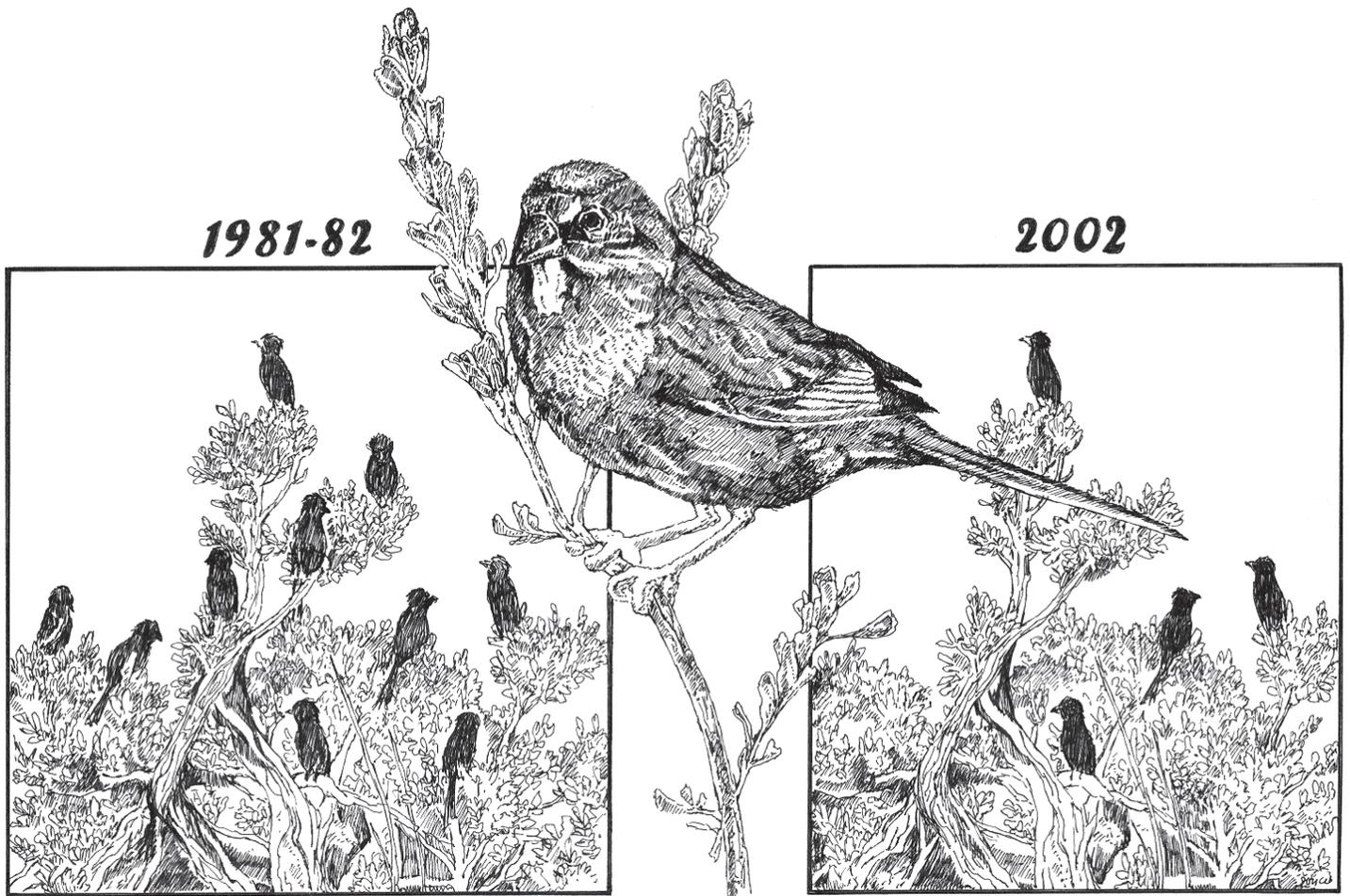




A 20-Year Recount of Bird Populations Along a Great Basin Elevational Gradient

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Abstract

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During 1981 and 1982, Dean E. Medin conducted bird censuses along an elevational gradient (5,250 to 11,400 feet) near and on Wheeler Peak of east-central Nevada. Twenty years later we conducted bird census on seven of his 12 plots. Data from the bristlecone pine—*Pinus longaeva*—plot were collected in 1981 but not published (data on file with the Great Basin National Park). Data for the remaining six plots were collected in 1982 and published.

In general, all 2002 bird counts from the seven study plots recorded substantially fewer numbers of total birds and, with the exception of the bristlecone pine and alpine study plots, recorded fewer bird species as compared to Medin's counts of 1981 and 1982. Total numbers of birds counted in the 70 visits (10 census visits for seven study plots) to all study plots for 1981 and 1982 was 5,034. This compares to 1,930 for 2002, or a reduction of 3,104 birds—a 62 percent reduction. Total number of bird species sighted in 1981 and 1982 was 83 compared to 75 in 2002, or a reduction of eight. Sixty-three species of birds were common to the 1981/1982, and the 2002 censuses. Twenty species of birds were sighted in 1981 and 1982 that were not sighted in 2002, and 12 species were sighted in 2002 that were not recorded in 1981 and 1982.

Keywords: Great Basin National Park, Wheeler Peak, neotropical birds

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Introduction

During 1981 and 1982, Dean E. Medin collected bird census data along an elevational gradient (5,250 to 11,400 feet) near and on Wheeler Peak of east-central Nevada. The data from his 11 plots in 1982 were published in Medin and others (2000). Twenty years later we conducted bird census on six of his 11 plots. We did not include bird counts on his five ecotone plots (Medin and others 2000) because they were square shaped and in our opinion did not represent ecotones. Narrow rectangular shaped plots would be more representative of ecotones. However, we did locate the five ecotone plots and took Global Positioning System (GPS) readings at their corners for future references. These readings are listed in appendix A. Photographs of the five ecotones are printed in Medin and others (2000). Also included in this study are 1981 bird census of Medin's bristlecone pine (*Pinus longaeva*, data on file at the Great Basin National Park) plot. Our re-censusing of the bristlecone pine would make a grand total of seven plots.

Study Area

The study area and many of the individual study plots have been described in detail in the following publications: Medin (1984, 1987, 1990a,b, 1992) and Medin and others (2000). Basically, the study area was confined to the Snake Valley and Snake Mountain Range, located in White Pine County, east-central Nevada. This study area is typical of the basin-and-range topography that characterizes much of the Great Basin. A large range of environmental conditions occurs within small distances giving rise to a multiplicity of plant communities. These plant communities are well defined on steep mountain slopes where they exist as elevational belts. Medin selected study plots within 12 plant communities (only seven used in this study) ranging from valley floor to alpine (Medin 1981 unpublished data collected from a bristlecone pine plot data on file at the Great Basin National Park;

Medin 1984; Medin and others 2000). Precipitation on the study area ranged from 8 inches (20 cm) at the valley floor to 30 inches (76 cm) at the alpine zone (Medin and others 2000). Climatically, the study area ranged from cold desert with cold winters and hot, dry summers to wet and cold alpine.

Methods

Seven of Medin's study plots (Medin 1981 unpublished data for his bristlecone pine cone plot; data on file at the Great Basin National Park; Medin and others 2000) were selected for re-censusing of bird populations: shadscale (*Atriplex confertifolia*) at 5,250 feet (1,600 m), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) at 5,700 feet (1,740 m), pinyon/juniper (*Pinus monophylla*, *Juniperus osteosperma*) at 6,800 feet (2,050 m), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) at 8,400 feet (2,550 m), mixed conifer at 9,600 feet (2,900 m), bristlecone pine at 10,500 feet (3,200 m; Medin 1984), and alpine 11,400 feet (3,475). (The bristlecone pine plot was not one of the study plots in the Medin and others 2000 study.) Study plots were 49.42 acres (20 ha) in size. All corners of the various study plots were marked with $\frac{5}{8}$ inch by 14 inch steel reinforcement rods and GPS readings taken. The GPS readings are given as a footnote at the end of the tables for the specific study plots.

We followed Medin's census methods, dates, and times as outlined in Medin and others (2000). In general, bird censuses were conducted using the Williams spot-map method except we recorded the sighting of birds and did not note their location on a plot map. The square study plots were surveyed and gridded by Cartesian Coordinate System using points and numbered stakes at 246.1 foot (75 m) intervals. In fact we were able to locate a majority of the original plastic stakes used by Medin (1981 unpublished data); Medin and others (2000) in 1981 and 1982. Ten census visits were made to each plot in 2002. All bird censuses were conducted between sunrise and early afternoon. To ensure complete coverage, the study

plots were censused by walking within 164 feet (50 m) of all points on the grid. Different census routes through the plots were used with different starting and ending points distributed as evenly as practical among visits (Medin and others 2000).

Data in tables 1 to 7 are mean number of birds for 10 censusing visits to a given plot. Data in tables 8 to 10 are the total number of birds for a given species for all 70 visits to all study plots. Data in tables 1 to 8 were subjected to a nonparametric Wilcoxon matched pairs test to test for differences between years for total birds (Hintze 1992).

Bird nomenclature is from Alsop (2001). Scientific names of birds cited in the text and tables are listed in appendix B. Plant nomenclature is after Plummer and others (1977).

Table 1—Comparisons between Medin and others (2000) bird counts of 1982 and counts conducted in 2002 for the shadscale^a (*Atriplex confertifolia*) habitat. Data expressed as mean number of bird for 10 visits.

Bird species	1982	2002
American crow	0.4	0.0
American kestrel	.4	.1
Barn swallow	.3	.1
Brewer's sparrow	1.0	.0
Common raven	2.0	1.9
Ferruginous hawk	.2	.0
Golden eagle	.2	.0
Horned lark	43.0	10.5
Long-billed curlew	.6	.0
Mountain bluebird	.1	.0
Mourning dove	.3	.0
Northern harrier	.5	.2
Northern rough-winged swallow ^b	.3	.0
Red-tailed hawk	.0	.1
Sage sparrow	.0	.9
Sage thrasher	.1	.0
Savannah sparrow	.1	.0
Swainson's hawk	.1	.0
Tree swallow	.0	.2
Violet-green swallow	.2	.0
Western meadowlark	.2	.0
Total birds	50.0	14.0
Total species	18 (13 not in 2002)	8 (3 not in Medin and others 2000)
Species common to both counts	5	

^aPlot corners were marked by ⁵/₈ by 14 inch steel reinforcement rods. GPS readings were as follows: **NW**-N39° 02.767', W114° 7.913'; **NE**-N39° 02.893', W114° 07.650'; **SW**-N39° 02.567', W114° 07.731'; **SE**-N39° 02.699', W114° 07.470'.

^bCalled rough-winged swallow by Medin and others 2000.

Results and Discussion

As with the bird census of 20 years before (Medin 1981 unpublished data; Medin and others 2000), our bird counts showed bird abundance was relatively low in low elevation study plots (shadscale, table 1; Wyoming big

Table 2—Comparisons between Medin and others (2000) bird counts of 1982 and counts conducted in 2002 for the Wyoming big sagebrush^a (*Artemisia tridentata* ssp. *wyomingensis*) habitat. Data expressed as mean number of bird for 10 visits.

Bird species	1982	2002
American crow	0.2	0.0
American kestrel	.1	.0
Black-billed magpie	.1	.0
Black-throated sparrow	11.0	2.8
Brewer's sparrow	19.0	.3
Broad-tailed hummingbird	.2	.1
Chipping sparrow	.0	.2
Common nighthawk	.1	.0
Common poorwill	.2	.0
Common raven	3.0	.5
Golden eagle	.5	.0
Greater sage grouse ^b	.1	.0
Green-tailed towhee	.1	.0
Horned lark	.8	.0
Lazuli bunting	.0	.1
Loggerhead shrike	.2	.0
Mourning dove	.5	.2
Northern harrier	.8	.0
Northern rough-winged swallow ^c	.1	.0
Pinyon jay	.1	1.0
Prairie falcon	.1	.0
Red-tailed hawk	.1	.0
Rough-legged hawk	.1	.0
Sage sparrow	11.0	8.3
Sage thrasher	3.0	.9
Savannah sparrow	.0	.1
Vesper sparrow	.1	.5
Violet-green swallow	.2	.5
Western meadowlark	.1	1.6
White-crown sparrow	.1	.2
White-throated swift	.2	.0
Total birds	52.1	17.3
Total species	28 (16 not in 2002)	15 (3 not in Medin and others 2000)
Species common to both counts	12	

^aPlot corners were marked by ⁵/₈ by 14 inch steel reinforcement rods. GPS readings were as follows: **NW**-N38° 59.687', W114° 08.719'; **NE**-N38° 59.726', W114° 08.409'; **SW**-N38° 59.436', W114° 08.665'; **SE**-N38° 59.480', W114° 08.358'.

^bCalled sage grouse by Medin and others 2000.

^cCalled rough-winged swallow by Medin and others 2000.

Table 3—Comparisons between Medin and others (2000) bird counts of 1982 and counts conducted in 2002 for the pinyon/juniper^a (*Pinus monophylla*, *Juniperus osteosperma*) habitat. Data expressed as mean number of bird for 10 visits.

Bird species	1982	2002
American crow	0.3	0.1
American kestrel	.3	.1
American robin	.4	.6
Ash-throated flycatcher	.2	.1
Barn swallow	.2	.0
Bewick's wren	.0	.3
Black-headed grosbeak	.1	.2
Black-throated gray warbler	4.0	3.1
Black-throated sparrow	.3	.0
Blue-gray gnatcatcher	.0	1.9
Brewer's blackbird	.1	.0
Broad-tailed hummingbird	1.0	1.4
Brown-headed cowbird	.5	.3
Bushtit	5.0	2.0
Cassin's finch	4.0	.0
Chipping sparrow	5.0	2.0
Clark's nutcracker	.6	.0
Chukar	.0	.2
Common nighthawk	.0	.2
Common raven	2.0	.5
Dark-eyed junco	2.0	.6
Dusty flycatcher	.3	.0
Evening grosbeak	.2	.0
Ferruginous hawk	.1	.0
Golden eagle	.2	.0
Great horned owl	.5	.0
Hermit thrush	.2	.0
Hairy woodpecker	.0	.1
House wren	.0	.1
Juniper titmouse ^b	6.0	.9
Lark sparrow	.1	.0
Lazuli bunting	.0	.1
Mountain bluebird	8.0	2.8
Mountain chickadee	9.0	1.1
Mourning dove	.7	.2
Northern flicker	.6	.4
Northern goshawk	.3	.0
Northern harrier	.3	.0
Pine siskin	1.0	2.4
Pinyon jay	10.0	2.4
Red-breasted nuthatch	.5	.1
Red-naped sapsucker ^c	.1	.0
Red-tailed hawk	.2	.0
Ruby-crowned kinglet	4.0	.5
Sharp-shinned hawk	.0	.2
Spotted towhee ^d	.2	.2
Townsend's solitaire	.7	.3
Violet-green swallow	.3	.0
Western scrub jay ^e	7.0	.9
Western tanager	.4	.1

Table 3—(Con.)

Bird species	1982	2002
White-crown sparrow	.0	.1
White-throated swift	.3	.0
Yellow-rumped warbler	1.0	.7
Total birds	78.2	27.2
Total species	44 (18 not in 2002)	35 (9 not in Medin and others 2000)
Species common to both counts	26	

^aPlot corners were marked by ⁵/₈ by 14 inch steel reinforcement rods. GPS readings were as follows: **NW**-38° 59.963', W114° 12.619'; **NE**-N39° 00.017', W114° 12.312'; **SW**-N38° 59.731', W114° 12.526'; **SE**-N38° 59.728', W114° 12.235'.

^bCalled plain titmouse by Medin and others 2000.

^cCalled yellow-bellied sapsucker by Medin and others 2000.

^dCalled Rufous-sided towhee by Medin and others 2000.

^eCalled scrub jay by Medin and others 2000.

sagebrush, table 2), increased to a maximum in mid to upper elevation study plots (pinyon/juniper, table 3; mountain big sagebrush, table 4; mixed conifer, table 5; bristlecone pine, table 6), and declined in the alpine study plot (table 7). A similar trend was followed by the number of bird species. Both total number of individual birds and number of bird species reached the highest value in the mountain big sagebrush study plot.

In general, all 2002 birds counts from the seven study plots recorded substantially—as determined by Wilcoxon matched pairs statistical test—fewer numbers of total birds, with the exception of the alpine study plots, and recorded fewer numbers of bird species as compared to Medin's count of 1981 (unpublished data) and Medin and others (2000) counts of 1982 (tables 1 to 7).

Total numbers of birds counted in the 70 visits to all study plots for 1981/1982 censuses were 5,034 (table 8). This compares to 1,930 for 2002, or a decline of 3,104 birds; a 62 percent reduction (table 8). Total number of bird species sighted in 1981/1982 was 83 compared to 75 in 2002, a decline of eight (table 8). Sixty-three species of birds were common to both the 1981/1982 and 2002 censuses (table 8). Twenty species of birds were sighted in 1981/1982 that were not sighted in 2002 (table 9). Fourteen out of 20 bird species sighted in 1981/1982 and not in 2002 were recorded in three or less sightings for the 10 census visits to the study plots (table 9). These species are apparently not common, and the failure of sighting in 2002 is not considered meaningful. However, the failure of sightings for these six remaining species does

Table 4—Comparisons between Medin and others (2000) bird counts of 1982 and counts conducted in 2002 for the mountain big sagebrush^a (*Artemisia tridentata* ssp. *vaseyana*) habitat. Data expressed as mean number of bird for 10 visits.

Bird species	1982	2002
American kestrel	2.0	.0
American robin	10.0	2.8
Black-chinned sparrow	.0	.2
Black-headed grosbeak	.2	.2
Blue-gray gnatcatcher	.0	.1
Blue grouse	.8	.3
Brewer's blackbird	.2	.0
Brewer's sparrow	23.0	11.3
Broad-tailed hummingbird	2.0	.8
Brown creeper	.1	.0
Brown-headed cowbird	.1	.7
Bushtit	.4	.3
Calliope hummingbird	.2	.0
Cassin's finch	6.0	7.2
Chipping sparrow	10.0	7.1
Clark's nutcracker	3.0	.2
Common nighthawk	.8	.0
Common raven	1.0	.7
Cooper's hawk	.0	.2
Cordilleran flycatcher	.0	.1
Dark-eyed junco	.8	2.6
Dusty flycatcher	6.0	.8
Evening grosbeak	10.0	.0
Golden eagle	.0	.2
Gray flycatcher	.0	.2
Great horned owl	.1	.0
Green-tailed towhee	30.0	9.8
Hermit thrush	.2	.0
House wren	3.0	.0
Juniper titmouse ^b	.0	.2
Lark sparrow	.1	.0
Lazuli bunting	.2	.0
MacGillivray's warbler	.5	.1
Mountain bluebird	4.0	.4
Mountain chickadee	5.0	2.0
Mourning dove	.8	.1
Northern flicker	3.0	.2
Northern goshawk	.2	.0
Northern harrier	1.0	.0
Northern rough-winged swallow ^c	.2	.0
Olive-sided flycatcher	.2	.0
Orange-crowned warbler	.1	.0
Pine siskin	1.0	1.3
Pinyon jay	.3	.0
Plumbeous vireo	.0	.1
Red-breasted nuthatch	.2	.0
Red-naped sapsucker ^d	4.0	.8
Red-tailed hawk	.3	.0
Ruby-crowned kinglet	2.0	1.3
Sage sparrow	.0	.2
Spotted towhee ^e	2.0	.6
Steller's jay	.2	.0
Townsend's solitaire	.1	.0

Table 4—(Con.)

Bird species	1982	2002
Tree swallow	.7	.0
Turkey vulture	.0	.1
Vesper sparrow	2.0	1.8
Violet-green swallow	.4	.2
Warbling vireo	.8	.6
Western scrub jay ^f	.8	.1
Western tanager	1.0	.5
White-crowned sparrow	2.0	.1
White-throated swift	.1	.0
Yellow-rumped warbler	8.0	4.4
Total birds	151.1	60.9
Total species	53 (23 not in 2002)	40 (10 not in Medin and others 2000)
Species common in both counts	30	

^aPlot corners were marked by ⁵/₈ by 14 inch steel reinforcement rods. GPS readings were as follows: **NW**-N39° 03.359', W114° 19.151'; **NE**-N39° 03.440', W114° 18.873'; **SW**-N39° 03.128', W114° 19.057'; **SE**-N39° 03.214', W114° 18.762'.

^bCalled plain titmouse by Medin and others 2000.

^cCalled rough-winged swallow by Medin and others 2000.

^dCalled yellow-bellied sapsucker by Medin and others 2000.

^eCalled Rufous-sided towhee by Medin and others 2000.

^fCalled scrub jay by Medin and others 2000.

create some concern about species status. Twelve species were sighted in 2002 that were not recorded in 1981/1982 (table 10). Nine of the species sighted in 2002 and not in 1981 and 1982 are probable chance sightings (table 10).

Shadscale Bird Census Plot

In 2002, it was apparent during our bird census visits to the shadscale plot that most of the shadscale plants had died out. The plot was basically a winterfat-bud sagebrush plot. Extensive shrub dieoff occurred in the shadscale zone of the Great Basin during the years 1977 to 1986 (Nelson and others 1989). Shrub loss may be related to record high precipitation during this 10 year period. We also observed that we were sighting far fewer birds (50 versus 14) and species of birds (18 versus 8, table 1) than reported by Medin and others (2000). Our concern was that these lower bird counts may be due to significant vegetative changes that could have occurred between our counts and those of Medin's in 1982 (Medin and others 2000). To check out this possibility, we conducted bird censuses on healthy shadscale stands south of the Baker, NV, airstrip, west of State Road 487 that connects Baker and Garrison, UT. Our counts were also lower than Medin

Table 5—Comparisons between Medin and others (2000) bird counts of 1982 and counts conducted in 2002 for the mixed conifer^a habitat. Data expressed as mean number of bird for 10 visits.

Bird species	1982	2002
American dipper	0.0	.1
American robin	2.0	.3
Brewer's blackbird	.0	.1
Broad-tailed hummingbird	.3	.1
Brown creeper	5.0	.4
Cassin's finch	6.0	.9
Chipping sparrow	.7	.2
Clark's nutcracker	6.0	3.1
Common raven	.1	.0
Cooper's hawk	.0	.1
Dark-eyed junco	5.0	1.6
Dusty flycatcher	.4	.0
Hairy woodpecker	.5	.1
Hermit thrush	8.0	3.0
Mountain bluebird	.8	.0
Mountain chickadee	13.0	2.4
Northern flicker	1.0	.2
Pine siskin	11.0	.3
Red-breasted nuthatch	4.0	1.0
Red crossbill	.0	.4
Red-naped sapsucker ^b	.3	.2
Red-tailed hawk	.0	.1
Ruby-crowned kinglet	2.0	.1
Sharp-shinned hawk	.1	.2
Townsend's solitaire	9.0	3.0
Tree swallow	.3	.0
Violet-green swallow	.2	.0
Warbling vireo	.0	.2
Western tanager	.1	.0
Western wood-pewee	.5	.0
White-breasted nuthatch	2.0	.8
Williamson's sapsucker	.1	.0
Yellow-rumped warbler	5.0	.7
Total birds	83.4	19.6
Total species	27 (8 not in 2002)	25 (6 not in Medin and others 2000)
Species common to both counts	19	

^aPlot corners were marked by 5/8 by 14 inch steel reinforcement rods. GPS readings were as follows: **NW**-N39° 00.553', W114° 18.056'; **NE**-N39° 00.632', W114° 17.779'; **SW**-N39° 00.332', W114° 17.975'; **SE**-N39° 00.396', W114° 17.683'.

^bCalled yellow-bellied sapsucker by Medin and others 2000.

and others (2000) and in agreement with the counts from their shadscale plot. Medin and others (2000) reported common raven and horned lark were the most prominent bird species on the plot (table 1). Our ranking agrees.

Table 6—Comparisons between bird counts of 1981 (Medin 1981 unpublished data on file at the Great Basin National Park) and counts conducted in 2002 for the bristlecone pine^a (*Pinus longaeva*) plot. Data expressed as mean number of bird for 10 visits.

Bird species	1982	2002
American crow	0.1	0.0
American robin	1.9	.2
Black rosy finch ^b	2.0	.0
Broad-tailed hummingbird	1.1	.5
Brown creeper	.0	.1
Cassin's finch	4.3	3.1
Chipping sparrow	.0	.3
Clark's nutcracker	6.3	6.3
Common raven	1.0	.5
Cordilleran flycatcher	.0	.2
Dark-eyed junco	10.0	2.5
Dusty flycatcher	1.9	.0
Golden eagle	.1	.0
Gray flycatcher	.0	.1
Hairy woodpecker	.0	.2
Hermit thrush	1.0	1.0
Mountain bluebird	7.9	1.7
Mountain chickadee	5.5	7.5
Northern flicker	1.7	1.5
Northern goshawk	.0	.1
Pine siskin	5.2	.8
Red-breasted nuthatch	.1	.3
Red crossbill	1.3	.5
Rock wren	.2	.0
Ruby-crowned kinglet	.0	.3
Townsend's solitaire	7.8	1.7
Tree swallow	.3	.0
Violet-green swallow	.2	.2
Virginia's warbler	.0	.3
White-breasted nuthatch	.8	1.0
Yellow-rumped warbler	4.6	3.2
Total birds	65.3	34.1
Total species	23 (6 not in 2002)	25 (8 not in Medin 1981 unpublished data)
Species common in both counts	17	

^aPlot corners were marked by 5/8 by 14 inch steel reinforcement rods. GPS readings were as follows: **NW**-N39° 00.261', W114° 18.357'; **NE**-N39° 00.374', W114° 18.113'; **SW**-N39° 00.035', W114° 18.286'; **SE**-N39° 00.118', W114° 17.993'.

^bCalled rosy finch by Medin 1981 unpublished data.

Wyoming Big Sagebrush Bird Census Plot

The Wyoming big sagebrush bird census plot is interesting from the point of view that due to drought and over grazing by sheep, its understory of grasses and forbs was essentially gone. Yet birds were able to

Table 7—Comparisons between Medin and others (2000) bird counts of 1982 and counts conducted in 2002 for the alpine^a habitat. Data expressed as mean number of bird for 10 visits.

Bird species	1982	2002
American kestrel	0.6	0.1
American pipit ^b	15.0	4.9
Black rosy finch ^c	.0	3.9
Broad-tailed hummingbird	.2	.4
Cassin's finch	.1	.5
Chipping sparrow	.0	.3
Clark's nutcracker	1.0	.0
Common raven	.2	1.7
Cooper's hawk	.0	.1
Dark-eyed junco	.3	.7
Golden eagle	.1	.0
Mountain bluebird	3.0	3.7
Mountain chickadee	.1	.0
Northern goshawk	.1	.0
Pine siskin	.2	2.1
Red-tailed hawk	.0	.2
Rock wren	.8	.6
Townsend's solitaire	.7	.3
Violet-green swallow	.8	.1
Virginia's warbler	.0	.2
White-crown sparrow	.1	.0
Zone-tailed hawk	.0	.1
Total birds	23.3	19.9
Total species	16 (5 not in 2002)	17 (6 not in Medin and others 2000)
Species common in both counts	11	

^aPlot corners were marked by $\frac{5}{8}$ by 14 inch steel reinforcement rods. GPS readings were as follows: **NW**-N39° 01.297', W114° 19.594'; **NE**-N39° 01.309', W114° 19.297'; **SW**-N39° 01.076', W114° 19.567'; **SE**-N39° 01.089', W114° 19.270'.

^bCalled water pipit by Medin and others 2000.

^cCalled rosy finch by Medin and others 2000.

survive. Welch (2002) compared the number of birds and bird species in burned-over big sagebrush sites dominated by perennial grasses against sites of unburned big sagebrush. He found that burned-over sites supported fewer bird species and fewer total number than sites of unburned big sagebrush.

Medin and others (2000) found the major bird species in this plot were black-throated sparrow, Brewer's sparrow, and sage sparrow (table 2). Sage thrasher, a sagebrush obligate, were sighted by Medin and others (2000) on this plot. The major bird species on the plot in 2002 were black-throated sparrow, sage sparrow, and western meadowlark. We also sighted sage thrashers on the plot but in reduced numbers from the 1982 count.

Pinyon/Juniper Bird Census Plot

Major bird species listed by Medin and others (2000) for the pinyon/juniper bird census plot were juniper titmouse, mountain bluebird, mountain chickadee, pinyon jay, and western scrub jay (table 3). Black-throated gray warbler, mountain bluebird, pine siskin, and pinyon jay were the major bird species sighted in our 2002 count. The blue-gray gnatcatcher was sighted by us a number of times but was not reported by Medin and others (2000).

Mountain Big Sagebrush Bird Census Plot

For both our 2002 bird counts and those reported by Medin and others (2000) in 1982, the mountain big sagebrush bird census plot supported the greatest number of birds and bird species in both the 1982 and 2002 studies (table 4). Major bird species on this plot in 1982 (Medin and others 2000) were American robin, Brewer's sparrow, chipping sparrow, evening grosbeak, and green-tailed towhee. For 2002, major bird species on this plot were Brewer's sparrow, Cassin's finch, chipping sparrow, green-tailed towhee, and yellow-rumped warbler.

Mixed Conifer Bird Census Plot

The mixed conifer bird census plot suffered the greatest reduction in total number of birds between the 1982 count and our 2002 count (table 5), an enormous 77 percent reduction. Number of birds species was nearly the same. Most prominent birds species found on the plot in 1982 (Medin and others 2000) were Cassin's finch, Clark's nutcracker, hermit thrush, mountain chickadee, pine siskin, and Townsend's solitaire. Our 2002 counts found the most prominent bird species to be Clark's nutcracker, dark-eyed junco, hermit thrush, mountain chickadee, red-breasted nuthatch, and Townsend's solitaire.

Bristlecone Pine Bird Census Plot

The 1981 bird count in table 6 represents unpublished data on file with the Great Basin National Park. Most prominent bird species of the 1981 bird counts were Clark's nutcracker, dark-eyed junco, mountain bluebird, and Townsend's solitaire. Major bird species of our 2002 counts were Cassin's finch, Clark's nutcracker, mountain chickadee, and yellow-rumped warbler.

Alpine Bird Census Plot

From a total number of birds and bird species perspective, the Alpine bird census plot was the least variable between the two counting periods. However, the domination of the site by American pipit in the 1982

Table 8—Comparisons between total birds sighted in 70 censuses (10 censuses of seven study plots) of six Medin's and others (2000) study plots and Medin's 1981 (unpublished data on file at the Great Basin National Park) bristlecone pine—*Pinus longaeva*—study plot versus 2002 bird count.

Bird species	1982	2002
American crow	10	1
American dipper	0	1
American kestrel	34	3
American pipit ^a	150	49
American robin	143	39
Ash-throated flycatcher	2	1
Barn swallow	5	1
Bewick's wren	0	3
Black-billed magpie	1	0
Black-chinned sparrow	0	2
Black-headed grosbeak	3	4
Black-rosy finch ^b	20	39
Black-throated gray warbler	40	31
Black-throated sparrow	113	28
Blue-gray gnatcatcher	0	20
Blue grouse	8	3
Brewer's blackbird	3	1
Brewer's sparrow	430	116
Broad-tailed hummingbird	48	33
Brown creeper	51	5
Brown-headed cowbird	6	10
Bushtit	54	23
Calliope hummingbird	2	0
Cassin's finch	204	117
Chipping sparrow	157	101
Clark's nutcracker	169	96
Chukar	0	2
Common nighthawk	9	2
Common poorwill	2	0
Common raven	93	58
Cooper's hawk	0	4
Cordilleran flycatcher	0	3
Dark-eyed junco	181	80
Dusty flycatcher	86	8
Evening grosbeak	102	0
Ferruginous hawk	3	0
Golden eagle	11	2
Gray flycatcher	0	3
Great horned owl	6	0
Greater sage grouse ^c	1	0
Green-tailed towhee	301	98
Hairy woodpecker	5	4
Hermit thrush	94	40
Horned lark	438	105
House wren	30	1
Juniper titmouse ^d	60	11
Lark sparrow	2	0
Lazuli bunting	2	2
Loggerhead shrike	2	0
Long-billed curlew	6	0
MacGillivray's warbler	5	1
Mountain bluebird	238	86

Table 8—(Con.)

Bird species	1982	2002
Mountain chickadee	326	130
Mourning dove	23	5
Northern flicker	63	23
Northern goshawk	6	1
Northern harrier	26	2
Northern rough-winged swallow ^e	6	0
Olive-sided flycatcher	2	0
Orange-crowned warbler	1	0
Pine siskin	184	69
Pinyon jay	104	34
Plumbeous vireo	0	1
Prairie falcon	1	0
Red-breasted nuthatch	48	14
Red crossbill	13	9
Red-naped sapsucker ^f	44	10
Red-tailed hawk	6	4
Rock wren	10	6
Rough-legged hawk	1	0
Ruby-crowned kinglet	80	22
Sage sparrow	110	94
Sage thrasher	31	9
Savannah sparrow	1	1
Sharp-shinned hawk	1	4
Spotted towhee ^g	22	8
Steller's jay	2	0
Swainson's hawk	1	0
Townsend's solitaire	183	53
Tree swallow	13	2
Turkey vulture	0	1
Vesper sparrow	21	23
Violet-green swallow	23	10
Virginia's warbler	0	5
Warbling vireo	8	8
Western meadowlark	3	16
Western scrub-jay ^h	78	10
Western tanager	15	6
Western wood-pewee	5	0
White-breasted nuthatch	28	18
White-crown sparrow	22	4
White-throated swift	6	0
Williamson's sapsucker	1	0
Yellow-rumped warbler	186	90
Zone-tailed hawk	0	1
Total species	83	75
Total bird sightings	5,034	1,930
Species common to both years	63	

^aCalled water pipit by Medin and others 2000.

^bCalled rosy finch by Medin and others 2000.

^cCalled sage grouse by Medin and others 2000.

^dCalled plain titmouse by Medin and others 2000.

^eCalled rough-winged swallow by Medin and others 2000.

^fCalled yellow-bellied sapsucker by Medin and others 2000.

^gCalled Rufous-sided towhee by Medin and others 2000.

^hCalled scrub jay by Medin and others 2000.

Table 9—Total number of birds for 70 censuses (10 censuses for seven plots) and bird species sighted in six of Medin's and others (2000) study plots and Medin's 1981 (unpublished data on file at the Great Basin National Park) bristlecone pine—*Pinus longaeva*—study plot but not sighted 2002 bird count.

Bird species	Number
Black-billed magpie	1
Calliope hummingbird	2
Common poorwill	2
Evening grosbeak	102
Ferruginous hawk	3
Great horned owl	6
Greater sage grouse ^a	1
Lark sparrow	2
Loggerhead shrike	2
Long-billed curlew	6
Northern rough-winged swallow ^b	6
Olive-sided flycatcher	2
Orange-crowned warbler	1
Prairie falcon	1
Rough-legged hawk	1
Steller's jay	2
Swainson's hawk	1
Western wood-pewee	5
White-throated swift	6
Williamson's sapsucker	1

^aCalled sage grouse by Medin and others 2000.

^bCalled rough-winged swallow by Medin and others 2000.

Table 10—Total number of birds 70 censuses (10 censuses for seven plots) and bird species sighted in 2002 and not by Medin and others (2000) in 1982 and by Medin 1981 unpublished bristlecone pine plot bird count (data on file at the Great Basin National Park).

Bird species	Number
American dipper	1
Bewick's wren	3
Black-chinned sparrow	2
Blue-gray gnatcatcher	20
Chukar	2
Cordilleran flycatcher	3
Cooper's hawk	4
Gray flycatcher	3
Plumbeous vireo	1
Turkey vulture	1
Virginia's warbler	5
Zone-tailed hawk	1

count was lacking in the 2002 count. Most prominent birds species in 1982 were American pipit and mountain bluebird. Most prominent in 2002 were American pipit, black rosy finch, and mountain bluebird.

Summary

In general, the most prominent bird species on the various study plots in 1982 were also the most prominent birds in 2002, with some exceptions. The large reduction in total number of birds seems to parallel the reports of others (Jehl and Johnson 1994). We do note that Medin collected his data during a wet period, and our data was collected during a dry period.

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Appendix A

Global Positioning System (GPS) readings for the corners of Medin and others (2000) five ecotones bird census plots. Corners were **not** marked by $\frac{5}{8}$ by 14 inches reinforcement bars.

Shadscale (*Atriplex confertifolia*)/Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) ecotone south of Baker airstrip.

NW N38° 59.212' W114° 07.373'; **NE** N38° 59.250' W114° 07.194'; **SW** N38° 59.071' W114° 07.324'; **SE** N38° 59.110' W114° 07.145'.

Wyoming big sagebrush/pinyon-juniper (*Pinus monophylla*-*Juniperus osteosperma*) ecotone south of Kious Spring.

NW N38° 59.034' W114° 09.371'; **NE** N38° 59.074' W114° 09.193'; **SW** N38° 58.497' W114° 09.323'; **SE** N38° 58.534' W114° 09.141'.

Pinyon-juniper/mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) ecotone north west of Baker Creek Campground.

NW N38° 59.356' W114° 14.508'; **NE** N38° 59.390' W114° 14.325'; **SW** N38° 59.218' W114° 14.439'; **SE** N38° 59.254' W114° 14.261'.

Mountain big sagebrush/mixed conifer ecotone south of Strawberry Creek.

NW N39° 02.514' W114° 18.462'; **NE** N39° 02.522' W114° 18.281'; **SW** N39° 02.372' W114° 18.420'; **SE** N39° 02.411' W114° 18.239'.

Mixed conifer/alpine ecotone west (about 1 mile) of Wheeler Peak Trail Head.

NW N39° 00.567' W114° 19.166'; **NE** N39° 00.559' W114° 18.579'; **SW** N39° 00.421' W114° 19.173'; **SE** N39° 00.418' W114° 18.585'.

Appendix B

Common and scientific names of birds in the text and tables (after Alsop 2001).

Common name	Scientific name	Common name	Scientific name
American crow	<i>Corvus brachyrhynchos</i>	Loggerhead shrike	<i>Lanius ludovicianus</i>
American dipper	<i>Cinclus mexicanus</i>	Long-billed curlew	<i>Numenius americanus</i>
American kestrel	<i>Falco sparverius</i>	Long-eared owl	<i>Asio otus</i>
American pipit ^a	<i>Anthus rubescens</i>	MacGillivray's warbler	<i>Oporornis tolmiei</i>
American robin	<i>Turdus migratorius</i>	Mountain bluebird	<i>Sialia currucoides</i>
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>	Mountain chickadee	<i>Poecile gambeli</i>
Barn swallow	<i>Hirundo rustica</i>	Mourning dove	<i>Zenaidura macroura</i>
Bewick's wren	<i>Thryomanes bewickii</i>	Northern flicker	<i>Colaptes auratus</i>
Black-billed magpie	<i>Pica hudsonia</i>	Northern goshawk	<i>Accipiter gentilis</i>
Black-chinned hummingbird	<i>Archilochus alexandri</i>	Northern harrier	<i>Circus cyaneus</i>
Black-chinned sparrow	<i>Spizella atrogularis</i>	Northern rough-winged swallow ^e	<i>Stelgidopteryx serripennis</i>
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	Olive-sided flycatcher	<i>Contopus cooperi</i>
Black rosy-finch ^b	<i>Leucosticte atrata</i>	Orange-crowned warbler	<i>Vermivora celata</i>
Black-throated gray warbler	<i>Dendroica nigrescens</i>	Pine siskin	<i>Carduelis pinus</i>
Black-throated sparrow	<i>Amphispiza bilineata</i>	Pinyon jay	<i>Gymnorhinus cyanocephalus</i>
Blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	Plumbeous vireo	<i>Vireo plumbeus</i>
Blue grouse	<i>Dendragapus obscurus</i>	Prairie falcon	<i>Falco mexicanus</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>	Red-breasted nuthatch	<i>Sitta canadensis</i>
Brewer's sparrow	<i>Spizella breweri</i>	Red-naped sapsucker ^f	<i>Sphyrapicus nuchalis</i>
Broad-tailed hummingbird	<i>Selasphorus platycercus</i>	Red-tailed hawk	<i>Buteo jamaicensis</i>
Brown creeper	<i>Certhia americana</i>	Rock wren	<i>Salpinctes obsoletus</i>
Brown-headed cowbird	<i>Molothrus ater</i>	Rough-legged hawk	<i>Buteo lagopus</i>
Bushtit	<i>Psaltirparus minimus</i>	Ruby-crowned kinglet	<i>Regulus calendula</i>
Calliope hummingbird	<i>Stellula calliope</i>	Sage sparrow	<i>Amphispiza belli</i>
Cassin's finch	<i>Carpodacus cassinii</i>	Sage thrasher	<i>Oreoscoptes montanus</i>
Chipping sparrow	<i>Spizella passerina</i>	Savannah sparrow	<i>Passerculus sandwichensis</i>
Chukar	<i>Alectoris chukar</i>	Sharp-shinned hawk	<i>Accipiter striatus</i>
Clark's nutcracker	<i>Nucifraga columbiana</i>	Spotted towhee ^g	<i>Pipilo maculatus</i>
Common nighthawk	<i>Chordeiles minor</i>	Steller's jay	<i>Cyanocitta stelleri</i>
Common poorwill	<i>Phalaenoptilus nuttallii</i>	Swainson's hawk	<i>Buteo swainsoni</i>
Common raven	<i>Corvus corax</i>	Townsend's solitaire	<i>Myadestes townsendi</i>
Cordilleran flycatcher	<i>Empidonax occidentalis</i>	Tree swallow	<i>Tachycineta bicolor</i>
Cooper's hawk	<i>Accipiter cooperii</i>	Turkey vulture	<i>Cathartes aura</i>
Dark-eyed junco	<i>Junco hyemalis</i>	Vesper sparrow	<i>Poecetes gramineus</i>
Dusky flycatcher	<i>Empidonax oberholseri</i>	Violet-green swallow	<i>Tachycineta thalassina</i>
Evening grosbeak	<i>Coccothraustes vespertinus</i>	Virginia's warbler	<i>Vermivora virginiae</i>
Ferruginous hawk	<i>Buteo regalis</i>	Warbling vireo	<i>Vireo gilvus</i>
Golden-crowned kinglet	<i>Regulus satrapa</i>	Western kingbird	<i>Tyrannus verticalis</i>
Golden eagle	<i>Aquila chrysaetos</i>	Western meadowlark	<i>Sturnella neglecta</i>
Gray flycatcher	<i>Empidonax wrightii</i>	Western scrub jay ^h	<i>Aphelocoma californica</i>
Great-horned owl	<i>Bubo virginianus</i>	Western tanager	<i>Piranga ludoviciana</i>
Greater sage grouse ^c	<i>Centrocercus urophasianus</i>	Western wood-pewee	<i>Contopus sordidulus</i>
Green-tailed towhee	<i>Pipilo chlorurus</i>	White-breasted nuthatch	<i>Sitta carolinensis</i>
Hairy woodpecker	<i>Picoides villosus</i>	White-crowned sparrow	<i>Zonotrichia leucophrys</i>
Hermit thrush	<i>Catharus guttatus</i>	White-throated swift	<i>Aeronautes saxatalis</i>
Horned lark	<i>Eremophila alpestris</i>	Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
House wren	<i>Troglodytes aedon</i>	Wilson's warbler	<i>Wilsonia pusilla</i>
Juniper titmouse ^d	<i>Baeolophus griseus</i>	Yellow-rumped warbler	<i>Dendroica coronata</i>
Lark sparrow	<i>Chondestes grammacus</i>	Zone-tailed hawk	<i>Buteo albonotatus</i>
Lazuli bunting	<i>Passerina amoena</i>		

^a Called water pipit by Medin and others 2000.

^b Called rosy finch by Medin and others 2000.

^c Called sage grouse by Medin and others 2000.

^d Called plain titmouse by Medin and others 2000.

^e Called rough winged swallow by Medin and others 2000.

^f Called yellow-bellied sapsucker by Medin and others 2000.

^g Called rufous-sided towhee by Medin and others 2000.

^h Called scrub jay by Medin and others 2000.

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