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Birds of an Upper Sagebrush-Grass Zone Habitat in East-Central Nevada

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RESEARCH SUMMARY

This paper describes breeding bird densities and bird community organization of an upper sagebrush-grass zone habitat in the southern Snake Range of White Pine County, east-central Nevada. Bird populations were determined by spot-mapping on a 20-ha plot during May, June, and July, 1981 to 1983. Total density of the breeding bird community ranged from 7.07 to 7.58 individuals/ha over the 3-year study. Standing crop biomass ranged from 158 to 172 g/ha. Twenty-five species were territorial on the census plot. The most abundant birds were Brewer's sparrows and green-tailed towhees. Those two species characterized the breeding bird community and accounted for 50 to 55 percent of the total population. Other common breeding species included chipping sparrows, yellow-rumped warblers, dusky flycatchers, vesper sparrows, dark-eyed juncos, and mountain chickadees. In numbers of breeding bird species and bird biomass, the upper sagebrush-grass zone was as high or higher than several other vegetational zones, and was only slightly exceeded in the mixed conifer zone. Comparisons suggest that the upper sagebrush-grass zone can provide important habitats for nongame birds during the breeding season in the Great Basin.

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INTRODUCTION

The basin-and-range topography that characterizes the Great Basin leads to a multiplicity of plant communities. For convenience, Billings (1951) lumped them into vegetation zones that can be typified by common plant communities. On mountain slopes vegetation zones are particularly well defined where they exist as elevational belts. One such zone is the upper sagebrush-grass zone that is most apparent in the dry mountain ranges of central and northern Nevada. It varies widely in elevational range, but usually occurs between 2,285 and 3,050 m (Cronquist and others 1972). The zone contains highly productive plant communities (Tueller and Eckert 1987), with generally denser vegetation than found in sagebrush communities at lower elevations.

The avifauna of this vegetation zone has received little quantitative study, but such data are basic to understanding the ecology of birds in the Great Basin and to the stewardship of their habitats. This paper describes breeding bird densities and bird community organization of an upper sagebrush-grass zone habitat in the southern Snake Range of east-central Nevada. Results are compared to breeding bird surveys conducted in other vegetation zones in the southern Snake Range. The study, conducted from 1981 to 1983, was restricted to passerine birds and birds with similar dispersion mechanisms and distribution patterns. Scientific names of plants and birds cited in the text are in the appendix.

STUDY AREA AND METHODS

The study area was located 60 km southeast of Ely in southeastern White Pine County, NV (NW $\frac{1}{4}$ of Sec. 26, T. 14 N., R. 68 E.) in the Strawberry Creek drainage of Great Basin National Park (Humboldt National Forest at the time of the study). Median elevation was approximately 2,530 m. Topography was dissected, with slopes ranging from 0 to over 40 percent and with a generally southeast aspect. Wheeler Peak, over 3,980 m in elevation

and located about 7 km south of the study site, was the dominant feature of the local landscape.

Mean annual precipitation is about 45 cm, most of which falls as snow. The growing season is short, averaging fewer than 100 days (Houghton and others 1975). An intermittent stream drained part of the study area. Livestock grazing was light or negligible (DeMeule 1990). The site was accessible by motor vehicle but experienced little recreational use.

Three major vegetation community types were identified on the study area. They were: big sagebrush-mountain snowberry/grass, quaking aspen-white fir/mountain snowberry, and curlleaf mountain mahogany/big sagebrush. Groves of aspen and extensive patches of curlleaf mountain mahogany are common elements of the upper sagebrush-grass zone in the Great Basin (Cronquist and others 1972).

The sagebrush-snowberry/grass community type was widespread and typified the study area. Associated shrubs included antelope bitterbrush and gray horsebrush. Small clumps or single plants of chokecherry and elderberry were locally distributed. Bluebunch wheatgrass, Sandberg's bluegrass, and longleaf phlox were common herbs. The curlleaf mountain mahogany/big sagebrush type formed a small woodland along a secondary ridge that bisected the site. Rabbitbrush and cheatgrass were common associated plants. A single elongated grove of aspen mixed with white fir was present along the intermittent stream. Mountain snowberry, rose, creeping barberry, and a variety of grasses and forbs formed the undergrowth.

A 20-ha plot was censused for breeding birds using the Williams spot-map method (International Bird Census Committee 1970). The census plot was chosen to best represent the upper sagebrush-grass zone in the southern Snake Range. The square plot was surveyed and gridded with points numbered and marked with stakes at 75-m intervals. Ten census visits to the plot were made annually between May 4 and July 2, from 1981 to 1983. Most of the spot-mapping was done between sunrise and early afternoon when birds were most active. To ensure complete coverage, the plot was censused

by walking within 50 m of all points on the grid. Census routes were varied. Recorded bird observations extended a minimum of 50 m beyond plot boundaries.

At the end of the sampling period each year, clusters of observations and coded activity patterns on species maps were circled to define breeding bird territories. Fractional parts of boundary territories were included in the results. The reciprocal of Simpson's index ($D=1/\sum p_i^2$, where p_i is the proportion of the sample belonging to the i th species) was used to calculate species diversity (Hill 1973).

Plant taxonomy follows Holmgren and Reveal (1966). Bird nomenclature is from the 1983 AOU Check-list (American Ornithologists' Union 1983).

RESULTS AND DISCUSSION

Twenty-five bird species bred on the study plot (table 1). Total breeding bird density ranged from 7.07 to 7.58 individuals/ha over the 3-year study. Total bird standing crop biomass ranged from 158 to 172 g/ha. From 22 to 23 species bred on the plot in any given year. The most common breeders were the Brewer's sparrow and green-tailed towhee. Those two species characterized the breeding bird community and accounted for 50 to 55 percent of the total population. Other common birds included chipping sparrows, yellow-rumped warblers, dusky flycatchers, vesper sparrows, and dark-eyed juncos.

Table 1—Density (individuals/ha), diversity, and other attributes of breeding bird populations, upper sagebrush-grass zone habitat, southern Snake Range, NV

| Species | Foraging guild ¹ | Nesting guild ² | Density | | |
|---|-----------------------------|----------------------------|---------|----------------|------|
| | | | 1981 | 1982 | 1983 |
| Broad-tailed hummingbird | FNI | BTN | 0.12 | 0.12 | 0.15 |
| Yellow-bellied sapsucker | TDO | PCN | .10 | .15 | .15 |
| Northern flicker | GGI | PCN | .10 | .08 | .08 |
| Dusky flycatcher | ASI | BTN | .25 | .40 | .35 |
| Clark's nutcracker | FGO | CTN | .05 | .05 | .02 |
| Mountain chickadee | FGI | SCN | .20 | .22 | .20 |
| Bushtit | FGI | BTN | .10 | + ³ | + |
| House wren | FGI | SCN | .20 | .20 | .10 |
| Ruby-crowned kinglet | FGI | CTN | .10 | .08 | + |
| Mountain bluebird | GGI | SCN | .22 | .20 | .10 |
| Townsend's solitaire | FFO | GRN | .02 | + | + |
| American robin | GGI | BTN | .18 | .20 | .20 |
| Warbling vireo | FGI | CDN | .10 | .10 | .10 |
| Yellow-rumped warbler | FGI | CDN | .30 | .50 | .25 |
| MacGillivray's warbler | FGI | BTN | .08 | .08 | .10 |
| Western tanager | FGI | CTN | .10 | .10 | .10 |
| Lazuli bunting | FFO | BTN | + | + | .10 |
| Green-tailed towhee | GGO | BTN | 1.55 | 1.88 | 1.92 |
| Rufous-sided towhee | GGO | BTN | .15 | .15 | .05 |
| Chipping sparrow | GGG | BTN | .38 | .45 | .38 |
| Brewer's sparrow | GGI | BTN | 2.02 | 1.92 | 1.98 |
| Vesper sparrow | GGO | GRN | .40 | .25 | .18 |
| White-crowned sparrow | GGO | BTN | + | .10 | .10 |
| Dark-eyed junco | GGG | GRN | .20 | .10 | .28 |
| Cassin's finch | GGG | CDN | .20 | .25 | .18 |
| Total individuals/ha | | | 7.12 | 7.58 | 7.07 |
| Standing crop biomass (g/ha) ⁴ | | | 160 | 172 | 158 |
| Species richness (S) | | | 23 | 22 | 22 |
| Species diversity (D) | | | 6.95 | 6.96 | 6.01 |
| Species evenness (E) | | | .59 | .61 | .58 |

¹After Diem and Zeveloff (1980). FNI = foliage nectivore-insectivore, TDO = timber drilling omnivore, GGI = ground gleaning insectivore, ASI = aerial feeding insectivore, FGO = foliage gleaning omnivore, FGI = foliage gleaning insectivore, FFO = foliage feeding omnivore, GGO = ground gleaning omnivore, GGG = ground gleaning granivore.

²After Diem and Zeveloff (1980). BTN = bush and small-tree nester, PCN = primary cavity nester, CTN = conifer tree nester, SCN = secondary cavity nester, GRN = ground nester, CDN = conifer-deciduous tree nester.

³+ indicates the bird was observed infrequently (less than three registrations).

⁴Species weights from Dunning (1984).

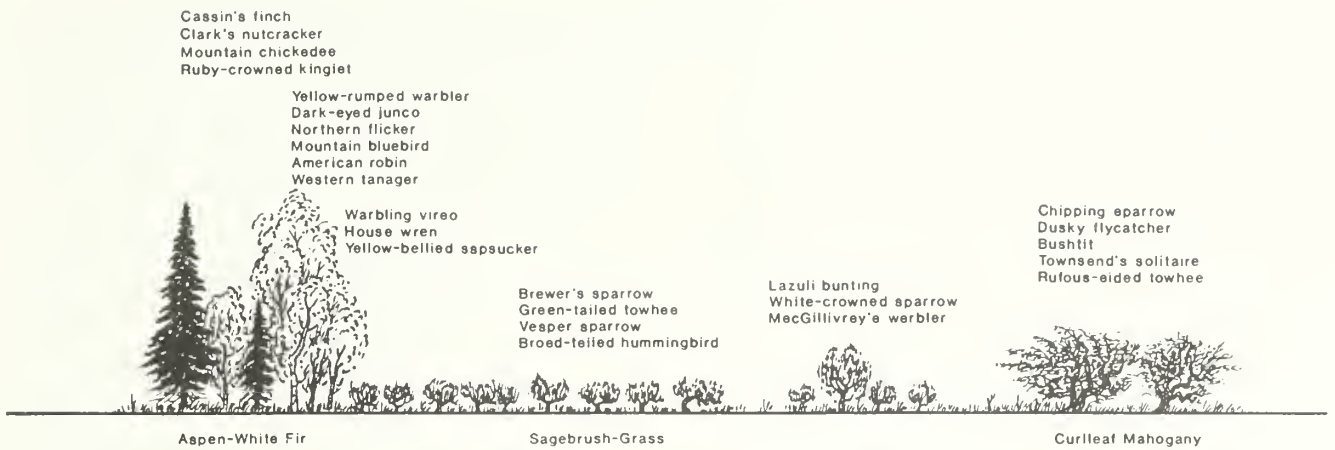


Figure 1—Generalized representation of plant life form or plant community associations of birds using an upper sagebrush-grass zone habitat in the breeding season, southern Snake Range, NV.

Other species, observed as occasional visitors to the study plot, included the northern harrier, sharp-shinned hawk, Cooper's hawk, northern goshawk, red-tailed hawk, golden eagle, American kestrel, mourning dove, great horned owl, tree swallow, black-billed magpie, common raven, and pine siskin.

Less frequently observed birds were the blue grouse, common nighthawk, white-throated swift, calliope hummingbird, hairy woodpecker, olive-sided flycatcher, violet-green swallow, Steller's jay, scrub jay, pinyon jay, red-breasted nuthatch, black-headed grosbeak, and Brewer's blackbird.

Most of the breeding bird species recorded during the study were associated with either a particular plant life form or one of the plant community types described for the study plot (fig. 1). Brewer's sparrows, vesper sparrows, and green-tailed towhees, for example, either foraged or nested almost exclusively in the sagebrush-snowberry/grass community. Those species normally breed in big sagebrush habitats throughout the range of that common shrub (Ryser 1985). Other birds, including dark-eyed juncos, broad-tailed hummingbirds, American robins, and chipping sparrows, were more cosmopolitan in their plant community associations. Bushtits, dusky flycatchers, and rufous-sided towhees were observed most commonly in the curlleaf mountain mahogany/big sagebrush community. Species normally associated with montane coniferous forests in the Great Basin—mountain chickadee, Cassin's finch, Clark's nutcracker, and ruby-crowned kinglet—were found only in the aspen-white fir/snowberry community. Warbling vireos were most frequently observed in the crowns of aspen trees.

Townsend's solitaires, bushtits, and lazuli buntings were uncommon breeders on the upper

sagebrush-grass zone study plot. Each bred in only one of the 3 years of study (table 1). Bushtits and lazuli buntings frequent a variety of habitats but are most common in mid-elevation woodlands and submontane shrub habitats (Behle and Perry 1975). The Townsend's solitaire is a bird of open coniferous forests, normally nesting at moderate to high elevations (Bent 1949).

Birds may be placed in categories, or guilds, based on similarities in their use of environmental resources (Root 1967). The 25 breeding bird species (table 1) were organized into feeding and nesting guilds based on their foraging behavior and the substrates used for nesting (table 2). Nine different foraging categories were represented in the breeding bird population. Birds that feed on the ground formed the largest single foraging guild. That guild made up from 74 to 77 percent of the breeding bird population. These, along with foliage feeders and gleaners, accounted for most of the breeding bird community. Aerial-sally feeders were represented by a single species—the dusky flycatcher. The only timber driller was the yellow-bellied sapsucker.

Thirteen of the 25 species that bred on the study plot were insectivores; eight were omnivores. Three species—chipping sparrow, dark-eyed junco, and Cassin's finch—were granivores. The broad-tailed hummingbird was the only nectivore represented in the breeding bird population.

Bush and small-tree nesters had the highest total density among four nesting guilds (table 2). Numerically, those species made up about 70 percent of the breeding avifauna on the plot. Brewer's sparrows, green-tailed towhees, dusky flycatchers, and chipping sparrows were the most common species in the bush and small-tree nesting guild. Tree nesters and

Table 2—Guild density (individuals/ha) of breeding bird populations, upper sagebrush-grass zone habitat, southern Snake Range, NV

| Guild | Guild density | | |
|-----------------------------|------------------------|-----------|-----------|
| | 1981 | 1982 | 1983 |
| Foraging | | | |
| Foliage feeders-gleaners | 1.37 (19) ¹ | 1.45 (19) | 1.12 (16) |
| Aerial-sally feeders | .25 (4) | .40 (5) | .35 (5) |
| Timber drillers | .10 (1) | .15 (2) | .15 (2) |
| Ground gleaners | 5.40 (76) | 5.58 (74) | 5.45 (77) |
| Nesting | | | |
| Tree nesters | .85 (12) | 1.08 (14) | .65 (9) |
| Bush and small-tree nesters | 4.83 (68) | 5.30 (70) | 5.33 (75) |
| Cavity nesters | .82 (11) | .85 (11) | .63 (9) |
| Ground nesters | .62 (9) | .35 (5) | .46 (7) |

¹Parenthetical expressions are percentages of total density.

cavity nesters were less common and about equally represented. The yellow-bellied sapsucker and northern flicker were the only primary cavity nesters. Secondary cavity nesters—mountain chickadees, house wrens, and mountain bluebirds—made up the bulk of the hole-nesting forms.

None of the breeding bird species (table 1) are restricted to the upper sagebrush-grass zone. Most are relatively more abundant in montane habitats at higher elevations in the Great Basin. Three species—Brewer's sparrows, vesper sparrows, and bushtits—occur more frequently in sagebrush or pinyon-juniper zones at lower elevations. Others, including the broad-tailed hummingbird, lazuli bunting, green-tailed towhee, and rufous-sided towhee, are most common in midelevation submontane shrub habitats (Behle and Perry 1975).

Ten of the 14 birds that Johnson (1975) called “standard” boreal species of Great Basin montane island avifaunas are represented in the upper sagebrush-grass zone habitat. That group is of interest ecologically because the species that comprise it nearly always occur together and may be taken to represent the basic community of western American boreal birds.

The number of breeding bird species recorded in the upper sagebrush-grass zone was as high or higher than in any of several other vegetation zones in the southern Snake Range (table 3). The number of breeding species in the upper sagebrush-grass zone was four times that recorded in the lower sagebrush zone and half again as large as that found in the pinyon-juniper zone. Breeding bird densities in

Table 3—Density, species richness, and standing crop biomass of breeding bird communities in different vegetation zones, southern Snake Range, NV

| Vegetation zone ¹ | Number of breeding bird species | Breeding bird density | Standing crop biomass | Source |
|-------------------------------|---------------------------------|-----------------------|-----------------------|--------------------|
| | | Individuals/ha | g/ha | |
| Alpine tundra | 1-2 | 0.37-0.52 | 8-10 | Medin 1987 |
| Bristlecone pine ² | 14 | 4.10 | 95 | Medin 1984 |
| Mixed conifer | 18-22 | 7.28-7.70 | 175-194 | Medin, unpublished |
| Upper sagebrush-grass | 22-23 | 7.07-7.58 | 158-172 | This study |
| Pinyon-juniper | 13-15 | 3.65-3.90 | 77-80 | Medin, unpublished |
| Lower sagebrush | 5-6 | 3.35-3.48 | 53-61 | Medin, unpublished |
| Shadscale | 2-3 | 1.38-1.62 | 42-49 | Medin 1990 |

¹Descriptions of the dominant vegetation in each zone are in Cronquist and others (1972).

²One year of study; information on all other zones based on 3 years of study.

the upper sagebrush-grass zone were slightly exceeded by those in the mixed conifer zone. Estimates of bird standing crop biomass were similarly ordered by vegetation zone. In the southern Snake Range, the richness and density of breeding bird communities apparently reach maximal values in the physiognomically more complex vegetation found in midelevation upper sagebrush-grass and mixed conifer zones. Minimal values of bird species richness and density are reached in the less complex vegetation that occurs at higher and lower elevations. These findings suggest that the upper sagebrush-grass vegetation zone can provide important habitats for nongame breeding birds in the Great Basin.

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APPENDIX: SCIENTIFIC AND COMMON NAMES OF PLANTS AND BIRDS CITED IN THE TEXT

Plants

| | |
|--------------------------------------|----------------------------|
| <i>Abies concolor</i> | white fir |
| <i>Agropyron spicatum</i> | bluebunch wheatgrass |
| <i>Artemisia tridentata vaseyana</i> | big sagebrush |
| <i>Berberis repens</i> | creeping barberry |
| <i>Bromus tectorum</i> | cheatgrass |
| <i>Cercocarpus ledifolius</i> | curlleaf mountain mahogany |
| <i>Chrysothamnus viscidiflorus</i> | rabbitbrush |
| <i>Phlox longifolia</i> | longleaf phlox |
| <i>Poa sandbergii</i> | Sandberg's bluegrass |
| <i>Populus tremuloides</i> | quaking aspen |
| <i>Prunus virginiana</i> | chokecherry |
| <i>Purshia tridentata</i> | antelope bitterbrush |
| <i>Rosa woodsii</i> | rose |
| <i>Sambucus caerulea</i> | elderberry |
| <i>Symphoricarpos oreophilus</i> | mountain snowberry |
| <i>Tetradymia canescens</i> | gray horsebrush |

Birds

| | |
|----------------------------------|------------------------|
| <i>Accipiter cooperi</i> | Cooper's hawk |
| <i>Accipiter gentilis</i> | northern goshawk |
| <i>Accipiter striatus</i> | sharp-shinned hawk |
| <i>Aeronautes saxatilis</i> | white-throated swift |
| <i>Aphelocoma coerulescens</i> | scrub jay |
| <i>Aquila chrysaetos</i> | golden eagle |
| <i>Bubo virginianus</i> | great horned owl |
| <i>Buteo jamaicensis</i> | red-tailed hawk |
| <i>Carduelis pinus</i> | pine siskin |
| <i>Carpodacus cassinii</i> | Cassin's finch |
| <i>Chordeiles minor</i> | common nighthawk |
| <i>Circus cyaneus</i> | northern harrier |
| <i>Colaptes auratus</i> | northern flicker |
| <i>Contopus borealis</i> | olive-sided flycatcher |
| <i>Corvus corax</i> | common raven |
| <i>Cyanocitta stelleri</i> | Steller's jay |
| <i>Dendragapus obscurus</i> | blue grouse |
| <i>Dendroica coronata</i> | yellow-rumped warbler |
| <i>Empidonax oberholseri</i> | dusky flycatcher |
| <i>Euphagus cyanocephalus</i> | Brewer's blackbird |
| <i>Falco sparverius</i> | American kestrel |
| <i>Gymnorhinus cyanocephalus</i> | pinyon jay |
| <i>Junco hyemalis</i> | dark-eyed junco |
| <i>Myadestes townsendi</i> | Townsend's solitaire |
| <i>Nucifraga columbiana</i> | Clark's nutcracker |
| <i>Oporornis tolmiei</i> | MacGillivray's warbler |
| <i>Parus gambeli</i> | Mountain chickadee |
| <i>Passerina amoena</i> | lazuli bunting |
| <i>Pheucticus melanocephalus</i> | back-headed grosbeak |
| <i>Pica pica</i> | black-billed magpie |
| <i>Picoides villosus</i> | hairy woodpecker |
| <i>Pipilo chlorurus</i> | green-tailed towhee |
| <i>Pipilo erythrophthalmus</i> | rufous-sided towhee |
| <i>Piranga ludoviciana</i> | western tanager |

Birds (Con.)

Pooecetes gramineus
Psaltiparus minimus
Regulus calendula
Selasphorus platycercus
Sialia currucoides
Sitta canadensis
Sphyrapicus varius
Spizella breweri
Spizella passerina
Stellula calliope
Tachycineta bicolor
Tachycineta thalassina
Troglodytes aedon
Turdus migratorius
Vireo gilvus
Zenaida macroura
Zonotrichia leucophrys

vesper sparrow
bushtit
ruby-crowned kinglet
broad-tailed hummingbird
mountain bluebird
red-breasted nuthatch
yellow-bellied sapsucker
Brewer's sparrow
chipping sparrow
calliope hummingbird
tree swallow
violet-green swallow
house wren
American robin
warbling vireo
mourning dove
white-crowned sparrow

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In number of breeding bird species and bird biomass, the upper sagebrush-grass zone was as high or higher than several other vegetational zones, and was only slightly exceeded in the mixed conifer zone. Findings indicate that the upper sagebrush-grass vegetational zone can provide important habitats for nongame breeding birds in the Great Basin.

KEYWORDS: breeding birds, density, diversity, biomass, vegetation zones, Great Basin



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