailed Towhee
(*Pipilo chlorurus*)
PIF Continental and Regional Stewardship Species – BCR 16
CO-PIF Physiographic Region 62 Priority Species

At lower elevations, the Green-tailed Towhee nests in mesic areas with a high diversity of shrub species, including sagebrush and pinyon-juniper, and at higher elevations it uses more xeric shrub areas. In 2006, we detected 175 Green-tailed Towhees in four habitats on MCB transects, and we were able to calculate a density estimate for this species in four habitats. Detections of Green-tailed Towhees in sage shrubland habitat were unreliable due to observer error.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for Green-tailed Towhee within 25 years in ponderosa pine habitat, within 30 years in pinyon-juniper habitat, within 40 years in spruce-fir habitat, and more than 40 years in high-elevation riparian habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Green-tailed Towhee on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	3.2	1.6	6.3	43	17	22
PJ	9.0	5.3	15	32	43	45
PP	15	8.6	24	31	87	93
SA	--	--	--	--	--	**
SF	2.0	0.8	4.9	58	15	15

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data not reliable due to observer error .
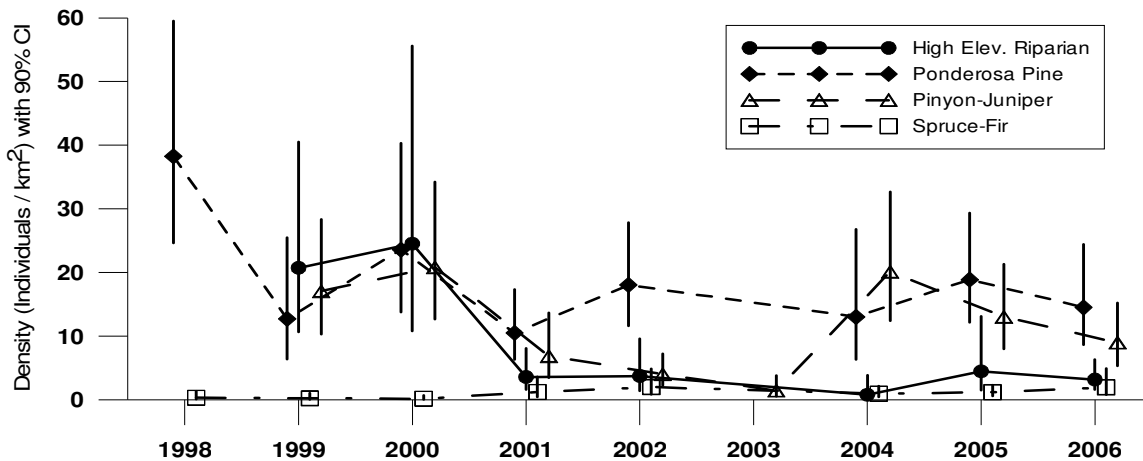
Estimated density of the Green-tailed Towhee (with 90% confidence intervals) on MCB transects 1998-2006

Green-tailed Towhee
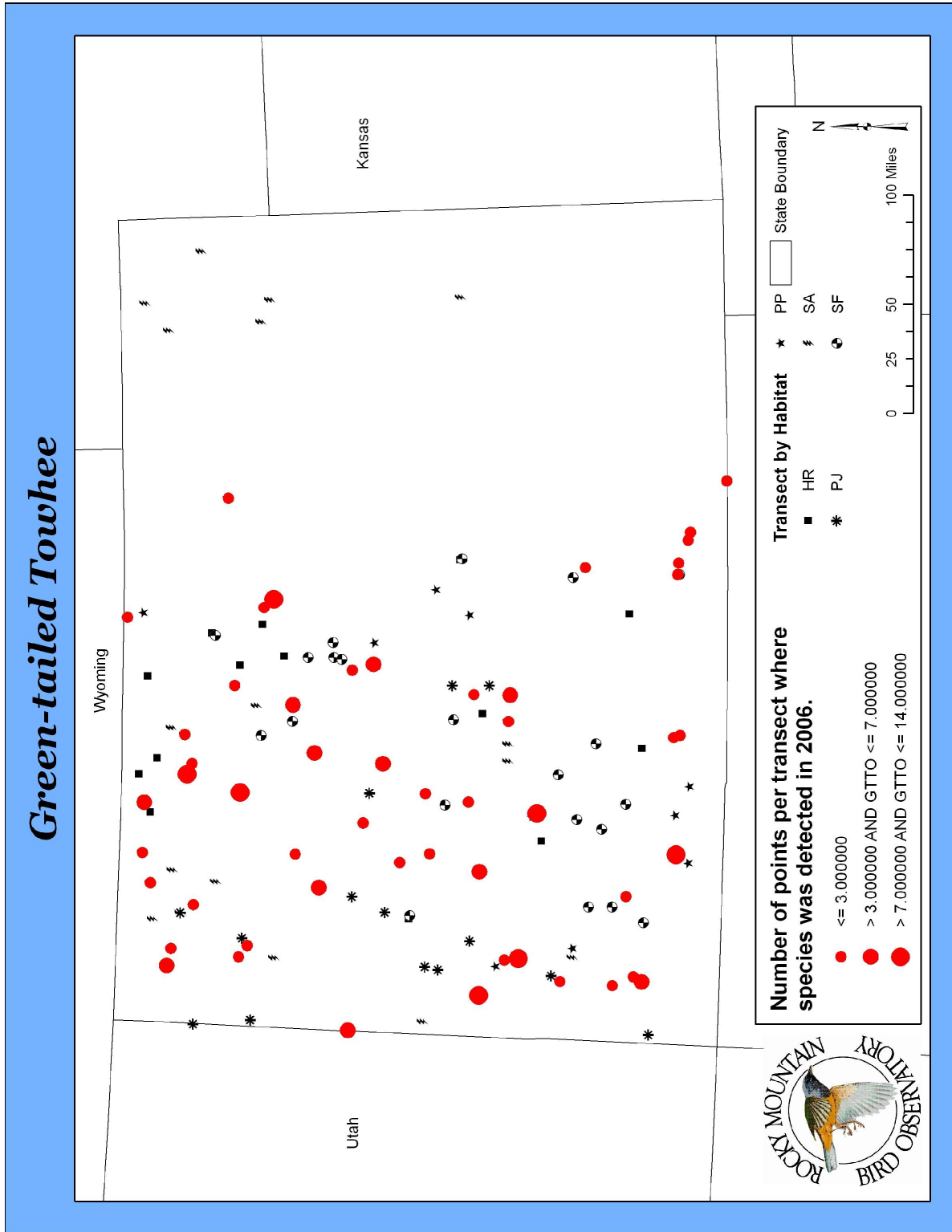
RMBO point-transect locations and detections of Green-tailed Towhees on transects in Colorado, 2006.

Cassin's Sparrow
(*Aimophila cassinii*)
CDOW - Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 18
PIF Regional Stewardship Species – BCR 18
CO-PIF Physiographic Region 36 Priority Species
USFS Region 2 Sensitive Species
USFWS Bird of Conservation Concern – BCR 18 and Nationally

In Colorado, the Cassin's Sparrow is found exclusively in the eastern prairie regions of the state. In the areas where the species breeds, there is typically some type of shrub or taller vegetation; it does not breed in pure open grassy areas. The semi-nomadic nature of this species makes it common in some years and difficult to find in others. In 2006, we detected Cassin's Sparrows in sage shrubland habitat on MCB transects but these detections were unreliable due to observer error.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Cassin's Sparrow for the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
SA	--	--	--	--	--	**

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data not reliable due to observer error.
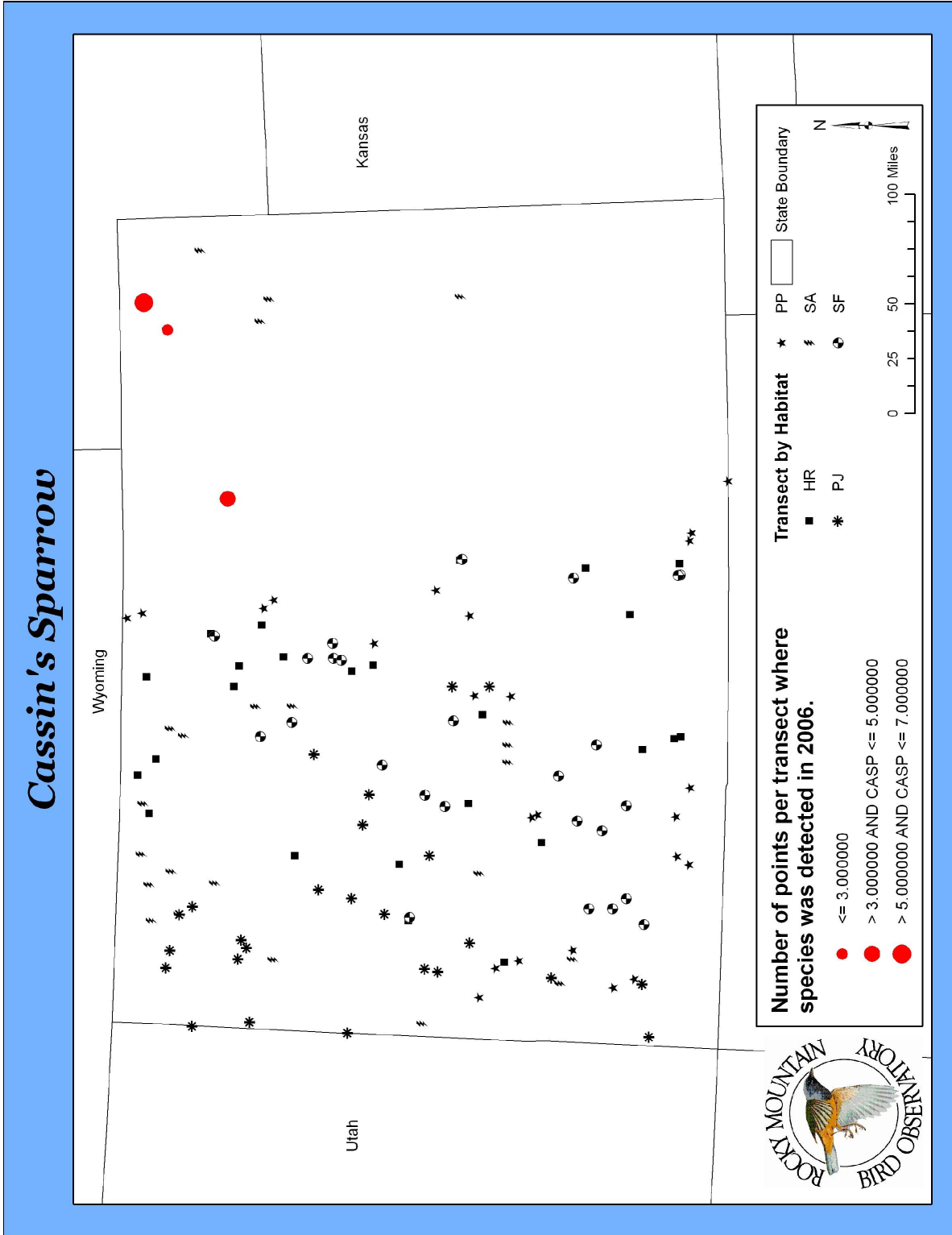
Cassin's Sparrow

RMBO point-transect locations and detections of Cassin's Sparrows on transects in Colorado, 2006.

Brewer's Sparrow
(*Spizella breweri*)
CDOW - Species of Greatest Conservation Need
PIF Species of Continental and Regional Concern – BCR 16 & 18
CO-PIF Physiographic Regions 62 & 87 Priority Species
USFS Region 2 Sensitive Species
USFWS – Bird of Conservation Concern - Nationally

The Brewer's Sparrow prefers sagebrush habitat but may also breed in areas dominated by mountain mahogany or other shrubs. Interestingly, this species is occasionally detected above timberline in shrubby areas and it is possible that the high-altitude individuals constitute a different species. In 2006, we detected 98 Brewer's Sparrows in three habitats on MCB transects and were able to calculate a density estimate in pinyon-juniper habitat. Detections of Brewer's Sparrows in sage shrubland habitat were unreliable due to observer error.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for Brewer's Sparrow within 30 years in pinyon-juniper habitat using point transect data.
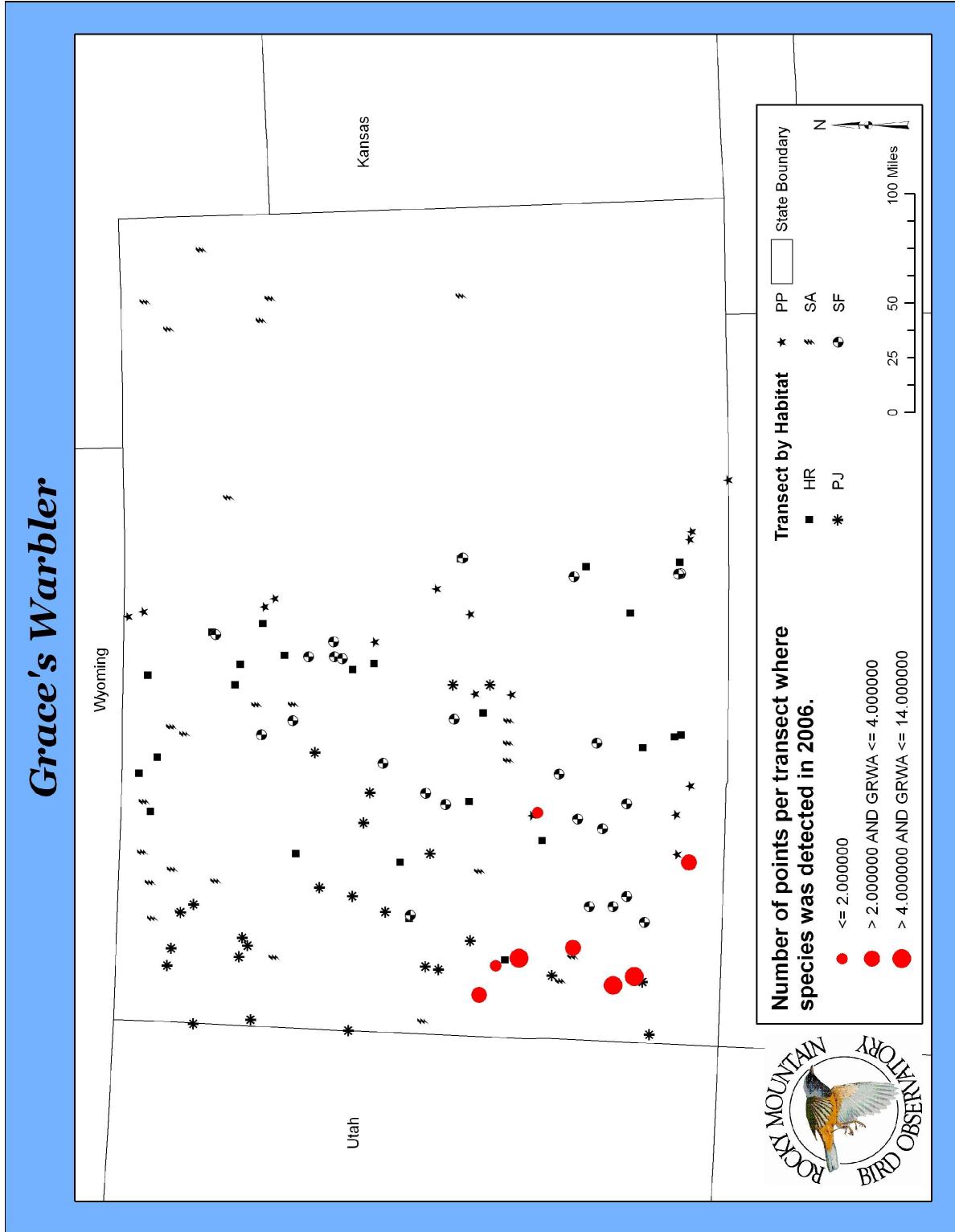
Total number of independent detections, number of individuals, and habitat-specific density estimates for the Brewer's Sparrow on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	ID	--	--	--	--	31
PJ	8.4	4.3	17	41	57	65
PP	ID	--	--	--	--	2
SA	--	--	--	--	--	**

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data not reliable due to observer error.
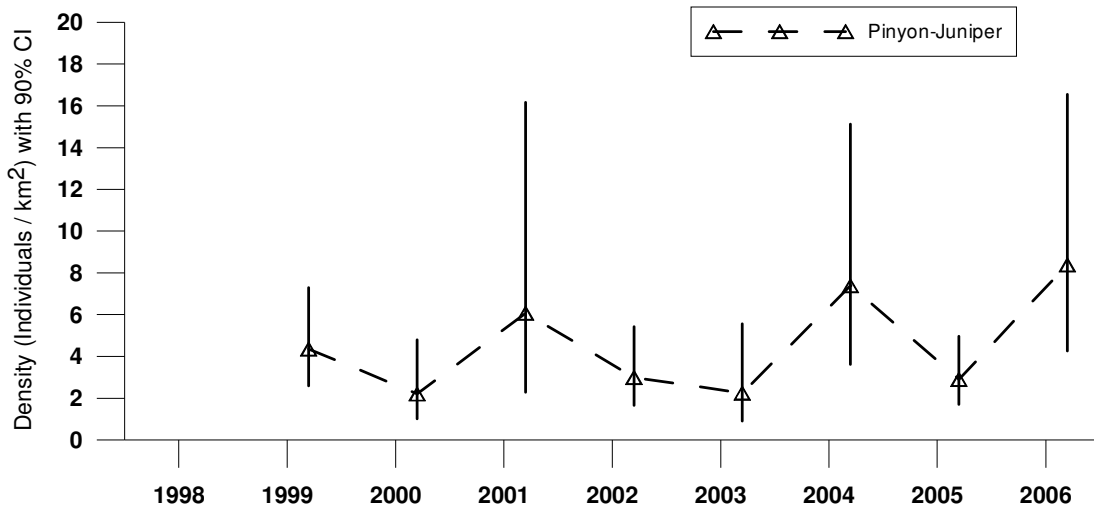
Estimated density of the Brewer's Sparrow (with 90% confidence intervals) on MCB transects 1998-2006
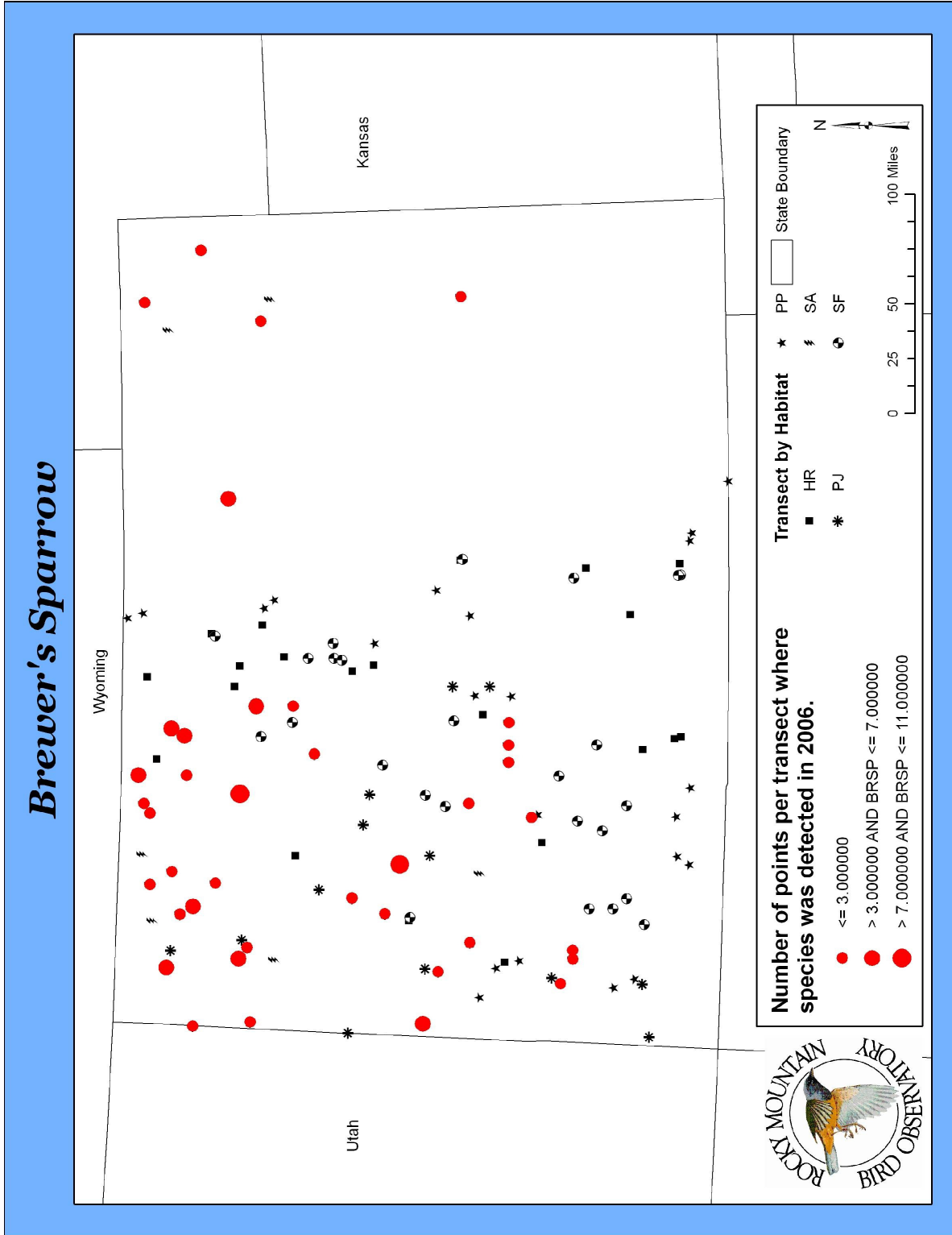
Brewer's Sparrow

RMBO point-transect locations and detections of Brewer's Sparrows on transects in Colorado, 2006.

Vesper Sparrow
(Pooecetes gramineus)
CDOW - Species of Greatest Conservation Need

In Colorado, the Vesper Sparrow prefers sage shrubland and montane grassland, but will occasionally nest in other habitats with patchily distributed shrubs and grass cover. In 2006, we detected 134 Vesper Sparrows in three habitats on MCB transects and were able to calculate a density estimate in two habitats. Detections of Vesper Sparrows in sage shrubland habitat were unreliable due to observer error.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for Vesper Sparrow within 35 years in ponderosa pine habitat and within 30 years in pinyon-juniper habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Vesper Sparrow on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	ID	--	--	--	--	40
PJ	9.7	6.0	16	29	53	57
PP	3.3	1.7	6.7	43	32	37
SA	--	--	--	--	--	**

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data not reliable due to observer error.
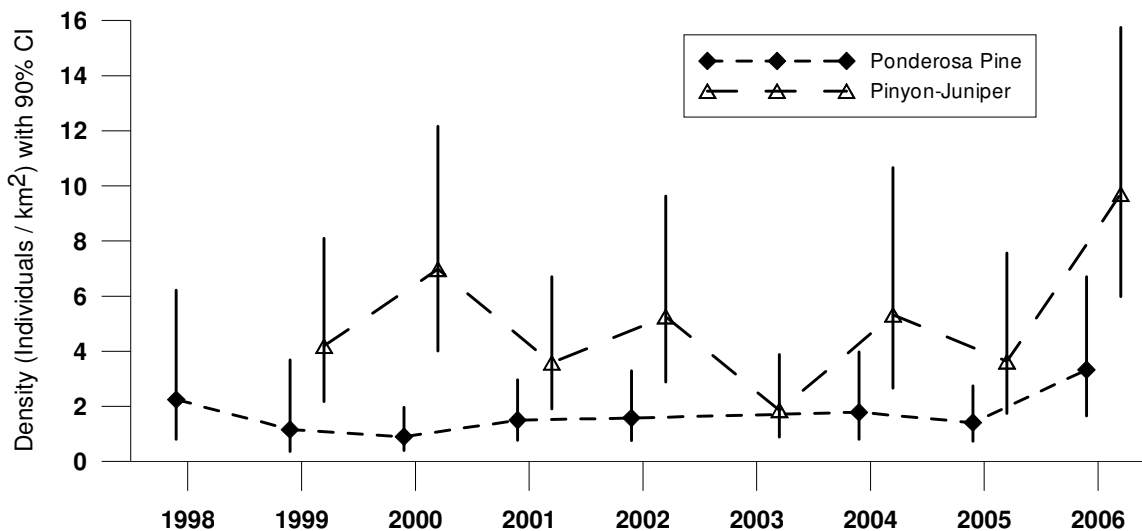
Estimated density of the Vesper Sparrow (with 90% confidence intervals) on MCB transects 1998-2006
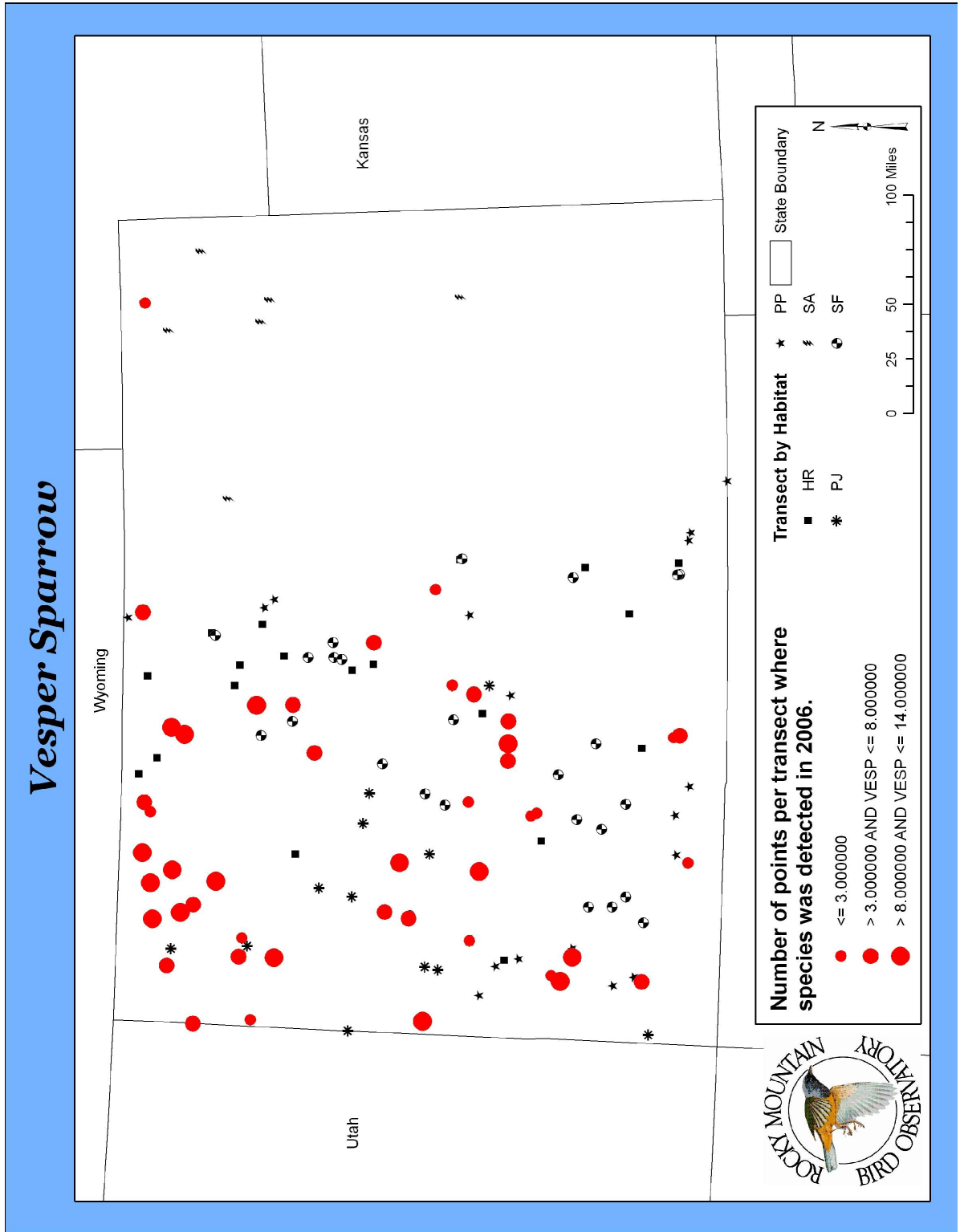
Vesper Sparrow

RMBO point-transect locations and detections of Vesper Sparrows on transects in Colorado, 2006.

Lark Sparrow
(*Chondestes grammacus*)
PIF Species of Regional Concern – BCR 18

The Lark Sparrow prefers arid, open areas with some shrub component and breeds in a variety of locations including prairies, roadsides, farms, and open woodlands. In 2006, we detected 25 Lark Sparrows in two habitats on MCB transects. Detections of Lark Sparrows in sage shrubland habitat were unreliable due to observer error.

In a few more seasons, using data from all years, we may be able to calculate a global detection function for this species and thereby generate annual density estimates in at least pinyon-juniper habitat that can be used for population-trend monitoring. Adding transects, especially in pinyon-juniper habitat, may improve our ability to monitor the Lark Sparrow.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Lark Sparrow on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PJ	ID	--	--	--	--	22
PP	ID	--	--	--	--	3
SA	--	--	--	--	--	**

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data unreliable due to observer error.

Lark Sparrow

Kansas

Wyoming

Utah

Number of points per transect where species was detected in 2006.

<= 2.000000

> 2.000000 AND LASP <= 5.000000

> 5.000000 AND LASP <= 11.000000

Transect by Habitat

PP   State Boundary

HR   SA

PJ   SF

N

0   25   50   100 Miles
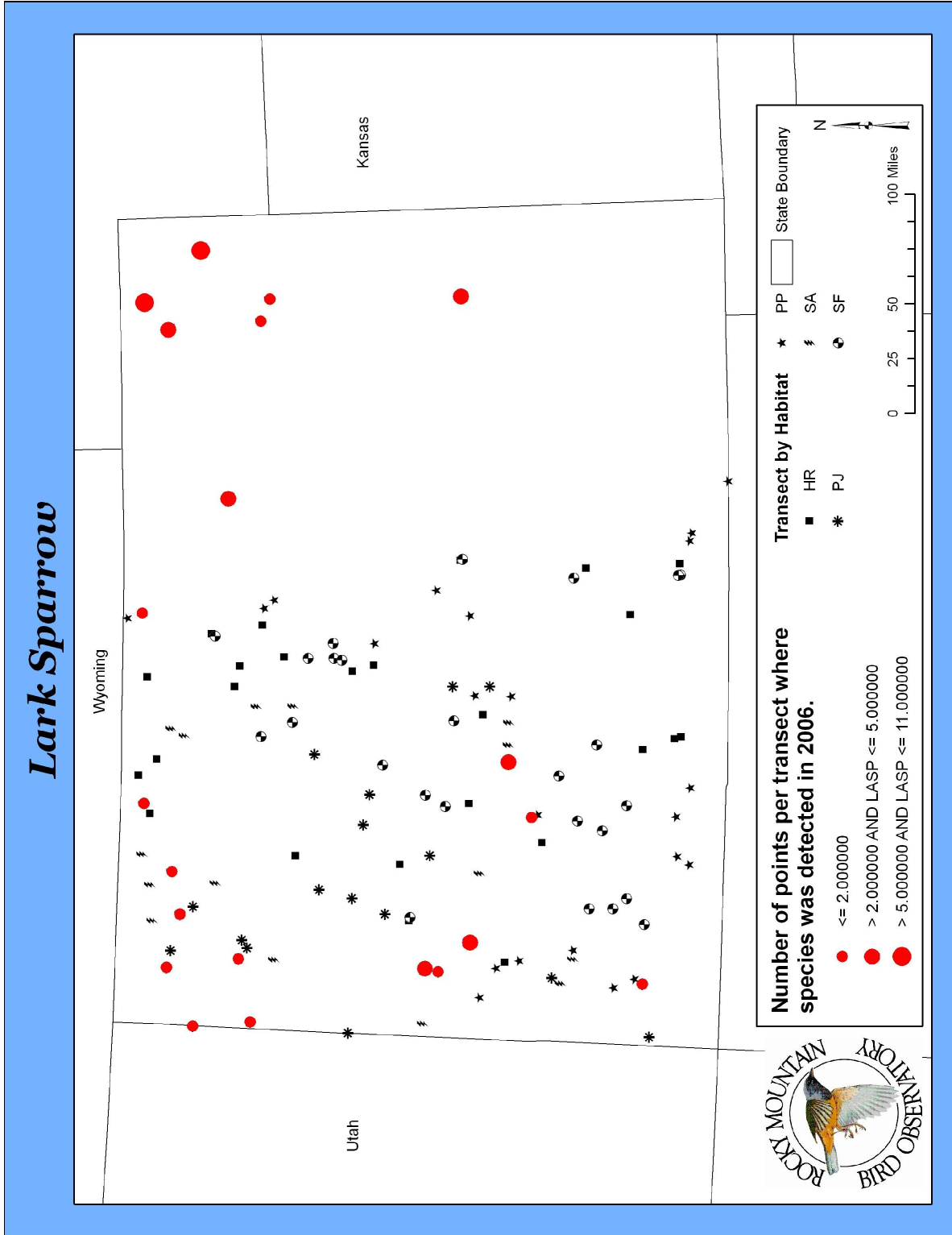
RMBO point-transect locations and detections of Lark Sparrows on transects in Colorado, 2006.

Black-throated Sparrow
(*Amphispiza bilineata*)
PIF Species of Regional Concern – BCR 16

The Black-throated Sparrow nests in arid areas of low-elevation with little or no ground cover and scattered shrubs. In 2006, we detected seven Black-throated Sparrows in pinyon-juniper habitat on MCB transects. Black-throated Sparrows are uncommon in Colorado and it is unlikely that we will be able to monitor the species with point-count transects.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Black-throated Sparrow on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PJ	ID	--	--	--	--	7

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.

Black-throated Sparrow
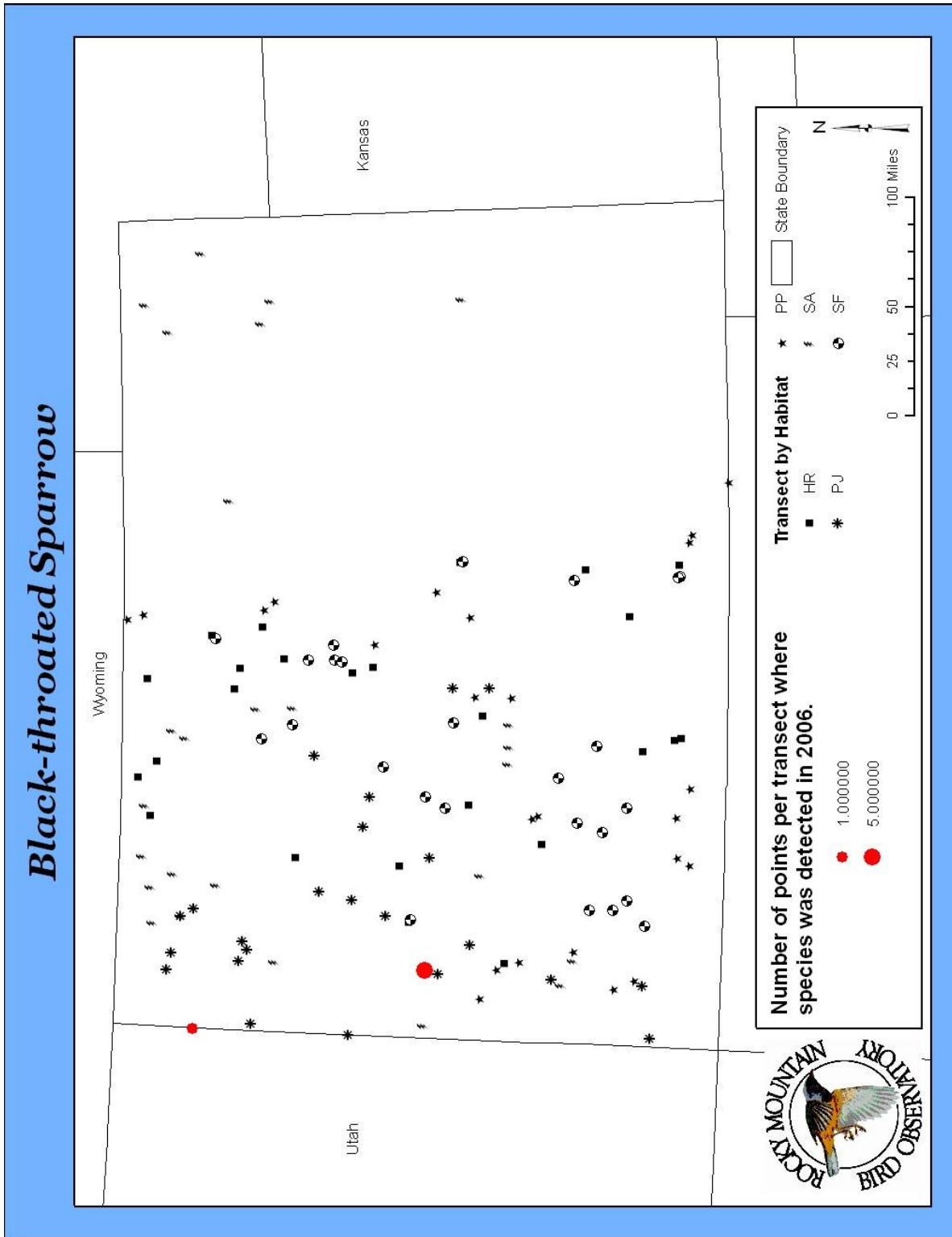
RMBO point-transect locations and detections of Black-throated Sparrows on transects in Colorado, 2006.

Sage Sparrow
(*Amphispiza belli*)
CDOW - Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 16
CO-PIF Physiographic Regions 62 & 87 Priority Species
USFS Region 2 Sensitive Species
USFWS Bird of Conservation Concern – BCR 16

The Sage Sparrow prefers open habitats with evenly spaced shrubs, and is closely tied to big sagebrush where it nests almost exclusively. In Colorado, we have found that some Sage Sparrows will breed in pure stands of greasewood. We detected one Sage Sparrow on a pinyon-juniper transect in 2006. The detections of Sage Sparrow in sage shrubland habitat in 2006 were unreliable due to observer error; therefore, we were unable to calculate a density estimate for the species in this habitat.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Sage Sparrow on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
PJ	ID	--	--	--	--	1
SA	--	--	--	--	--	**

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
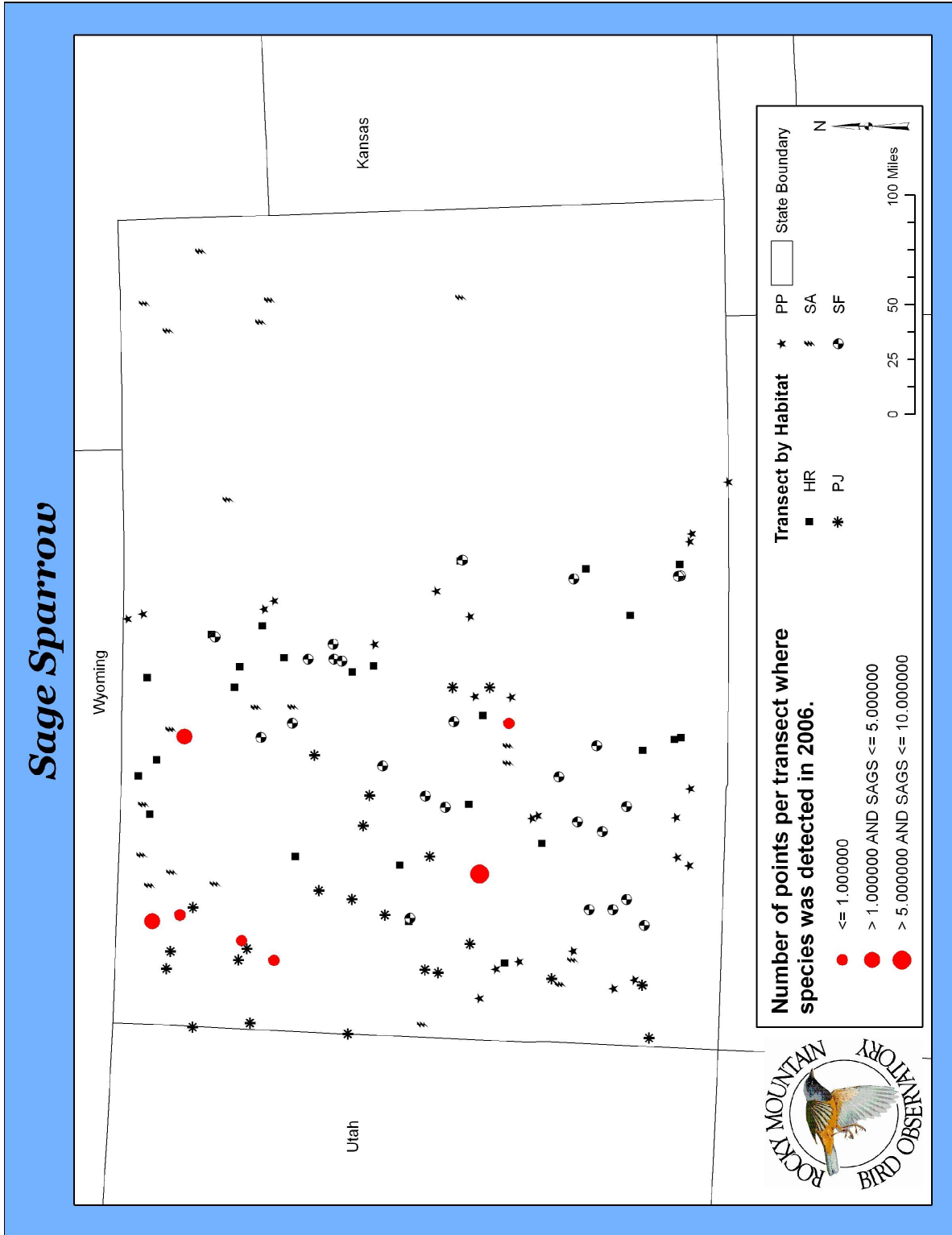
Sage Sparrow

RMBO point-transect locations and detections of Sage Sparrows on transects in Colorado, 2006.

Lark Bunting

(*Calamospiza melanocorys*)
CDOW - Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 18
PIF Continental and Regional Stewardship Species – BCR 18
CO-PIF Physiographic Region 36 Priority Species
USFWS Bird of Conservation Concern – BCR 18

The Lark Bunting is found primarily in native grassland habitat, however it is very nomadic and more common in some years that others. We detected 217 Lark Buntings in two habitats on MCB transects in 2006. We were able to calculate a density estimate in sage shrubland habitat in 2006.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for Lark Bunting within 40 years in sage shrubland habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Lark Bunting on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
SA	24	26	12	48	186	215
SF	ID	--	--	--	--	2

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
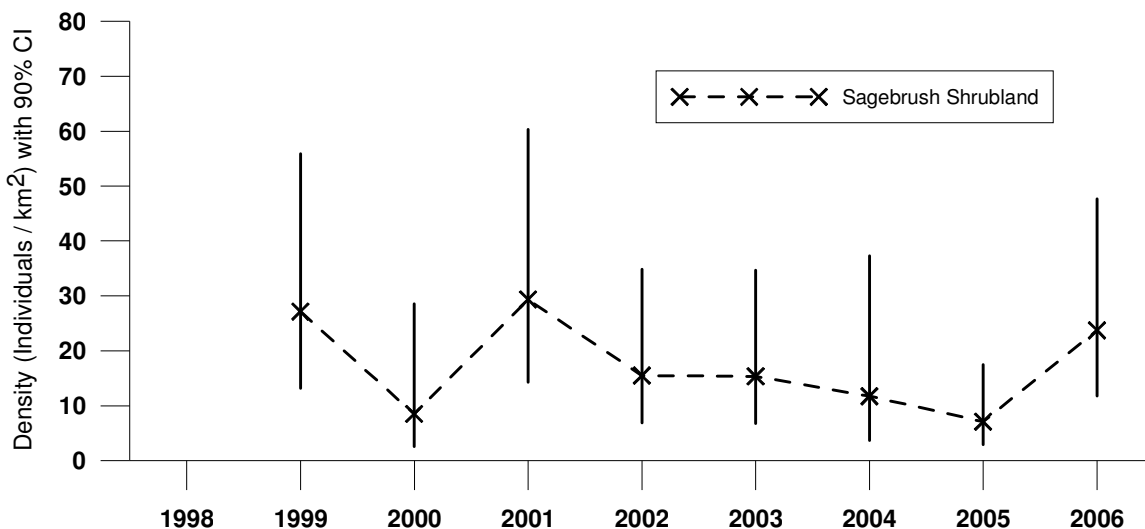
Estimated density of the Lark Bunting (with 90% confidence intervals) on MCB transects 1998-2006
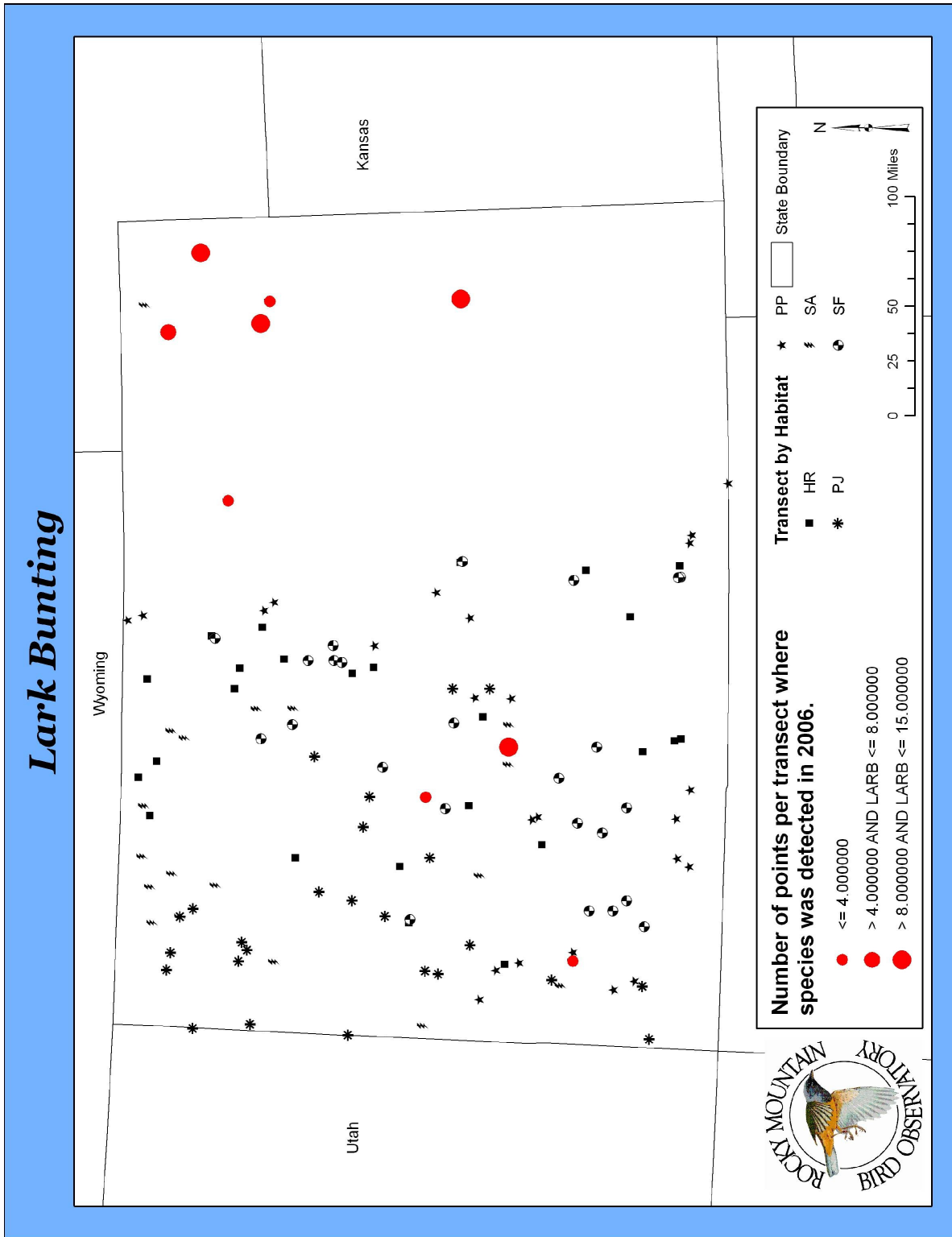
Lark Bunting

RMBO point-transect locations and detections of Lark Buntings on transects in Colorado, 2006.

Lazuli Bunting

(*Passerina amoena*)
CDOW - Species of Greatest Conservation Need
CO-PIF Physiographic Region 62 Priority Species

Lazuli Buntings nest in riparian areas, particularly those with a rich mix of shrubs. In 2006, we detected 52 Lazuli Buntings in three habitats on MCB transects, and we were able to calculate a density estimate for high-elevation riparian habitat.

Power simulation indicated that it would take more than 40 years to detect a 3% average annual population change with 80% power for the Lazuli Bunting within high-elevation riparian habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Lazuli Bunting on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	5.4	2.1	14	62	22	24
PJ	ID	--	--	--	--	20
SF	ID	--	--	--	--	8

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
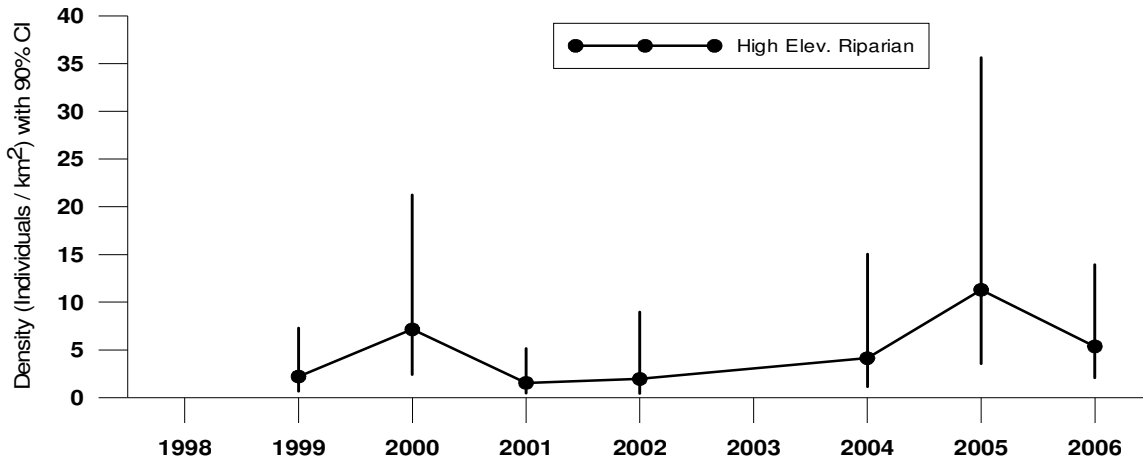
Estimated density of the Lazuli Bunting (with 90% confidence intervals) on MCB transects 1998-2006.
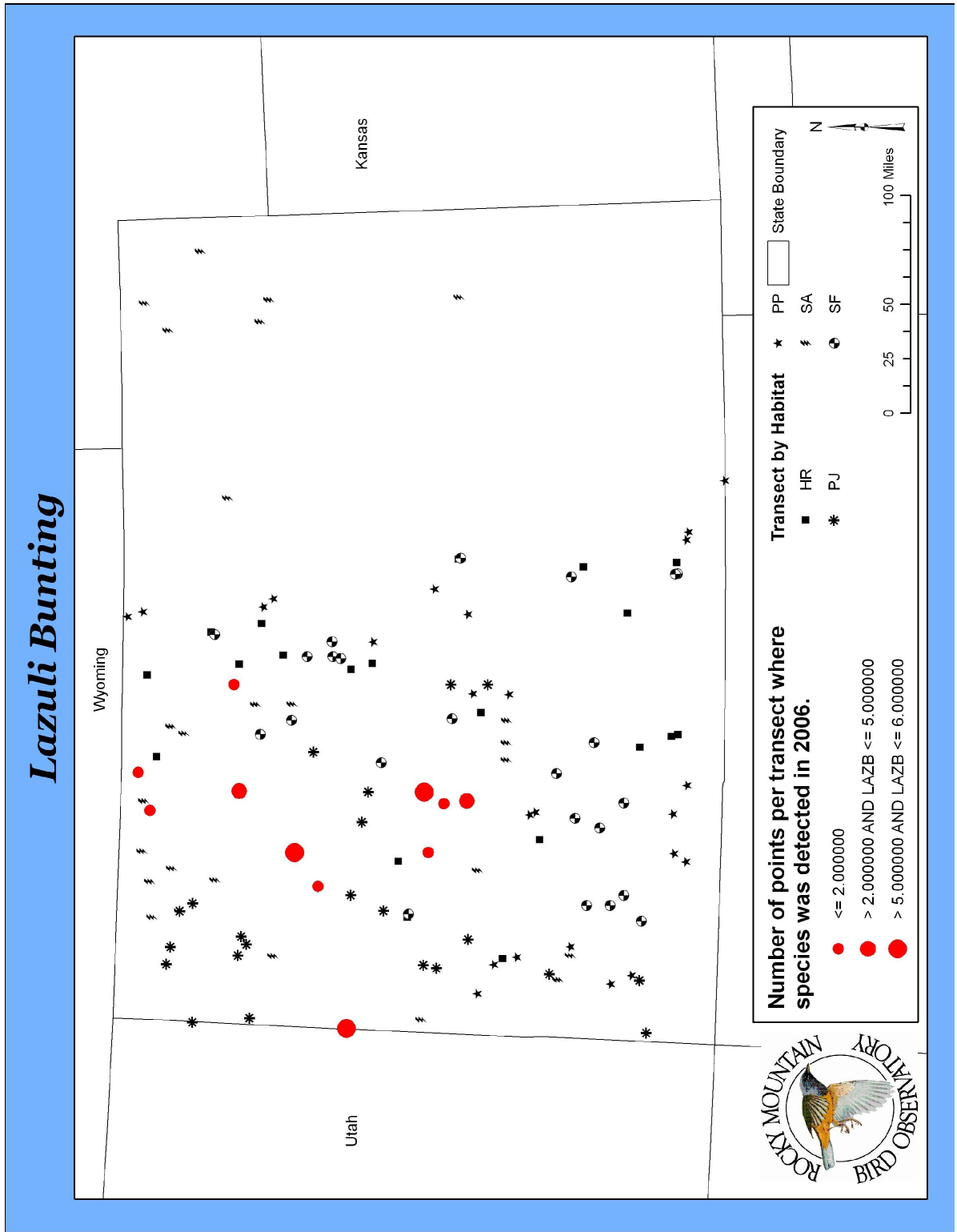
Lazuli Bunting

RMBO point-transect locations and detections of Lazuli Buntings on transects in Colorado, 2006.

Western Meadowlark
(*Sturnella neglecta*)
PIF Regional Stewardship Species – BCR 18

The Western Meadowlark nests primarily in native grasslands, semi-desert shrublands, and sagebrush shrublands. In 2006, we detected 443 Western Meadowlarks in four habitats on MCB transects. We were able to calculate a density estimate for pinyon-juniper habitat.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for Western Meadowlark within 20 years in sage shrubland habitat and 35 years in pinyon-juniper habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Western Meadowlark on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	ID	--	--	--	--	4
PJ	0.6	0.2	1.6	65	33	36
PP	ID	--	--	--	--	13
SA	21	14	30	30	378	390

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
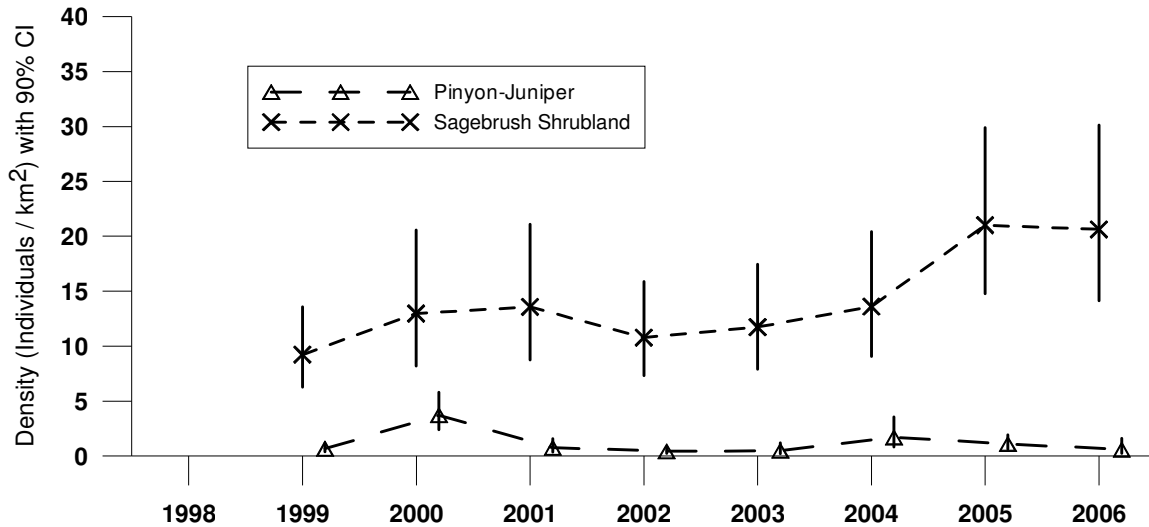
Estimated density of the Western Meadowlark (with 90% confidence intervals) on MCB transects 1998-2006

Western Meadowlark
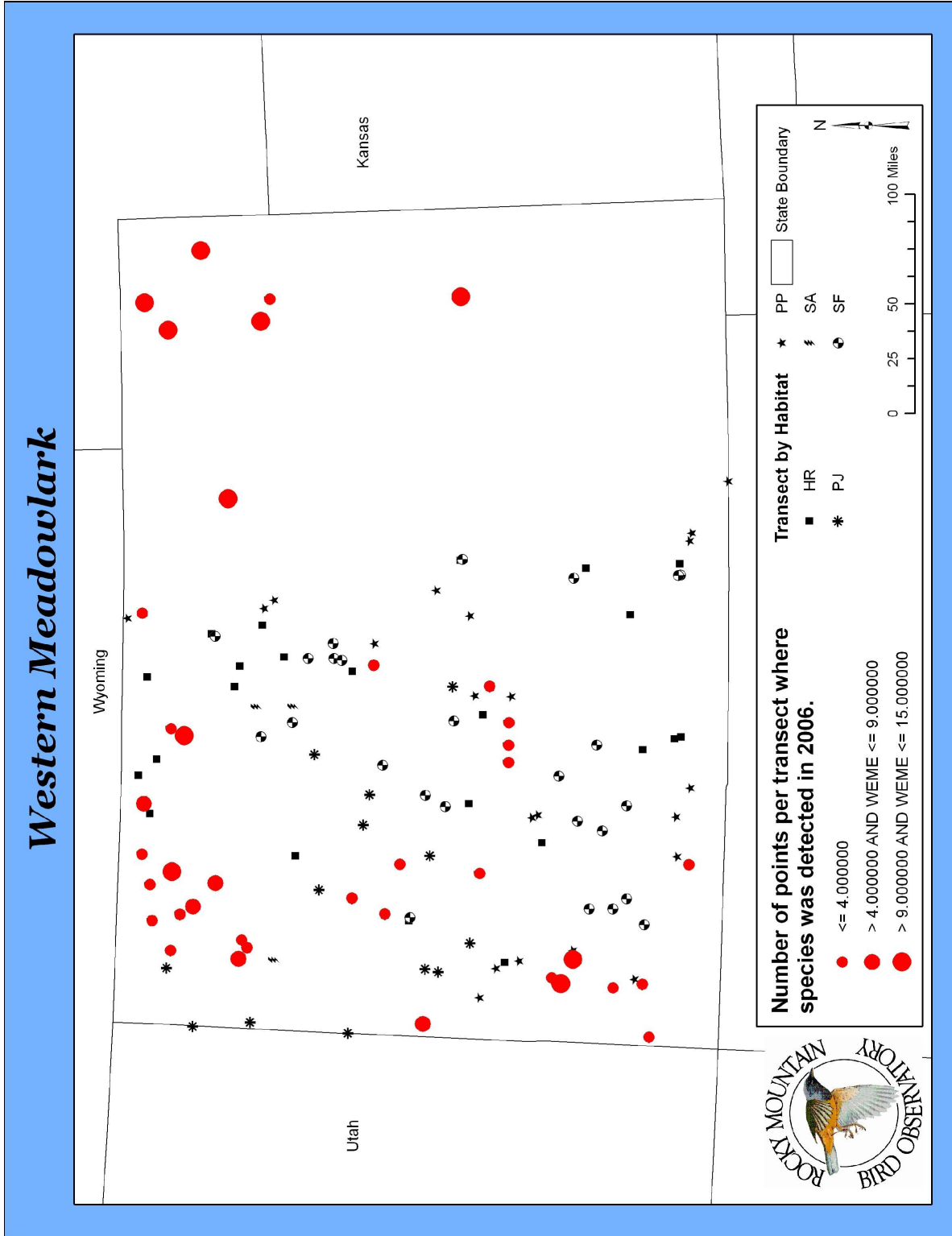
RMBO point-transect locations and detections of Western Meadowlarks on transects in Colorado, 2006.

Cassin's Finch
(*Carpodacus cassinii*)
CDOW – Species of Greatest Conservation Need
PIF Species of Regional Concern – BCR 16

Cassin's Finches nest in all coniferous forests, but they prefer high-elevation conifers and will rarely breed in lower pinyon-juniper habitat. The species leaves the mountains only in years when food is scarce. We detected 69 Cassin's Finches in three habitats on MCB transects in 2006. Detections of Cassin's Finches in sage shrubland habitat were unreliable due to observer error. We were able to calculate a density in ponderosa pine and spruce fir habitats.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Cassin's Finch within 35 years in ponderosa pine habitat and within 35 years in spruce-fir habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Cassin's Finch on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	ID	--	--	--	--	26
PP	6.4	3.3	12	40	17	23
SA	--	--	--	--	--	**
SF	4.1	2.2	7.6	38	17	20

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data unreliable due to observer error.
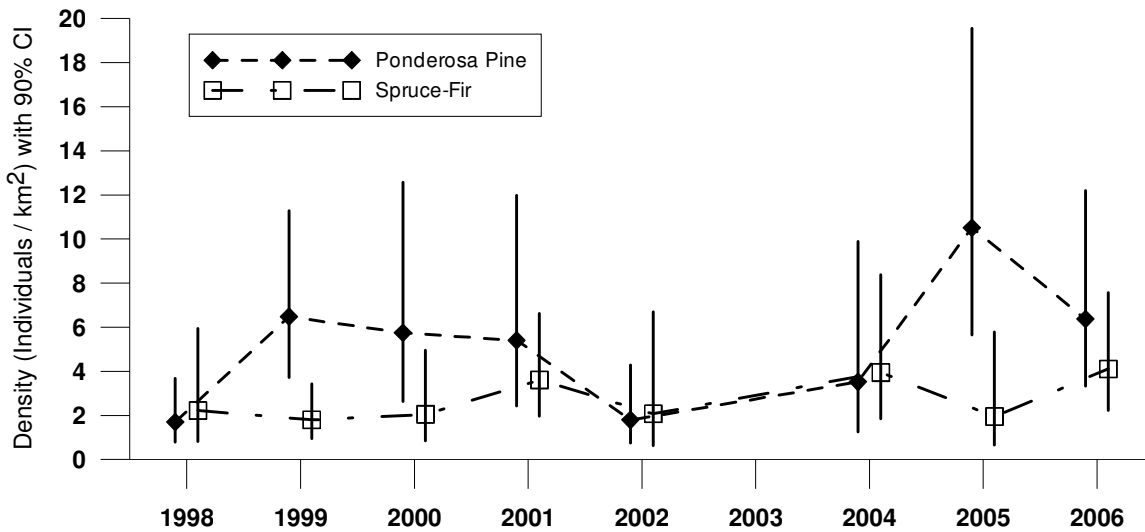
Estimated density of the Cassin's Finch (with 90% confidence intervals) on MCB transects 1998-2006
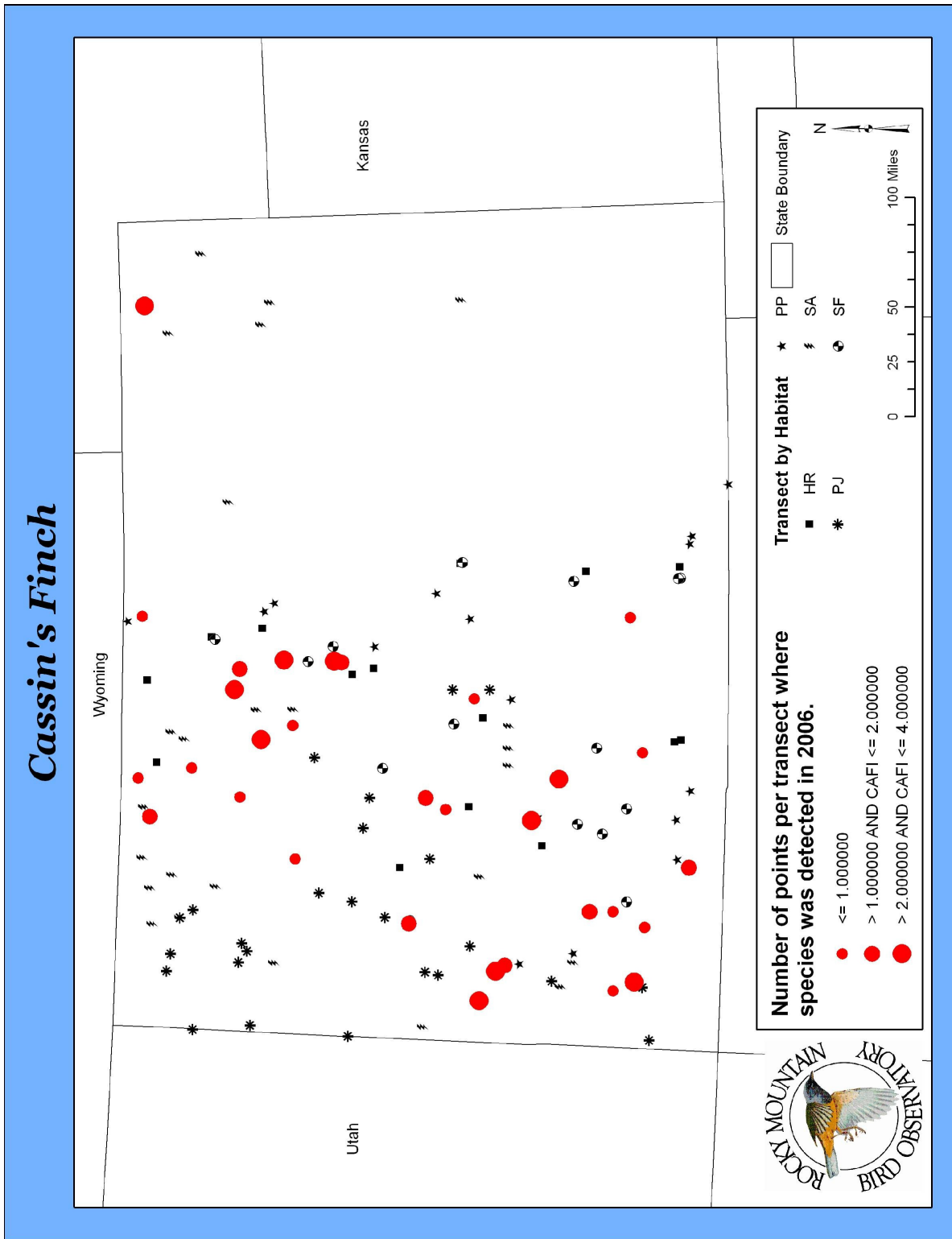
RMBO point-transect locations and detections of Cassin's Finches on transects in Colorado, 2006.

Red Crossbill
(Loxia curvirostra)
CDOW - Species of Greatest Conservation Need

Red Crossbills have been separated into several different "types" based on their dependence on a particular species of conifer (Kingery 1998). In Colorado, Red Crossbills use Douglas-fir, ponderosa pine, and lodgepole pine (Kingery 1998). We detected 241 Red Crossbills in four habitats on MCB transects in 2006 and calculated a density estimate for this species in three habitats.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Red Crossbill within 35 years in ponderosa pine habitat and more than 40 years in high-elevation riparian and spruce-fir habitats using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Red Crossbill on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	%CV	n	N
HR	1.1	0.5	2.5	51	8	24
PJ	ID	--	--	--	--	13
PP	7.8	4.4	14	35	67	92
SF	23	14	39	31	68	112

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; %CV = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
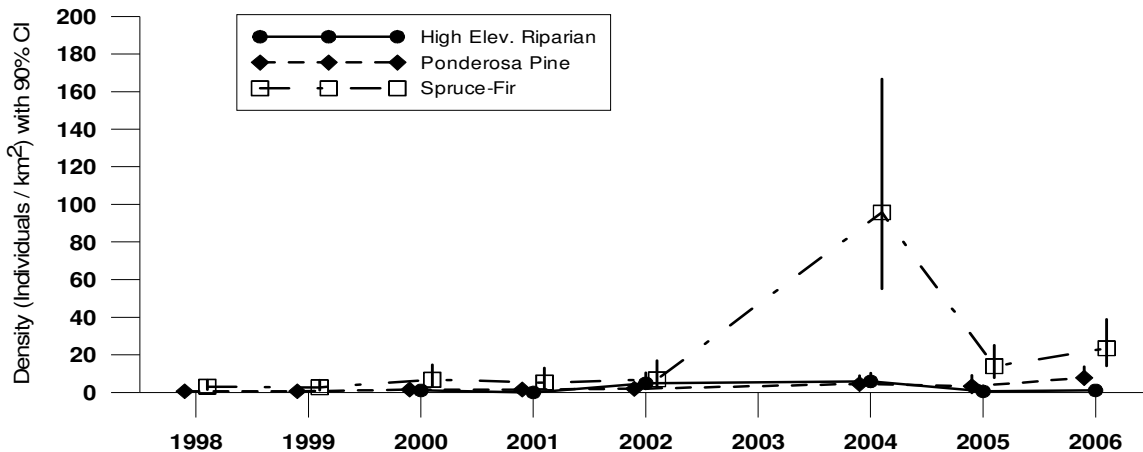
Estimated density of the Red Crossbill (with 90% confidence intervals) on MCB transects 1998-2006.
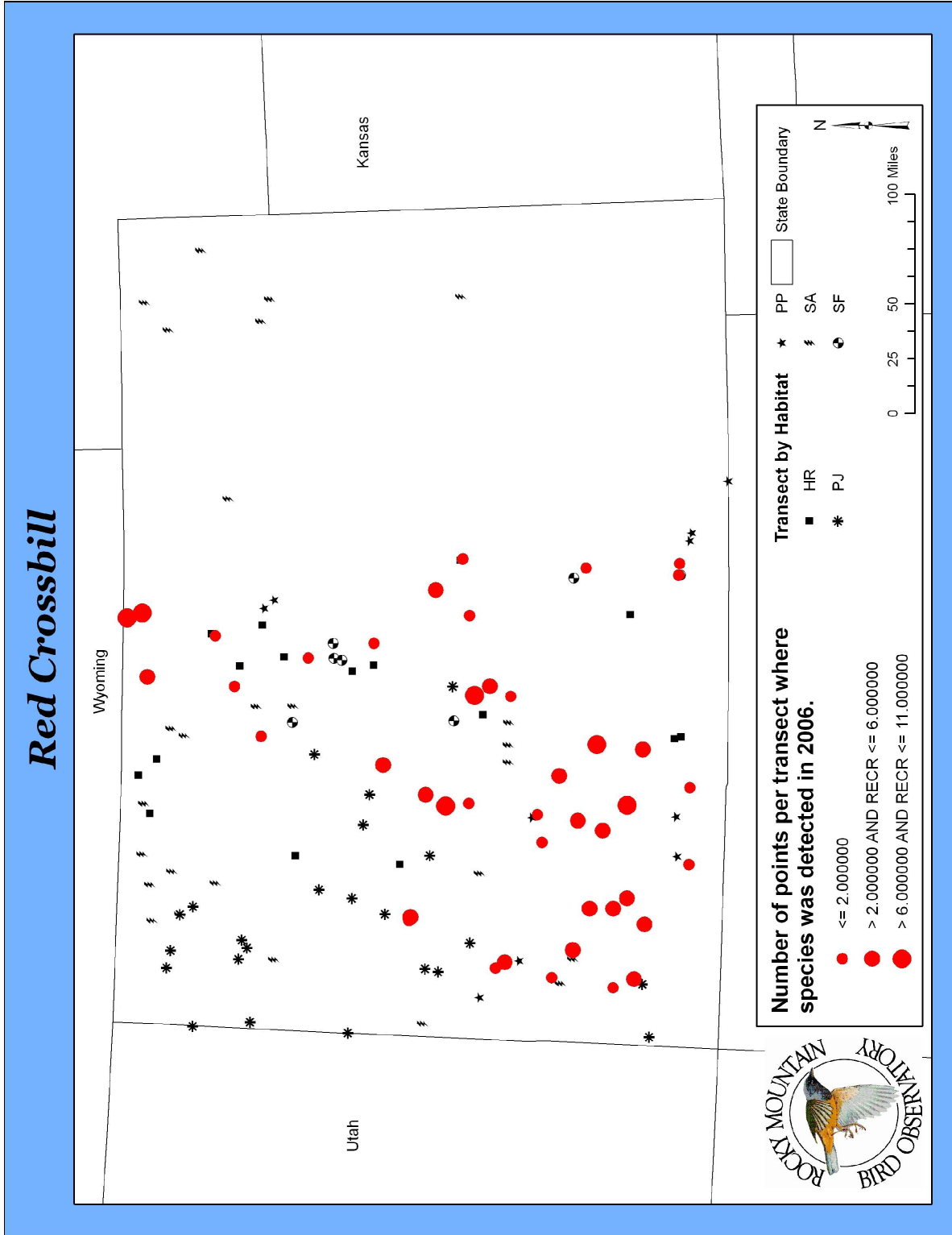
Red Crossbill

RMBO point-transect locations and detections of Red Crosbills on transects in Colorado, 2006.

Pine Siskin
(Carduelis pinus)
PIF Species of Regional Concern – BCR 16
PIF Regional Stewardship Species – BCR 16

Pine Siskins nest in a variety of habitats, especially coniferous forests. In 2006, we detected 667 Pine Siskins in four habitats on MCB transects and calculated a density estimate for this species in three habitats.

Power simulation indicated that we would be able to detect a 3% average annual population change with 80% power for the Pine Siskin within 25 years in high-elevation riparian, within 25 years in ponderosa pine, and within 20 years in spruce-fir habitat using point transect data.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Pine Siskin on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	88	29	55	141	216	299
PJ	ID	--	--	--	--	9
PP	21	54	8.9	48	64	86
SF	238	18	178	320	229	273

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data; ** = data unreliable due to observer error.
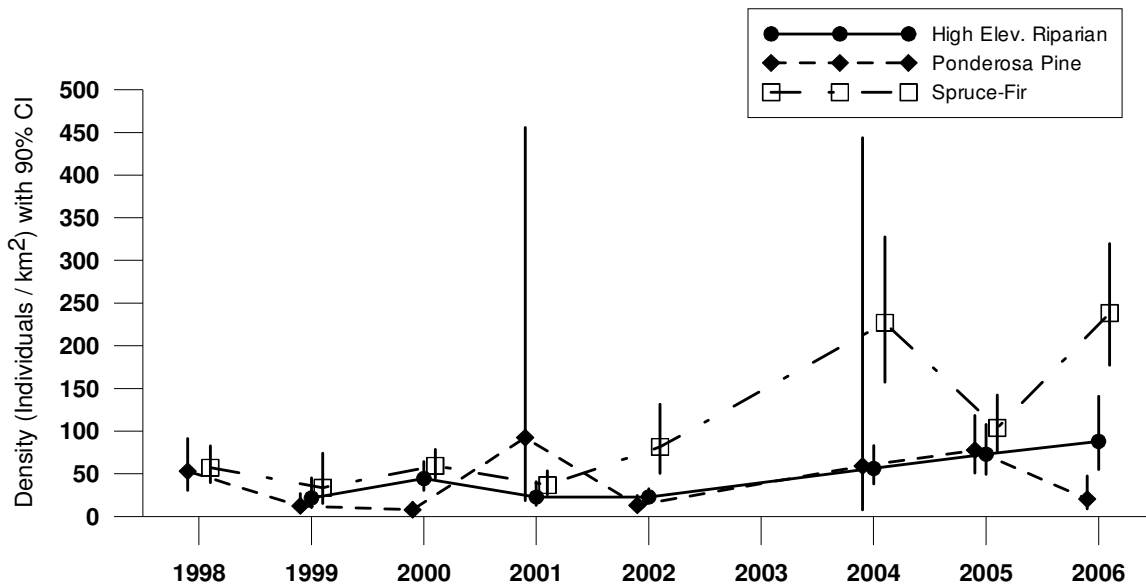
Estimated density of the Pine Siskin (with 90% confidence intervals) on MCB transects 1998-2006.
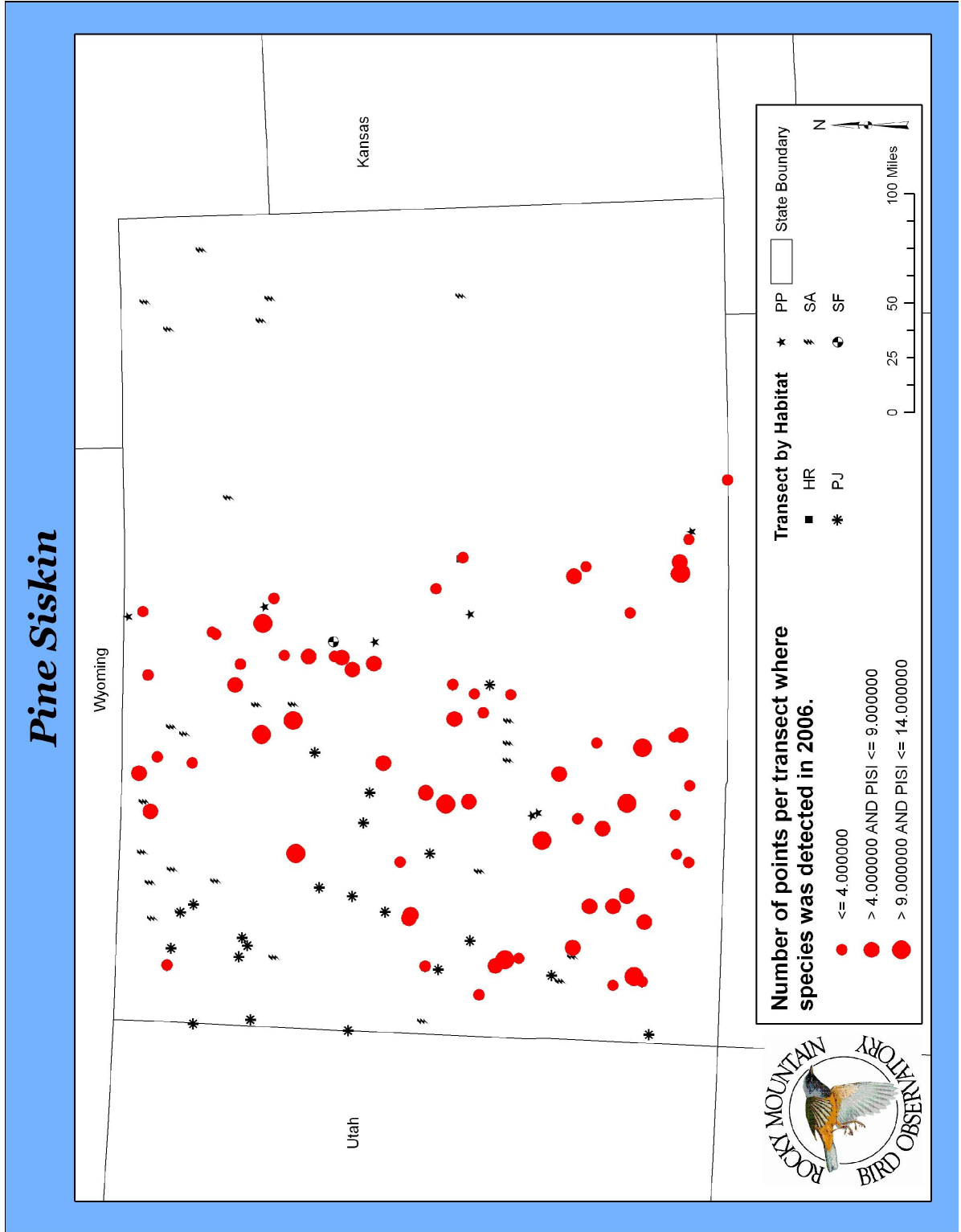
Pine Siskin

RMBO point-transect locations and detections of Pine Siskins on transects in Colorado, 2006.

Evening Grosbeak
(Coccothraustes vespertinus)
CDOW - Species of Greatest Conservation Need

In Colorado, the Evening Grosbeak nests primarily in coniferous forests, especially ponderosa pine, but also spruce-fir. We detected 28 Evening Grosbeaks in three habitats on MCB transects in 2006. We were not able to calculate a density estimate for Evening Grosbeaks in any habitat.

The Evening Grosbeak is probably too rare and localized in Colorado to be adequately monitored by point transects. However, in a few more seasons, using data from all years, we may be able to calculate a global detection function for this species and thereby generate annual density estimates in some forested habitats that can be used for population-trend monitoring.

Total number of independent detections, number of individuals, and habitat-specific density estimates for the Evening Grosbeak on the MCB monitoring project, 2006.

Habitat	D	LCL	UCL	CV	n	N
HR	ID	--	--	--	--	7
PP	ID	--	--	--	--	10
SF	ID	--	--	--	--	11

D = Density (birds/square kilometer); LCL = lower 90% confidence interval of the density; UCL = upper 90% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.
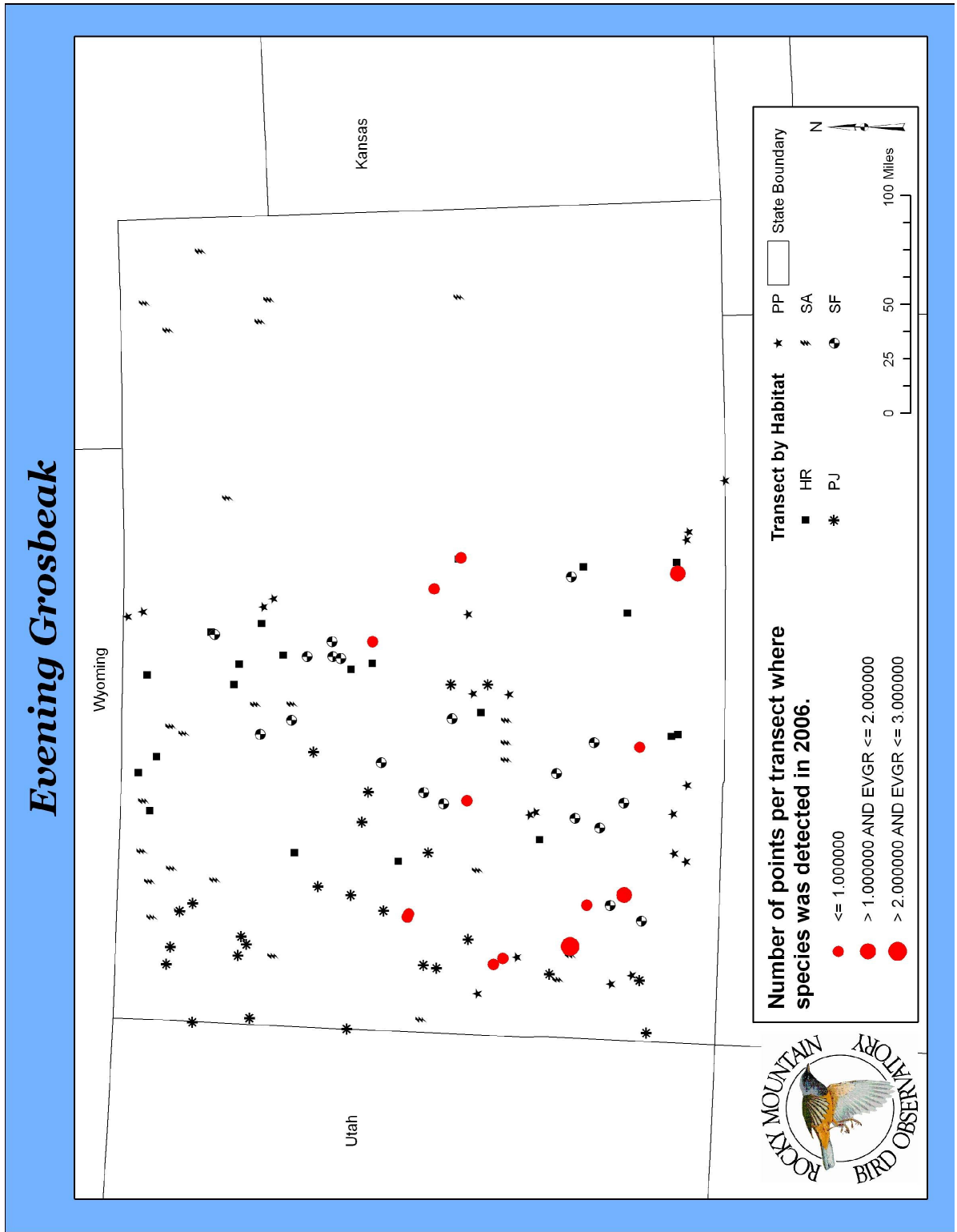
RMBO point-transect locations and detections of Evening Grosbeaks on transects in Colorado, 2006.

APPENDIX B. BIRDS DETECTED ON POINT TRANSECTS – SPECIES AND TOTALS

List of all bird species observed in Colorado from 1998-2006, with management designations and species totals by habitats surveyed in 2006 and by year.

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Abert's Squirrel											6										1	6
Alder Flycatcher																				3		0
American Avocet															7	26	12	24	36	14	10	0
American Bittern			SGCN				R2SS								2	1	7	6	3	3		0
American Coot															12	26	51	28	81	42	121	0
American Crow									11	7	15	9		20	61	70	63	110	79	106	101	42
American Dipper			SGCN			PR87			3				5		3	1	11	11	5	8	6	3
American Goldfinch									1	4	2		3		52	57	49	17	62	88	19	7
American Kestrel										2	7	9	3		45	42	34	57	53	47	51	18
American Pipit						PR62							4		335	475	538	458	552	629	503	4
American Redstart																1	1		3			0
American Robin									419	64	225	20	202	831	1179	1401	1451	1198	757	1583	1554	930
American Three-toed Woodpecker			SGCN				R2SS		4		4		20	13	14	52	16	37	4	62	55	28
American White Pelican	SS		SGCN												1	1	90		12	14	14	0
American Wigeon															1	9	3	1	1	11	5	0
Ash-throated Flycatcher										145	8		1		68	47	113	101	101	115	149	153
Audubon's Warbler									107	8	193		332	935	1044	1019	1362	851	445	985	1029	640
Bald Eagle		FT,ST	SGCN									2			4		1		1		1	2
Baltimore Oriole																4	3		8	1	5	0
Band-tailed Pigeon			SGCN	CC		PR62 & 87					3		11		7	7	5	4	12	11	16	3
Bank Swallow										5					319	28	168	23	124	170	16	5
Barn Owl																					1	0
Barn Swallow									1	17	1	6			97	98	28	42	94	62	70	25
Belted Kingfisher									1					1	26	12	27	10	23	26	5	1
Bewick's Wren								N		255		1			244	190	153	120	156	197	159	256
Black Phoebe															2	2	2		3	7		0
Black Rail			SGCN					N									1		4	7	2	0

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Black Swift			SGCN			PR87	R2SS	N, 16									200	3	12	2		0
Black-billed Cuckoo								N													1	0
Black-billed Magpie				RS					2	37	5	54	1	9	293	159	193	165	231	222	191	99
Black-capped Chickadee									4	6	2		4		187	131	87	127	93	118	72	12
Black-chinned Hummingbird			SGCN			PR87			1	11		1			31	33	20	17	22	42	35	13
Black-chinned Sparrow				CC				N													1	0
Black-crowned Night-Heron									2						2	7	21	17	10	25	3	2
Black-headed Grosbeak									14	29	46		2	40	218	234	247	141	276	342	284	91
Black-necked Stilt																	1		1		6	0
Black-throated Gray Warbler			SGCN	RC		PR87		16		231		4			200	197	226	193	131	220	218	235
Black-throated Sparrow				RC						7					5	15	2	14		2	9	7
Blue Grosbeak										9			4		44	53	49	34	61	45	35	9
Blue Jay															18	34	51	2	49	31	6	0
Blue-gray Gnatcatcher										148	14	4	5		211	211	178	247	140	277	239	166
Blue-winged Teal															1	10	7	2	10	7	28	0
Bobolink			SGCN																	1		0
Boreal Owl			SGCN			PR62	R2SS													1		0
Brewer's Blackbird									21	4	1	58	2		83	63	117	117	137	153	204	84
Brewer's Sparrow			SGCN	CC,RC	CC,RC	PR62 & 87	R2SS	N	31	65	2	56	2		626	710	697	635	866	739	883	154
Broad-tailed Hummingbird			SGCN	RS		PR62			153	24	53		36	210	437	526	443	405	258	503	614	266
Broad-winged Hawk														1								1
Brown Creeper									1	21		46	72		99	115	76	82	32	120	95	68
Brown Thrasher															8	6	23	4	21	14	4	0
Brown-capped Rosy-Finch			SGCN	CC,CS,RS		PR62									8	28	13	25	31	80	52	0
Brown-headed Cowbird									28	55	66	23	68		327	402	469	450	436	545	381	172
Bullock's Oriole		ST								2		1			62	63	89	82	153	75	74	3
Burrowing Owl			SGCN	RC,RS		PR36 & 87	R2SS	N, 16, 18				1			24	4	18	12	10	5	13	1
Bushtit										75					40	51	19	60	49	110	79	75
California Gull									1						3		4		4	2	6	1
Calliope Hummingbird				CC																	1	0
Canada Goose									38		40		1		37	28	57	76	256	110	136	78
Canyon Towhee															6	2		9	3			0
Canyon Wren				RC						15					22	10	10	8	11	12	24	15

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Carolina Wren										2												2
Cassin's Finch		SGCN	RC						26		23	8	20	36	87	97	72	41	36	95	117	77
Cassin's Kingbird					PR87										9	22	6	12	16	2	9	0
Cassin's Sparrow		SGCN	RC,RS		PR36		R2SS	N, 18				23			200	322	159	281	491	296	336	23
Cattle Egret																1			1	1		0
Cedar Waxwing									1	5	5				11	7	18	22	23	19	16	11
Chestnut-collared Longspur		SGCN	RC				R2SS	N, 16, 18							1						3	0
Chihuahuan Raven			RS												3	5	6	26	8	11	22	0
Chimney Swift															1			1	4		1	0
Chipping Sparrow									41	240	136	10	85	182	457	648	570	517	297	715	661	512
Chukar										5					5	1		2	1	2		5
Cinnamon Teal															3	19	22	25	29	8	34	0
Clark's Grebe																		2	1		1	0
Clark's Nutcracker			CS,RS						34	13	43	5	68	176	186	143	212	257	89	227	329	163
Clay-colored Sparrow												2			1				1		2	2
Cliff Swallow									9	15	3	7		1	549	166	904	234	353	601	309	34
Common Goldeneye																	1	2				0
Common Grackle												2			37	82	104	50	151	132	54	2
Common Merganser									3						7	5	13	2	32	13	5	3
Common Nighthawk			RC	RC							17	4		15	41	41	47	59	32	71	75	21
Common Poorwill					PR87					7					1				1	4	3	7
Common Raven									27	390	35	54	20	91	144	199	380	372	327	416	426	526
Common Snipe														2	10	11	18	22	21	35	30	0
Common Yellowthroat									2						31	65	150	77	182	154	106	2
Cooper's Hawk									2	3				10	9	8	9	10	4	14	13	5
Cordilleran Flycatcher		SGCN	RS		PR62				26		11		30	59	221	118	213	152	54	162	119	67
Curve-billed Thrasher		SGCN													2	3	1	1		1	5	0
Dark-eyed Junco									10		54		23	14	2		53	15	6		303	87
Dickcissel			CC					N								2	8		1	5	11	0
Double-crested Cormorant																1	6		6	3	10	0
Downy Woodpecker											5			8	16	20	24	45	21	53	26	5
Dusky Flycatcher		SGCN							96	20	73			194	379	425	555	493	331	558	508	189
Dusky Grouse		SGCN	CC		PR87						1		6	8	4	26	15	23	19	52	48	7
Eared Grebe		SGCN													9	10	74	8	4	14	20	0

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Eastern Bluebird																2	3		5			0
Eastern Kingbird									6						58	37	86	21	101	82	25	6
Eastern Phoebe																1	1			1	2	0
Eurasian Collared-Dove																					1	0
European Starling														1	97	28	123	46	182	183	173	0
Evening Grosbeak			SGCN						7		10		11	45	38	25	96	53	22	14	36	28
Ferruginous Hawk	SS	SSC	SGCN	RC	RC,RS	PR36	R2SS	N, 16, 18				1			7	4	10	13	5	2	6	1
Field Sparrow															4		4			4	5	0
Flammulated Owl			SGCN	CC,RS		PR62	R2SS	N, 16										1			1	0
Forster's Tern			SGCN												13	5	4	4		23	4	0
Fox Sparrow									47				4	2	48	46	31	29	33	67	96	51
Franklin's Gull															1						2	0
Gadwall															1	17	25	34	44	54	53	0
Gambel's Quail															6	5	8		15	13	7	0
Golden Eagle			SGCN	RC				16	1	3		1	3	16	13	21	22	22	17	22	22	5
Golden-crowned Kinglet									10				82	148	120	192	61	71	15	63	56	92
Grace's Warbler			SGCN	CC,RC		PR62 & 87		N, 16			99		22		45	31	46	60	1	22	80	99
Grasshopper Sparrow					RC,CS,RS	PR36	R2SS	N				9			154	230	175	158	213	146	277	9
Gray Catbird			SGCN												1	24	21	10	20	31	11	0
Gray Flycatcher			SGCN			PR87				208					202	192	167	188	127	198	183	208
Gray Jay									15				64	108	70	129	63	122	7	162	71	79
Gray Vireo			SGCN	CC,RC,RS		PR87		N, 16		25					6	3	16	6	17	41	31	25
Gray-headed Junco									155	5	151		356	814	976	1378	965	953	427	1392	867	667
Great Blue Heron										1		1			23	32	32	7	54	54	27	2
Great Crested Flycatcher													1			1	3			18		1
Great Horned Owl										1	1		1	3	10	4	6	1	4	5	6	3
Greater Prairie-Chicken			SGCN		CC,RC	PR36	R2SS									11	6	5	6		14	0
Greater Roadrunner															2	1	3	1			1	0
Greater Sage-Grouse	SS	SSC	SGCN	CC,RC			R2SS	N				5				1	5		1		4	5
Greater Scaup																					2	0
Great-tailed Grackle															2	2	1	3	14	1	21	0
Green Heron															2	4	1	1	1			0
Green-tailed Towhee					CS,RS	PR62			22	45	93	43	15	242	812	1224	973	875	608	1014	1048	218

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Green-winged Teal									2							4	8	27	10	7	17	2
Hairy Woodpecker									6	8	41		40	117	68	194	133	129	51	197	189	95
Hammond's Flycatcher						PR62			4		75		4	72	52	73	69	64	99	88	85	83
Hepatic Tanager																	2			9		0
Hermit Thrush									80	2	100		339	560	555	725	765	713	335	890	875	521
Hermit Warbler																			2			0
Hooded Warbler																	2		1			0
Horned Lark						PR87			1	2		226			1459	1008	1408	1618	1974	1745	2386	229
House Finch										134	16				110	83	60	68	68	128	90	150
House Sparrow															18	4	5	2	9	14	5	0
House Wren									41	2	131	1	1	410	550	662	782	533	622	727	567	176
Indigo Bunting															6		6		1	5		0
Indigo x Lazuli Bunting Hybrid																	1		1			0
Juniper Titmouse			SGCN	RC		PR87				48					47	59	79	54	47	52	36	48
Killdeer										1		7			93	67	147	83	161	133	129	8
Ladder-backed Woodpecker																		1	2		1	0
Lark Bunting			SGCN		RC,CS,RS	PR36		18				215	2		1401	858	1222	505	1337	887	998	217
Lark Sparrow				RC						22	3	57		2	265	572	443	469	320	293	401	82
Lazuli Bunting			SGCN			PR62			24	20			8	5	61	86	60	27	39	78	98	52
Least Flycatcher																				1		0
Lesser Goldfinch										1	4				12	26	31	20	14	58	26	5
Lesser Scaup			SGCN						3							32	27	3	8	11		3
Lewis's Woodpecker			SGCN	CC,RC,CS,RS	CC,RC	PR36, 62 & 87	R2SS	N, 16, 18						2	3	6	13	4	6	3	3	0
Lincoln's Sparrow									541		3		73	170	409	549	697	620	316	931	864	617
Loggerhead Shrike			SGCN	RC	RC	PR87	R2SS	N							34	25	27	33	37	20	23	0
Long-billed Curlew	SS	SC	SGCN			PR36		N, 18							7	2	2	6	8	4	11	0
Long-eared Owl													3			2	3				3	3
MacGillivray's Warbler						PR62			22	6	13		6	46	190	295	326	262	153	201	230	47
Magnolia Warbler														8							1	0
Mallard									16	1			4		47	42	111	48	137	159	108	17
Marsh Wren															18	39	71	83	122	38	38	0
McCown's Longspur			SGCN		CC,CS,RS	PR36	R2SS	N, 18							77	6	26	88	107	179	130	0
Morning Warbler																			2		1	0
Mountain Bluebird				RC,CS,RS					29	160	61	45	2	87	181	190	173	288	245	405	373	297

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Mountain Chickadee									115	46	132		321	600	804	959	919	789	231	861	806	614
Mountain Plover	SS	SSC	SGCN			PR36	R2SS	N, 16, 18							4	5	5	3	2			0
Mourning Dove									9	279	182	54		30	497	606	576	780	894	1095	993	524
Northern Bobwhite											0				7	1	24	3	30	30	3	0
Northern Cardinal																					1	0
Northern Flicker									60	21	111	6	25	8	5	533	89	265	128	318	288	223
Northern Goshawk	SS		SGCN				R2SS		1		4		4	8	9	9	1			6	4	5
Northern Harrier			SGCN		RC	PR36 & 87	R2SS	N, 16, 18							9	13	19	12	15	9	26	0
Northern Mockingbird												2			124	162	54	197	168	70	141	2
Northern Pintail			SGCN												2	1	4	3		4	11	0
Northern Pygmy-Owl															1		1	1	1	1	3	0
Northern Rough-winged Swallow													1	97	36	42	29	95	97	39		0
Northern Shoveler															5	2	3	6	5		19	0
Olive-sided Flycatcher			SGCN	CC		PR62	R2SS	N	12		27		11	76	61	128	63	60	26	80	75	50
Orange-crowned Warbler									30	13	30		7	151	225	260	253	216	208	261	262	80
Orchard Oriole												3			18	24	46	2	56	46	15	3
Osprey			SGCN											1	1		3		1	7		0
Ovenbird														1		1	3	3		4	3	1
Peregrine Falcon		SSC	SGCN			PR62 & 87	R2SS	N, 16, 18		1	2				1	2	2			3	2	3
Pied-billed Grebe											1				6	5	1	8	2	12	1	
Pine Grosbeak									5				68	85	54	103	46	48	16	95	57	73
Pine Siskin				RC,RS					299	9	86		273	714	557	643	826	684	168	1505	1261	667
Pinyon Jay			SGCN	CC,RC,CS,RS	CC	PR87		16		145	6				207	131	231	188	143	280	202	151
Plumbeous Vireo			RS						1	66	75	2	44		138	165	227	188	100	217	195	144
Prairie Falcon			SGCN	RC	RC	PR36		N, 16, 18			1		1		3	2	4	9	5		4	1
Purple Martin			SGCN			PR62	R2SS		5	5	10			2	11	4	4	7	21	23	36	20
Pygmy Nuthatch			SGCN	RC					3		147		89	67	102	103	118			293	88	150
Red Crossbill			SGCN						24	13	92		112	150	32	102	148	245	73	924	278	241
Red Squirrel									9		6	43								105	359	58
Red-bellied Woodpecker																2		3	3	1	0	
Red-breasted Nuthatch									7	6	4		76	70	241	258	223	198	105	394	214	93
Red-eyed Vireo											1				1	4				1	1	1

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Redhead															6	28			29	2	21	0
Red-headed Woodpecker				CC,RC				N							1	10	9	1	9	3	4	0
Red-naped Sapsucker			SGCN			PR62		N	41		11		7	68	90	113	92	140	79	214	206	59
Red-necked Phalarope																					1	0
Red-shafted Flicker									7	3	2		10	155	494	18	307	5	14	1	83	22
Red-tailed Hawk									12	9	5	17	1	23	44	72	65	69	61	65	80	44
Red-winged Blackbird									24	5	6	28		7	250	289	529	621	919	655	701	63
Ring-billed Gull									1						2	1		1		10	6	1
Ring-necked Duck															3	11	3	8	20	7	6	0
Ring-necked Pheasant												3			16	23	20	25	33	41	67	3
Rock Pigeon															26		9	34	47	17	29	0
Rock Wren			RS						8	76	20	1		14	187	117	155	159	174	160	171	105
Rose-breasted Grosbeak																3				1		0
Ruby-crowned Kinglet									265	3	48		410	490	571	613	856	738	356	985	930	726
Ruddy Duck															10	17	27	12	27	19	21	0
Rufous Hummingbird			SGCN					N					2		1		2	1	1	7	19	2
Rufous-crowned Sparrow																	5	4	3		2	0
Rusty Blackbird													3		3							3
Sage Grouse																	1	4		4		0
Sage Sparrow			SGCN	RC		PR62 & 87	R2SS	16		1			30		25	77	38	86	101	83	75	31
Sage Thrasher			SGCN							7	237				123	91	161	207	218	241	315	244
Sandhill Crane	SC		SGCN								1	1			2	5	6	2	47	5		2
Savannah Sparrow									74	1	1				41	52	86	53	54	83	59	76
Say's Phoebe			RS		RS							3			15	31	21	36	42	64	19	3
Scaled Quail			SGCN	CC,RC	CC,RC										11	26	2	25	21	16	22	0
Scissor-tailed Flycatcher																				1		0
Sharp-shinned Hawk									3		1		1		3	3	4	9	5	10	10	4
Snowy Egret			SGCN												2	6	6	5	1	5	2	0
Solitary Sandpiper								N, 16, 18													3	0
Song Sparrow									88		2	1	1	3	284	242	184	161	139	172	96	92
Sora															3	5	13	4	11	3	24	0
Spotted Sandpiper									9				5		78	69	101	30	102	109	48	9
Spotted Towhee									1	150	88	5	41		836	863	683	447	458	640	468	244
Steller's Jay									21	3	80		23	235	423	297	451	308	95	280	322	127

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Swainson's Hawk			SGCN	CC,RC	CC,RS	PR36		N, 16	2			5			11	14	22	36	22	23	26	7
Swainson's Thrush									10	2	1	2		3	20	48	31	49	38	111	29	15
Townsend's Solitaire									7	6	50		22	132	206	101	238	159	55	182	165	85
Tree Swallow									71	2	5	6	2	47	65	68	64	457	120	143	147	86
Turkey Vulture									1	10	5	7		3	24	23	31	42	77	119	37	23
Upland Sandpiper			SGCN			PR36		N							3	12	4	2	5	2	11	0
Veery			SGCN									2	1	2	6	11	3			5	4	2
Vesper Sparrow			SGCN						40	57	37	396		34	345	365	410	434	343	401	497	530
Violet-green Swallow			RS			PR62			90	43	176	370	8	220	315	436	518	449	329	607	809	687
Virginia Rail															2	5	15	5	9	16	0
Virginia's Warbler			SGCN	CC,RC,RS		PR62 & 87	16			64	124			35	326	248	242	241	222	359	349	188
Warbling Vireo			RS						194	6	230		44	1080	1255	1168	1458	1047	984	1075	1352	474
Western Bluebird			RS			PR87				2	56	1		26	30	43	40	67	11	101	107	59
Western Grebe			SGCN												1	1	9	3	1	7	0
Western Kingbird						PR87					1	29			79	84	139	158	238	152	208	30
Western Meadowlark					RS				4	36	13	390		4	1445	1630	1407	1501	1901	1432	2249	443
Western Scrub-Jay										84	1				121	105	112	72	65	55	64	85
Western Tanager									20	15	159		61	277	468	481	651	464	311	598	648	255
Western Wood-Pewee									46	1	185		9	269	428	355	586	402	226	539	440	241
White-breasted Nuthatch									5	9	110		3	87	210	221	170	137	41	192	179	127
White-crowned Sparrow									400			105	88		654	791	862	781	647	1248	1285	505
White-eyed Vireo																			1			0
White-faced Ibis	SS		SGCN												1	14	17	12	1	16	170	0
White-tailed Ptarmigan			SGCN			PR62	R2SS								7	6	7	14	8	14	18	0
White-throated Sparrow										2			1	1								3
White-throated Swift			SGCN	CC,RS	CC	PR87			5	22	2	6		5	18	45	57	45	35	129	121	35
White-winged Crossbill													18	8	2			13		11	1	18
Wild Turkey											16			7	5	3	2	14	2	6	12	16
Willet						PR62											1	2	1	2	2	0
Williamson's Sapsucker			SGCN	CS,RS		PR62		N, 16	8		34		10	74	75	66	109	102	21	157	148	52
Willow Flycatcher		FE,SE	SGCN	CC,RC					12						4	14	11	24	3	8	18	12
Wilson's Phalarope			SGCN					N,16							6	3	19	53	39	29	17	0
Wilson's Snipe									28	1					1				10		39	29
Wilson's Warbler						PR62			151	1			31	37	106	112	196	190	37	238	192	183
Winter Wren																					1	0

Species	BLM-CO	CO	CDOW	PIF-BCR16	PIF-BCR18	PIF-CO	USFS	USFWS	HR	PJ	PP	SA	SF	1998	1999	2000	2001	2002	2003	2004	2005	2006
Wood Duck													1			7	2	2	7	10		1
Yellow Warbler				RC					47	2				9	288	291	275	143	258	294	218	49
Yellow-billed Cuckoo	SS	SSC,SC	SGCN				R2SS	N, 16								4	4	1	1	1		0
Yellow-billed Magpie																	1				1	0
Yellow-breasted Chat															55	60	88	4	54	57	10	0
Yellow-headed Blackbird										1				2	45	83	223	159	278	110	187	1
Yellow-rumped Warbler												6										6
Yellow-shafted Flicker																	3				1	0