Monitoring Colorado's Birds:
Final Report for the 1999, First Full-effort Year

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Abstract

In 1999, Colorado 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 pilot effort of the full-scale breeding-bird monitoring plan, as delineated by Leukering and Carter (1998).

We conducted an intensive literature search to compile all known breeding localities for all of Colorado's colonially-breeding waterbirds and a small suite of limited-range species. We augmented the literature search with an extensive effort to contact biologists, land managers, birders, and other people with information on breeding locations of these species. During the course of the 1999 field season, we visited a large number of these to determine how many sites were still active and, if so, the number of breeding individuals at each. In addition, we obtained data from various contacts on the activity and colony size of many more colonies.

After 1998's successful pilot transect season (Leukering 1999; three habitats: Aspen, Ponderosa Pine, and Spruce-Fir), we attempted to initiate the transect protocol in an additional ten habitats in 1999. Though we encountered many difficulties, this year's effort was an incredible success, as the habitat-based transects provided excellent data on 94 breeding species (coefficients of variation of $\leq$50%) and solid data on an additional 54 breeding species (coefficients of variation between 50% and 100%). This total of 148 is 62% of all regularly-occurring Colorado breeding species.

Future years' data should be even better. Establishing 300 new transects in 1999 proved to be an impossible task for a number of reasons. About the most recalcitrant hindrance was the difficulty we encountered in finding appropriate tracts in which to place transects due to the numerous errors in habitat allocation in the Colorado GAP data set. This is the GIS information that we used to randomly select transect locations in both years (1998 and 1999). This proved to be a difficulty in 1998, but we only conducted transects in three habitats that year; having these difficulties with ten habitats caused uncountable lost field days and resulted in incomplete sample size for a number of habitats.

Additionally, we were unable to obtain the services of enough qualified field workers to physically conduct all the work required. This was due to two reasons: 1) we had a very small pool of qualified applicants from which to select (for reasons unsure) and 2) we had to wait until contracts were in place before hiring, thus we lost a few of the qualified applicants to other positions before we started the hiring process. Because the *Monitoring Colorado's Birds* project is personnel-intensive, it is imperative that we be able to conduct hiring in January and February before a large number of qualified applicants have already signed on to other projects.

Introduction

Colorado Bird Observatory (CBO) initiated efforts to create and conduct a Colorado-wide effort to monitor breeding-bird populations in 1995. In 1997, after review by statisticians and Colorado

Division of Wildlife (CDOW) biologists, we redesigned the program (*Monitoring Colorado's Birds* (Leukering and Carter 1998)) and conducted a small, pilot effort in 1998 on three habitats (Leukering and Carter 1999). With the success of the 1998 effort, we expanded field work in 1999 to include all originally-allocated habitats and special-species efforts - in effect, a full-scale pilot effort. This report delineates effort and results of the 1999 field season and provides recommendations and suggestions for changes to be incorporated in 2000.

Methods

We used three methods: point transects, colony counts, and censussing, to obtain population data for all of Colorado's breeding-bird species.

Point transects–We established transects of 15 point counts in each of 30 randomly-selected stands in each of 11 habitats. Using the Colorado GAP data set, we numbered all publicly-owned stands of the habitats in Colorado and randomly selected 60 from each habitat. We then randomly selected 30 of those in which we established point transects. In a few instances, selected stands were not the indicated habitat or access across private land was denied, so we discarded them and randomly selected a replacement from the original set of randomly-selected stands. Most replacement stands were randomly selected from all stands, regardless of ownership. We selected all Grassland transects randomly from all stands with only seven falling on public lands.

Each transect was conducted by one observer using protocol established by Leukering (1998). The observer located the selected stand on the ground and ran the transect along a randomly-selected bearing. It was usually impossible to run the entire transect along the random bearing, as stand boundaries, property boundaries, and physical obstructions forced turns in the transect direction. When this happened, the observer randomly turned right or left perpendicular to the random bearing, subsequently alternating perpendicular directions if additional turns were necessary. In some stands, the narrowness of the stands predicated the location and bearing of the transects.

Transects consisted of 15 5-minute point counts spaced at 250-m intervals along a line. We considered the intervals between points as legs of a true transect. At the individual points, we recorded the radial distance to each bird detected. Along the transect legs, we recorded only individuals of a short list of the habitat's target species whose population densities are relatively low (thus, poorly-recorded on point counts) and estimated distance to each. Individual birds initially detected between points were not recorded on points.

Observers recorded weather data (sky condition--cloud cover and precipitation, wind--Beaufort scale, and temperature) and the time at the start and end of each transect. At each point, the observer recorded whether the point was within 100m of a road. Also at each point, he/she recorded the specific habitat and seral stage (1-5 scale; Buttery and Gillam 1983) of each of the two predominant habitats around the point (often there was only one habitat present). Upon arriving at a point, the observer recorded habitat data, then conducted the point count.

We used program DISTANCE (Laake et al. 1994) 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). The program can analyze several forms of distance sampling data, fitting a detection curve to the data set to be analyzed. The program avoids some serious biases inherent in traditional analysis of point-count data (e.g. detectability among habitats or years), but comes with three assumptions: all birds at distance 0 are detected; distances of birds close to the point are measured accurately, and birds do not move in response to the observer's presence.

We did not perform any analyses other than the initial DISTANCE analysis (e.g. truncation or grouping), as we are simply interested in reporting general results. Additionally, these data have no meaning in trend-detection until more years have been completed.

Low-elevation Riparian and Wetland transects–We selected Low-elevation Riparian transects by determining the number of navigable (by canoe or raft) river miles below 5500' elevation in Colorado on 14 rivers and sorted them by river and distance. We then randomly selected 30 one-mile stretches of the river miles total and determined the locations of those stretches. We conducted transects of one river mile length, with one person conducting the transect and another operating the craft. For Wetland transects, we randomly selected 60 wetland stands, regardless of ownership. We then randomly selected 30 of those and established a 250-meter transect in each. Field workers conducting these transects started from the selected access point and ran the transect on a randomly-selected bearing.

Special Species--The 1999 field season plan called for the following strategies to be applied toward monitoring and tracking species that would not be monitored by point transects:

1. A pilot series of nocturnal point transects for owls and nightjars;
2. A census of the known breeding sites of colonially-nesting waterbirds;
3. A statewide survey of lakes and ponds below 7500 ft. to locate previously unrecorded breeding sites of colonially-nesting waterbirds and nesting sites of several marsh- and lake-nesting species;
4. A census of known breeding sites and explorations of potential sites of some species with very localized breeding ranges;
5. Exploration of some little-studied areas that are known or suspected to host significant bird populations (e.g. the Arkansas River);
6. Compilation of data from other observers; and
7. Analysis of point-transect data to determine whether additional species will require focused attention in future seasons.

We did not analyze data from colony counts and censussing, as those numbers will simply be compared on a year-to-year or length-of-project basis to determine trends of those species. We will utilize only those years' data that we consider to be complete.

Results

Point transects--We conducted 309 point transects in 13 habitats (average of 23.8 per habitat), completing or nearly completing all transects in most habitats (Table 1). We were hampered greatly by a shortage of field workers, due partly to not being able to hire until late in the season,

but mostly to the lack of qualified applicants. Thus we nearly completed all early-season habitats (e.g. Grassland and Semi-desert Shrubland), but as the season progressed, we fell further and further behind. Additionally, we only completed seven Wetland transects, partly due to staffing shortages and other factors, most importantly not receiving the random selection from of transect locations until mid-June (which is after the time period we had planned to conduct the transects).

Table 1. Number of transects conducted in each habitat with totals of species and individuals detected (excluding flyovers) in *MCB* 2000 field season.

Habitat	# transects run	# species detected	# individuals detected
Alpine Tundra	21	66	2927
Aspen	26	45	1194
Grassland	28	65	3046
High-elevation Riparian	19	85	1660
Low-elevation Riparian	23	81	1801
Mixed Conifer	25	81	2295
Montane Shrubland	21	93	2190
Piñon-Juniper	30	88	3017
Ponderosa Pine	29	87	3268
Sage Shrubland	28	109	2724
Semi-desert Shrubland	29	90	2173
Spruce-Fir	23	58	1978
Wetland	7	32	235
Totals (13 habitats)	309	219	28508

We obtained data on 219 breeding-bird species via the point-transect program, with summary data provided in Appendix A for 168 of those. This appendix lists data from all habitat-target species and a somewhat subjective sample of other species. Species that are considered well-sampled are those with coefficients of variation (%CV; hereafter CV) of less than 50%, with 2 or fewer parameters included in the detection-curve function (m), and with the two sources of variation (detection probability and sample size) reasonably balanced (~1:2 to ~2:1; thus with the percent of variation due to sample size (%var(n)) falling between 33.3 and 66.7). 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 less than 25 years.

We obtained CVs of ≤50% for 67 habitat target species (see Leukering and Carter 1998) and CVs between 50% and 100% for an additional 18 habitat target species (Table 2). 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 would be Lincoln's Sparrow in Aspen. We designated Lincoln's Sparrow as a target in High-elevation Riparian (Leukering and Carter 1998), yet obtained our lowest CV of all habitat-species interactions from Lincoln's Sparrow in Aspen: 5.6% (Appendix A). After we get another couple years' of data, we will re-analyze habitat designations using the densities we generate with *DISTANCE* from our transect data.

Table 2. Habitat target species with coefficients of variation of less than 100% and with percent of variance due to sample size of less than 100% (well-sampled species).

Species	Habitat	% CV	Species	Habitat	% CV
American Pipit	Alpine Tundra	29.7	Western Scrub-Jay	Montane Shrubland	60.5
Western Wood-Pewee	Aspen	21.7	Orange-crowned Warbler	Montane Shrubland	46.7
Warbling Vireo	Aspen	10.4	Virginia's Warbler	Montane Shrubland	31.1
Tree Swallow	Aspen	47.5	Green-tailed Towhee	Montane Shrubland	16.9
Violet-green Swallow	Aspen	43.5	Spotted Towhee	Montane Shrubland	17.8
Burrowing Owl	Grassland	66.0	Gray Flycatcher	Piñon-Juniper	46.9
Common Nighthawk	Grassland	77.4	Ash-throated Flycatcher	Piñon-Juniper	20.6
Horned Lark	Grassland	11.6	Plumbeous Vireo	Piñon-Juniper	23.0
Cassin's Sparrow	Grassland	42.2	Pinyon Jay	Piñon-Juniper	33.1
Grasshopper Sparrow	Grassland	27.4	Juniper Titmouse	Piñon-Juniper	32.3
Lark Bunting	Grassland	13.4	Bushtit	Piñon-Juniper	28.5
McCown's Longspur	Grassland	71.6	Bewick's Wren	Piñon-Juniper	23.3
Western Meadowlark	Grassland	10.9	Blue-gray Gnatcatcher	Piñon-Juniper	17.0
Cordilleran Flycatcher	High-elevation Riparian	38.6	Black-throated Gray Warbler	Piñon-Juniper	82.8
Swainson's Thrush	High-elevation Riparian	74.0	Williamson's Sapsucker	Ponderosa Pine	35.3
MacGillivray's Warbler	High-elevation Riparian	31.9	Hairy Woodpecker	Ponderosa Pine	40.9
Wilson's Warbler	High-elevation Riparian	97.6	Pygmy Nuthatch	Ponderosa Pine	34.6
Fox Sparrow	High-elevation Riparian	54.9	Western Bluebird	Ponderosa Pine	61.1
Lincoln's Sparrow	High-elevation Riparian	43.3	Grace's Warbler	Ponderosa Pine	64.3
White-crowned Sparrow	High-elevation Riparian	63.0	Chipping Sparrow	Ponderosa Pine	24.8
Great Blue Heron	Low-elevation Riparian	45.8	Sage Thrasher	Sage Shrubland	55.0
Northern Flicker	Low-elevation Riparian	30.7	Brewer's Sparrow	Sage Shrubland	22.0
Eastern Kingbird	Low-elevation Riparian	31.8	Vesper Sparrow	Sage Shrubland	26.8
Bank Swallow	Low-elevation Riparian	63.4	Sage Sparrow	Sage Shrubland	53.6
American Robin	Low-elevation Riparian	36.7	Scaled Quail	Semidesert Shrubland	75.7
Yellow Warbler	Low-elevation Riparian	40.6	Loggerhead Shrike	Semidesert Shrubland	64.5
Yellow-breasted Chat	Low-elevation Riparian	29.2	Lark Sparrow	Semidesert Shrubland	44.7
Song Sparrow	Low-elevation Riparian	32.9	Three-toed Woodpecker	Spruce-Fir	49.3
Black-headed Grosbeak	Low-elevation Riparian	36.8	Gray Jay	Spruce-Fir	24.7
Blue Grosbeak	Low-elevation Riparian	45.0	Clark's Nutcracker	Spruce-Fir	41.8
Orchard Oriole	Low-elevation Riparian	65.7	Red-breasted Nuthatch	Spruce-Fir	39.2
Bullock's Oriole	Low-elevation Riparian	44.4	Golden-crowned Kinglet	Spruce-Fir	39.7
Steller's Jay	Mixed Conifer	26.0	Ruby-crowned Kinglet	Spruce-Fir	15.8
White-breasted Nuthatch	Mixed Conifer	37.8	Hermit Thrush	Spruce-Fir	16.9
Brown Creeper	Mixed Conifer	41.7	Pine Grosbeak	Spruce-Fir	32.3
Yellow-rumped Warbler	Mixed Conifer	17.8	Cassin's Finch	Spruce-Fir	62.2
Western Tanager	Mixed Conifer	25.9	Pine Siskin	Spruce-Fir	33.2
Dark-eyed Junco	Mixed Conifer	15.9			

In general, despite an incomplete sample of transects in many of the habitats, sample sizes for many bird species were quite good. Even some low-density species were detected in reasonable numbers (e.g. Red-tailed Hawks on 30 transects with a total of 37 individuals). Some high-density species were detected in very large numbers (e.g. 1125 Warbling Vireos on 121 transects in eight habitats).

We analyzed on a gross basis the frequency of occurrence on transects by habitat for a select group of species. This analysis is reported in Appendix B.

Special Species–The site-gathering aspect of the special-species effort was highly successful, as we compiled data on at least 325 specific locations for breeding colonial waterbirds and some limited-range species. However, a shortage of field workers, especially at CBO but also at other agencies that conduct scheduled counts, hampered completion of planned work.

1. Nocturnal transects. Due to limited access, the high-elevation nocturnal transects proved unworkable during the nesting season of the resident owls. The number of contacts on all transects was not high, but high enough to merit running this pilot for at least one more season. Once we complete the 2000 season, we will analyze the data to determine how many nocturnal transects we will need to monitor the various species.

2. Colonial waterbirds. We censussed a substantial number of historical sites and added many new ones to the database. The results from a wide variety of sources indicated directions for sharpening censussing protocols (see Appendix C for numbers).

Eared Grebe. We censussed 30 of the planned sites; field workers did not survey historical sites in the San Luis Valley and the Arkansas Valley. Nesting was confirmed at one new site (Moore Reservoir in Grand County) and adults were observed in the nesting period at two new sites.

Western Grebe. We visited 14 of the 39 catalogued sites, but did not survey historical sites in the San Luis and Arkansas valleys.

Clark's Grebe. Of the 24 planned sites, we censussed seven. The center of this species' state population in the Arkansas Valley was not surveyed.

American White Pelican. CBO field workers surveyed two of three historical nesting sites. Adults and juvenile birds were counted at McFarlane Reservoir and at Antero Reservoir. Nesting also occurred at Riverside Reservoir; personnel who banded young there estimated that probably more than 1000 young fledged, but they did not conduct a formal count.

Double-crested Cormorant. We surveyed nine of 14 sites.

Great Blue Heron. We attempted to locate and survey all of the sites reported by Miller and Graul (1987), who listed 63 sites (eight of which had become inactive by the end of their study) as well as 54 sites reported since that compilation. We received reports of active nests at 52 sites and added six new sites located during the field season to the historical database. The database now contains 123 sites, many of which are presently inactive. The most significant gaps in the data for 1999 are from the Yampa and South Platte valleys.

Great Egret. We received a report on the only known active nesting colony in the state. Another historical site showed no signs of nesting activity, but a pair was present in a previously unreported location.

Snowy Egret. We censussed six of the ten historical sites. The only nesting we found was in the San Luis Valley at Monte Vista NWR.

Cattle Egret. Field workers and volunteers visited five of the six historical nesting sites, with nesting birds (<10) found only at Parker Pond at Monte Vista NWR.

Black-crowned Night-Heron. We surveyed 16 of 23 sites with historical records, with significant numbers reported from Monte Vista NWR, Arapaho NWR, and Denver City Park. No other successful nesting was documented.

California Gull. Of the four historical nesting sites, we surveyed three, confirming successful nesting at all (Antero Reservoir and at two sites in North Park).

Franklin's Gull. While surveying for Forster's Terns, we recorded the first breeding record of this species in Colorado at Walden Reservoir (Levad 2000). We also noted possible breeding at Lake John Annex and at Lower Latham Reservoir.

Forster's Tern. We confirmed nesting at Walden Reservoir and at Lake John Annex.

Black Tern. A pair summered at Walden Reservoir among the nesting Forster's Terns and acted as if they were nesting locally, but field workers could not confirm breeding. We received no other summer reports of Black Terns in the state.

3. Lake/pond survey. The shortage of field workers caused us to drop this survey as a formal element of the 1999 field season. We developed a database of 823 potential sites from maps, and entered historical breeding records from the literature. We received approximately 100 incidental field reports which were entered into the database; this effort will continue in 2000.

4. Other surveys.

Green Heron. We observed individuals at two sites in the Grand Valley, but searches failed to confirm nesting. One appeared on a lowland riparian transect on the White River in Rio Blanco County; this site will be further explored in 2000.

Black Rail. We received counts from the two known summer sites, with birds present at both.

Willet. We surveyed all of the known nesting sites. In addition we documented a new nesting site at Fruitgrower's Reservoir in Delta County.

Black Swift. We attempted to locate all historical breeding sites. Several of those reported by Owen Knorr (1961) were relocated; others remain mysterious. Most of the sites reported since Knorr's work were surveyed for occupancy. Field workers explored a number of potential nest sites and located many new colonies.

Black Phoebe. Field technicians conducted a survey of the San Miguel River between the towns of Naturita and Uruvan, the site of the only known established population. A nesting pair was also found upstream on the San Miguel from Naturita, suggesting a need to expand this survey. Additionally, a nesting pair was found on the Colorado River near Debeque by field workers conducting a lowland riparian transect.

Eastern Phoebe. The shortage of field workers precluded surveying for this species.

Scissor-tailed Flycatcher. The shortage of field workers precluded surveying for this species, though one nest was reported to us from Black Forest, El Paso County.

Bell's Vireo. The shortage of field workers precluded surveying thoroughly for this species.

Purple Martin. We constructed a database of 79 confirmed or potential breeding sites from the Breeding Bird Atlas Project, the Colorado Natural Heritage Program, and from interviews. Field workers visited 37 of these sites in 1999 and found Martins at 30.

Bobolink. We compiled data from existing counts in Boulder, Douglas, Larimer, Moffat (Carpenter Ranch only), and Rio Blanco counties. We conducted a search of the historic Gunnison County sites, but found no birds. We were not able to survey the historical sites in the Platte River Valley in the northeastern corner of the state.

Scott's Oriole. CBO Field Technicians surveyed the known historic nesting territories in Garfield, Mesa, and Montezuma counties. We located ten territories, at least one in each historical area, and found one nest.

5. Special area investigation. The Arkansas River exploration was not conducted as we determined that it would not be an efficient use of limited field time. Interviews of local experts indicate that the target species are very unlikely to be found along the Arkansas and that significant access problems will hamper further exploration of this resource. However, we will attempt to conduct some aspects of this project in 2000.

6. Other observers. We gathered information from a number of sources (see Acknowledgments).

7. We conducted an analysis of the point-transect data and have added the following species to the special-species program as we gathered very little or no data on these species on transects:

Pied-billed Grebe. In 1999, we planned to monitor this species via the Wetland transects. However, field workers reported nesting at eight sites, including the largest nesting site reported in the state to date (where?). Therefore, we will attempt a census of this species in 2000 and the 1999 reports will serve as the beginning of a database of nesting sites.

Osprey. After obtaining location data for all of the known breeding sites in Colorado, we will conduct a pilot effort in 2000 to survey them.

Mountain Plover. In conjunction with the Prairie Partners Registry (PPR; another program housed at CBO), we are seeking specific, programmatic funding from the Colorado Division of Wildlife to obtain state-wide population estimates and information on reproductive success on Mountain Plover, Long-billed Curlew, and Burrowing Owl. This program, if funded, would commence late in the 2000 field season, so Colorado-wide surveys would not be conducted until 2001.

Upland Sandpiper. In conjunction with PPR, we will conduct a pilot effort in 2000 to census all known areas supporting this species.

Long-billed Curlew. See Mountain Plover, above.

Discussion

In 1999, the first year of running all aspects of the MCB project, we completed most tasks and obtained solid data on most of Colorado's breeding-bird species. We conducted 309 of a designed 390 transects, compiled long lists of breeding locations for 18 species (total of 586 site/species interactions), compiled a database of potential Black Swift waterfall-nesting sites, and visited >100 special-species breeding locations.

However, we were constrained in many tasks by a shortage of qualified field workers, thus did not complete all tasks. Because we did not complete all 30 transects in each habitat, analyses were hampered for many species and/or habitats. Despite this, quite a few low-density species had surprisingly-robust data, auguring well for short-term trend-detection.

Because 1999 was a pilot season of a very long-term project, we feel that detailed analyses for all species is premature at this time. However, since all partners and funders are interested in management implications of the MCB data, we here provide brief synopses of 1999 results for those species deemed of most concern in Colorado. Various bird species are listed by different agencies as being of concern, with some overlap among lists. Lists include the Colorado list of Threatened and Endangered Species (CO T&E) (citation?) and the USFS Region 2 List of Sensitive Species (FS-SS) (USFS 1994). These lists are intended to focus attention on potential effects of various management regimes on these species.

The following is offered as interpretation of 1999 data obtained on these listed species and is provided to assist managers in using these data. Only those species for which we obtained data are addressed here. Species that we do not treat here include: American Bittern, White-faced Ibis, Osprey, Greater Prairie-Chicken, Lesser Prairie-Chicken, Sharp-tailed Grouse, Sandhill Crane, Snowy Plover, Mountain Plover, Upland Sandpiper, Yellow-billed Cuckoo, Flammulated Owl, and Boreal Owl. Since all federally-listed species (Bald Eagle, Piping Plover, and Least Tern) are monitored by the U.S. Fish & Wildlife Service and by the state, we do not expend any effort monitoring them and do not treat them here. Additionally, the following species are not currently known to nest in Colorado and are also, therefore, excluded from analyses: Common Loon, Trumpeter Swan, Harlequin Duck, Merlin, Black-backed Woodpecker, and Baird's Sparrow.

Northern Goshawk (FS-SS). We recorded five individuals of this species on four transects in two habitats (Mixed Conifer and Ponderosa Pine). Even combining all habitats does not provide adequate sample size for analysis. We suggest that existing programs to monitor this species, particularly on USFS lands, continue and that additional and more thorough attempts to monitor the species statewide be made. We plan to gather data from all USFS districts in the future as one means to accomplish this.

Ferruginous Hawk (FS-SS). We counted seven Ferruginous Hawks on six transects in three habitats. Even pooling all habitats does not allow for successful analysis of so few data. In 2000, in conjunction with PPR, we will be conducting a pilot effort to survey for this species (focusing on finding active nests).

Long-billed Curlew (FS-SS). We recorded seven individuals on only one transect. In conjunction with the PPR, we will be conducting a focussed pilot effort in 2000 to monitor this species in the state.

Black Tern (FS-SS). Despite widespread efforts to locate pairs of this marsh-dependent species, we only found one pair in the state (among a colony of Forster's Terns and Franklin's Gulls on Walden Reservoir). We did not thoroughly survey some historic breeding sites in the San Luis Valley; hopefully, there are many pairs there waiting to be found. However, our results from northern Colorado suggest that this species is virtually gone from the area (and state?) as a breeder and requires ***immediate attention*** (cf. Kingery 1998 for data from earlier in the decade).

Burrowing Owl (CO T&E; FS-SS). We detected 29 individuals on only four Grassland transects in 1999. Despite this, the analysis results were encouraging. Also in 1999, PPR conducted a statewide survey for this species finding 2675 individuals in 468 colonies in 29 counties (Hutchings et al. 1999, Hutchings pers. comm.). We will continue to work with PPR to obtain monitoring data on this species.

Black Swift (FS-SS). In focused effort, we counted 39 Swifts at 28 waterfall sites (of 66 visited). As this survey continues to inspect more and more sites, we anticipate that sample sizes will grow and the data will be valuable at determining a population trend for this species.

Lewis's Woodpecker (FS-SS). We detected only four individuals of this species on two Ponderosa Pine transects and none on Low-elevation Riparian transects. This species occurs very locally in Ponderosa Pine forests, apparently requiring the more open structure of fire-created stands (Johnsgard 1986); a condition that is presently quite rare in Colorado. The vagaries of random transect selection apparently produced no Low-elevation Riparian transects in Lewis's-occupied areas on the Arkansas River.

Three-toed Woodpecker (FS-SS). We detected 10 individuals on six Spruce-Fir transects. In two seasons of effort, we have yet to find a Three-toed in any other habitat, despite their occurrence in all coniferous habitats from Ponderosa Pine uphill to Spruce-Fir. This suggests that our original assessment of this species as a target in Spruce-Fir is justified. Also, despite the small sample size we obtained in 1999, the results were very positive - low coefficient of variation and reasonably-balanced sources of variance. In 2001 in conjunction with the Pike N.F., we plan to initiate statewide transects in recently-burned areas, specifically targeted at this species.

Olive-sided Flycatcher (FS-SS). We counted 49 individuals on 36 transects in six habitats, with 12 or fewer flycatchers in each. Due to low sample sizes, analyses by habitat provided poor results. As in 1998 (Leukering and Carter 1999), this species had higher densities in Aspen than in any other habitat sampled. We believe that with the addition of Lodgepole Pine transects and completion of Mixed Conifer transects in 2000, we will be able to obtain robust statewide data on this species. However, habitat-specific data will probably continue to be relatively poor.

Willow Flycatcher (FS-SS). Though we report no data on this species in Appendix A, we recorded two individuals on one High-elevation Riparian transect. As for Fox Sparrow, below, we anticipate that the split of this habitat into Mid- and High-elevation Riparian (with 30 transects in each) will produce more data on Willow Flycatchers (a Mid-elevation Riparian species) in the future. We detected no individuals of the Southwestern race (*eximia*) on Low-

elevation Riparian transects, due both to the low incidence of occurrence of any Willow Flycatchers in this habitat in western Colorado and to the vagaries of random transect selection.

Loggerhead Shrike (FS-SS). We counted 34 Shrikes on 16 transects in four habitats, with the lion's share of observations being in Semi-desert Shrubland (22 birds on nine transects). Despite this fairly low sample size, the analysis proved fairly robust, with the coefficient of variation being slightly higher than our threshold of 50% and the two sources of variance being not quite balanced. Once 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 simply increasing the number or through separating the habitat into component east side and west-side habitats, we anticipate that sample size of this species will increase. Interestingly, this species is apparently well-sampled on the eastern plains by the Breeding Bird Survey but not by our Grassland transects. This dichotomy is of concern and some attention should be focused on this species there.

Purple Martin (FS-SS). We visited 37 of 79 known Martin sites in Colorado and confirmed occupation of 30 of those. The surveying for this species is one of the projects that was hampered by a field staff shortage. With more complete coverage of known sites in the future, we anticipate having the ability to assess population size and trend of Colorado's breeders.

Pygmy Nuthatch (FS-SS). The 1999 *MCB* field season produced solid data on this species, we counted 65 individuals on 17 Ponderosa Pine transects. This resulted in a very low CV and balanced sources of variance, though three parameters were required to fit a curve to the detection function. Should we continue to get results such as this, we will be able to obtain trend detection in <10 years.

Golden-crowned Kinglet (FS-SS). We recorded a total of 82 individuals on 34 transects in four habitats, with Spruce-Fir transects providing over half of the detections (the majority of the remaining detections were in Mixed Conifer). The data obtained in Spruce-Fir was quite robust with only the number of parameters involved in the detection-curve function falling outside of that preferred. Again, as in 1998 (Leukering and Carter 1999), this species' vocalizations are difficult to hear (being very high-pitched and not loud) at long distances, so detections were skewed to the short end of the distance spectrum. This is the primary reason behind the need for three parameters to fit a curve function to the detections. The data suggest that this species occurs in fairly high densities (5.33/ha) and that Spruce-Fir transects, at least, will be able to effectively monitor the species in a fairly short time period (<10 years).

Grasshopper Sparrow (FS-SS). We detected 154 individual Grasshopper Sparrows on 20 transects in two habitats, including 140 birds on over half of the Grassland transects. Despite this, the two sources of variance were not balanced in this species, thus suggesting some caution in interpreting the results. However, the coefficient of variation and low number of parameters involved in the detection-curve function suggest that this species' Colorado population can be effectively monitored by *MCB* in <10 years.

Fox Sparrow (FS-SS). Despite being a species that occurs in low densities, the data that we obtained on Fox Sparrow in 1999 were surprisingly robust. We counted 26 birds on seven transects in two habitats, with the data from High-elevation Riparian being very strong, despite it being a habitat in which we conducted less than 2/3 of the transects. Thus, we believe that with

the separation of this habitat into two types, Mid-elevation Riparian (not prime Fox Sparrow habitat) and High-elevation Riparian (prime Fox Sparrow habitat) in future field seasons, we will obtain robust data allowing for trend-detection in this species in <10 years.

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Gwen Lee assisted on many aspects of the project, including Purple Martin counts and, especially, with data entry and other design and preparation tasks.

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Appendix A. Results obtained for 168 species from 1999 *MCB* transects.

Species	Habitat	N	D	% CV	K	M	%Var (n)
Great Blue Heron	Grassland	1	0.01	100.0	1	0	100.0
Great Blue Heron	Low-elevation Riparian	19	0.04	45.8	11	1	84.5
Turkey Vulture	Grassland	3	0.01	73.5	2	0	100.0
Turkey Vulture	Low-elevation Riparian	9	0.00	57.3	5	0	100.0
Turkey Vulture	Montane Shrubland	4	0.01	58.6	3	0	100.0
Turkey Vulture	Piñon-Juniper	2	0.00	69.4	2	0	100.0
Turkey Vulture	Semidesert Shrubland	1	0.00	100.0	1	0	100.0
Northern Harrier	Grassland	1	0.00	100.0	1	0	100.0
Northern Harrier	Semidesert Shrubland	3	0.01	999.9	3	3	0.2
Cooper's Hawk	Montane Shrubland	2	0.02	68.9	2	0	100.0
Cooper's Hawk	Piñon-Juniper	2	0.00	69.4	2	0	100.0
Cooper's Hawk	Sage Shrubland	3	1.44	505.8	2	2	2.1
Northern Goshawk	Mixed Conifer	3	0.79	73.3	2	0	100.0
Northern Goshawk	Ponderosa Pine	2	0.01	69.4	2	0	100.0
Swainson's Hawk	Grassland	3	0.00	55.6	3	0	100.0
Swainson's Hawk	Sage Shrubland	3	0.00	73.4	2	0	100.0
Red-tailed Hawk	Aspen	2	0.00	69.3	2	0	100.0
Red-tailed Hawk	Grassland	1	0.00	100.0	1	0	100.0
Red-tailed Hawk	Low-elevation Riparian	6	0.00	43.2	5	0	100.0
Red-tailed Hawk	Mixed Conifer	5	0.22	174.6	2	2	21.9
Red-tailed Hawk	Montane Shrubland	8	0.21	540.7	5	2	1.0
Red-tailed Hawk	Piñon-Juniper	4	0.01	302.9	5	2	2.4
Red-tailed Hawk	Ponderosa Pine	5	0.03	133.0	5	2	9.7
Red-tailed Hawk	Sage Shrubland	1	0.00	100.0	1	0	100.0
Red-tailed Hawk	Semidesert Shrubland	5	0.00	50.2	4	0	100.0
Ferruginous Hawk	Grassland	3	0.17	999.9	3	2	0.1
Ferruginous Hawk	Sage Shrubland	3	0.02	73.4	2	0	100.0
Ferruginous Hawk	Semidesert Shrubland	1	0.00	100.0	1	0	100.0
Golden Eagle	Grassland	1	0.00	100.0	1	0	100.0
Golden Eagle	Piñon-Juniper	1	0.00	100.0	3	0	100.0
Golden Eagle	Sage Shrubland	3	0.00	55.6	3	0	100.0
Golden Eagle	Semidesert Shrubland	8	0.00	62.9	6	2	39.5
American Kestrel	Grassland	4	0.01	59.4	3	0	100.0
American Kestrel	Low-elevation Riparian	15	0.02	41.6	9	0	100.0
American Kestrel	Montane Shrubland	3	0.01	54.8	3	0	100.0
American Kestrel	Piñon-Juniper	2	0.00	69.4	3	0	100.0
American Kestrel	Sage Shrubland	5	0.00	41.3	5	0	100.0
American Kestrel	Semidesert Shrubland	8	0.01	35.2	7	0	100.0
Chukar	Piñon-Juniper	4	0.01	100.0	1	0	100.0
Chukar	Semidesert Shrubland	1	0.00	100.0	1	0	100.0
Ring-necked Pheasant	Grassland	5	0.00	81.8	2	0	100.0
Ring-necked Pheasant	Sage Shrubland	3	0.01	664.8	2	3	1.2
Ring-necked Pheasant	Semidesert Shrubland	6	0.00	69.3	2	0	100.0
Blue Grouse	Spruce-Fir	2	0.01	69.1	2	0	100.0
White-tailed Ptarmigan	Alpine Tundra	3	0.00	54.8	3	0	100.0
Wild Turkey	Ponderosa Pine	2	0.00	69.4	2	0	100.0

Species	Habitat	N	D	% CV	K	M	%Var (n)
Northern Bobwhite	Low-elevation Riparian	7	0.01	63.5	3	0	100.0
Scaled Quail	Grassland	1	0.02	100.0	1	0	100.0
Scaled Quail	Semidesert Shrubland	11	0.05	75.7	2	1	90.7
Gambel's Quail	Low-elevation Riparian	3	0.00	73.2	2	0	100.0
Gambel's Quail	Piñon-Juniper	2	0.01	100.0	1	0	100.0
Gambel's Quail	Semidesert Shrubland	2	0.00	100.0	1	0	100.0
Killdeer	Grassland	25	0.26	50.8	7	2	62.5
Killdeer	High-elevation Riparian	1	0.02	100.0	1	0	100.0
Killdeer	Low-elevation Riparian	71	0.29	63.9	8	3	90.6
American Avocet	Grassland	4	0.05	69.4	2	0	100.0
Spotted Sandpiper	High-elevation Riparian	8	1.10	100.4	4	2	30.5
Spotted Sandpiper	Low-elevation Riparian	65	0.64	24.4	20	2	55.4
Upland Sandpiper	Grassland	2	0.00	69.4	2	0	100.0
Upland Sandpiper	Sage Shrubland	1	0.12	100.0	1	0	100.0
Long-billed Curlew	Grassland	7	0.01	100.0	1	0	100.0
Common Snipe	High-elevation Riparian	1	1.68	100.0	1	0	100.0
Band-tailed Pigeon	Mixed Conifer	4	0.04	78.1	2	0	100.0
Band-tailed Pigeon	Spruce-Fir	2	0.03	100.0	1	0	100.0
Mourning Dove	Grassland	79	0.55	33.7	22	2	71.1
Mourning Dove	High-elevation Riparian	13	0.11	68.7	4	2	63.6
Mourning Dove	Low-elevation Riparian	70	0.13	25.3	18	1	67.2
Mourning Dove	Montane Shrubland	34	0.27	39.5	13	2	75.1
Mourning Dove	Piñon-Juniper	115	1.12	22.3	24	2	56.8
Mourning Dove	Ponderosa Pine	29	0.69	51.0	8	2	48.3
Mourning Dove	Sage Shrubland	59	0.49	25.5	14	2	83.7
Mourning Dove	Semidesert Shrubland	73	0.44	33.1	15	1	96.1
Yellow-billed Cuckoo	Low-elevation Riparian	1	0.00	100.0	1	0	100.0
Greater Roadrunner	Semidesert Shrubland	1	0.00	100.0	1	0	100.0
Great Horned Owl	Grassland	1	0.01	100.0	1	0	100.0
Great Horned Owl	Low-elevation Riparian	9	0.05	38.5	6	0	100.0
Burrowing Owl	Grassland	29	0.02	66.0	4	1	91.0
Common Nighthawk	Grassland	10	0.05	77.4	7	2	66.7
Common Nighthawk	Montane Shrubland	4	0.00	68.9	2	0	100.0
Common Nighthawk	Piñon-Juniper	2	0.06	69.4	2	0	100.0
Common Nighthawk	Ponderosa Pine	15	0.17	96.6	5	2	29.2
Common Nighthawk	Sage Shrubland	10	0.04	72.1	4	2	64.7
Common Nighthawk	Semidesert Shrubland	1	0.00	100.0	1	0	100.0
Common Poorwill	Piñon-Juniper	1	4.39	100.0	1	0	100.0
White-throated Swift	Piñon-Juniper	3	0.19	100.0	1	0	100.0
White-throated Swift	Ponderosa Pine	6	0.07	76.5	2	0	100.0
White-throated Swift	Sage Shrubland	3	0.01	100.0	1	0	100.0
Black-chinned Hummingbird	Low-elevation Riparian	3	0.02	55.1	3	0	100.0
Black-chinned Hummingbird	Mixed Conifer	7	0.53	86.3	2	0	100.0
Black-chinned Hummingbird	Piñon-Juniper	11	265.81	318.8	6	2	0.3
Broad-tailed Hummingbird	Alpine Tundra	20	0.70	53.4	7	1	63.5
Broad-tailed Hummingbird	Aspen	39	43.86	426.9	17	4	0.3

Species	Habitat	N	D	% CV	K	M	%Var (n)
Broad-tailed Hummingbird	Grassland	1	0.34	100.0	1	0	100.0
Broad-tailed Hummingbird	High-elevation Riparian	68	20.75	58.6	12	3	18.4
Broad-tailed Hummingbird	Mixed Conifer	57	2.40	33.3	17	5	43.7
Broad-tailed Hummingbird	Piñon-Juniper	36	81.39	293.4	15	2	0.5
Broad-tailed Hummingbird	Ponderosa Pine	56	3.36	27.8	19	3	73.4
Broad-tailed Hummingbird	Spruce-Fir	13	0.90	46.1	7	1	63.1
Belted Kingfisher	High-elevation Riparian	4	0.40	396.3	2	2	3.8
Belted Kingfisher	Low-elevation Riparian	15	0.15	69.1	8	2	24.5
Lewis's Woodpecker	Ponderosa Pine	4	0.03	78.2	2	0	100.0
Red-naped Sapsucker	Aspen	27	4.81	359.9	6	2	2.4
Red-naped Sapsucker	High-elevation Riparian	20	9.35	72.8	5	3	45.3
Red-naped Sapsucker	Mixed Conifer	13	0.15	71.3	6	4	39.1
Red-naped Sapsucker	Ponderosa Pine	9	0.22	203.8	5	2	4.4
Red-naped Sapsucker	Spruce-Fir	2	0.30	100.0	1	0	100.0
Williamson's Sapsucker	Aspen	3	0.30	73.3	2	0	100.0
Williamson's Sapsucker	Mixed Conifer	17	10.19	102.8	8	2	12.1
Williamson's Sapsucker	Ponderosa Pine	37	0.36	35.3	15	3	61.7
Williamson's Sapsucker	Spruce-Fir	8	3.98	270.0	4	2	4.3
Downy Woodpecker	Low-elevation Riparian	1	0.01	100.0	1	0	100.0
Downy Woodpecker	Mixed Conifer	3	0.06	73.3	2	0	100.0
Downy Woodpecker	Ponderosa Pine	4	2.23	393.1	3	2	2.3
Hairy Woodpecker	Aspen	13	0.37	40.6	10	1	54.1
Hairy Woodpecker	Mixed Conifer	70	0.14	70.2	7	2	25.4
Hairy Woodpecker	Montane Shrubland	5	0.27	361.7	3	2	3.1
Hairy Woodpecker	Piñon-Juniper	3	0.32	319.2	2	3	5.3
Hairy Woodpecker	Ponderosa Pine	18	0.24	40.9	13	1	43.6
Hairy Woodpecker	Spruce-Fir	8	0.13	42.8	6	0	100.0
Three-toed Woodpecker	Spruce-Fir	10	0.16	49.3	6	1	67.3
Northern Flicker	High-elevation Riparian	66	0.91	31.2	14	3	85.1
Northern Flicker	Aspen	38	0.60	39.1	20	2	26.6
Northern Flicker	Grassland	1	0.01	100.0	1	0	100.0
Northern Flicker	Low-elevation Riparian	30	0.06	30.7	14	1	85.1
Northern Flicker	Mixed Conifer	53	0.35	23.9	18	3	57.7
Northern Flicker	Montane Shrubland	36	0.22	33.8	19	2	20.0
Northern Flicker	Piñon-Juniper	36	0.30	17.2	14	2	60.1
Northern Flicker	Ponderosa Pine	92	0.67	26.0	24	5	38.1
Northern Flicker	Spruce-Fir	33	0.17	44.5	14	2	20.2
Olive-sided Flycatcher	Aspen	12	0.38	165.8	9	2	3.3
Olive-sided Flycatcher	High-elevation Riparian	6	0.07	91.7	5	2	21.3
Olive-sided Flycatcher	Mixed Conifer	12	0.19	99.5	8	2	14.8
Olive-sided Flycatcher	Piñon-Juniper	2	0.20	69.4	2	0	100.0
Olive-sided Flycatcher	Ponderosa Pine	10	0.03	33.1	8	0	100.0
Olive-sided Flycatcher	Spruce-Fir	7	0.03	52.4	4	0	100.0
Western Wood-Pewee	Aspen	185	3.15	21.7	19	1	90.4
Western Wood-Pewee	High-elevation Riparian	30	0.82	83.6	10	3	21.3
Western Wood-Pewee	Low-elevation Riparian	24	0.05	29.7	12	1	71.8

Species	Habitat	N	D	% CV	K	M	%Var (n)
Western Wood-Pewee	Mixed Conifer	22	0.26	44.1	7	2	85.0
Western Wood-Pewee	Montane Shrubland	5	0.06	49.4	4	0	100.0
Western Wood-Pewee	Piñon-Juniper	9	0.03	50.8	5	0	100.0
Western Wood-Pewee	Ponderosa Pine	88	1.03	25.9	19	1	86.5
Western Wood-Pewee	Spruce-Fir	4	0.02	78.0	2	0	100.0
Willow Flycatcher	High-elevation Riparian	2	0.07	100.0	1	0	100.0
Hammond's Flycatcher	Aspen	28	2.61	41.2	8	3	86.0
Hammond's Flycatcher	Mixed Conifer	8	0.03	46.8	5	0	100.0
Hammond's Flycatcher	Ponderosa Pine	10	0.38	69.8	3	1	73.4
Hammond's Flycatcher	Spruce-Fir	5	0.30	57.5	3	0	100.0
Dusky Flycatcher	Aspen	37	2.08	38.7	11	3	74.4
Dusky Flycatcher	High-elevation Riparian	30	1.42	60.1	8	2	48.3
Dusky Flycatcher	Mixed Conifer	33	1.20	51.2	11	2	47.3
Dusky Flycatcher	Montane Shrubland	63	3.46	999.9	13	4	0.0
Dusky Flycatcher	Piñon-Juniper	34	4.14	28.3	9	2	31.0
Dusky Flycatcher	Ponderosa Pine	138	6.78	23.0	19	1	90.6
Dusky Flycatcher	Spruce-Fir	3	0.06	73.2	2	0	100.0
Gray Flycatcher	Piñon-Juniper	171	4.71	46.9	23	6	9.6
Gray Flycatcher	Sage Shrubland	19	0.12	66.0	7	3	66.0
Cordilleran Flycatcher	Aspen	25	0.70	37.2	9	0	100.0
Cordilleran Flycatcher	High-elevation Riparian	42	1.27	38.6	10	1	82.2
Cordilleran Flycatcher	Mixed Conifer	44	1.66	31.5	18	2	54.6
Cordilleran Flycatcher	Montane Shrubland	4	0.05	58.6	3	0	100.0
Cordilleran Flycatcher	Piñon-Juniper	1	0.05	100.0	1	0	100.0
Cordilleran Flycatcher	Ponderosa Pine	13	0.29	57.6	6	1	61.4
Cordilleran Flycatcher	Spruce-Fir	26	5.31	91.2	9	2	10.2
Black Phoebe	Low-elevation Riparian	2	0.06	69.1	2	0	100.0
Say's Phoebe	Low-elevation Riparian	1	0.03	100.0	1	0	100.0
Say's Phoebe	Montane Shrubland	2	0.28	68.9	2	0	100.0
Say's Phoebe	Piñon-Juniper	5	0.05	64.8	3	0	100.0
Say's Phoebe	Sage Shrubland	2	0.01	69.4	2	0	100.0
Say's Phoebe	Semidesert Shrubland	5	0.05	93.6	4	2	28.8
Ash-throated Flycatcher	Grassland	1	0.34	100.0	1	0	100.0
Ash-throated Flycatcher	Piñon-Juniper	47	0.96	20.6	14	2	65.7
Ash-throated Flycatcher	Semidesert Shrubland	5	0.04	123.3	2	3	44.0
Cassin's Kingbird	Grassland	10	0.04	95.7	2	1	88.8
Western Kingbird	Grassland	34	0.32	51.3	14	5	64.1
Western Kingbird	Low-elevation Riparian	13	0.02	33.1	9	0	100.0
Western Kingbird	Sage Shrubland	16	0.93	129.5	4	2	22.4
Western Kingbird	Semidesert Shrubland	11	0.08	57.9	4	1	88.3
Eastern Kingbird	Grassland	7	0.15	96.1	3	2	35.1
Eastern Kingbird	Low-elevation Riparian	50	0.23	31.8	11	2	79.9
Loggerhead Shrike	Grassland	4	0.01	78.2	2	0	100.0
Loggerhead Shrike	Piñon-Juniper	1	0.04	100.0	1	0	100.0
Loggerhead Shrike	Sage Shrubland	7	0.02	48.8	4	0	100.0
Loggerhead Shrike	Semidesert Shrubland	22	0.11	64.5	9	2	23.8

Species	Habitat	N	D	% CV	K	M	%Var (n)
Gray Vireo	Piñon-Juniper	6	0.45	33.3	4	0	100.0
Plumbeous Vireo	High-elevation Riparian	2	0.24	68.7	2	0	100.0
Plumbeous Vireo	Low-elevation Riparian	5	0.01	49.7	4	0	100.0
Plumbeous Vireo	Mixed Conifer	6	0.98	92.8	2	3	62.4
Plumbeous Vireo	Montane Shrubland	19	0.61	60.5	9	4	25.3
Plumbeous Vireo	Piñon-Juniper	39	1.12	23.0	16	2	74.1
Plumbeous Vireo	Ponderosa Pine	45	0.91	33.7	11	1	88.0
Plumbeous Vireo	Spruce-Fir	7	0.16	85.7	2	2	66.5
Warbling Vireo	Aspen	531	13.64	10.4	26	1	88.0
Warbling Vireo	High-elevation Riparian	70	1.81	41.5	11	4	62.2
Warbling Vireo	Low-elevation Riparian	2	0.01	69.1	2	0	100.0
Warbling Vireo	Mixed Conifer	209	3.82	19.2	24	1	89.1
Warbling Vireo	Montane Shrubland	88	1.98	24.7	19	3	68.6
Warbling Vireo	Piñon-Juniper	19	1.25	64.5	7	3	39.0
Warbling Vireo	Ponderosa Pine	157	2.41	21.4	22	1	87.3
Warbling Vireo	Spruce-Fir	49	1.48	39.3	10	2	62.3
Gray Jay	Aspen	10	1.06	68.9	5	2	52.9
Gray Jay	High-elevation Riparian	6	0.16	68.7	2	0	100.0
Gray Jay	Mixed Conifer	3	0.02	73.3	2	0	100.0
Gray Jay	Spruce-Fir	57	3.12	24.7	15	3	75.7
Steller's Jay	Aspen	37	0.64	37.0	13	4	53.5
Steller's Jay	High-elevation Riparian	29	0.81	50.0	8	2	53.0
Steller's Jay	Mixed Conifer	86	1.12	26.0	22	2	35.6
Steller's Jay	Montane Shrubland	34	0.34	57.2	11	2	50.8
Steller's Jay	Piñon-Juniper	5	0.25	183.3	1	3	29.8
Steller's Jay	Ponderosa Pine	140	1.39	34.3	27	4	10.4
Steller's Jay	Spruce-Fir	42	0.97	46.6	11	2	36.4
Blue Jay	Grassland	1	0.01	100.0	1	0	100.0
Blue Jay	Low-elevation Riparian	16	0.02	40.9	5	0	100.0
Western Scrub-Jay	Montane Shrubland	24	0.34	60.5	8	2	43.2
Western Scrub-Jay	Piñon-Juniper	71	3.22	68.8	21	4	4.5
Pinyon Jay	Piñon-Juniper	122	1.63	33.1	13	2	43.0
Pinyon Jay	Semidesert Shrubland	8	0.00	56.4	4	0	100.0
Clark's Nutcracker	Alpine Tundra	15	0.02	72.1	6	3	57.6
Clark's Nutcracker	Aspen	16	0.37	86.2	6	2	38.4
Clark's Nutcracker	High-elevation Riparian	3	0.01	54.4	3	0	100.0
Clark's Nutcracker	Mixed Conifer	18	0.23	64.4	7	2	38.1
Clark's Nutcracker	Montane Shrubland	10	0.21	224.2	4	2	6.5
Clark's Nutcracker	Piñon-Juniper	15	0.11	85.4	6	3	38.6
Clark's Nutcracker	Ponderosa Pine	25	0.24	52.4	12	2	33.5
Clark's Nutcracker	Spruce-Fir	38	0.37	41.8	10	2	48.6
Black-billed Magpie	Grassland	1	0.01	100.0	1	0	100.0
Black-billed Magpie	High-elevation Riparian	22	0.19	50.0	4	2	98.2
Black-billed Magpie	Low-elevation Riparian	48	0.49	93.4	13	3	9.9
Black-billed Magpie	Montane Shrubland	62	0.56	42.9	12	3	85.6
Black-billed Magpie	Piñon-Juniper	61	0.25	28.9	15	1	65.2

Species	Habitat	N	D	% CV	K	M	%Var (n)
Black-billed Magpie	Ponderosa Pine	6	0.01	44.1	5	0	100.0
Black-billed Magpie	Sage Shrubland	23	0.04	36.5	7	0	100.0
Black-billed Magpie	Semidesert Shrubland	47	0.07	41.1	10	1	91.5
American Crow	Aspen	4	0.00	69.3	2	0	100.0
American Crow	Grassland	2	0.01	100.0	1	0	100.0
American Crow	Low-elevation Riparian	7	0.01	75.7	2	0	100.0
American Crow	Montane Shrubland	12	0.01	44.3	5	0	100.0
American Crow	Piñon-Juniper	12	0.02	82.6	3	2	72.8
American Crow	Ponderosa Pine	7	0.06	134.8	2	2	31.8
American Crow	Sage Shrubland	7	0.01	63.8	3	0	100.0
Chihuahuan Raven	Grassland	3	0.00	73.5	2	0	100.0
Common Raven	Alpine Tundra	12	0.10	52.6	7	2	45.1
Common Raven	Aspen	7	0.00	74.7	4	2	49.8
Common Raven	Grassland	2	0.00	100.0	1	0	100.0
Common Raven	High-elevation Riparian	3	0.05	1000.0	2	2	100.0
Common Raven	Low-elevation Riparian	8	0.01	53.0	4	0	100.0
Common Raven	Mixed Conifer	10	0.01	48.7	8	2	43.9
Common Raven	Piñon-Juniper	31	0.10	55.3	14	2	33.7
Common Raven	Ponderosa Pine	32	0.13	49.0	17	3	22.2
Common Raven	Sage Shrubland	10	0.01	89.5	7	4	16.1
Common Raven	Semidesert Shrubland	18	0.00	43.5	9	1	67.7
Common Raven	Spruce-Fir	5	0.15	309.7	3	2	3.5
Horned Lark	Alpine Tundra	109	2.17	21.4	13	4	63.9
Horned Lark	Grassland	827	12.35	11.6	29	3	84.0
Horned Lark	Sage Shrubland	182	2.50	33.9	14	2	88.7
Horned Lark	Semidesert Shrubland	376	3.86	20.0	23	2	89.9
Purple Martin	Montane Shrubland	8	0.61	100.6	3	3	43.7
Tree Swallow	Aspen	16	1.01	47.5	6	3	79.5
Tree Swallow	High-elevation Riparian	14	1.23	74.5	3	3	54.0
Tree Swallow	Mixed Conifer	8	1.72	327.1	5	3	2.7
Tree Swallow	Montane Shrubland	9	0.19	49.8	5	0	100.0
Tree Swallow	Ponderosa Pine	9	0.18	105.1	3	2	35.0
Tree Swallow	Sage Shrubland	1	0.40	100.0	1	0	100.0
Violet-green Swallow	Aspen	57	4.22	43.5	14	2	34.2
Violet-green Swallow	High-elevation Riparian	27	0.33	50.5	6	1	79.9
Violet-green Swallow	Mixed Conifer	27	1.03	37.4	7	2	91.9
Violet-green Swallow	Montane Shrubland	40	1.50	45.9	12	2	49.7
Violet-green Swallow	Piñon-Juniper	44	2.02	46.5	12	2	51.8
Violet-green Swallow	Ponderosa Pine	49	1.92	45.3	14	2	32.5
Violet-green Swallow	Sage Shrubland	5	2.17	184.2	1	2	29.5
N. Rough-winged Swallow	Grassland	6	0.21	60.6	3	0	100.0
N. Rough-winged Swallow	High-elevation Riparian	19	1.37	68.2	4	4	89.3
N. Rough-winged Swallow	Low-elevation Riparian	32	0.50	31.8	12	4	88.3
N. Rough-winged Swallow	Semidesert Shrubland	12	0.01	68.3	4	0	100.0
Bank Swallow	Grassland	3	0.02	73.5	2	0	100.0
Bank Swallow	Low-elevation Riparian	174	1.47	63.4	7	3	87.4

Species	Habitat	N	D	% CV	K	M	%Var (n)
Cliff Swallow	Grassland	17	2.04	67.5	3	2	93.7
Cliff Swallow	Low-elevation Riparian	222	1.35	44.4	12	5	97.8
Cliff Swallow	Montane Shrubland	6	0.13	49.2	4	0	100.0
Cliff Swallow	Sage Shrubland	5	0.04	100.0	1	0	100.0
Barn Swallow	Grassland	9	4.65	262.4	7	2	2.3
Barn Swallow	Low-elevation Riparian	53	0.48	45.3	11	2	81.8
Barn Swallow	Sage Shrubland	3	3.49	999.9	3	2	0.1
Barn Swallow	Semidesert Shrubland	4	1.13	999.9	2	2	0.1
Black-capped Chickadee	Aspen	6	0.21	55.4	4	0	100.0
Black-capped Chickadee	High-elevation Riparian	22	37.83	267.9	5	2	3.4
Black-capped Chickadee	Low-elevation Riparian	9	0.04	35.0	7	0	100.0
Black-capped Chickadee	Mixed Conifer	17	0.25	56.4	5	1	71.9
Black-capped Chickadee	Montane Shrubland	71	3.61	26.3	14	3	92.2
Black-capped Chickadee	Piñon-Juniper	25	0.49	47.4	9	2	66.0
Black-capped Chickadee	Ponderosa Pine	14	0.46	55.4	5	1	84.9
Mountain Chickadee	Aspen	96	3.03	24.1	23	2	46.2
Mountain Chickadee	High-elevation Riparian	39	1.10	44.0	8	2	82.1
Mountain Chickadee	Mixed Conifer	164	4.09	18.7	23	2	65.3
Mountain Chickadee	Montane Shrubland	19	0.20	43.3	8	2	58.8
Mountain Chickadee	Piñon-Juniper	25	6.41	41.8	10	2	31.1
Mountain Chickadee	Ponderosa Pine	195	3.85	14.3	28	2	58.2
Mountain Chickadee	Spruce-Fir	164	8.50	25.8	23	4	18.4
Juniper Titmouse	Piñon-Juniper	44	2.16	32.3	16	5	28.1
Bushtit	Montane Shrubland	10	0.24	100.0	1	0	100.0
Bushtit	Piñon-Juniper	36	13.97	28.5	13	2	51.9
Red-breasted Nuthatch	Aspen	38	0.48	29.9	12	2	82.8
Red-breasted Nuthatch	Mixed Conifer	95	1.03	41.8	20	5	21.2
Red-breasted Nuthatch	Ponderosa Pine	46	0.36	42.5	14	3	38.2
Red-breasted Nuthatch	Spruce-Fir	32	1.11	39.2	13	2	58.3
White-breasted Nuthatch	Aspen	5	0.07	50.1	4	0	100.0
White-breasted Nuthatch	High-elevation Riparian	6	0.05	92.1	2	2	62.7
White-breasted Nuthatch	Mixed Conifer	38	0.54	37.8	10	1	78.1
White-breasted Nuthatch	Montane Shrubland	20	0.21	48.6	8	2	58.9
White-breasted Nuthatch	Piñon-Juniper	26	1.11	31.5	12	1	26.9
White-breasted Nuthatch	Ponderosa Pine	80	1.38	23.8	19	3	68.0
White-breasted Nuthatch	Spruce-Fir	15	0.17	65.7	4	1	78.9
Pygmy Nuthatch	Mixed Conifer	6	0.13	69.2	3	0	100.0
Pygmy Nuthatch	Ponderosa Pine	65	2.20	34.6	17	3	61.3
Brown Creeper	Alpine Tundra	4	0.05	68.9	2	0	100.0
Brown Creeper	Aspen	9	0.62	50.5	5	0	100.0
Brown Creeper	High-elevation Riparian	7	0.35	100.0	1	0	100.0
Brown Creeper	Mixed Conifer	13	1.01	41.7	9	1	71.8
Brown Creeper	Ponderosa Pine	17	0.64	26.1	12	0	100.0
Brown Creeper	Spruce-Fir	31	4.75	43.2	13	2	28.7
Rock Wren	Alpine Tundra	3	0.02	73.0	2	0	100.0
Rock Wren	High-elevation Riparian	9	0.07	102.0	2	2	76.1

Species	Habitat	N	D	% CV	K	M	%Var (n)
Rock Wren	Montane Shrubland	2	0.04	68.9	2	0	100.0
Rock Wren	Piñon-Juniper	75	0.66	34.2	16	2	86.6
Rock Wren	Ponderosa Pine	3	0.00	55.6	3	0	100.0
Rock Wren	Sage Shrubland	34	0.21	78.5	5	3	47.8
Rock Wren	Semidesert Shrubland	48	0.18	36.7	14	2	89.9
Canyon Wren	Piñon-Juniper	12	0.07	72.4	3	2	91.9
Canyon Wren	Semidesert Shrubland	1	0.01	100.0	1	0	100.0
Bewick's Wren	Grassland	1	0.02	100.0	1	0	100.0
Bewick's Wren	Low-elevation Riparian	8	0.03	58.9	3	0	100.0
Bewick's Wren	Montane Shrubland	10	0.31	128.9	2	3	40.0
Bewick's Wren	Piñon-Juniper	215	3.79	23.3	22	3	92.9
Bewick's Wren	Semidesert Shrubland	7	0.17	194.5	3	2	8.5
House Wren	Aspen	139	6.51	27.5	22	2	69.2
House Wren	Grassland	1	0.00	100.0	1	0	100.0
House Wren	High-elevation Riparian	51	2.60	31.6	11	2	90.5
House Wren	Low-elevation Riparian	38	0.08	26.0	13	0	100.0
House Wren	Mixed Conifer	73	1.16	51.2	23	3	9.8
House Wren	Montane Shrubland	72	1.92	27.6	17	2	71.0
House Wren	Ponderosa Pine	60	1.83	36.2	21	2	42.5
House Wren	Spruce-Fir	12	1.82	132.6	5	2	15.6
American Dipper	High-elevation Riparian	1	2.07	100.0	1	0	100.0
Golden-crowned Kinglet	Aspen	10	0.69	29.1	9	0	100.0
Golden-crowned Kinglet	High-elevation Riparian	8	1.77	61.4	4	1	81.4
Golden-crowned Kinglet	Mixed Conifer	20	0.39	40.2	8	0	100.0
Golden-crowned Kinglet	Spruce-Fir	44	5.33	39.7	13	3	54.2
Ruby-crowned Kinglet	Alpine Tundra	18	0.20	48.7	7	2	77.3
Ruby-crowned Kinglet	Aspen	109	1.98	24.2	23	4	43.5
Ruby-crowned Kinglet	High-elevation Riparian	23	0.26	40.9	8	2	73.1
Ruby-crowned Kinglet	Mixed Conifer	63	0.58	34.4	15	2	37.4
Ruby-crowned Kinglet	Ponderosa Pine	52	0.41	55.8	9	2	43.4
Ruby-crowned Kinglet	Spruce-Fir	219	4.69	15.8	21	5	67.7
Blue-gray Gnatcatcher	Montane Shrubland	39	4.64	44.9	7	3	86.8
Blue-gray Gnatcatcher	Piñon-Juniper	130	16.31	17.0	24	3	63.6
Blue-gray Gnatcatcher	Semidesert Shrubland	10	1.12	80.3	4	2	77.8
Western Bluebird	Piñon-Juniper	3	0.24	100.0	1	0	100.0
Western Bluebird	Ponderosa Pine	25	1.52	61.1	10	2	29.9
Mountain Bluebird	Alpine Tundra	19	0.29	35.4	8	1	88.0
Mountain Bluebird	Aspen	9	0.20	39.1	6	0	100.0
Mountain Bluebird	High-elevation Riparian	3	0.16	1000.0	2	3	0.2
Mountain Bluebird	Mixed Conifer	9	0.23	64.5	6	2	42.5
Mountain Bluebird	Montane Shrubland	20	1.05	44.4	8	1	75.7
Mountain Bluebird	Piñon-Juniper	81	3.22	26.1	18	3	38.7
Mountain Bluebird	Ponderosa Pine	16	3.07	145.4	5	2	10.6
Mountain Bluebird	Sage Shrubland	18	0.11	38.7	9	2	69.4
Mountain Bluebird	Spruce-Fir	3	0.10	73.2	2	0	100.0
Townsend's Solitaire	Alpine Tundra	4	0.00	68.9	2	0	100.0

Species	Habitat	N	D	% CV	K	M	%Var (n)
Townsend's Solitaire	Aspen	22	1.15	77.5	11	2	13.4
Townsend's Solitaire	High-elevation Riparian	12	0.32	161.8	9	2	2.9
Townsend's Solitaire	Mixed Conifer	42	0.57	28.6	13	3	70.4
Townsend's Solitaire	Montane Shrubland	5	0.02	49.4	4	0	100.0
Townsend's Solitaire	Piñon-Juniper	6	0.07	82.4	6	2	20.2
Townsend's Solitaire	Ponderosa Pine	69	0.66	23.4	25	2	41.5
Townsend's Solitaire	Spruce-Fir	29	0.86	55.3	13	2	19.7
Swainson's Thrush	High-elevation Riparian	5	0.03	74.0	3	1	74.6
Swainson's Thrush	Spruce-Fir	1	9.15	100.0	1	0	100.0
Hermit Thrush	Alpine Tundra	7	0.01	72.9	5	2	34.9
Hermit Thrush	Aspen	93	0.54	24.6	20	2	46.5
Hermit Thrush	High-elevation Riparian	9	0.03	54.4	4	0	100.0
Hermit Thrush	Mixed Conifer	75	0.76	41.1	15	2	41.6
Hermit Thrush	Montane Shrubland	15	0.05	66.6	5	3	52.9
Hermit Thrush	Piñon-Juniper	6	0.05	104.2	4	4	23.2
Hermit Thrush	Ponderosa Pine	57	0.29	29.1	23	3	55.3
Hermit Thrush	Spruce-Fir	236	2.33	16.9	23	3	66.0
American Robin	Alpine Tundra	44	0.71	36.7	13	2	48.1
American Robin	Aspen	198	4.75	26.5	23	5	28.2
American Robin	High-elevation Riparian	98	8.54	35.8	18	2	28.3
American Robin	Low-elevation Riparian	34	0.13	36.7	13	2	61.5
American Robin	Mixed Conifer	129	2.54	18.6	25	5	69.2
American Robin	Montane Shrubland	136	1.97	13.7	21	3	43.7
American Robin	Piñon-Juniper	81	4.07	131.0	19	4	1.3
American Robin	Ponderosa Pine	186	2.34	17.5	28	2	45.0
American Robin	Sage Shrubland	53	0.57	30.5	15	2	73.2
American Robin	Spruce-Fir	97	2.67	18.1	22	4	74.1
Gray Catbird	Low-elevation Riparian	2	0.01	69.1	2	0	100.0
Northern Mockingbird	Grassland	44	0.36	66.3	7	4	65.3
Northern Mockingbird	Low-elevation Riparian	6	0.01	69.1	2	0	100.0
Northern Mockingbird	Sage Shrubland	19	0.14	68.3	4	1	92.5
Northern Mockingbird	Semidesert Shrubland	55	0.44	72.9	11	3	30.9
Sage Thrasher	Sage Shrubland	82	0.52	55.0	10	4	46.2
Sage Thrasher	Semidesert Shrubland	39	0.48	51.2	8	5	69.9
Brown Thrasher	Low-elevation Riparian	8	0.13	145.1	3	2	21.1
Curve-billed Thrasher	Semidesert Shrubland	2	0.01	69.3	2	0	100.0
American Pipit	Alpine Tundra	297	9.28	29.7	19	3	37.4
American Pipit	Spruce-Fir	5	0.33	100.0	1	0	100.0
Cedar Waxwing	Low-elevation Riparian	4	0.01	58.9	3	0	100.0
Cedar Waxwing	Montane Shrubland	5	0.13	81.5	2	0	100.0
Cedar Waxwing	Spruce-Fir	2	0.33	100.0	1	0	100.0
European Starling	Grassland	3	0.05	73.5	2	0	100.0
European Starling	Low-elevation Riparian	61	0.08	59.0	7	0	100.0
European Starling	Piñon-Juniper	5	0.01	81.8	2	0	100.0
European Starling	Sage Shrubland	2	0.00	69.4	2	0	100.0
Orange-crowned Warbler	Aspen	47	1.03	37.4	9	2	93.6

Species	Habitat	N	D	% CV	K	M	%Var (n)
Orange-crowned Warbler	High-elevation Riparian	8	0.50	61.1	3	0	100.0
Orange-crowned Warbler	Mixed Conifer	27	0.52	48.6	6	1	88.3
Orange-crowned Warbler	Montane Shrubland	35	2.10	46.7	6	2	92.4
Orange-crowned Warbler	Piñon-Juniper	8	0.65	70.7	4	2	83.5
Orange-crowned Warbler	Ponderosa Pine	78	2.45	61.4	8	3	45.2
Orange-crowned Warbler	Spruce-Fir	2	0.05	100.0	1	0	100.0
Virginia's Warbler	Montane Shrubland	80	3.38	31.1	12	3	86.1
Virginia's Warbler	Piñon-Juniper	117	12.15	36.4	15	3	46.9
Virginia's Warbler	Ponderosa Pine	83	2.04	38.4	8	2	92.2
Yellow Warbler	Aspen	15	0.77	65.0	6	1	88.0
Yellow Warbler	Grassland	2	0.01	100.0	1	0	100.0
Yellow Warbler	High-elevation Riparian	79	9.33	56.9	8	3	88.8
Yellow Warbler	Low-elevation Riparian	53	0.17	40.6	16	3	34.9
Yellow Warbler	Montane Shrubland	20	0.76	69.3	3	1	81.4
Yellow-rumped Warbler	Alpine Tundra	28	0.59	38.0	9	1	78.7
Yellow-rumped Warbler	Aspen	244	7.53	14.9	25	1	92.7
Yellow-rumped Warbler	High-elevation Riparian	25	11.97	192.4	9	2	3.2
Yellow-rumped Warbler	Mixed Conifer	181	4.97	17.8	23	2	91.7
Yellow-rumped Warbler	Piñon-Juniper	12	1.25	76.6	5	3	52.7
Yellow-rumped Warbler	Ponderosa Pine	236	4.93	18.3	26	3	69.4
Yellow-rumped Warbler	Spruce-Fir	222	7.72	13.2	23	3	54.9
Black-throated Gray Warbler	Piñon-Juniper	179	5.89	82.8	25	4	1.6
Grace's Warbler	Ponderosa Pine	45	0.83	64.3	10	5	31.1
MacGillivray's Warbler	Aspen	42	1.20	34.8	12	1	92.5
MacGillivray's Warbler	High-elevation Riparian	62	5.68	31.9	12	2	64.8
MacGillivray's Warbler	Mixed Conifer	21	1.16	59.2	6	2	56.2
MacGillivray's Warbler	Montane Shrubland	21	4.92	186.5	7	2	4.9
MacGillivray's Warbler	Ponderosa Pine	7	0.22	81.0	3	2	55.8
MacGillivray's Warbler	Spruce-Fir	3	0.05	73.2	2	0	100.0
Common Yellowthroat	Low-elevation Riparian	15	0.04	28.3	10	0	100.0
Wilson's Warbler	Aspen	10	0.44	53.8	5	2	72.4
Wilson's Warbler	High-elevation Riparian	34	26.41	97.6	6	3	16.6
Wilson's Warbler	Spruce-Fir	25	3.62	109.0	8	5	14.3
Yellow-breasted Chat	Low-elevation Riparian	52	0.19	29.2	12	1	93.8
Western Tanager	Aspen	52	0.97	26.3	15	2	91.5
Western Tanager	High-elevation Riparian	36	1.71	54.7	10	2	54.5
Western Tanager	Mixed Conifer	113	2.20	25.9	17	3	70.1
Western Tanager	Montane Shrubland	28	0.70	43.6	8	2	68.2
Western Tanager	Piñon-Juniper	20	0.17	36.5	10	2	78.3
Western Tanager	Ponderosa Pine	143	3.18	21.9	26	4	83.7
Western Tanager	Spruce-Fir	25	0.80	42.7	6	4	82.4
Green-tailed Towhee	Aspen	29	0.69	34.7	12	2	72.7
Green-tailed Towhee	High-elevation Riparian	70	3.78	63.9	10	3	24.8
Green-tailed Towhee	Mixed Conifer	69	1.09	26.6	17	2	53.4
Green-tailed Towhee	Montane Shrubland	198	6.00	16.9	17	1	92.1
Green-tailed Towhee	Piñon-Juniper	201	2.55	20.0	16	2	80.8

Species	Habitat	N	D	% CV	K	M	%Var (n)
Green-tailed Towhee	Ponderosa Pine	114	1.29	30.0	20	1	93.3
Green-tailed Towhee	Sage Shrubland	160	2.81	30.6	14	3	95.0
Green-tailed Towhee	Semidesert Shrubland	17	0.30	64.4	5	2	88.7
Green-tailed Towhee	Spruce-Fir	8	0.01	66.7	3	0	100.0
Spotted Towhee	High-elevation Riparian	31	1.85	123.4	3	2	42.9
Spotted Towhee	Low-elevation Riparian	16	0.04	48.2	6	0	100.0
Spotted Towhee	Mixed Conifer	25	0.31	63.2	5	2	59.3
Spotted Towhee	Montane Shrubland	367	9.50	17.8	19	1	95.1
Spotted Towhee	Piñon-Juniper	256	7.01	19.9	18	5	79.1
Spotted Towhee	Ponderosa Pine	46	1.41	53.4	7	2	77.3
Canyon Towhee	Grassland	5	0.05	70.9	2	0	100.0
Canyon Towhee	Semidesert Shrubland	1	0.01	100.0	1	0	100.0
Cassin's Sparrow	Grassland	58	0.86	42.2	10	2	67.9
Cassin's Sparrow	Sage Shrubland	68	0.49	56.2	4	1	95.6
Cassin's Sparrow	Semidesert Shrubland	75	0.42	67.3	5	3	59.5
Chipping Sparrow	Aspen	19	0.22	60.1	7	1	96.7
Chipping Sparrow	High-elevation Riparian	8	0.16	55.4	3	0	100.0
Chipping Sparrow	Mixed Conifer	33	1.48	79.1	11	2	11.6
Chipping Sparrow	Montane Shrubland	58	1.26	30.5	13	1	91.6
Chipping Sparrow	Piñon-Juniper	200	5.51	114.2	29	4	0.8
Chipping Sparrow	Ponderosa Pine	119	3.64	24.8	21	2	47.7
Chipping Sparrow	Sage Shrubland	12	0.08	78.7	3	2	94.1
Chipping Sparrow	Semidesert Shrubland	5	0.26	104.6	3	2	30.7
Chipping Sparrow	Spruce-Fir	7	0.15	61.3	3	1	84.4
Brewer's Sparrow	Grassland	24	0.84	41.4	9	2	84.0
Brewer's Sparrow	Montane Shrubland	80	16.04	92.7	19	3	2.1
Brewer's Sparrow	Piñon-Juniper	40	1.15	23.8	14	2	77.9
Brewer's Sparrow	Sage Shrubland	354	7.13	22.0	21	3	87.6
Brewer's Sparrow	Semidesert Shrubland	198	4.50	24.3	19	2	78.0
Field Sparrow	Low-elevation Riparian	4	0.01	100.0	1	0	100.0
Vesper Sparrow	Grassland	1	0.34	100.0	1	0	100.0
Vesper Sparrow	Montane Shrubland	15	0.19	51.3	5	0	100.0
Vesper Sparrow	Piñon-Juniper	30	0.32	42.3	10	2	89.2
Vesper Sparrow	Sage Shrubland	179	2.27	26.8	17	1	93.9
Vesper Sparrow	Semidesert Shrubland	84	1.28	36.4	16	2	93.8
Lark Sparrow	Grassland	78	3.01	43.0	12	4	76.5
Lark Sparrow	Montane Shrubland	4	0.14	77.9	2	0	100.0
Lark Sparrow	Piñon-Juniper	2	0.06	69.4	2	0	100.0
Lark Sparrow	Sage Shrubland	41	1.03	34.3	10	3	83.6
Lark Sparrow	Semidesert Shrubland	147	3.41	44.7	19	4	27.8
Black-throated Sparrow	Piñon-Juniper	2	0.06	100.0	1	0	100.0
Black-throated Sparrow	Semidesert Shrubland	2	0.17	100.0	1	0	100.0
Sage Sparrow	Sage Shrubland	24	0.46	53.6	5	1	86.3
Sage Sparrow	Semidesert Shrubland	6	0.08	50.0	4	0	100.0
Lark Bunting	Grassland	982	10.64	13.4	27	2	88.3
Lark Bunting	Sage Shrubland	299	3.90	49.9	6	4	75.8

Species	Habitat	N	D	% CV	K	M	%Var (n)
Lark Bunting	Semidesert Shrubland	196	1.78	65.4	7	2	97.6
Savannah Sparrow	Alpine Tundra	31	0.45	71.9	2	2	97.1
Savannah Sparrow	Grassland	2	0.02	100.0	1	0	100.0
Savannah Sparrow	Sage Shrubland	3	0.05	100.0	1	0	100.0
Grasshopper Sparrow	Grassland	140	3.23	27.4	15	2	90.7
Grasshopper Sparrow	Sage Shrubland	14	0.72	60.2	5	2	74.4
Fox Sparrow	High-elevation Riparian	22	1.31	54.9	6	2	61.2
Fox Sparrow	Spruce-Fir	4	0.02	100.0	1	0	100.0
Song Sparrow	Grassland	2	0.03	100.0	1	0	100.0
Song Sparrow	High-elevation Riparian	80	5.03	39.9	10	4	89.5
Song Sparrow	Low-elevation Riparian	53	0.29	32.9	15	2	69.0
Song Sparrow	Montane Shrubland	31	0.90	89.2	2	2	96.0
Lincoln's Sparrow	Alpine Tundra	36	0.56	36.1	9	2	94.5
Lincoln's Sparrow	Aspen	152	4.59	5.6	19	1	90.1
Lincoln's Sparrow	High-elevation Riparian	112	11.21	43.3	11	3	49.6
Lincoln's Sparrow	Spruce-Fir	20	0.36	47.4	9	2	56.5
White-crowned Sparrow	High-elevation Riparian	48	4.35	63.0	6	2	52.0
White-crowned Sparrow	Alpine Tundra	390	4.03	16.0	20	1	94.8
White-crowned Sparrow	Aspen	49	1.10	73.5	13	2	18.3
White-crowned Sparrow	Spruce-Fir	15	0.29	43.3	7	2	77.2
Dark-eyed Junco	High-elevation Riparian	26	6.51	81.7	9	4	12.7
Dark-eyed Junco	Alpine Tundra	28	0.31	60.5	7	2	83.5
Dark-eyed Junco	Aspen	256	19.38	24.3	26	3	16.5
Dark-eyed Junco	Mixed Conifer	186	4.21	15.9	22	4	64.5
Dark-eyed Junco	Montane Shrubland	10	0.21	57.3	4	0	100.0
Dark-eyed Junco	Piñon-Juniper	3	0.03	73.5	3	0	100.0
Dark-eyed Junco	Ponderosa Pine	190	8.05	18.8	28	2	53.0
Dark-eyed Junco	Spruce-Fir	192	5.83	100.6	23	4	0.7
McCown's Longspur	Grassland	77	2.02	71.6	3	2	94.9
Chestnut-collared Longspur	Grassland	1	0.01	10.0	1	0	100.0
Black-headed Grosbeak	Aspen	6	0.02	55.4	4	0	100.0
Black-headed Grosbeak	Grassland	1	0.03	100.0	1	0	100.0
Black-headed Grosbeak	High-elevation Riparian	14	0.63	76.4	7	2	27.4
Black-headed Grosbeak	Low-elevation Riparian	33	0.07	36.8	12	3	53.6
Black-headed Grosbeak	Mixed Conifer	6	0.07	60.4	4	1	67.8
Black-headed Grosbeak	Montane Shrubland	55	1.33	45.3	10	2	59.8
Black-headed Grosbeak	Piñon-Juniper	30	1.68	34.3	7	2	58.7
Black-headed Grosbeak	Ponderosa Pine	33	0.40	39.0	11	2	67.1
Black-headed Grosbeak	Spruce-Fir	1	0.08	100.0	1	0	100.0
Blue Grosbeak	Grassland	2	0.28	100.0	1	0	100.0
Blue Grosbeak	Low-elevation Riparian	22	0.10	45.0	12	2	33.0
Blue Grosbeak	Semidesert Shrubland	16	0.15	75.5	3	2	88.5
Lazuli Bunting	High-elevation Riparian	13	0.16	65.2	3	0	100.0
Lazuli Bunting	Low-elevation Riparian	22	0.05	27.5	10	0	100.0
Lazuli Bunting	Montane Shrubland	8	0.25	68.8	2	0	100.0
Lazuli Bunting	Piñon-Juniper	3	0.06	100.0	1	0	100.0

Species	Habitat	N	D	% CV	K	M	%Var (n)
Indigo Bunting	High-elevation Riparian	2	0.01	68.7	2	0	100.0
Indigo Bunting	Low-elevation Riparian	1	0.00	100.0	1	0	100.0
Red-winged Blackbird	Grassland	39	0.36	60.9	13	2	51.8
Red-winged Blackbird	High-elevation Riparian	13	2.04	248.0	3	2	7.3
Red-winged Blackbird	Low-elevation Riparian	49	0.17	26.6	13	2	90.1
Western Meadowlark	Grassland	579	4.18	10.9	29	2	65.3
Western Meadowlark	Low-elevation Riparian	11	0.01	60.1	4	0	100.0
Western Meadowlark	Montane Shrubland	74	0.49	36.4	10	1	97.4
Western Meadowlark	Piñon-Juniper	60	0.11	30.6	14	1	85.4
Western Meadowlark	Sage Shrubland	268	1.34	33.9	18	6	31.9
Western Meadowlark	Semidesert Shrubland	437	0.99	12.8	26	2	80.2
Brewer's Blackbird	High-elevation Riparian	11	0.30	58.1	3	0	100.0
Brewer's Blackbird	Low-elevation Riparian	19	0.10	50.0	7	2	73.4
Brewer's Blackbird	Montane Shrubland	7	0.29	163.8	2	3	18.1
Brewer's Blackbird	Piñon-Juniper	2	0.13	100.0	1	0	100.0
Brewer's Blackbird	Sage Shrubland	16	0.17	65.2	3	0	100.0
Brewer's Blackbird	Semidesert Shrubland	19	0.23	62.9	4	2	95.6
Brewer's Blackbird	Spruce-Fir	1	0.71	100.0	1	0	100.0
Common Grackle	Grassland	3	0.02	73.5	2	0	100.0
Common Grackle	Low-elevation Riparian	51	0.33	77.6	3	0	100.0
Great-tailed Grackle	Low-elevation Riparian	2	0.02	69.1	2	0	100.0
Brown-headed Cowbird	Aspen	11	0.79	82.6	5	2	28.2
Brown-headed Cowbird	Grassland	17	0.58	41.9	14	3	67.4
Brown-headed Cowbird	High-elevation Riparian	2	0.06	68.7	2	0	100.0
Brown-headed Cowbird	Low-elevation Riparian	49	0.23	25.9	13	2	86.2
Brown-headed Cowbird	Mixed Conifer	7	3.76	553.3	7	2	0.4
Brown-headed Cowbird	Montane Shrubland	59	1.56	26.7	15	2	85.4
Brown-headed Cowbird	Piñon-Juniper	59	2.49	35.1	18	2	46.7
Brown-headed Cowbird	Ponderosa Pine	47	0.94	30.5	14	1	78.3
Brown-headed Cowbird	Sage Shrubland	58	1.14	41.1	13	3	62.9
Brown-headed Cowbird	Semidesert Shrubland	5	0.03	70.8	2	0	100.0
Orchard Oriole	Low-elevation Riparian	18	0.17	65.7	6	4	76.1
Bullock's Oriole	Grassland	4	0.04	59.4	3	0	100.0
Bullock's Oriole	Low-elevation Riparian	20	0.11	44.4	7	3	75.2
Bullock's Oriole	Montane Shrubland	14	0.27	60.5	6	1	62.4
Bullock's Oriole	Piñon-Juniper	2	0.00	69.4	2	0	100.0
Brown-capped Rosy-Finch	Alpine Tundra	8	0.24	100.6	3	3	56.7
Pine Grosbeak	Alpine Tundra	3	0.01	54.8	3	0	100.0
Pine Grosbeak	Spruce-Fir	32	0.69	32.3	11	1	79.5
Cassin's Finch	Alpine Tundra	7	0.14	73.6	4	2	50.1
Cassin's Finch	Aspen	5	0.04	50.1	4	0	100.0
Cassin's Finch	Mixed Conifer	23	0.47	74.9	8	4	29.5
Cassin's Finch	Montane Shrubland	4	0.02	58.6	3	0	100.0
Cassin's Finch	Piñon-Juniper	3	0.04	73.5	2	0	100.0
Cassin's Finch	Ponderosa Pine	32	1.12	183.4	15	4	1.6
Cassin's Finch	Spruce-Fir	9	0.38	62.2	7	3	31.6

Species	Habitat	N	D	% CV	K	M	%Var (n)
House Finch	Low-elevation Riparian	12	0.04	52.3	5	0	100.0
House Finch	Piñon-Juniper	88	2.74	32.4	14	1	92.3
House Finch	Sage Shrubland	6	0.02	73.4	2	0	100.0
House Finch	Spruce-Fir	1	0.01	100.0	1	0	100.0
Red Crossbill	Aspen	9	0.47	71.9	3	1	79.2
Red Crossbill	Ponderosa Pine	9	0.13	48.3	6	0	100.0
Red Crossbill	Spruce-Fir	9	0.14	50.1	5	0	100.0
White-winged Crossbill	Spruce-Fir	2	2.77	100.0	1	0	100.0
Pine Siskin	Alpine Tundra	53	0.97	43.9	7	2	86.9
Pine Siskin	Aspen	85	2.62	24.7	18	1	82.1
Pine Siskin	High-elevation Riparian	72	2.89	40.3	11	3	89.0
Pine Siskin	Mixed Conifer	99	1.41	25.8	21	3	49.8
Pine Siskin	Montane Shrubland	16	0.54	41.3	7	1	76.3
Pine Siskin	Piñon-Juniper	8	3.54	162.8	5	3	7.2
Pine Siskin	Ponderosa Pine	74	0.90	23.5	20	3	66.2
Pine Siskin	Spruce-Fir	73	3.45	33.2	16	2	63.2
Lesser Goldfinch	Low-elevation Riparian	6	0.01	60.1	3	0	100.0
Lesser Goldfinch	Piñon-Juniper	1	0.13	100.0	1	0	100.0
American Goldfinch	Low-elevation Riparian	16	0.04	33.1	9	0	100.0
Evening Grosbeak	Mixed Conifer	9	0.16	42.1	5	0	100.0
Evening Grosbeak	Ponderosa Pine	8	0.03	59.4	3	0	100.0
Evening Grosbeak	Spruce-Fir	9	0.50	84.7	2	2	89.0
House Sparrow	Low-elevation Riparian	13	0.03	50.8	4	0	100.0

Table 2. Differing results by habitat for a variety of species from the point-transect aspect of the ***Monitoring Colorado's Birds*** program, 1999 data. n=sample size; k=the number of transects in that habitat in which the species was detected; K=the number of transects conducted in that habitat; Density is expressed in birds/ha; and the coefficient of variation expressed as a percentage.

Species	Habitat	n	k	K	Density	CV(%)
Three-toed Woodpecker	Spruce-Fir	10	6	23	0.16	49.3
Warbling Vireo	Aspen	531	26	26	13.64	10.4
	Mixed Conifer	209	24	25	3.82	19.2
	Montane Shrubland	88	19	21	1.98	24.7
	Ponderosa Pine	157	22	29	2.41	21.4
	Spruce-Fir	49	10	23	1.48	39.3
Horned Lark	Alpine Tundra	109	13	21	2.17	21.4
	Grassland	827	29	28	12.35	11.6
	Sage Shrubland	182	14	28	2.50	33.9
	Semidesert Shrubland	376	23	27	3.86	20.0
Blue-gray Gnatcatcher	Montane Shrubland	39	7	21	4.64	44.9
	Piñon-Juniper	130	23	29	13.50	19.7
American Robin	Aspen	198	23	26	4.75	26.5
	Alpine Tundra	44	13	21	0.71	36.7
	Mixed Conifer	129	25	25	2.54	18.6
	Montane Shrubland	136	21	21	1.97	13.7
	Piñon-Juniper	81	18	29	0.79	37.9
	Ponderosa Pine	186	28	29	2.34	17.5
	Sage Shrubland	53	15	28	0.57	30.5
	Spruce-Fir	97	22	23	2.67	18.1
Brewer's Sparrow	Grassland	24	9	28	0.84	41.4
	Montane Shrubland	80	19	21	16.04	92.7
	Piñon-Juniper	40	14	29	0.55	30.6
	Sage Shrubland	354	21	28	7.13	22.
	Semidesert Shrubland	198	19	27	4.5	24.3
Lark Bunting	Grassland	982	27	28	10.64	13.4
	Sage Shrubland	299	6	28	3.9	49.9
	Semidesert Shrubland	196	7	27	1.78	65.4
Brown-capped Rosy-Finch	Alpine Tundra	8	3	21	0.24	100.6

Appendix C. Results of incomplete special-species monitoring, 1999.

Species	# of	# of	# Nests	# Sites	# Sites	# Sites
Pied-billed Grebe	226	7		8*	8	8
Eared Grebe	1375	462	33	39	30	15
Western Grebe	237	35	18	39	14	11
Clark's Grebe	207	16		24	7	5
American White Pelican	326	179		3	2	3
Double-crested Cormorant	227	93	34	14	7	9
American Bittern	16			1*	1	1
Great Blue Heron		208	840	123	77	53
Great Egret	12		12	3	3	2
Snowy Egret	250		70	10	6	1
Cattle Egret			<10	6	5	1
Green Heron	2			2*	2	2
Black-crowned Night-Heron	474	18	238	23	16	11
White-faced Ibis	524		145	7	4	2
Mississippi Kite	7			2*	2	2
Piping Plover	7			2	2	2
Willet	101	1		9	9	6
Franklin's Gull	5	12		1	1	1
California Gull	521	278		4	3	3
Forster's Tern	48	9		4	3	2
Least Tern	50	29	39	8	8	8
Black Tern	2			4	3	1
Eurasian Collared-Dove	6		1	3	3	3
Black Swift	53	33	33	45		
Acorn Woodpecker	7					
Black Phoebe	16	6	2	2	2	2
Scissor-tailed Flycatcher	2		1			
Bell's Vireo	4					
Purple Martin	168	6	15	81		
Chestnut-sided Warbler	1					1
Ovenbird	9					3
Hooded Warbler	1					1
Northern Cardinal	2					2
Bobolink	192		19		16	16
Scott's Oriole	13	4	1	15		
White-winged Crossbill	2			1		

* Species were only censussed at Browns Park NWR; 2000 work will focus more on these species.