Monitoring Colorado's Birds:
The 2001 Field Season

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Abstract

In 2001, Rocky Mountain Bird Observatory, in conjunction with its funding partners, Colorado Division of Wildlife, U.S.D.A. Forest Service, and U.S. Bureau of Land Management, conducted the *Monitoring Colorado's Birds* breeding-bird monitoring plan, as updated in 2001 (Leukering et al. 2001a).

We conducted transects in 13 habitats this year. We dropped the Lodgepole Pine transects that were run in 2000 from this year's suite of habitats, as those transects were unfunded and we did not have sufficient time or personnel to conduct them without negatively impacting the funded habitats. The habitat-stratified transects provided excellent data on 90 breeding species.

We conducted an extensive survey of breeding colonial waterbirds, counting individuals of 16 species at sites with a history of breeding by any of these species, as well as at a large number of sites deemed to have a high potential for breeding. These counts entailed 462 discrete monitoring tasks, with a count of one species at one site comprising a task. In addition, we counted all waterbirds at 448 lakes, most of which do not have known colony sites. We also documented breeding sites and counted individuals of twelve species with limited breeding ranges in Colorado. We continued to gather information on locations of breeding sites for colonial and limited-distribution species and have added a number of such sites to the list of locations to visit in 2002. Our counts in 2001 suggest that we will be able to monitor all of the colonial waterbirds and at least four of the limited-range species (Osprey, Black Phoebe, Bobolink, and Scott's Oriole), raising the total monitored to ~72% of all Colorado's annually-breeding species.

The program is well on its way to being completely established on the ground. Further program analysis will be forthcoming in a subsequent report in early 2002, but a couple such items are presented here: 1) Habitat designations should be re-examined in light of our results from four years' effort and 2) funding from cooperating agencies will need to rise to keep up with rising costs.

Introduction

Rocky Mountain Bird Observatory (RMBO) initiated efforts to create and conduct a Colorado-wide project to monitor breeding-bird populations in 1995 (see Leukering et al. 2001a). In 1997, after review by statisticians and Colorado Division of Wildlife (CDOW) biologists, we redesigned the program to focus on obtaining count-based data for all breeding-bird species in the state on a randomly-allocated and habitat-stratified basis and conducted a pilot effort in 1998 in three habitats (Leukering and Carter 1999). With the success of the 1998 effort, we expanded fieldwork in 1999 to include all originally allocated habitats and special-species efforts. We continued the project in 2001 and this report presents the results of that effort. This report also fulfills the requirements in Item F in our contract with CDOW (PSC-347-2000) and for our contracts with U.S.D.A. Forest Service Region 2 (CCS-09-00-99-076) and U.S. Bureau of Land Management (CSP001043).

Methods

As in prior years, we used three methods (transects, colony counts, and censussing) to obtain population data for Colorado's breeding-bird species. We briefly outline these methods, below; please refer to Leukering et al. (2001b) for specifics on these methods.

Point transects–We established transects of 15 point counts in each of 30 randomly-selected stands in each of 11 habitats (Alpine Tundra, Aspen, Grassland, High-elevation Riparian, Mixed Conifer, Montane Shrubland, Piñon-Juniper, Ponderosa Pine, Sage Shrubland, Semi-desert Shrubland, and Spruce-Fir). We recorded all birds detected on the points and recorded an estimate of distance from the point to each bird. For species of low density, designated *a priori*, detected on points, we also recorded the distance to the individual perpendicular to the line of the transect. We also noted individuals of low-density species detected between points and recorded perpendicular distances for those individuals. See Leukering et al. (2001b) for more specifics of the various methodologies.

We used program DISTANCE (Thomas et al. 1998) to analyze distance-estimate data. In this report, all references to density estimates are values provided by DISTANCE from our data. The notation, concepts, and analysis methods of the program were developed in Buckland et al. (1993) and Buckland et al. (2001). The program can analyze several forms of distance-sampling data, fitting a detection curve to the data set to be analyzed. The program limits some serious biases inherent in traditional analysis of point-count data (e.g., detectability among habitats or years), but comes with three assumptions: 1) all birds at distance 0 are detected; 2) distances of birds close to the point are measured accurately; and 3) birds do not move in response to the observer's presence. We conducted an initial analysis of species for which we obtained sample sizes of >24 individuals. We did this to look at the data histograms and the detection-function curve fit and then truncated as needed to eliminate outliers. For species of low density and, thus, low detection rates, we pooled data across these 11 habitats and utilized the transect data (that is, the between-point detections).

Low-elevation Riparian and Wetland transects – We randomly selected 30 one-mile stretches of navigable river below 5500' elevation and determined their locations. We conducted line transects by watercraft (raft or canoe) of one river mile in length, with one person conducting the transect and another operating the craft. For Wetland transects, we randomly selected 30 sites and established a 300-meter line transect at each. Transect survey duration was 30 minutes for both habitats. We analyzed these data as for the point transects, above.

Census of historical breeding sites of colonially-nesting waterbirds – We surveyed known nesting sites of the following species: Eared Grebe, Western Grebe, Clark's Grebe, American White Pelican, Double-crested Cormorant, Great Blue Heron, Great Egret, Snowy Egret, Cattle Egret, Black-crowned Night-Heron, White-faced Ibis, Franklin's Gull, California Gull, Forster's Tern, and Black Tern. We also visited numerous lakes and ponds to determine the likelihood of future nesting of any of these species at those locations. See Leukering et al. (2001b) for more specifics on these methods.

Nocturnal Transects – In 1999, we overlaid a Colorado map with a statewide, regular 5x5 grid to create 25 grid intersections within the boundaries of the state. From these intersections, we selected

transects to follow the nearest road which would support 20 points spaced ½-mile apart and which would be passable by two-wheel drive vehicles in good weather (see Leukering et al. 2001b for additional specifics of transect placement and operation). After analyzing the 2000 data from the 25 nocturnal transects, we determined that the eastern-plains transects were virtually useless for owls (we recorded exceedingly few birds), but the montane routes showed promise. Therefore, we bisected the montane part of the original grid, creating an additional 52 potential start points. We randomly selected 30 of the new grid intersections for transect placement bringing the total number of montane transects to 45 (15 of the original 25 transects were montane transects). This program will be analyzed in a subsequent report in early 2002.

Survey of ponds and lakes – We conducted counts of grebes, wading birds, waterfowl, gulls, and terns at lakes and ponds throughout the state, most below 7000' elevation. Observers noted numbers of adults, juveniles, and active nests. Counts were conducted from as many points as necessary to adequately count each site.

Other focused species surveys

American Bittern–We obtained data on year 2001 locations from *North American Birds* regional editors and other contacts. We also surveyed sites of confirmed breeding as reported in Kingery (1998) and counted individuals detected through the survey of lakes and ponds.

Green Heron–We obtained data on year 2001 locations from *North American Birds* regional editors and other contacts. We also surveyed selected sites of confirmed breeding as reported in Kingery (1998) and counted individuals detected through the survey of lakes and ponds.

Osprey–Data were gathered from established monitoring efforts in Grand Co. and elsewhere, with volunteers and staff visiting a majority of the other known breeding sites.

Black Rail–We conducted callback surveys at all of the known historical summer locations in Colorado and at a number of additional sites in the Arkansas River valley.

Willet–*MCB* conducted a census of all breeding sites located during the 1998 field season. Sites included Arapaho NWR, Hebron Waterfowl Area, Walden Reservoir, Lake John, Delaney Buttes, Cowdrey Reservoir, wetlands along the Yampa River, and Fruitgrowers Reservoir.

Black Swift–USFS personnel, RMBO staff, and volunteers conducted a census of 39 of the 46 documented breeding sites and surveyed an additional 78 sites for evidence of breeding.

Black Phoebe–We conducted a count of individuals on the San Miguel River between Piñon and the confluence of the San Miguel and Dolores rivers, and at all other known nesting sites. We also recorded incidental observations at other locations.

Scissor-tailed Flycatcher– We obtained data on year 2001 locations from *North American Birds* regional editors and other contacts.

Bell's Vireo–Field workers counted all individuals at historical breeding areas along the South Platte River and in Yuma County.

Purple Martin–We visited as many sites with a history of occurrence by this species as possible and counted birds present. Also, in cooperation with another study being conducted by RMBO personnel, we located active nests and recorded nest and vegetation measurements at each.

Bobolink–We surveyed known sites and searched for previously undocumented sites along the Yampa River Valley in Routt and Moffat counties and the White River Valley in Rio Blanco County. We collected data from existing studies in Boulder County, from surveys by volunteers in Larimer, Morgan, Douglas, and Elbert counties, and from incidental records.

Scott's Oriole– We visited all known breeding sites and determined occupancy of each; we also obtained incidental records from field work that documented three new sites.

Results

Transects – We conducted 349 transects in 13 habitats (average of 26.8 per habitat; Table 1). This was the highest number in three years of conducting these transects. We obtained data on 216 bird species via the transects and provide summary data in Appendix A for 91 of those. This appendix lists results from all habitat target species and all habitat-species associations and for low-density species across all habitats for which we obtained a sample size of detections of >24.

Table 1. Number of transects conducted in each habitat with totals of species and individuals detected (excluding flyovers) in *MCB* 2001 field season.

Habitat	# transects run	# species detected	# individuals
Alpine Tundra	25	46	1694
Aspen	29	68	3446
Grassland	22	55	2291
High-elevation Riparian	25	82	2487
Low-elevation Riparian	27	98	1723
Mixed Conifer	26	81	3031
Montane Shrubland	27	101	3117
Piñon-Juniper	29	75	2327
Ponderosa Pine	30	73	3060
Sage Shrubland	27	86	2468
Semi-desert Shrubland	26	70	1986
Spruce-Fir	27	59	2456
Wetland	29	86	1057
Totals (13 habitats)	349	216	31,143

Nocturnal Transects. The results from this spring's expanded effort were disappointing. We obtained sufficient sample size for no species. This result is very different from that we obtained in 2000 and are unsure as to its cause. However, all transects that we ran in 2000 on which we obtained so many owl detections were run again in 2001 with a paltry number of detections. We will analyze the nocturnal transect program in the subsequent report on the term of the *MCB* project as a whole.

Lakes survey. We counted waterbirds (grebes, cormorants, wading birds, waterfowl, gulls, and terns) at 448 bodies of water in 46 counties. We visited a large percentage of Colorado's water bodies that are visible from public access and greater than ten acres in surface area. Numbers are included in the species accounts which follow, and the data are summarized in Table 2. Specific site data are available from the authors or from Ken Giesen at the Colorado Division of Wildlife.

Colonial waterbirds. We visited and censussed a substantial number of historic sites and added a number of new sites to the database. We summarize those data in Table 3. Specific site data are available from the authors or from Ken Giesen at the Colorado Division of Wildlife.

Surveys of other localized species. We counted individuals of a number of limited-distribution and/or peripheral species at 482 sites and detected 1206 individual adults of 13 species (Table 3). Specific site data are available from the authors or from Ken Giesen at the Colorado Division of Wildlife.

Table 2. Results of the *MCB* survey of 448 water bodies in 46 counties, summer 2001.

Species	# of sites	# of adults	# of juveniles	Total # of individuals
Pied-billed Grebe	17	78	30	108
Eared Grebe	36	2136	135	2271
Western Grebe	28	779	8	787
Clark's Grebe	24	1007	23	1030
American White Pelican	80	8616	0	8616
Double-crested Cormorant	29	1016	34	1050
Great Blue Heron	15	157	2	159
Great Egret	4	10	0	10
Snowy Egret	7	47	20	67
Cattle Egret	2	9	0	9
Green Heron	1	1	0	1
Black-crowned Night-Heron	10	135	60	195
White-faced Ibis	18	1282	0	1282
Canada Goose	86	7110	318	7428
Wood Duck	4	4	29	33
Gadwall	30	881	164	1045
American Wigeon	18	254	76	330
Mallard	67	1656	723	2379
Blue-winged Teal	9	68	12	80
Cinnamon Teal	20	372	91	463
Northern Shoveler	8	53	33	86
Northern Pintail	8	48	12	60
Green-winged Teal	16	348	23	371
Canvasback	5	11	4	15
Redhead	18	1300	17	1317
Ring-necked Duck	14	727	3	730
Greater Scaup	1	1	0	1
Lesser Scaup	8	563	0	563
Bufflehead	2	95	0	95
Barrow's Goldeneye	1	1	0	1
Common Merganser	8	75	25	100
Ruddy Duck	19	321	102	423
American Coot	58	5315	583	5898

Franklin's Gull	25	2680	0	2680
California Gull	26	1954	194	2148
Forster's Tern	10	125	0	125
Least Tern	3	15	4	19
Black Tern	8	66	0	66
Totals		39316	2725	42041

Table 3. Summary of *MCB* special monitoring projects, summer 2001.

Species	# of sites in database	# of sites surveyed	# of active sites	# of confirmed sites[1]	# of nests occupied	# of adults	# of juveniles
Eared Grebe	67	65	51	27	456	2696	56
Western Grebe	63	53	31	6	28	666	28
Clark's Grebe	40	35	26	4	0	1546	23
American White Pelican	3	3	3	2	0	496	478
Double-crested Cormorant	33	31	23	17	971	2241	54
Great Blue Heron	159	154	80	78	1196	1429	125
Great Egret	4	4	3	2	10	20	0
Snowy Egret	21	21	7	7	232	482	177
Cattle Egret	11	11	4	3	67	108	25
Black-crowned Night-Heron	40	36	24	12	428	723	166
White-faced Ibis	20	20	4	4	3470	4189	0
Franklin's Gull	2	2	2	1	0	102	14
California Gull	9	9	9	3	0	1833	273
Forster's Tern	6	6	3	3	5	71	0
Black Tern	14	13	3	1	0	32	2
Colonial Waterbird Totals:	492	463	273	170	6863	16634	1421
American Bittern	29	18	10	0	0	16	0
Green Heron	17	6	6	1	1	9	2
Osprey	88	78	49	52	52	98	37
Black Rail	3	3	3	0	0	73	0
Willet	18	18		10	0	104	0
Black Swift	311	117	48	55	53	216	22
Lewis's Woodpecker	32	32	30	29	12	62	9
Black Phoebe	34	34	25	18	18	39	13
Bell's Vireo	12	5	4	0	0	33	0
Purple Martin	124	92	69	54	107	262	38
Ovenbird	20	5	4	0	0	9	0
Bobolink	64	50	41	0	0	269	0
Scott's Oriole	25	24	11	0	0	16	0
Special project totals:	777	482	300	219	243	1206	121

[1] Confirmed sites are those in which we obtained proof (e.g., nests) of nesting

Discussion

In 2001, we experienced fewer logistical problems compared to the number in previous years of this project. We were able to obtain nearly enough technicians this year, thanks to the early initiation in hiring enabled by timely completion of the contract with CDOW. Without the loss of one technician (due to that person's inability to conduct the field work) early in June, we would have come very close to completing all transects. When we realized that we would not be able to conduct all 390 transects, we prioritized conducting those transects that had not yet been established. This effort should enable a relatively problem-free field season in 2002, as nearly all transects have now

been established.

In general, despite an incomplete sample of transects in most habitats, sample sizes for many species were sufficient for analysis. Even some low-density species were detected in reasonable numbers (e.g., Red-tailed Hawks on 53 transects with a total of 60 individuals). Some high-density species were detected in very large numbers (e.g., 926 Dark-eyed Juncoes on 140 transects in 10 habitats). The fact that we obtained robust data despite completing only one habitat's transects (Ponderosa Pine) is encouraging.

Species that are considered well-sampled via transects are those with coefficients of variation of the density estimates (D CV in Appendix A; hereafter CV) of less than 50% and with two or fewer parameters (m) included in the detection-curve function. Species with CVs of >50% will simply require a longer period in which to detect trends with statistical significance. Thus, species with CVs between 50% and 100% will require us to conduct the transects for more than 12 years to detect population trends, but will still take fewer than 25 years.

We obtained CVs of ≤50% for 91 species and CVs (Appendix A). For no other species did we obtain sufficient sample size. This is a change from previous years, when we analyzed the data for all species regardless of sample size. However, we now believe that this tack was in error and that any results from analysis of low sample sizes are suspect, strongly so for very low sample sizes. Thus, we opted not to conduct those analyses (see Leukering et al. 2001b). However, there were many instances when we obtained lower CVs and/or higher sample sizes for particular species in habitats in which we did not designate them as targets. The best example of this from the 2001 data would, again, be White-crowned Sparrow in Alpine Tundra. We designated the species as a target in High-elevation Riparian (Leukering et al. 2001a; also see Leukering et al. 2001b for similar result in 2000), yet obtained one of our lowest CVs of all habitat-species interactions from White-crowned Sparrow in Alpine Tundra: 9.0% (Appendix A). We will revisit habitat designations for individual species by comparing the densities we generate with *DISTANCE* from our transect data.

The survey of lakes and ponds produced some interesting results. For most of the species we counted, we have no way to know what proportion of the birds were breeders. In fact, those birds counted of a few species, e.g., Franklin's Gull, are actually comprised mostly of early fall migrants. Though the number of water bodies that we hit was minimal compared to the number in Colorado, we did visit many of the most productive sites. So, while the various species totals are in no way a complete reckoning of the summering populations of waterbirds, for most species, our numbers are probably in the correct order of magnitude. We anticipate visiting many more water bodies in years to come as we more fully develop the program in cooperation with numerous volunteers and contributors. We do anticipate that this effort could assist greatly the state and federal agencies charged with monitoring waterbird numbers, particularly those of the game species involved.

As all partners and funders are interested in management implications of the *MCB* data, we here provide brief synopses of 2001 results for those species deemed of most concern and/or interest in Colorado. Various bird species are listed by different agencies as being of concern, with some overlap among lists. Lists include the state list (CO ETSC)(CDOW 2001), the Colorado BLM list (BLM-SS)(Morgan 2000), and the USFS Region 2 List of Sensitive Species (FS-SS) (U.S.D.A. Forest

Service 1994). These lists are intended to focus attention on potential effects of various management regimes on these species. Those species so listed are indicated below. However, there are a few species so listed that we do not treat as we obtained little or no data on them. These are Greater Prairie-Chicken, Lesser Prairie-Chicken, Sharp-tailed Grouse, Sandhill Crane, Flammulated Owl, and Boreal Owl. Since all federally-listed species (Bald Eagle, Piping Plover, Snowy Plover, Least Tern, and Spotted Owl) are monitored by the U.S. Fish & Wildlife Service, U.S. Forest Service, and by the state, we do not attempt to monitor them and do not consider them here (except for Snowy Plover). Peregrine Falcon, though federally de-listed, is still within the five-year mandatory monitoring, thus the state and federal agencies still have this responsibility; we do not yet consider it part of our purview.

Pied-billed Grebe – No monitoring was planned for 2001, but incidental reports by field workers have increased the database of potential nesting sites to 70 locations.

Eared Grebe – *MCB* staff surveyed 65 of 67 sites with a history of confirmed or possible nesting, including all major sites. Nesting was confirmed at 27 sites. Only two difficult-to-access, low-priority sites were missed. Although the number of adults that we counted was very similar to prior counts (Giroir and Leukering 1999), the nest count was much lower (682 in 2000, 456 in 2001). Production was down significantly at Walden Reservoir and other North Park sites, which had even lower water levels than in 2000. The extensive lakes survey turned up 156 additional birds at seven sites with no history of nesting, and one small, previously-unrecorded nesting colony.

Western Grebe – We surveyed 53 of 63 sites with a history of confirmed or possible nesting, including all major sites. All of the sites not visited were low priority sites which have had only small numbers of nests recorded and no recent evidence of nesting. Twenty-eight active nests and 28 juveniles were found at six sites confirmed breeding, one fewer than in 2000. Adults were present at 31 sites; the total number of adults--mostly non-breeding birds--at these sites was 666, down more than 300 birds from 2000 surveys covering nearly all of the same sites. Low water levels at several reservoirs probably resulted in a poor production year. The extensive survey of lakes found an additional 313 non-breeding adult Western Grebes at 42 sites and an additional 207 *Aechmophorus sp.* grebes at nine sites.

Clark's Grebe – Our database contains 40 historical and possible nesting sites. We surveyed 35 of these and found 1546 adults, primarily non-breeding birds, at 22 sites with 23 juveniles at four sites. All of the sites not visited were low priority sites that have had only small numbers recorded recently and no recent evidence of nesting. The extensive lakes survey counted an additional 164 non-breeding adult Clark's Grebes at 31 sites and 207 *Aechmophorus sp.* grebes at nine sites.

American White Pelican (CO ETSC; BLM-SS) – RMBO field workers surveyed the three historical nesting sites. Successful nesting occurred at Riverside Reservoir and at MacFarlane Reservoir. Numbers were down at Riverside Reservoir, with fewer than 200 young on 12 July (Ron Ryder, pers. comm.), and only 28 flightless juveniles were present on 3 August. On 13 July, 278 juveniles were counted at MacFarlane, up from 167 on 13 July 2000. Nesting failed at Antero Reservoir for the second successive year, probably due to disturbance by recreationists. The extensive lakes survey tallied 8616 non-breeding pelicans at 79 additional sites.

Double-crested Cormorant – We surveyed 31 of 33 sites with a history of confirmed or possible nesting, including all major sites. All of the unvisited sites are of low priority that have no recent evidence of nesting. Adults were present at 23 sites, and breeding was confirmed at 17 sites; 2241 adults and 971 active nests were counted. The total number of active nests was up from 814 in

2000. RMBO surveys of other lakes counted 634 non-breeding adults at an additional 60 sites.

American Bittern (FS-SS). Although we did not attempt a state-wide survey of this species in 2001, we continued compiling known nesting sites for future surveys. We conducted some preliminary counts incidental to visiting these sites for other species and gathered count data from agencies. The database contains 29 sites. We visited or received reports on 17, nine of which were occupied by at least one singing male (total = 15). We are cataloguing sites and devising protocols for surveying this species in the future.

Great Blue Heron – We surveyed 154 of 159 sites in the database. With one exception, the unvisited sites have not been active for more than three years. We were denied access to Empire Reservoir, the only unvisited site with any likelihood of having more than ten nests. We have formally requested permission to access this site in 2002. Of those visited, adults were present at 80 sites, and 78 sites had at least one active nest; these sites contained a total of 1196 active nests. In surveys conducted in 1981-1983, Miller and Graul (1987) found 55 sites that were active for at least one of the three years. The sum-of-highest counts for these sites was 1448 nests, and the seven largest colonies accounted for more than 50% of the population. In three years (1999-2001), we have noted 102 sites to be active for at least one of the three years. The sum-of-highest counts for these sites was 1875 nests, and the twelve largest colonies accounted for more than 50% of the population. Only the Chatfield colony was among the largest colonies in both time frames, and this colony has moved nearly a mile upstream since 1983.

Great Egret – A cooperator surveyed the historical colony on Boulder Creek and counted four active nests, down sharply form 19 in 2000, which had been the highest count. The ColonyWatch volunteer for the Longmont colony found six active nests; this was a new site in 2000, with one nest. Another volunteer observed a pair (not observed to be nesting) at Milton Reservoir, Weld Co..

Snowy Egret – All 21 of the historical and potential breeding sites in the database were surveyed. We found nests and/or juveniles at seven sites and counted 482 adults at these sites. Based on flight-line counts and a nest count at Adams Lake, we estimate that there were 232 active nests in 2001. The numbers were very similar to those of 2000, when we counted 495 adults at six active breeding sites. A new nesting site found in 2001 at Timnath Reservoir represents the first breeding record for Larimer County.

Cattle Egret – All 11 of the historical and/or potential breeding sites in the database were surveyed. We counted 108 adults at four sites that had either active nests or juvenile birds. Based on flight-line counts and a nest count at Adams Lake, we estimate that there were 67 active nests in 2001. In 2000, we estimated 51 active nests. Because this species is very difficult to monitor without undue disturbance of nesting activities, these estimates have a fairly wide margin of error and do not indicate any population change.

Green Heron – We did not formally survey the seventeen sites where nesting has been confirmed or suspected. We received reports of birds present in six locations during the nesting season but no confirmations of breeding.

Black-crowned Night-Heron – We surveyed 36 of 40 historical and potential sites in the database and counted nests and/or juveniles at 18. All of the sites not visited are low priority sites that have no recent evidence of nesting. Observers counted 463 adults, and we estimate approximately 388 active nests. In 2000, we counted 406 adults and estimated 225 nests. Because this species is difficult to monitor without undue disturbance of nesting activities, these estimates have a fairly wide margin of error. Annual variations thus far detected probably reflect

improvements in coverage and monitoring protocol rather than any population change. Surveys during the past three seasons have increased understanding of the distribution and abundance of this species, and we have greater confidence in the counts and estimates for 2001 than in previous years.

White-faced Ibis (BLM-SS; FS-SS) – *MCB* staff, volunteers, and U.S. Fish & Wildlife Service employees surveyed all 20 sites where nesting by this species has been previously confirmed or deemed probable and confirmed breeding at four, all in the San Luis Valley. Observers counted 4189 adults at the nesting sites, nearly a 20% increase over the count of 3403 in 2000. Because this species is difficult to monitor without undue disturbance to nesting activities, these estimates have a wide margin of error. Annual variations thus far detected may reflect improvements in monitoring protocol at least as much as population change; however, this species has clearly increased in numbers in recent years. As protocols are refined, the margin of error will decrease significantly. Based on flight-line counts and a nest count at Adams Lake, we estimate that there were approximately 3470 active nests in 2001.

Osprey (FS-SS). We obtained data on 78 of 88 recently occupied nest sites by survey or receiving reports from volunteers and agency biologists. Unvisited sites were primarily sites for which we had inadequate information to find. Fifty-two nests were found to be active, 34 of those in Grand County.

Northern Goshawk (BLM-SS; FS-SS). We recorded eight individuals of this species on eight transects in six habitats (Aspen, High-elevation Riparian, Mixed Conifer, Montane Shrubland, Piñon-Juniper, and Ponderosa Pine). We recorded three individuals in each of the 1999 and 2000 field seasons. The spread of habitats in which we have recorded the species over the past three years points out the habitat-generalist nature of the species and the low density in which it occurs in montane Colorado. We suggest that existing programs to monitor this species, particularly on USFS lands, continue and that additional and more thorough attempts be made to monitor the species statewide. We plan to gather data from all USFS districts in the future as one way to accomplish this.

Ferruginous Hawk (CO ETSC; BLM-SS; FS-SS). We counted only 10 Ferruginous Hawks on seven Grassland transects. This is an increase from the previous year's total of two individuals on two Grassland transects. In 2001, the Prairie Partners program of RMBO conducted a preliminary statewide survey for this species (focusing on finding active nests). In 2002, we will continue to work with Prairie Partners to develop an effective survey method for this species.

Snowy Plover (BLM-SS; FS-SS). *MCB* did not plan any effort for this species in 2001. In preparation for initiating census efforts in the future, we beagn compiling playa lake locations in southeast Colorado.

Mountain Plover (Candidate-ESA; CO ETSC; BLM-SS) We counted only five birds, all on a single Grassland transect. As with Ferruginous Hawk, the Prairie Partners program at RMBO is developing an effective methodology to monitor this species through section-based surveys. In 2001, we also conducted a pilot road-based effort to monitor low-density Grassland species (e.g., Swainson's Hawk, Mountain Plover, Long-billed Curlew, Burrowing Owl, and Loggerhead Shrike). The initial year's data are promising and this technique may be the most efficacious way to monitor these species (RMBO data).

Willet – *MCB* staff surveyed all major historical locations in North Park and counted 103 birds (vs. 83 in 2000, 77 in 1999, 112 in 1998 (Leukering et al. 2001b and Giroir 1999). We also recorded small numbers of Willets at Fruitgrowers Reservoir, Delta Co. (2), and at Yampa River wetlands in Moffat County (3).

Upland Sandpiper (FS-SS). We counted only two individuals on two transects, one each in Grassland and Low-elevation Riparian. However, the Prairie Partners section-based efforts instigated in 2001 show promise in monitoring this species.

Long-billed Curlew (CO ETSC; BLM-SS; FS-SS). We recorded only two individuals, one each on single Grassland and Sage Shrubland transects. This is similar to 2000 results in which two individuals were recorded, both on Grassland transects. As for Mountain Plover, the early-season transects in eastern Colorado resulted in much better data on this species (RMBO data).

Franklin's Gull – The colony at Walden Reservoir remains the only documented colony in the state, and it continues to grow despite very low water levels at this reservoir in 2001. The count at the colony has expanded from five adults in 1999 to 84 in 2000 to 102 in 2001. Although this species was detected at a number of other sites, no evidence of breeding was observed away from Walden Reservoir. The lakes and ponds survey counted an additional 2680 adults, but these were almost entirely all early fall migrants, as very few counts detected the species prior to July.

California Gull – RMBO field workers and volunteers visited all nine historical or potential sites and found adults present at all sites and confirmed breeding at three: MacFarlane and Walden reservoirs in North Park and Riverside Reservoir in Weld county. Totals of 1833 adults and 273 juveniles were counted at these sites. The colony at Antero Reservoir failed, probably due to disturbance from recreationists. The birds were discouraged from nesting at the Arkansas Valley sites to protect nesting Least Terns and Piping Plovers from predation. None of the intermittent sites were active. The extensive survey of lakes counted 804 non-breeding birds at 37 sites.

Forster's Tern – We surveyed all six historical nesting sites and confirmed nesting at three: Walden Reservoir; Lake John Annex; and Cowdry Lake; all in Jackson County, with 71 adults present at these sites, 60 at Lake John Annex. Either active nests or flightless juveniles were seen at each site. No nesting was documented in the San Luis Valley; although adults were observed at Blanca Wetlands in June.

Black Tern (BLM-SS; FS-SS). Two colonies of six and ten pairs, respectively, were found at two marshes on private land south of Alamosa. Adults carrying food and performing distraction displays confirmed nesting. We counted another 92 birds at 15 sites through the extensive lake survey, but no evidence of breeding was found at any of these sites. Despite widespread efforts to locate pairs of this marsh-dependent species in each of the previous two seasons, we could not confirm nesting in the state and counted fewer than twenty birds each year. In the first half of the 20th century, significant colonies of these terns nested in North Park, San Luis Valley, and the marshes of the South Platte and Arkansas rivers. Although the discovery of these active colonies provides hope, this species is on the verge of extirpation as a breeder in the state and requires **immediate attention** (cf. Kingery 1998 for data from the Breeding Bird Atlas period).

Yellow-billed Cuckoo - (BLM-SS; FS-SS). *MCB* staff detected 11 on six Low-elevation Riparian transects. This is up considerably from 2000 in which only three individuals were detected on three Low-elevation Riparian transects. Because the species is highly dependent on certain caterpillar populations that are periodic in nature, we expect to see great variation in numbers of cuckoos from year to year. Additionally, in all of our field work in western Colorado in 2001, we detected only one cuckoo, a singing bird near Grand Junction. In the past four years, we have been unable to find this potential ESA-Candidate subspecies at more than one site in western Colorado.

Burrowing Owl (CO ETSC; FS-SS). In 2001, we detected 15 individuals on transects in three habitats (Grassland, Sage Shrubland, and Semi-desert Shrubland), with Grassland providing 13 of those detections. Because this species is not randomly-distributed across the landscape (i.e., owls

occur in loose colonies), it is likely that our numbers will vary depending on which Grassland transects are conducted. The Prairie Partners section-based efforts will help provide valuable data on this species. On the Western Slope, fairly intensive searches resulted in the finding of only 13 owls at nine locations in the 2001 nesting season. This species has declined sharply in this part of the state during the past decade. Three owls in two locations were reported in the San Luis Valley, where the species is rare. The Boulder County Nature Association tracked this species in Boulder County, documenting five nesting attempts, the highest number of nesting pairs in the county since the late 1980s (Steve Jones, pers. comm.).

Black Swift (FS-SS). RMBO staff and volunteers visited 117 waterfalls this season, surveying 39 of the 48 previously known colony sites and searching for evidence of nesting at 78 others. They observed adults, active nests, or juveniles at 55 sites and discovered 18 new breeding colonies. In all, they counted 216 adults, 53 active nests, and 22 juvenile birds. The two-year total for this effort now extends to 165 waterfalls surveyed and 24 new colonies discovered.

Lewis's Woodpecker (FS-SS). In 2001, we recorded 32 locations where field staff and volunteers found this species. We will import Breeding Bird Atlas locations and, in the future, select some percentage of those locations for focused effort.

Three-toed Woodpecker (FS-SS). We detected 16 individuals, one bird each on single Aspen and Mixed-Conifer transects, and 14 on eight Spruce-Fir transects. The results are similar to 2000, in which 14 individuals were detected in three habitats (Lodgepole, Mixed Conifer, and Spruce-Fir). In the future, we are optimistic about USFS-funded possibilities to conduct state-wide transects in recently-burned areas, specifically targeted at Three-toeds and Olive-sided Flycatcher.

Olive-sided Flycatcher (FS-SS). We counted 62 individuals on 38 transects in seven habitats, down slightly from 68 on 50 transects in nine habitats in 2000. However, seven of those birds were recorded in Lodgepole Pine, a habitat in which we did not conduct transects in 2001. Last year, we recorded highest densities of Olive-sideds in High-elevation Riparian. This year, Ponderosa Pine accounted for the highest number of detections (n=16), with Mixed Conifer (n=12) and Spruce-Fir (n=10) being the only others in which we recorded 10 or more detections.

Willow Flycatcher (FS-SS). We detected 11 individuals on four transects in three habitats (High-elevation Riparian, Low-elevation Riparian, and Montane Shrubland) in 2001. One High-elevation Riparian transect accounted for eight of these detections. Because this species is a Mid-elevation Riparian specialist (a non-funded habitat), we anticipate that the running of this habitat's transects would produce solid data on Willow Flycatcher.

Black Phoebe – Surveys located 39 birds at 34 sites along the San Miguel River, the highest count yet recorded in this area. The territory on the Colorado River in Garfield County was occupied for the fourth consecutive year. One pair was reported from the St. Charles River in Pueblo County where at least two pairs were reported and nesting was documented in 2000.

Bell's Vireo – We located 19 singing males (and seven females) in a small area along Black Wolf Creek and six singing males at two spots near Bonny Reservoir (both in Yuma County). At least one male continued on a territory at Tamarack Ranch SWA, Logan County. We found no birds at the Wray Fish Hatchery Ponds or along the North Fork of the Republican River where many singing males occupied territories in 2000.

Loggerhead Shrike (FS-SS). We counted 23 Shrikes on 14 transects in three habitats with the majority being in Semi-desert Shrubland (20 birds on 11 transects). The results are similar to our 2000 results in which we counted 24 Shrikes on 16 transects in four habitats, with the majority being in Semi-desert Shrubland (18 birds on 11 transects). If we increase the number of transects in Semi-

desert Shrubland (this habitat on the West Slope of Colorado is very different from the same habitat on the east side of the state), either through increasing the overall number or through separating the habitat into component east-side and west-side habitats, we anticipate that sample size of this species will increase. As for Mountain Plover, the early-season transects in eastern Colorado resulted in better data on this species (RMBO data).

Purple Martin (FS-SS). RMBO field staff and volunteers surveyed 92 of 124 known sites with a history of confirmed or likely nesting by this species. They observed 262 adults at 69 of those sites and confirmed breeding at 54 sites, locating a total of 107 nests. Nest data were gathered for a study of habitat requirements conducted by RMBO's Forested Ecosystems Program.

Pygmy Nuthatch (FS-SS). For the third year in a row, the *MCB* field season produced good data on this species. We counted 86 individuals on 20 Ponderosa Pine transects (in 2000 we detected 83 birds on 20 Ponderosa Pine transects) and seven individuals in three other habitats (High-elevation Riparian, Mixed Conifer, and Montane Shrubland). This resulted in a very low CV, 20.1%, in a one-parameter model. Should we continue to get comparable results, we will be able to detect a trend in <12 years.

Golden-crowned Kinglet (FS-SS). Although we conducted more transects this year than in 2000, the total of detections of this species was much lower. We detected only 56 individuals on 21 transects in four habitats (Aspen, High-elevation Riparian, Mixed Conifer, and Spruce-Fir). In contrast, in 2000 we recorded a total of 139 individuals on 38 transects in six habitats, with Spruce-Fir transects providing over half of the detections. The data obtained in Spruce-Fir this year were robust with only one parameter involved in the detection-curve function and a CV of 17.6%. The data suggest that Spruce-Fir transects alone will be able to effectively monitor the species in a fairly short time period (<12 years). We will be looking at this species closely over the next few years to determine whether this year's detection rate was an anomaly.

Ovenbird – We found no Ovenbirds in two historical sites in Boulder County. Although we surveyed five historic sites and counted nine territorial males, time constraints largely curtailed planned efforts to locate new sites.

Grasshopper Sparrow (FS-SS). We detected 156 individual Grasshopper Sparrows on 16 transects in two habitats, including 128 birds on Grassland transects. This is considerably lower than in 2000 in which we counted 230 individuals on 17 transects in three habitats (183 on Grassland transects). The CV of the selected, two-parameter model was 13.0%. The data suggest that the Colorado population can be effectively monitored by *MCB* in <12 years.

Fox Sparrow (FS-SS). As in 1999 and 2000, the data that we obtained on Fox Sparrow in 2001 were surprisingly robust. We counted 31 birds in four habitats, with Alpine Tundra accounting for 12 individuals on six transects. Because Fox Sparrows are associated with High-elevation Riparian habitat, it is not surprising to encounter them on other high-elevation habitat transects. However, it is surprising that the highest total would be from Alpine Tundra. For all habitats combined, the CV was low (**24._%**). Should we continue to obtain robust data over the years, we will obtain trend detection for this species in <12 years.

Bobolink – RMBO field staff and volunteers surveyed 50 sites and counted 281 adults, 221 of those singing males. Coverage was nearly complete for the Yampa River, White River, Boulder Open Space, Elbert County, Gunnison Basin, and San Miguel Basin populations. We received no reports of the species from the South Platte River valley.

Scott's Oriole – We surveyed 24 of 25 historical territories and counted 16 adults, including 14 males defending territories. The Godiva Rim area in Moffat County, which had a territorial male

in the early 1990's was not surveyed. The Ninaview BBS route in Las Animas County had this species for the second successive year.

In addition to various species of management concern, we wish to discuss a small number of species that are of interest to us. In this vein, we have selected these species from all habitats.

Alpine Tundra: This habitat is the most inaccessible of all habitats in this program, mostly due to lack of roads, and is the last habitat for which transects are run in the field season. As we cannot run transects in the habitat until the end of the season and since the Alpine Tundra transect period overlaps that of a few montane forest habitats, Alpine Tundra transects tend to get short shrift when workers decide which transect to run on a given day in that overlap period. Regardless, we have firmly established 25 transects.

American Pipit - We detected 496 on 24 transects. We truncated the distance estimates at 175 meters, thus removing 17 long-distance outliers. The resultant model (Appendix A) produced a nicely-low CV of 10.8%. This species illustrates a very stable pattern of detections and of density-modeling (the CV from the 2000 density estimate was 10.9%) which suggests that trend detection will be possible in about six years.

Aspen: A number of Aspen transects include points in recent clear cuts, and the transects traverse stands of a wide range of age classes and seral stages. Aspen is seldom a climax vegetation, and many transects contain significant incursions of spruce-fir and other conifers. As a result, these transects provide detections of a number of species generally associated with conifers. These transects should do a good job of tracking changes due to manipulation, especially clear-cut logging, and natural succession.

Red-naped Sapsucker - In Aspen, we detected 31 on 18 transects. The truncated model (at 113 meters; losing three detections) produced a CV of 32.0%, well within our target of 50% or less. Small patches of Aspen typically lie along the edges of streams flowing through coniferous forests, so this species appeared regularly on transects through these conifer-dominated habitats. Red-napeds primarily excavate cavities in aspens, but they forage heavily in willows, thus its highest concentrations are in Aspen close to riparian zones. We can expect a significant increase in detections when we add Mid-elevation Riparian transects to the program.

Grassland: This habitat, which we have *a priori* limited to that on the eastern plains of Colorado, is primarily in private ownership. Colorado contains a large portion of the shortgrass prairie region and many species reach high densities in Colorado. Colorado shortgrass prairie is also important for low-density species (Long-billed Curlew and Loggerhead Shrike), those which initiate nesting prior to us conducting transects (Mountain Plover), and colonial species (Burrowing Owl) which point transects do not obtain sufficient sample sizes to monitor. RMBO has a particular interest in this habitat and we are, primarily through our Prairie Partners program, implementing additional efforts to monitor the birds of this imperiled habitat.

Cassin's Sparrow - In Grassland, we detected only 42 individuals on six transects. These numbers compare poorly to the 181 individuals on 12 transects with a CV of 13.7%. However, this species, like many grassland-breeding species, is highly nomadic and exhibits little fidelity to nesting areas. Instead, the species' populations track available resources, which are highly dependent upon local rainfall. Therefore, there are years when the species is numerous and widespread in the state,

as in 2000. In other years, they are relatively scarce, as in 2001. In most years, we also detect this species in numbers in two other habitats on the eastern plains, Semi-desert Shrubland and Sage Shrubland. This year's numbers for those two habitats were 26 individuals on four transects (in 2000, 110 on eight) and 29 individuals on two transects (in 2000, 30 on two), respectively. Despite the lower sample sizes (except in Sage Shrubland), the results from all three habitats were robust, with a Grassland CV of 26.4% (30.9% in Sage Shrubland and 28.3% in Semi-desert Shrubland). However, the great year-to-year swings in abundance of Cassin's Sparrow in the state will mean that true trend detection will take longer than it would for similar species with breeding-site fidelity.

Lark Bunting - The 2001 data set (652 individuals on 19 transects) for the State Bird produced a CV of 9.7% on a density estimate on the eastern plains Grassland transects of 0.61 individuals/hectare. The 2000 density of 0.60 individuals/hectare was based on a sample of 563 individuals on 16 transects. The extreme nomadism shown by Lark Buntings makes local monitoring of breeding populations difficult, as among-year variance is high. This is even true for large "local" areas as the eastern plains of Colorado. BBS data suggest a long-term decline in this species' population (Sauer et al. 2001). Though Lark Bunting is probably suffering through a decline (it has certainly lost range to the developing Front Range metropolitan areas in Colorado), it is difficult to be confident of specific numbers when the center of breeding abundance can shift from state to state among years. We also detect Lark Buntings in large numbers in Sage Shrubland and Semi-desert Shrubland, two habitats that mimic the Bunting's requirement of grass and a structure component. The 2001 data set from Sage Shrubland and Semi-desert Shrubland were of 286 on nine transects (CV of 13.6%) and 39 individuals on six transects (CV of 32.1%), respectively. In 2000, the corresponding numbers were 88 on three transects and 48 on four transects, respectively.

High-elevation Riparian: This habitat designation is aimed at willow-riparian bird communities, thus quite a few species that are typical of more-forested riparian habitats (e.g., Western Tanager) are not targeted here. We are currently not conducting transects in Mid-elevation Riparian, which would target such species. High-elevation Riparian transects typically run through coniferous and/or aspen forests, thus incidentally increasing sample sizes for some forest bird species.

Wilson's Warbler - In 2001, we recorded 115 individuals on 14 High-elevation Riparian transects. The results from this habitat are good (Appendix A; CV of 17.6%) and suggest that we will detect a trend in <10 years, assuming that CVs do not change appreciably over the years.

Lincoln's Sparrow - We detected 552 individuals on 44 transects in the species' two primary Colorado habitats: Aspen (199 on 23 transects) and High-elevation Riparian (353 on 21 transects). Within High-elevation Riparian, an excellent model was produced by a truncation of detections at 103 meters, including a CV of 11.1%. The Aspen data were truncated at 94 meters and produced a CV of 12.0%. These are both superb CVs and will produce trend detection in fewer than ten years.

Lodgepole Pine: Due to insufficient funding and staffing levels, we were unable to continue work in this habitat. However, it remains a high priority to add for future years of *MCB*.

Low-elevation Riparian: This habitat is one of the more difficult in which to conduct transects. The transects require two personnel, are run mostly through private property, have high diversity and density of bird species, and are dependent on appropriate water levels to allow floating a canoe or raft. Thus, low water, such as in 2001, posed a problem.

Bullock's Oriole - *MCB* recorded this species primarily on Low-elevation Riparian transects,

with 37 individuals on 20 transects. The good CV produced by the untruncated model is sufficient. However, this species' breeding season is strongly constrained at the end, due to the adults' need to perform a molt migration to the American southwest and northern Mexico (they typically leave in July). Thus, we can probably reduce the CV in future years when we can conduct the Low-elevation Riparian transects in a tighter time frame than we have managed so far.

Mixed Conifer. This designation is aimed at the white fir-invaded ponderosa pine habitats in southwestern Colorado, but also includes a variety of tree species associations. These include Douglas-fir and blue spruce, Douglas-fir and ponderosa pine, and lodgepole pine and Engelmann spruce. Also in this habitat are various mixed or homogeneous stands involving bristlecone pine and limber pine. Due to this heterogeneity in habitat definition, the avifauna from transect to transect varies more than in most other habitats. Despite this, we obtained robust sample size for many bird species (Appendix A).

Cordilleran Flycatcher - Though we do not consider this species a target in this habitat, we did detect 49 individuals in Mixed Conifer with the resultant density estimate having a low CV of 14.5%. When we can add Mid-elevation Riparian to the set of habitats in which we conduct transects, we will probably obtain a much greater sample for this species.

Montane Shrubland: This habitat is found throughout the state in the foothills and lower montane elevations and, in most areas, is dominated by Gambel's oak. The two species represented below can be found anywhere that this habitat occurs. Since the Colorado breeding range of Virginia's Warbler (Andrews and Righter 1992, Kingery 1998) coincides fairly strongly with the range of Gambel's oak in Colorado (Kelly 1970), we suggest that it is more of an oak obligate. This habitat is, physically, the most challenging in which to establish transects due to the high density in which oak tends to grow. Therefore, many transects are located on trails or roads.

Dusky Flycatcher - We detected 228 individuals on 26 Montane Shrubland transects. That habitat provided solid results (a CV of 12.7%) indicating that we will be able to detect a trend for this species in <10 years. Dusky Flycatcher occurs in other habitats where the species' structure requirements are met (open canopy and a dense understory layer), but achieve highest densities in Colorado in Montane Shrubland.

Virginia's Warbler - We detected 109 Virginia's Warblers on 22 transects in this habitat. The species is strongly associated with Gambel's Oak whether it is under an overstory or not, thus explaining its strong representation in Ponderosa Pine, which often has an oak understory (41 individuals on 15 transects; CV of 24.1%).

Piñon-Juniper: Like Sage Shrubland, this habitat has two geographically-different avian components. The western portion contains most of the habitat obligates, e.g., Gray Flycatcher, Gray Vireo, and Black-throated Gray Warbler. The eastern portion contains relatively fewer individuals of these species, but includes one species found in West-Slope Piñon-Juniper only in the southwest: Cassin's Kingbird. West-Slope Piñon-Juniper begins to peter out north of Grand Junction, where it starts to become more juniper-dominated, eventually appearing only on hills in vast areas of Sage Shrubland in the northwest corner of the state. On the East Slope, Piñon-Juniper is rare north of Colorado Springs, with the largest portion from the New Mexico border north to Pueblo, mostly on private and Department of Defense lands. We are considering splitting this habitat into two in the future and allocating 30 transects in the eastern range (where we currently have none).

Gray Flycatcher - We detected 146 individuals on 20 transects in 2001. The truncated (at 99 meters) data set produced a good model with a CV of 12.2%. With continued low CVs, we should detect a trend for this species in <10 years. In Colorado, Gray Flycatchers prefer Piñon-Juniper with a sage understory, so we expect to record this species in some numbers in Sage Shrubland, where there are junipers. In 2001, we recorded too few individuals in that habitat to analyze our distance data.

Juniper Titmouse - This is a Piñon-Juniper specialist throughout its wide range, though it occurs rarely in high densities. We detected 68 individuals on 18 transects. We truncated the data set of distance estimates at 104 meters (excluding eight detections), obtaining a model with a CV of 41.2%. As for all cavity-nesting species in Piñon-Juniper, Juniper Titmice require older stands with trees large enough to house cavities sufficiently large for their makers (usually Hairy Woodpecker in western Colorado). This is likely the primary reason we detected this species on only 18 transects.

Black-throated Gray Warbler - We detected 214 individuals on 29 transects in Piñon-Juniper. This is one of the very few species that we recorded on every transect in the species' target habitat. The CV produced from the truncated data set (at 109 meters) was a low 14.5%.

Ponderosa Pine: Fire suppression in the past century may have significantly altered the structure of ponderosa pine stands in the state and consequently the relative abundance of a number of the bird species. Our transects should do a good job of tracking changes due to efforts to manage stands with the goal of restoring them to historical conditions. Controlled burns have already been conducted on established transects.

Western Bluebird. Analysis of data for this species yielded a good CV of 27.6%, even though we detected only 31 individuals on 13 transects in Ponderosa Pine. In 2000, we detected 32 Western Bluebirds on ten transects. This species prefers open ponderosa stands more similar to those that are believed to be the historic condition. Thus, fire suppression has probably caused a general decline of these bluebirds in many places.

Grace's Warbler. Field workers detected 40 individuals on eight Ponderosa Pine transects. This is the greatest number that we have censused for this Ponderosa Pine obligate in the four years of conducting transects in this habitat. The CV provided (18.5%) by the untruncated data set was excellent considering that the species occurs in Colorado only in the southwestern corner and one can expect to record Grace's Warblers on fewer than ten transects every year.

Sage Shrubland: Data from this habitat may be affected by an avifauna that varies considerably between the big sagebrush transects of the Western Slope and the sand sagebrush transects on the eastern plains. Future years may require additional transects in one or both of these habitats in order to achieve adequate sample size for some species. Species makeup and population sizes also may be affected by large-scale changes that have occurred in this habitat; Piñon-Juniper has expanded into the pre-settlement range of sagebrush, bringing with it a new array of birds, and birds detected in smaller Sage Shrubland stands often reflect this incursion. It may be necessary to establish transects in larger stands to insure that we are detecting the proper array of species.

Brewer's Sparrow. This was the most frequently detected species on Sage Shrubland transects, with 381 counted on 18 transects (in 2000, 364 individuals on 18 transects). The CV provided by the truncated (at 129 meters) data set was 14.1%. This seems high, considering the abundance of the species in the habitat. However, the dichotomy between west-side big sagebrush and the eastern plains sandsage possibly accounts for this, as Brewer's Sparrow occurs only

sporadically in the latter and at lower densities. This species is also common in Semi-desert Shrubland, in which we detected 179 individuals (on 15 transects). The resultant CV was a low 13.4%. We should obtain trend detection for this species in both habitats in <12 years. However, Brewer's Sparrow is exhibiting a general population decline (BBS data) that, if expressed in Colorado, would extend the period necessary for trend detection.

Sage Sparrow. In 2001, we detected only 24 individuals on six transects. This is many fewer than in 2000 (46 on six transects). The sample size fell below our threshold for analysis. However, as Sage Sparrow is a target species, we conducted the analysis but do not have confidence in the results, due to the low sample size. Again, this species' peak song period occurs in April, considerably earlier than the window in which we conduct Sage Shrubland transects. Thus, the vagaries of early-season weather, which could encourage or discourage early nesting by this species, can greatly affect the number of Sage Sparrows we detect. If nesting starts early and is not negatively impacted by weather, then few Sage Sparrows will be singing in the second half of May, as their breeding season is then nearly complete. Effective monitoring of this species would require conducting transects as much as a month earlier at a time when few (if any) other locally breeding species have arrived from winter quarters to the south. Thus, we would need to conduct transects in the habitat twice which would create a large, added expense to monitoring Sage Shrubland birds.

Semi-desert Shrubland: This is another habitat for which there are major differences in the avian composition between east and west slopes. The east slope habitat supports Scaled Quail, Greater Roadrunner, Curve-billed Thrasher, Canyon Towhee, Cassin's Sparrow, and Lark Bunting. The west slope Semi-desert Shrubland avifauna lacks these species and is depauperate, being dominated by Horned Lark. We should consider splitting this habitat into east- and west-slope types and establishing 30 transects in each.

Lark Sparrow - In 2001, we detected only 211 individuals on 18 transects (377 individuals on 20 transects in 2000). BBS data (Sauer et al. 2001) show a long-term decline in the species' breeding populations which, in combination with our data, suggests that Lark Sparrow requires focused attention. The CV of 15.1% is higher than last year's 8.0%, probably due to the lower sample size.

Spruce-Fir: This habitat shares virtually all of its species with other conifer forest types in Colorado. However, most species typical of spruce-fir achieve their highest densities in that habitat, though a few reach highest density in either Lodgepole Pine or Mixed Conifer.

Golden-crowned Kinglet - This is a conifer specialist throughout its wide range and, in Colorado, is most common in spruce-fir, but with populations in most forests containing a strong fir or spruce component. In 2001, we detected 31 individuals on 12 transects with a resultant CV of 24.7%. This is a much lower sample size than the 88 individuals on 18 transects (CV of 14.6%) recorded in 2000. The reason for such a dramatic difference in detections is unknown.

Wetland: The two species discussed here illustrate the main problem with the Wetland transects, the strong disparity in avifaunas in the two basic wetland types: meadows and tall emergent growth (e.g., cattail and bulrush) with open water. Because we currently consider these as one habitat, we have problems with obtaining sufficient sample size on most species. This may require us in the future to increase the number of transects that we conduct in Wetlands.

Marsh Wren - This species is a Wetland specialist, preferring tall, emergent annual vegetation, e.g., cattail or bulrush. We detected 65 Marsh Wrens on 12 transects in 2001. The

resultant CV of 29.8% is sufficient to provide for trend detection within our targeted period. In Colorado, this species is most abundant in the extensive wetlands in the San Luis Valley with significant populations in other wetland complexes, particularly in North Park. However, on the eastern plains, where there are numerous, but usually small, wetlands, Marsh Wren is of very locally distributed. The species is common at Lower Latham Reservoir, Weld Co., but occurs in only a few other marshes on the plains. Thus, since many of our Wetland transects are in eastern plains marshes, we do not detect the species on half of the Wetland transects in the state.

Yellow-headed Blackbird - Field workers detected 120 Yellow-heads on 14 transects in 2001. The relatively high CV (32.9%) of the density estimate (1.06 individuals/ha) for the sample size we obtained is due to the species' strong coloniality resulting in a large number of birds, but on only about half the transects. Those transects that traverse wetlands with shallower water and that do not support bulrush are not much used by Yellow-headed Blackbirds for nesting.

Conclusions and recommendations

Though this report is not the place that we intend analysis of the program as a whole, some conclusions from the operation of this program are warranted here, now that RMBO has nearly completed establishment of most aspects of *MCB*. We will treat most of these items in more depth in the subsequent, program-analysis report. Our transect methodology obtains large sample sizes for a sizable percentage of Colorado's avifauna. Completing every habitat's transects would provide for sufficient sample size for a few additional species that are currently not monitored due to low sample sizes. In consultation with our funders, we should re-examine some of the habitat designations, specifically all of the Bureau of Land Management-funded habitats (Piñon-Juniper, Sage Shrubland, and Semi-desert Shrubland), as each of those habitats is quite different on opposite sides of the state. We are looking for ways to streamline the project to make it more efficient and cost-effective. However, the project is costing more and more as costs in all budget sectors are rising. RMBO has not passed along these rising costs since the project's inception, but we can ill afford to continue this. We will need to raise funding levels in the near future or consult with our funders to determine what aspects of the program can be dropped in order to save other aspects.

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Appendix A. *MCB* year 2001 results of DISTANCE analysis for species with sample sizes >24 in individual habitats or in all habitats combined (except for Sage Sparrow with sample of 24). *= target habitat for species indicated; m=number of parameters required to fit detection-curve function to data in selected model; ESW=Effective Strip Width (distance inside which at least 50% of birds present are detected); D=density estimate, individuals per hectare (from program DISTANCE); D LCL and D UCL=Lower and upper, respectively, 95% confidence intervals of density estimate; D CV=coefficient of variation of the density estimate; P=probability of detection; Total n=untruncated sample size; Model n=sample size used in selected model; Proportion of total n used=proportion of Total n used in the selected model.

Species	Habitat	m	ESW	D	D LCL	D UCL	D CV	P	Total n	Model n	Proportion of total n used
American Coot	Wetland*	1	122.4	0.136	0.056	0.333	0.462	0.61	30	30	1.00
Killdeer	Low-elevation Riparian*	1	23.9	0.191	0.101	0.362	0.321	0.60	38	38	1.00
Spotted Sandpiper	Low-elevation Riparian*	1	26.3	0.251	0.178	0.354	0.173	0.42	55	55	1.00
Mourning Dove	Grassland	2	106.4	0.060	0.040	0.092	0.217	0.23	85	70	0.82
Mourning Dove	Low-elevation Riparian	1	68.2	0.182	0.127	0.259	0.174	0.53	103	103	1.00
Mourning Dove	Montane Shrubland	1	93.2	0.023	0.013	0.040	0.294	0.32	34	25	0.74
Mourning Dove	Piñon-Juniper	1	122.7	0.023	0.016	0.034	0.192	0.38	66	47	0.71
Mourning Dove	Ponderosa Pine	1	100.9	0.026	0.015	0.045	0.287	0.37	41	36	0.88
Mourning Dove	Sage Shrubland	2	97.0	0.029	0.008	0.113	0.747	0.12	37	35	0.95
Mourning Dove	Semi-desert Shrubland	2	96.7	0.066	0.034	0.130	0.348	0.10	78	76	0.97
Broad-tailed Hummingbird	Aspen*	1	31.7	0.461	0.313	0.678	0.197	0.33	66	62	0.94
Broad-tailed Hummingbird	High-elevation Riparian	1	27.2	0.861	0.629	1.178	0.160	0.20	75	74	0.99
Broad-tailed Hummingbird	Mixed Conifer	1	37.0	0.451	0.328	0.622	0.164	0.22	75	74	0.99
Broad-tailed Hummingbird	Montane Shrubland	1	37.1	0.458	0.345	0.608	0.145	0.20	81	80	0.99
Broad-tailed Hummingbird	Piñon-Juniper	1	37.6	0.158	0.105	0.238	0.209	0.34	30	30	1.00
Broad-tailed Hummingbird	Ponderosa Pine	2	29.9	0.403	0.265	0.613	0.215	0.20	53	49	0.92
Williamson's Sapsucker	All habitats	1	109.8	0.004	0.002	0.006	0.270	0.43	43	43	1.00
Red-naped Sapsucker	Aspen*	1	70.8	0.040	0.020	0.080	0.320	0.39	31	28	0.90
Red-naped Sapsucker	All habitats	1	89.8	0.006	0.004	0.009	0.185	0.45	60	59	0.98
Northern Flicker	Low-elevation Riparian*	1	102.1	0.045	0.029	0.070	0.224	0.50	38	38	1.00
Northern Flicker	Aspen	2	79.1	0.047	0.022	0.098	0.387	0.24	46	39	0.85
Northern Flicker	High-elevation Riparian	1	68.7	0.044	0.025	0.075	0.279	0.41	34	24	0.71
Northern Flicker	Mixed Conifer	1	97.8	0.037	0.026	0.052	0.184	0.33	51	42	0.82
Northern Flicker	Montane Shrubland	1	71.8	0.041	0.024	0.072	0.286	0.39	40	27	0.68
Northern Flicker	Piñon-Juniper	1	233.1	0.004	0.002	0.006	0.229	0.34	26	26	1.00
Northern Flicker	Ponderosa Pine	1	74.0	0.090	0.062	0.129	0.187	0.26	77	67	0.87
Northern Flicker	Spruce-Fir	1	105.1	0.020	0.012	0.034	0.274	0.19	27	27	1.00
Olive-sided Flycatcher	All habitats	1	128.8	0.003	0.002	0.004	0.216	0.63	45	45	1.00
Western Wood-Pewee	Aspen*	2	60.1	0.423	0.327	0.546	0.131	0.31	210	204	0.97
Western Wood-Pewee	Mixed Conifer	1	94.4	0.038	0.023	0.065	0.269	0.50	48	41	0.85

Appendix A. Continued.

Western Wood-Pewee	Montane Shrubland	1	88.3	0.048	0.029	0.081	0.261	0.54	51	48	0.94
Western Wood-Pewee	Ponderosa Pine	2	96.7	0.136	0.080	0.229	0.271	0.47	180	173	0.96
Hammond's Flycatcher	All habitats	1	87.0	0.003	0.001	0.004	0.297	0.54	28	28	1.00
Gray Flycatcher	Piñon-Juniper*	1	44.5	0.527	0.415	0.668	0.122	0.20	146	140	0.96
Dusky Flycatcher	Aspen	2	42.0	0.144	0.056	0.369	0.494	0.26	37	34	0.92
Dusky Flycatcher	High-elevation Riparian	2	52.2	0.242	0.161	0.365	0.210	0.29	79	77	0.97
Dusky Flycatcher	Mixed Conifer	1	51.7	0.106	0.067	0.168	0.235	0.27	34	34	1.00
Dusky Flycatcher	Montane Shrubland*	2	58.5	0.518	0.404	0.665	0.127	0.37	228	225	0.99
Dusky Flycatcher	Piñon-Juniper	2	50.3	0.156	0.073	0.334	0.396	0.14	56	53	0.95
Dusky Flycatcher	Ponderosa Pine	2	47.3	0.302	0.203	0.448	0.203	0.25	95	92	0.97
Cordilleran Flycatcher	Aspen	1	51.8	0.148	0.105	0.208	0.176	0.37	57	53	0.93
Cordilleran Flycatcher	High-elevation Riparian	1	56.6	0.123	0.085	0.179	0.191	0.38	49	46	0.94
Cordilleran Flycatcher	Mixed Conifer	1	68.9	0.086	0.065	0.114	0.145	0.31	49	49	1.00
Ash-throated Flycatcher	Piñon-Juniper*	1	99.3	0.051	0.037	0.069	0.156	0.36	77	68	0.88
Western Kingbird	Grassland	1	64.9	0.070	0.040	0.122	0.292	0.42	46	30	0.65
Western Kingbird	Semi-desert Shrubland	1	90.5	0.025	0.014	0.045	0.300	0.27	25	25	1.00
Eastern Kingbird	Low-elevation Riparian	2	45.7	0.142	0.085	0.236	0.254	0.40	54	54	1.00
Plumbeous Vireo	Montane Shrubland	1	70.4	0.046	0.027	0.077	0.267	0.43	32	29	0.91
Plumbeous Vireo	Piñon-Juniper*	2	82.0	0.083	0.054	0.128	0.222	0.31	83	75	0.90
Plumbeous Vireo	Ponderosa Pine	2	97.7	0.068	0.050	0.091	0.150	0.41	88	88	1.00
Warbling Vireo	Aspen*	1	62.9	1.043	0.930	1.170	0.059	0.09	552	552	1.00
Warbling Vireo	High-elevation Riparian	1	62.0	0.353	0.279	0.446	0.120	0.20	160	158	0.99
Warbling Vireo	Mixed Conifer	1	77.1	0.324	0.280	0.375	0.075	0.31	232	231	1.00
Warbling Vireo	Montane Shrubland	1	64.7	0.427	0.349	0.523	0.104	0.19	232	227	0.98
Warbling Vireo	Ponderosa Pine	2	73.8	0.197	0.153	0.253	0.129	0.52	157	146	0.93
Warbling Vireo	Spruce-Fir	2	75.0	0.054	0.033	0.089	0.258	0.61	37	37	1.00
Gray Jay	Spruce-Fir*	1	65.6	0.054	0.031	0.094	0.288	0.28	28	28	1.00
Steller's Jay	Aspen	1	94.2	0.031	0.019	0.051	0.257	0.33	43	37	0.86
Steller's Jay	High-elevation Riparian	1	97.2	0.028	0.017	0.046	0.256	0.29	32	31	0.97
Steller's Jay	Mixed Conifer*	2	80.9	0.120	0.088	0.163	0.158	0.19	102	94	0.92
Steller's Jay	Ponderosa Pine	1	87.7	0.116	0.091	0.148	0.123	0.38	149	122	0.82
Steller's Jay	Spruce-Fir	1	97.7	0.040	0.029	0.057	0.175	0.33	47	47	1.00
Blue Jay	Low-elevation Riparian*	1	93.3	0.050	0.026	0.097	0.335	0.69	39	39	1.00
Western Scrub-Jay	Montane Shrubland*	1	63.4	0.065	0.038	0.110	0.272	0.40	39	33	0.85
Western Scrub-Jay	Piñon-Juniper	1	94.3	0.038	0.024	0.058	0.225	0.26	50	45	0.90
Clark's Nutcracker	Spruce-Fir*	1	133.3	0.018	0.012	0.027	0.215	0.38	43	39	0.91
Black-billed Magpie	Low-elevation Riparian	1	75.2	0.040	0.021	0.077	0.333	0.67	26	25	0.96
Black-billed Magpie	Semi-desert Shrubland	1	168.5	0.015	0.009	0.026	0.270	0.54	53	56	1.06
Common Raven	Piñon-Juniper	2	161.2	0.012	0.005	0.031	0.490	0.03	43	43	1.00
Common Raven	Ponderosa Pine	1	153.0	0.007	0.004	0.012	0.276	0.37	27	22	0.81

Appendix A. Continued.

Western Wood-Pewee	Montane Shrubland	1	88.3	0.048	0.029	0.081	0.261	0.54	51	48	0.94
Horned Lark	Alpine Tundra	1	84.3	0.125	0.096	0.161	0.132	0.30	103	103	1.00
Horned Lark	Grassland*	2	95.6	0.488	0.411	0.580	0.088	0.23	490	457	0.93
Horned Lark	Sage Shrubland	2	38.8	1.316	0.979	1.768	0.151	0.13	279	251	0.90
Horned Lark	Semi-desert Shrubland	1	70.6	0.584	0.477	0.715	0.104	0.22	360	356	0.99
Violet-green Swallow	Aspen*	2	51.6	0.115	0.067	0.199	0.282	0.23	44	41	0.93
Violet-green Swallow	High-elevation Riparian	1	43.1	0.166	0.106	0.260	0.230	0.09	36	36	1.00
Violet-green Swallow	Mixed Conifer	1	57.7	0.093	0.057	0.151	0.251	0.40	40	37	0.93
Violet-green Swallow	Piñon-Juniper	1	41.4	0.109	0.062	0.191	0.291	0.27	30	25	0.83
Violet-green Swallow	Ponderosa Pine	1	58.3	0.097	0.062	0.153	0.234	0.35	52	45	0.87
Mountain Chickadee	Alpine Tundra	1	66.8	0.037	0.014	0.094	0.493	0.55	21	19	0.90
Mountain Chickadee	Aspen	2	46.2	0.486	0.371	0.638	0.139	0.23	145	139	0.96
Mountain Chickadee	High-elevation Riparian	1	62.5	0.136	0.096	0.193	0.179	0.15	62	62	1.00
Mountain Chickadee	Mixed Conifer	1	60.5	0.404	0.329	0.495	0.104	0.14	177	177	1.00
Mountain Chickadee	Piñon-Juniper	1	72.0	0.030	0.016	0.056	0.323	0.22	24	21	0.88
Mountain Chickadee	Ponderosa Pine	1	54.1	0.325	0.245	0.431	0.144	0.29	145	130	0.90
Mountain Chickadee	Spruce-Fir*	1	59.1	0.603	0.510	0.711	0.085	0.11	256	256	1.00
Juniper Titmouse	Piñon-Juniper*	2	38.2	0.305	0.139	0.671	0.412	0.14	68	60	0.88
Red-breasted Nuthatch	Aspen	1	69.5	0.057	0.034	0.098	0.274	0.39	42	37	0.88
Red-breasted Nuthatch	Mixed Conifer	1	79.8	0.106	0.083	0.135	0.125	0.34	82	81	0.99
Red-breasted Nuthatch	Spruce-Fir*	1	78.1	0.062	0.044	0.088	0.178	0.34	46	46	1.00
White-breasted Nuthatch	Piñon-Juniper	1	89.4	0.023	0.014	0.038	0.257	0.38	31	25	0.81
White-breasted Nuthatch	Ponderosa Pine	2	76.9	0.113	0.074	0.171	0.213	0.37	98	91	0.93
Pygmy Nuthatch	Ponderosa Pine*	1	62.3	0.142	0.096	0.210	0.201	0.35	81	75	0.93
Brown Creeper	All habitats	1	39.3	0.012	0.008	0.018	0.203	0.55	52	52	1.00
Rock Wren	Alpine Tundra	1	104.3	0.018	0.010	0.032	0.288	0.39	23	23	1.00
Rock Wren	Piñon-Juniper	2	123.9	0.011	0.006	0.022	0.354	0.30	27	23	0.85
Rock Wren	Sage Shrubland	1	146.0	0.015	0.009	0.025	0.251	0.36	41	41	1.00
Rock Wren	Semi-desert Shrubland	1	106.9	0.031	0.021	0.044	0.187	0.32	43	43	1.00
Bewick's Wren	Piñon-Juniper	1	80.3	0.147	0.113	0.191	0.135	0.21	135	127	0.94
House Wren	Aspen	1	55.2	0.539	0.435	0.668	0.110	0.20	229	220	0.96
House Wren	High-elevation Riparian	1	58.4	0.131	0.083	0.207	0.235	0.38	52	52	1.00
House Wren	Low-elevation Riparian*	2	73.6	0.260	0.160	0.421	0.240	0.37	159	159	1.00
House Wren	Mixed Conifer	1	72.2	0.142	0.105	0.193	0.155	0.16	89	89	1.00
House Wren	Montane Shrubland	1	60.2	0.204	0.154	0.271	0.145	0.37	102	94	0.92
House Wren	Ponderosa Pine	1	68.7	0.101	0.075	0.136	0.150	0.31	65	65	1.00
Marsh Wren	Wetland*	1	44.8	0.769	0.425	1.393	0.298	0.47	65	60	0.92
Golden-crowned Kinglet	Spruce-Fir*	1	28.1	0.323	0.200	0.521	0.247	0.18	31	31	1.00
Ruby-crowned Kinglet	Aspen	2	100.4	0.129	0.103	0.162	0.116	0.37	174	177	1.02
Ruby-crowned Kinglet	High-elevation Riparian	1	81.5	0.123	0.096	0.156	0.124	0.32	103	95	0.92

Appendix A. Continued.

Western Wood-Pewee	Montane Shrubland	1	88.3	0.048	0.029	0.081	0.261	0.54	51	48	0.94
Ruby-crowned Kinglet	Mixed Conifer	1	69.5	0.235	0.182	0.302	0.130	0.22	140	136	0.97
Ruby-crowned Kinglet	Ponderosa Pine	2	78.0	0.055	0.037	0.084	0.212	0.62	49	46	0.94
Ruby-crowned Kinglet	Spruce-Fir*	1	79.3	0.395	0.337	0.463	0.081	0.21	305	302	0.99
Blue-gray Gnatcatcher	Montane Shrubland	1	42.9	0.266	0.196	0.359	0.155	0.34	64	62	0.97
Blue-gray Gnatcatcher	Piñon-Juniper*	1	36.9	0.420	0.295	0.597	0.181	0.30	85	77	0.91
Western Bluebird	Ponderosa Pine*	1	70.2	0.046	0.027	0.079	0.276	0.24	31	31	1.00
Mountain Bluebird	Piñon-Juniper	1	69.2	0.075	0.054	0.104	0.169	0.32	51	48	0.94
Townsend's Solitaire	Mixed Conifer	1	106.3	0.033	0.022	0.050	0.209	0.41	48	45	0.94
Townsend's Solitaire	Ponderosa Pine	1	86.6	0.077	0.060	0.100	0.130	0.33	84	79	0.94
Hermit Thrush	Aspen	1	121.8	0.068	0.052	0.089	0.139	0.32	146	135	0.92
Hermit Thrush	High-elevation Riparian	2	158.6	0.014	0.009	0.020	0.198	0.77	55	40	0.73
Hermit Thrush	Mixed Conifer	1	114.5	0.058	0.045	0.074	0.128	0.34	104	91	0.88
Hermit Thrush	Ponderosa Pine	2	128.8	0.029	0.017	0.048	0.261	0.28	70	65	0.93
Hermit Thrush	Spruce-Fir*	2	127.9	0.147	0.121	0.179	0.100	0.20	297	293	0.99
American Robin	Alpine Tundra	2	59.0	0.126	0.059	0.267	0.392	0.29	63	51	0.81
American Robin	Aspen	2	73.5	0.280	0.215	0.366	0.136	0.28	214	203	0.95
American Robin	High-elevation Riparian	2	82.9	0.248	0.206	0.299	0.095	0.18	199	199	1.00
American Robin	Low-elevation Riparian*	1	58.7	0.162	0.105	0.250	0.216	0.43	79	79	1.00
American Robin	Mixed Conifer	1	79.9	0.238	0.193	0.293	0.106	0.22	187	182	0.97
American Robin	Montane Shrubland	1	91.2	0.155	0.124	0.194	0.114	0.23	185	164	0.89
American Robin	Piñon-Juniper	1	101.2	0.033	0.023	0.049	0.195	0.35	56	46	0.82
American Robin	Ponderosa Pine	2	85.5	0.218	0.168	0.282	0.133	0.29	241	217	0.90
American Robin	Sage Shrubland	1	141.8	0.013	0.008	0.021	0.256	0.40	38	32	0.84
American Robin	Spruce-Fir	1	69.0	0.214	0.171	0.269	0.117	0.35	128	124	0.97
Northern Mockingbird	Semi-desert Shrubland	2	173.5	0.011	0.007	0.017	0.216	0.46	46	42	0.91
Sage Thrasher	Sage Shrubland*	2	170.9	0.026	0.020	0.035	0.150	0.55	104	97	0.93
Sage Thrasher	Semi-desert Shrubland	1	122.3	0.027	0.017	0.043	0.244	0.29	50	49	0.98
American Pipit	Alpine Tundra*	2	60.1	1.140	0.924	1.408	0.108	0.12	496	479	0.97
Orange-crowned Warbler	Mixed Conifer	2	67.6	0.069	0.047	0.103	0.204	0.59	38	38	1.00
Orange-crowned Warbler	Montane Shrubland*	1	57.6	0.273	0.210	0.355	0.134	0.21	117	115	0.98
Orange-crowned Warbler	Ponderosa Pine	2	54.8	0.068	0.038	0.124	0.307	0.38	28	28	1.00
Virginia's Warbler	Montane Shrubland*	1	53.3	0.302	0.230	0.396	0.139	0.19	109	109	1.00
Virginia's Warbler	Piñon-Juniper	1	67.5	0.111	0.080	0.154	0.168	0.34	68	70	1.03
Virginia's Warbler	Ponderosa Pine	1	52.9	0.100	0.062	0.160	0.241	0.29	41	38	0.93
Yellow Warbler	High-elevation Riparian	1	46.5	0.238	0.165	0.343	0.188	0.35	60	60	1.00
Yellow Warbler	Low-elevation Riparian*	1	61.0	0.124	0.082	0.188	0.206	0.40	63	63	1.00
Yellow Warbler	Montane Shrubland	1	60.3	0.186	0.135	0.257	0.165	0.17	86	86	1.00
Yellow-rumped Warbler	Aspen	1	58.1	0.590	0.489	0.712	0.096	0.32	281	267	0.95
Yellow-rumped Warbler	High-elevation Riparian	2	68.0	0.165	0.120	0.228	0.165	0.38	94	89	0.95

Appendix A. Continued.

Western Wood-Pewee	Montane Shrubland	1	88.3	0.048	0.029	0.081	0.261	0.54	51	48	0.94
Yellow-rumped Warbler	Mixed Conifer	1	60.9	0.651	0.554	0.766	0.083	0.21	293	290	0.99
Yellow-rumped Warbler	Ponderosa Pine	2	66.0	0.330	0.262	0.416	0.118	0.44	216	196	0.91
Yellow-rumped Warbler	Spruce-Fir*	2	65.9	0.657	0.573	0.754	0.070	0.20	348	347	1.00
Black-throated Gray Warbler	Piñon-Juniper*	2	60.4	0.405	0.305	0.539	0.145	0.31	214	199	0.93
Grace's Warbler	Ponderosa Pine*	1	55.8	0.094	0.066	0.135	0.185	0.33	40	40	1.00
MacGillivray's Warbler	Aspen	1	58.0	0.187	0.140	0.248	0.146	0.34	87	84	0.97
MacGillivray's Warbler	High-elevation Riparian*	2	41.8	0.334	0.236	0.471	0.177	0.19	69	68	0.99
MacGillivray's Warbler	Mixed Conifer	1	57.8	0.067	0.040	0.113	0.267	0.17	27	27	1.00
MacGillivray's Warbler	Montane Shrubland	1	51.2	0.337	0.252	0.449	0.148	0.25	116	112	0.97
Common Yellowthroat	Low-elevation Riparian	1	65.7	0.064	0.030	0.139	0.392	0.57	35	35	1.00
Common Yellowthroat	Wetland*	1	62.0	0.880	0.533	1.452	0.250	0.65	99	95	0.96
Wilson's Warbler	Alpine Tundra	1	54.0	0.133	0.080	0.221	0.263	0.23	45	45	1.00
Wilson's Warbler	High-elevation Riparian*	2	45.8	0.467	0.331	0.658	0.176	0.23	115	114	0.99
Yellow-breasted Chat	Low-elevation Riparian	1	60.3	0.134	0.068	0.263	0.342	0.65	67	67	1.00
Western Tanager	Aspen	2	73.7	0.059	0.037	0.094	0.239	0.61	49	43	0.88
Western Tanager	Mixed Conifer*	1	84.5	0.269	0.232	0.313	0.077	0.31	238	231	0.97
Western Tanager	Montane Shrubland	1	84.0	0.054	0.037	0.077	0.186	0.37	50	48	0.96
Western Tanager	Piñon-Juniper	1	93.2	0.021	0.012	0.035	0.272	0.34	31	24	0.77
Western Tanager	Ponderosa Pine	1	97.2	0.136	0.109	0.170	0.114	0.25	178	175	0.98
Western Tanager	Spruce-Fir	1	77.8	0.065	0.045	0.094	0.186	0.32	48	48	1.00
Green-tailed Towhee	Aspen	3	107.9	0.021	0.012	0.037	0.293	0.75	33	33	1.00
Green-tailed Towhee	High-elevation Riparian	1	76.5	0.059	0.034	0.101	0.278	0.39	41	40	0.98
Green-tailed Towhee	Mixed Conifer	1	74.9	0.097	0.067	0.139	0.187	0.22	65	65	1.00
Green-tailed Towhee	Montane Shrubland	1	76.6	0.644	0.561	0.740	0.071	0.20	485	480	0.99
Green-tailed Towhee	Piñon-Juniper	1	71.3	0.056	0.036	0.085	0.218	0.33	40	38	0.95
Green-tailed Towhee	Ponderosa Pine	1	72.3	0.104	0.072	0.150	0.188	0.23	74	74	1.00
Green-tailed Towhee	Sage Shrubland*	2	94.2	0.167	0.136	0.205	0.105	0.61	194	188	0.97
Green-tailed Towhee	Semi-desert Shrubland	1	112.7	0.015	0.008	0.028	0.343	0.35	23	23	1.00
Spotted Towhee	Mixed Conifer	1	105.6	0.031	0.017	0.058	0.316	0.32	47	42	0.89
Spotted Towhee	Montane Shrubland*	1	64.1	0.600	0.509	0.707	0.084	0.18	313	313	1.00
Spotted Towhee	Piñon-Juniper	2	81.3	0.204	0.160	0.260	0.125	0.49	200	181	0.91
Spotted Towhee	Ponderosa Pine	2	98.3	0.036	0.024	0.056	0.222	0.47	48	48	1.00
Cassin's Sparrow	Grassland*	1	134.2	0.020	0.012	0.034	0.264	0.43	42	37	0.88
Cassin's Sparrow	Sage Shrubland	2	146.7	0.010	0.006	0.019	0.309	0.53	29	28	0.97
Cassin's Sparrow	Semi-desert Shrubland	1	184.8	0.006	0.003	0.010	0.283	0.33	26	25	0.96
Chipping Sparrow	Mixed Conifer	1	67.0	0.215	0.166	0.280	0.134	0.18	116	116	1.00
Chipping Sparrow	Montane Shrubland	1	73.1	0.096	0.070	0.131	0.162	0.36	65	65	1.00
Chipping Sparrow	Piñon-Juniper	2	58.2	0.324	0.238	0.443	0.159	0.31	160	148	0.93
Chipping Sparrow	Ponderosa Pine*	2	60.5	0.204	0.122	0.341	0.264	0.21	110	102	0.93

Appendix A. Continued.

Western Wood-Pewee	Montane Shrubland	1	88.3	0.048	0.029	0.081	0.261	0.54	51	48	0.94
Chipping Sparrow	Spruce-Fir	1	64.8	0.061	0.032	0.116	0.333	0.55	33	31	0.94
Brewer's Sparrow	Piñon-Juniper	1	86.8	0.041	0.025	0.066	0.252	0.37	43	41	0.95
Brewer's Sparrow	Sage Shrubland*	2	59.2	0.815	0.618	1.074	0.141	0.21	381	362	0.95
Brewer's Sparrow	Semi-desert Shrubland	1	74.1	0.260	0.200	0.338	0.134	0.20	179	175	0.98
Vesper Sparrow	Grassland	1	137.3	0.015	0.008	0.027	0.317	0.49	28	28	1.00
Vesper Sparrow	Piñon-Juniper	1	77.9	0.025	0.014	0.042	0.278	0.36	30	21	0.70
Vesper Sparrow	Sage Shrubland*	1	86.7	0.198	0.165	0.238	0.094	0.32	192	189	0.98
Vesper Sparrow	Semi-desert Shrubland	1	101.0	0.050	0.031	0.079	0.242	0.40	75	62	0.83
Lark Sparrow	Grassland	1	87.6	0.042	0.025	0.070	0.263	0.33	33	33	1.00
Lark Sparrow	Sage Shrubland	1	65.3	0.196	0.133	0.289	0.199	0.28	122	106	0.87
Lark Sparrow	Semi-desert Shrubland*	2	76.1	0.285	0.212	0.383	0.151	0.24	211	202	0.96
Sage Sparrow	Sage Shrubland	1	99.1	0.000	0.000	0.010	0.300	0.34	24	24	1.00
Lark Bunting	Grassland*	2	98.5	0.611	0.506	0.738	0.097	0.20	652	607	0.93
Lark Bunting	Sage Shrubland	2	59.8	0.554	0.425	0.722	0.136	0.36	286	251	0.88
Lark Bunting	Semi-desert Shrubland	1	65.6	0.057	0.031	0.106	0.321	0.26	39	30	0.77
Savannah Sparrow	Alpine Tundra	2	72.9	0.039	0.020	0.077	0.360	0.36	24	24	1.00
Savannah Sparrow	High-elevation Riparian	1	56.5	0.083	0.039	0.179	0.404	0.39	31	31	1.00
Grasshopper Sparrow	Grassland*	2	91.9	0.140	0.108	0.180	0.130	0.67	127	121	0.95
Grasshopper Sparrow	Sage Shrubland	2	78.1	0.036	0.022	0.059	0.251	0.62	28	28	1.00
Fox Sparrow	All habitats										
Song Sparrow	High-elevation Riparian	1	43.6	0.275	0.191	0.397	0.187	0.16	61	61	1.00
Song Sparrow	Low-elevation Riparian*	1	71.9	0.080	0.049	0.132	0.247	0.53	48	48	1.00
Song Sparrow	Wetland	2	68.9	0.217	0.103	0.455	0.382	0.51	26	26	1.00
Lincoln's Sparrow	Alpine Tundra	1	71.4	0.098	0.063	0.151	0.223	0.39	69	58	0.84
Lincoln's Sparrow	Aspen	1	49.9	0.696	0.551	0.880	0.120	0.28	199	193	0.97
Lincoln's Sparrow	High-elevation Riparian*	2	48.9	1.244	1.002	1.544	0.111	0.23	353	347	0.98
Lincoln's Sparrow	Spruce-Fir	1	71.4	0.086	0.061	0.121	0.177	0.33	53	53	1.00
White-crowned Sparrow	Alpine Tundra	2	81.1	0.760	0.640	0.900	0.090	0.05	584	580	0.99
White-crowned Sparrow	Aspen	1	72.9	0.114	0.077	0.168	0.199	0.27	85	81	0.95
White-crowned Sparrow	High-elevation Riparian*	1	66.5	0.251	0.187	0.335	0.149	0.24	135	129	0.96
White-crowned Sparrow	Spruce-Fir	1	71.2	0.107	0.069	0.165	0.222	0.15	66	66	1.00
Dark-eyed Junco	Aspen	2	53.7	0.544	0.382	0.774	0.181	0.30	234	210	0.90
Dark-eyed Junco	High-elevation Riparian	1	61.0	0.221	0.161	0.304	0.163	0.37	100	96	0.96
Dark-eyed Junco	Mixed Conifer*	1	68.9	0.325	0.267	0.396	0.100	0.18	185	185	1.00
Dark-eyed Junco	Ponderosa Pine	1	66.7	0.205	0.154	0.272	0.146	0.28	128	124	0.97
Dark-eyed Junco	Spruce-Fir	1	60.5	0.506	0.414	0.620	0.103	0.29	237	225	0.95
McCown's Longspur	Grassland*	0	122.0	0.016	0.009	0.029	0.292	1.00	25	25	1.00
Black-headed Grosbeak	Low-elevation Riparian*	1	85.9	0.059	0.033	0.106	0.298	0.70	42	42	1.00
Black-headed Grosbeak	Montane Shrubland	1	75.5	0.155	0.116	0.206	0.147	0.28	116	112	0.97

Appendix A. Continued.

Western Wood-Pewee	Montane Shrubland	1	88.3	0.048	0.029	0.081	0.261	0.54	51	48	0.94
Blue Grosbeak	Low-elevation Riparian*	1	57.4	0.057	0.032	0.101	0.294	0.60	27	27	1.00
Red-winged Blackbird	Low-elevation Riparian	1	72.0	0.109	0.074	0.160	0.194	0.49	65	65	1.00
Red-winged Blackbird	Sage Shrubland	2	43.0	0.077	0.020	0.299	0.771	0.16	29	18	0.62
Red-winged Blackbird	Semi-desert Shrubland	2	73.5	0.070	0.032	0.152	0.411	0.19	49	46	0.94
Red-winged Blackbird	Wetland*	1	50.2	2.953	2.105	4.142	0.167	0.46	267	258	0.97
Western Meadowlark	Grassland*	2	168.7	0.170	0.138	0.209	0.107	0.19	517	494	0.96
Western Meadowlark	Low-elevation Riparian	1	173.1	0.020	0.010	0.041	0.364	0.72	29	29	1.00
Western Meadowlark	Piñon-Juniper	1	218.4	0.005	0.003	0.008	0.283	0.28	42	30	0.71
Western Meadowlark	Sage Shrubland	2	110.4	0.138	0.105	0.181	0.140	0.27	244	213	0.87
Western Meadowlark	Semi-desert Shrubland	2	137.4	0.159	0.130	0.195	0.104	0.29	386	368	0.95
Western Meadowlark	Wetland	1	158.2	0.094	0.050	0.179	0.326	0.79	26	26	1.00
Yellow-headed Blackbird	Wetland*	1	64.4	1.063	0.552	2.045	0.329	0.43	120	119	0.99
Brewer's Blackbird	Sage Shrubland	1	54.4	0.059	0.035	0.098	0.265	0.32	26	22	0.85
Common Grackle	Low-elevation Riparian	1	37.3	0.132	0.070	0.249	0.318	0.48	44	41	0.93
Brown-headed Cowbird	Low-elevation Riparian	1	48.1	0.140	0.096	0.204	0.188	0.59	56	56	1.00
Brown-headed Cowbird	Montane Shrubland	1	59.1	0.212	0.158	0.286	0.153	0.16	94	94	1.00
Brown-headed Cowbird	Piñon-Juniper	1	66.2	0.071	0.045	0.114	0.239	0.25	46	42	0.91
Brown-headed Cowbird	Ponderosa Pine	1	70.6	0.054	0.037	0.081	0.205	0.35	37	37	1.00
Brown-headed Cowbird	Semi-desert Shrubland	2	67.2	0.054	0.020	0.144	0.515	0.13	31	30	0.97
Brown-headed Cowbird	Wetland	1	43.6	0.316	0.164	0.609	0.334	0.61	25	24	0.96
Orchard Oriole	Low-elevation Riparian*	1	47.8	0.096	0.049	0.188	0.342	0.53	38	38	1.00
Bullock's Oriole	Low-elevation Riparian*	1	69.6	0.064	0.039	0.104	0.247	0.71	37	37	1.00
Cassin's Finch	All habitats	1	60.4	0.005	0.003	0.009	0.309	0.70	33	33	1.00
House Finch	Piñon-Juniper	1	69.4	0.051	0.029	0.090	0.296	0.40	36	33	0.92
Pine Siskin	Alpine Tundra	1	80.2	0.043	0.025	0.072	0.268	0.26	32	32	1.00
Pine Siskin	High-elevation Riparian	1	56.4	0.135	0.094	0.193	0.184	0.34	52	50	0.96
Pine Siskin	Mixed Conifer	1	51.8	0.394	0.293	0.529	0.151	0.29	130	127	0.98
Pine Siskin	Spruce-Fir*	1	63.9	0.239	0.196	0.292	0.101	0.30	119	119	1.00
American Goldfinch	Low-elevation Riparian*	1	48.8	0.062	0.030	0.125	0.362	0.68	25	25	1.00
Evening Grosbeak	Mixed Conifer	1	72.7	0.043	0.024	0.076	0.301	0.26	27	27	1.00