

ALPINE BIRDS OF THE BEARTOOTH MOUNTAINS

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Although McChesney (1879), Saunders (1921), and Skinner (1925) have mentioned some of the birds of the Beartooth Mountains, no one has described in detail the avifauna of the extensive alpine areas in this part of Montana and Wyoming. This paper is a contribution on the birds of this major biotic community, the alpine zone. The alpine zone is defined as that area which is altitudinally above regions of normal tree growth and includes areas of krummholz—"the crooked wood"—making up part of the forest-tundra ecotone.

Data for this paper were obtained in the periods 14 to 17 June and 30 August to 2 September 1958; 3 to 7 July 1959; 1 and 2 October 1960; 15 June to 13 September 1961; 8 June to 23 August 1963; 14 June to 22 September and 28 to 30 December 1963; and 10 June to September 1964, while working on other projects that made it possible to be in the field daily. Continuous residence was especially valuable for it enabled us to observe birds that visit the alpine zone only rarely or in migration. No regular observations were made earlier than 8 June, and except for the brief October and December trips, none was made after 22 September. Therefore early spring and late fall migrants may not be completely represented.

A great expanse of alpine environment is included in six closely associated plateaus of the Beartooth Mountains in the Custer National Forest of Carbon County, Montana, and the Shoshone National Forest of Park County, Wyoming (fig. 1). Most of our observations were obtained on Beartooth Plateau although a few were made on Line Creek and Hellroaring plateaus. Beartooth Plateau lies about 35 miles east of the northeast corner of Yellowstone National Park, near lat. 45° N and long. 109° 30' W. The plateau, about six miles wide and 12 miles long, is between 10,000 and 11,000 feet in elevation with timberlines ranging from 9000 feet on the southern exposures to 10,000 feet on the northern slopes. It is bisected for most of its length by the Beartooth Highway. The Beartooth is a geologically mature plateau which Hughes (1933) has called an exhumed peneplain.

Winter snow deposited on the plateau melts rather slowly; quite extensive snowbanks are present until early August. Melt water from these deposits maintains mesic alpine environments. Most alpine birds nest on the ground and must wait for the snow to disappear before nest building can begin. This has also been noted by Weeden (1960) for alpine tundra and by Irving (1960) for arctic tundra. The amount and distribution of winter and spring snow are thus of considerable importance in determining when and where these birds breed. The snowbanks themselves provide important habitat for certain birds, especially Water Pipits (*Anthus spinoletta*), Horned Larks (*Eremophila alpestris*), and Black Rosy Finches (*Leucosticte atrata*). Pipits and larks forage on the snow, gleaning insects which have been carried aloft by thermal activity and dropped on the drifts. Dipterans, hymenopterans, hemipterans, and coleopterans make up the majority of insects evident on the snow surface. Many seeds germinate while still covered by a few inches of snow or soon after exposure. As the exposed cotyledons become visible at the edge of the drift, they, as well as a few insects, are harvested by Black Rosy Finches that select these edge sites for most of their feeding activity.

Close examination of the alpine tundra reveals many microhabitats. These provide an abundance of edge situations, but ecotones in the tundra frequently span only a

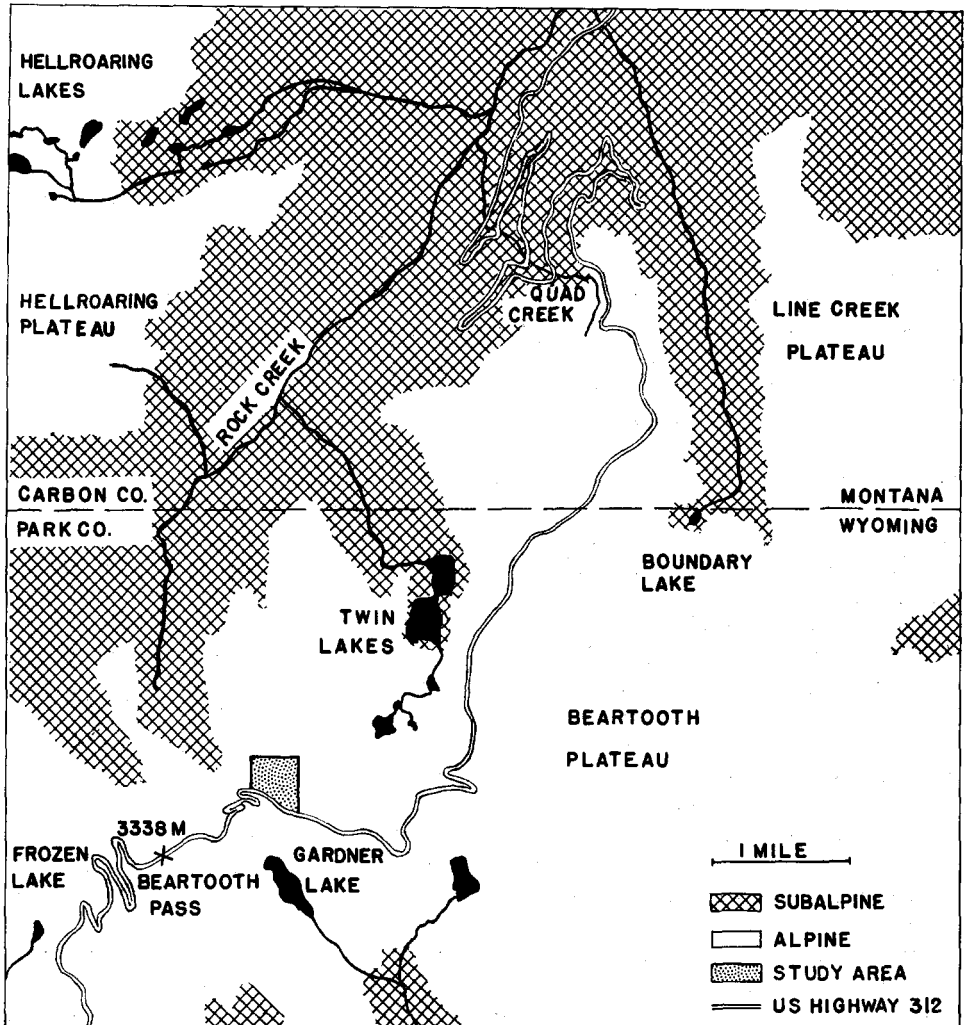


Figure 1. Distribution of subalpine areas and the main topographical features mentioned in the text.

few centimeters or millimeters. Bamberg (1961) and Johnson and Billings (1962) have described the vegetation, and Nimlos and McConnell (1962) the soils of the Beartooth. Therefore we will only briefly review the major stand types, keeping in mind that each of these is in reality a mosaic of microhabitats which reflect the actions of some of the subtle agents of physical and biotic change that are characteristic of the alpine. When enhanced by the vagaries of weather, these agents collectively serve as rather severe limitations to the size, form, time of flowering, seed production, and period of rapid growth for most alpine plants, and they affect bird life either directly or indirectly.

Wet meadows are alpine stand types found adjacent to many of the lakes and small streams that meander along the floor of the basins. These wet meadow associa-

tions make up from 18 to 20 per cent of the surface topography based on transect estimates and are important as breeding sites to the White-crowned Sparrow (*Zonotrichia leucophrys*) and, to a lesser extent, to the Water Pipit. The dominant plants in this association are sedge (*Carex scopulorum*) and the parallel-veined willow (*Salix planifolia*), which grows from six to about 16 inches in height. The willows cover the nests of White-crowned Sparrows.

The availability of water, coupled with the freezing temperatures of autumn and winter, is thought to produce ice lenses beneath the turf, resulting in the formation of hummocks, some of which reach heights of 18 inches. Pipits frequently nest at the sides of the sedge-covered hummocks, and many birds use them as cover during periods of inclement weather and at night in the postbreeding period.

Bordering the wet meadow and usually grading gradually into dry meadow is a stand type which Bamberg (1961) has classified as moist meadow. Tufted hairgrass (*Deschampsia caespitosa*) is the dominant plant of this association, which makes up from 6 to 8 per cent of the total topography. Hummocks as high as six inches are frequently present. This area is saturated with water early in the season when snow melt water flows across it, but usually becomes snow free before the wet meadow. With the disappearance of the drifts, drying begins, and soil moisture decreases by early August. This association, like the wet meadow, is found in depressed situations, and winter winds deposit considerable amounts of snow here. Water Pipits frequently build nests on the low hummocks or at the base of grass clumps.

The dry meadow association makes up from 50 to 55 per cent of the alpine surface. Mountain avens (*Geum rossii*), American bistort (*Polygonum bistortoides*), mountain sage (*Artemisia scopulorum*), alpine fescue (*Festuca ovina*), and several species of *Carex* are the dominant plants of this community, which includes much bare soil between the taprooted forbs and the bunchgrasses. Graminoids are less common than in more mesic situations. This extensive community could be divided into several more limited habitats, for it spans a variety of microenvironments, but can be combined under a single heading for our purposes. Horned Larks nest and feed extensively here as well as on the fellfield. Foraging for insects is accomplished while walking about through the short vegetation. Eaton (MS) suggests that this area is inhabited by a greater number and variety of insect species throughout the summer than the other stand types. Those most evident are dipterans, grasshoppers, and a large carabid beetle. In addition this is the site favored by the large Mormon cricket (*Anabrus simplex*) that serves as prey for Sparrow Hawks (*Falco sparverius*) in late August.

The most exposed stand type, where very little snow remains in the winter except in the lee of the larger rocks, is called fellfield. The wind erodes fine materials, so that the surface has more than 40 per cent exposed rock. The exposed part of this rock usually has from 30 to 70 per cent of its surface covered by lichens. The dominant plants include cushion pink (*Silene acaulis*), dwarf clover (*Trifolium nanum*), a club moss (*Selaginella densa*), *Arenaria obtusiloba*, and *Phlox pulvinata*—all cushion or rosette forms.

The krummholz at the lower edge of the tundra is marked by wind-sheared, prostrate, or flagged trees characteristic of this ecotone. White-barked pine (*Pinus albicaulis*) and alpine fir (*Abies lasiocarpa*) are the principal species. Observations reveal an almost universal tendency for these trees to start their growth in the lee of a rock, stump of a dead tree, or behind some other surface feature that reduces the exposure to wind. The trees trap a considerable amount of snow, so that the lower branches are frequently covered until early July. This melting snow serves as a source of mois-

ture during late June and early July when precipitation is generally limited to occasional light showers. Only Robins (*Turdus migratorius*) were found nesting in the krummholz, but many species were seen here during late summer and early fall, apparently resting before flying across the unbroken expanse of tundra. Earlier in the season White-crowned Sparrows and Mountain Bluebirds (*Sialia currucoides*) used the trees for singing perches and set up temporary territories, but no nests were located in the conifers.

ANNOTATED LIST OF SPECIES

An asterisk preceding a species name indicates that collected specimens are in the Montana State University Zoological Museum.

Anas platyrhynchos. Mallard. A flock of six was seen on Boundary Lake 31 August 1958; one bird was molting into the male nuptial plumage, the rest in hen plumage. A single female was seen on 26 July 1963, on the study area pond during a dense fog. A male and two females flew over Boundary Lake on 26 June 1964.

Anas acuta. Pintail. A single male was seen on the study area pond on 2 September 1958; again on two occasions in 1961. On 17 July a bird flew over the study area during a severe wind storm, and on 6 September two birds were seen in the evening on the study area pond.

Anas carolinensis. Green-winged Teal. Seen for the first time on 2 September 1958, when a flock of 11 birds fed on the study area pond. A group of seven birds fed on the pond on the morning of 8 August 1963, and we saw two more on 21 August and 21 September. Three birds were seen on 7 August 1964, on the same pond.

**Anas clypeata*. Shoveller. The pond on the study area was occupied by 32 birds on 24 August 1961, and by 12 birds on 28 August 1961.

Accipiter striatus. Sharp-shinned Hawk. Seen only once, on the morning of 15 August 1963.

**Buteo jamaicensis*. Red-tailed Hawk. One bird flew over our quarters on 9 August 1961. We collected a juvenile female on 25 August 1963.

Buteo lagopus. Rough-legged Hawk. Late-summer visitor to the alpine meadows. One bird was seen on 29 August 1961, and two more were observed over Beartooth Pass on 7 September 1961. In 1963 single birds were seen on 7 August and 9 September. One bird was seen on 16 August 1964. Both this and the previous species are common at lower elevations in late summer.

Buteo regalis. Ferruginous Hawk. One was seen on 24 and 25 August 1961, along the highway at the state line. A single bird was seen over our quarters on 17 July 1964.

Aquila chrysaetos. Golden Eagle. Regular visitor to the alpine meadows throughout the season. Although we never found an eyrie, this species probably nests in the cliffs surrounding the plateau. Both adult and immature birds frequent the area, where they are thought to prey upon the Yellow-bellied Marmot (*Marmota flaviventris*).

**Circus cyaneus*. Marsh Hawk. Summer visitor to the alpine regions from late July to late September. Earliest record was 25 July 1963, and latest, 23 September 1962. Most birds were in juvenile plumage.

**Falco mexicanus*. Prairie Falcon. Regular visitor to the alpine meadows throughout the season. Like the eagle, this species probably nests in the cliffs. They are often seen flying low over the study area from one basin to the other. On 22 August 1961 one was hunting rosy finches along the cliffs east of the study area, and on 27 July 1964 one was hunting pipits. This falcon and the Golden Eagle are the most common raptors of the season.

Falco peregrinus. Peregrine Falcon. Seen only on 21 August 1961.

Falco columbarius. Pigeon Hawk. Seen once on 13 August 1963 and again on 28 July 1964.

Falco sparverius. Sparrow Hawk. Infrequent visitor to the alpine. Four birds seen in the same area on 24 and 25 August 1961. On 26 August 1963 five birds were seen landing and taking off in the same area, possibly in pursuit of grasshoppers and Mormon crickets. Not seen in other years.

Dendragapus obscurus. Blue Grouse. A hen with three half-grown chicks was seen on 14 August 1964, at the head of Quad Creek.

**Charadrius vociferus*. Killdeer. One female was collected from the study area on 6 July 1963.

**Capella gallinago*. Common Snipe. The alpine meadows with their marshy areas would seem ideal for snipe, but we saw them only on a few occasions. Two birds were collected on 1 October 1960, from Boundary Lake. One winnowing bird was seen on 17 June 1961, over the study area, and a flight of eight birds flew south over the same area on 7 August 1961. A single bird was seen on 12 August 1963.

**Tringa solitaria*. Solitary Sandpiper. One male was collected when he flushed from a sedge meadow on 29 July 1963. Two single birds were seen on 3 and 29 August 1963, respectively, and two birds on 16 August 1963. Not seen in other years.

**Erolia bairdii*. Baird's Sandpiper. The most common of the Scolopacidae; a regular migrant from the middle of July to the end of the season. They can be seen singly or in small groups of up to 10 birds feeding along lake shores and creeks. Seen gleaning insects from an extensive snowfield on 16 August 1964.

**Limosa fedoa*. Marbled Godwit. One female was collected on 28 June 1964. The bird was observed feeding in pools of melt water from snowdrifts.

Larus pipixcan. Franklin's Gull. An immature bird was flushed from a small stream on Hellroaring Plateau on 20 July 1963.

Zenaidura macroura. Mourning Dove. Seen only once on 10 August 1961, when it flushed from a solifluction terrace on the study area.

Bubo virginianus. Great Horned Owl. Known from feathers found on the study area. We heard one bird at 2100, 16 August 1964, from the direction of Rock Creek Canyon.

**Asio otus*. Long-eared Owl. Seen once, on 10 August 1963, along the highway in our car lights. Another bird believed to have been of this species flew over our quarters in the evening of 18 August 1963. We tried unsuccessfully to collect a bird on 15 August 1964, over the study area. One was collected at 0600, 28 August 1964.

Chordeiles minor. Common Nighthawk. A single bird was seen over the study area on 21 August 1961, and another on 6 August 1963. A flight of nine birds was seen on 13 August 1963. These birds came out of Rock Creek Canyon and crossed the plateau into Gardner Lake Basin. The flight looked like a migratory movement.

Aëronautes saxatalis. White-throated Swift. A single bird was seen flying southeast over the study area, 23 June 1963.

Selasphorus rufus. Rufous Hummingbird. In 1963 hummingbirds were seen or heard three times during the season but were never identified. In 1964 we saw hummingbirds many times, but only once was a bird positively identified, as it fed on *Sedum rosea*. We believe this bird had its nest in the Twin Lakes Basin and used the alpine meadows as a feeding ground.

**Colaptes cafer* × *auratus*—hybrid. Flicker. One bird was collected while it fed on ants in a dry meadow on Hellroaring Plateau, 18 July 1963.

**Eremophila alpestris*. Horned Lark. Present throughout the season and a common breeding bird from the middle of June to the middle of July. Nests are exposed above and placed behind tufts of grass or rock. Clutch size ranged from two to five eggs, with three being most common. There is only one clutch per season. Flock formation occurs in the middle of August.

Tachycineta thalassina. Violet-green Swallow. Two birds flying south crossed the plateau on 14 August 1964.

Iridoprocne bicolor. Tree Swallow. Two were seen flying over our weather station at 1800, 1 July 1963.

Corvus corax. Common Raven. Resident of the subalpine and lower elevations and frequent visitor to the alpine meadows throughout the season. On 11 July 1963 a group of 13 birds was seen hopping about on the tundra catching moths that were present in large numbers. On 22 August 1961 a group of 16 birds fed at one sheep carcass, and another flock of 33 flew over the study area. Usually seen in groups of two or three. One bird was seen on 29 December 1963, just east of the study area.

Nucifraga columbiana. Clark's Nutcracker. Common resident of the many canyons surrounding the plateaus. Two adults and one immature flew over the study area from Twin Lakes

Basin to Rock Creek Basin, 29 June 1964. Single birds flew over Beartooth Pass, 9 and 18 July 1964, respectively. A female was seen feeding a juvenile on the edge of the study area on 27 July 1964.

**Sitta canadensis*. Red-breasted Nuthatch. Seen and heard among the rocks at the head of the Twin Lakes Basin on 16 August 1963.

**Cinclus mexicanus*. Dipper. One seen and heard singing by the small lake immediately above Twin Lakes on 12 and 16 July 1961. An old nest was found under large boulders on the east side of this lake. Not seen in other years.

**Salpinctes obsoletus*. Rock Wren. Nests in the talus slopes and rock piles surrounding the plateaus and is occasionally seen on the plateaus themselves. Our earliest record is 19 June 1962.

**Turdus migratorius*. Robin. Summer resident of the krummholz. One nest with four large young was found at Boundary Lake on 27 June 1963. The presence of several old nests indicated use during previous years. Nests are located in the krummholz; the alpine wet meadows and stream edges are used for foraging. Seen on the study area from the day of our arrival and throughout June and then again in late July and early August. Two dead juveniles were found on the study area on 9 and 13 August 1963.

**Sialia currucoides*. Mountain Bluebird. Summer resident of the subalpine and visitor to the alpine meadows throughout June. The birds are usually seen in pairs and give the impression of searching for nest cavities. We caught a male in a small rodent live trap on 25 June 1963. A female entered a trailer parked on the plateau through an open window on 5 July 1964.

**Myadestes townsendi*. Townsend's Solitaire. Seen flying over the study area during fog on 20 September 1963.

**Anthus spinoletta*. Water Pipit. Present throughout the season and a common breeding bird from the middle of June to the end of July. Nests are sunk in the ground or in vegetation and are partly protected by overhanging rock or turf. Clutch size ranged from three to six eggs; four and five were the most common. There is only one clutch per season. Flocks form during second half of August.

**Lanius excubitor*. Northern Shrike. One female was collected in the krummholz at the head of Quad Creek on 18 August 1963.

**Vermivora celata*. Orange-crowned Warbler. Identified by R. S. Hoffmann when the bird flushed from the willows at Boundary Lake on 8 August 1964.

**Dendroica auduboni*. Audubon Warbler. One bird was seen in the krummholz at Frozen Lake on 24 August 1963. One fogbound bird was noted on the study area on 20 September 1963. In 1964 one bird was seen at Boundary Lake on 8 August.

**Wilsonia pusilla*. Wilson's Warbler. Seen twice in the willows along the stream flowing out of Frozen Lake on 24 and 27 August 1963. On 26 June 1964 a male sang from the willows at Boundary Lake. On 25 August 1961 three birds were seen at the same lake.

**Sturnella neglecta*. Western Meadowlark. A rare visitor to the alpine meadows. Single birds were seen on 25 July and 1 and 11 August 1961. Another single bird was seen on 20 September 1963, on the study area, after a very dense early-morning fog.

**Xanthocephalus xanthocephalus*. Yellow-headed Blackbird. Two immature birds were flushed from a dried pond on the study area on 20 September 1963. They were fogbound during migration.

**Agelaius phoeniceus*. Red-winged Blackbird. One immature bird was seen on the study area on 23 July 1961.

**Euphagus cyanocephalus*. Brewer's Blackbird. A male flew over the study area on 11 July 1964.

**Molothrus ater*. Brown-headed Cowbird. One very fat mature female was collected on the study area on 17 August 1963. Two more birds were seen on 8 August 1964. The presence of the cowbird in the alpine coincides with the presence of horses and domestic sheep which occur on the study area each year. We observed the birds feeding on horse dung.

**Carpodacus cassinii*. Cassin's Finch. Frequently seen in the subalpine coniferous forests, but observed only twice in the alpine on 20 June 1963, in Twin Lakes Basin, and again on 18 July 1963, on Hellroaring Plateau.

**Leucosticte atrata*. Black Rosy Finch. Common breeding bird in the steep, rocky canyon walls. Male was seen courting a female on 14 June 1958 and 1 July 1961. We saw a female with nesting material on 15 June 1963, on the study area. Immature birds were seen on 26 July 1963 and 14 August 1964. One was seen near the state line on 29 December 1963. Large flocks, from 40 to 180 birds, form in late August.

**Spinus pinus*. Pine Siskin. Siskins were seen irregularly when they flew across the plateau en route from canyon to canyon. We never saw them land on the study area itself. Earliest record was 1 July 1964 and the latest was 30 August 1963.

**Spinus tristis*. American Goldfinch. Single birds flew over the study area on 27 August 1963 and 1 July 1964.

**Chlorura chlorura*. Green-tailed Towhee. One immature was caught in a mouse trap at the edge of the krummholz at the head of Quad Creek on 16 August 1963.

**Passerculus sandwichensis*. Savannah Sparrow. Rare visitor to the alpine. One was collected by R. S. Hoffmann on 25 August 1961, and another by C. Nellis on 1 September 1964. One seen on the study area on 16 August 1963.

**Pooecetes gramineus*. Vesper Sparrow. Migrant during the second half of the summer. One was collected on 22 August 1961. Single birds were seen on 11, 14, and 26 August 1963, and 10 August 1964.

**Junco oreganus*. Oregon Junco. Common in the subalpine coniferous forests. Two birds were seen on the study area during the dense early-morning fog of 20 September 1963.

**Spizella passerina*. Chipping Sparrow. Crosses the alpine meadow en route from one canyon to another, from late July to the middle of August. One bird was seen feeding on the study area on 16 August 1964.

**Spizella pallida*. Clay-colored Sparrow. One bird was collected on 18 August 1963, along the highway near the state line.

**Spizella breweri*. Brewer's Sparrow. One bird was collected on 26 August 1961, on Hellroaring Plateau by R. S. Hoffmann.

**Zonotrichia leucophrys*. White-crowned Sparrow. Common breeding bird in willow meadows from the middle of June to the end of July. Clutch size ranged from two to five eggs, four being most common. Nests are placed on the ground among willows.

**Melospiza lincolni*. Lincoln's Sparrow. Suspected breeding bird of the lower alpine willow meadows. We never found a nest, but we heard singing males in each season. Present throughout the season in small numbers. One immature was caught in a mouse trap on 14 August 1964.

DISCUSSION

The annotated list contains 62 species. A glance at this list suggests the probability that nearly all species represented in the neighboring lower altitudes occasionally migrate over or stop on the tundra.

The number of bird species resident or breeding in any alpine region is generally limited. On the Beartooth, the Water Pipit, Horned Lark, White-crowned Sparrow, Black Rosy Finch, and Robin comprise the breeding group although the Golden Eagle, Common Raven, Prairie Falcon, Rock Wren, and Lincoln's Sparrow should probably be included in spite of our failure to find nests during the summer. Finzel (1964), working in the Libby Flats of the Snowy Range of Wyoming, also reported the pipit, lark, and sparrow as breeding in the alpine at 10,500 feet.

The remaining birds are members of the subalpine and other communities and only visit the alpine seasonally or sporadically. In this group regular visitors seen every summer are the Rough-legged Hawk, Marsh Hawk, Baird's Sandpiper, Great Horned Owl, Vesper Sparrow, and Chipping Sparrow. All others are vagrants and are not necessarily seen each year. All the birds listed by Finzel (1964) as visitors to the Libby Flats were also seen on the Beartooth Plateau, except the Mountain Chickadee (*Parus gambeli*), Pine Grosbeak (*Pinicola enucleator*), and the Gray-

TABLE 1
FREQUENCY DISTRIBUTION AND PERIOD OF OCCURRENCE OF BIRDS IN THE STUDY AREA

| Days of observation | June | | July | | August | | Sept. | | | | | | | |
|---|----------------------------------|------------|------------|------------|------------|------------|------------|--------|----|-----|----|-----|----|-----|
| | 1963 15 | 1964 18 | 1963 24 | 1964 31 | 1963 22 | 1964 18 | 1963 19 | | | | | | | |
| | Days ^a % ^b | Days % | Days % | Days % | Days % | Days % | Days % | Days % | | | | | | |
| <i>Breeding birds on the study area</i> | | | | | | | | | | | | | | |
| Water pipit | 15 | 100 | 18 | 100 | 24 | 100 | 31 | 100 | 22 | 100 | 18 | 100 | 17 | 100 |
| Horned Lark | 10 | 66 | 16 | 89 | 23 | 96 | 25 | 81 | 12 | 55 | 16 | 89 | 17 | 89 |
| Black Rosy Finch | 15 | 100 | 18 | 100 | 22 | 92 | 26 | 84 | 9 | 41 | 5 | 28 | 8 | 42 |
| White-crowned Sparrow | 9 | 60 | 15 | 83 | 17 | 71 | 8 | 26 | 3 | 14 | | | 1 | 5 |
| <i>Probably breeding elsewhere</i> | | | | | | | | | | | | | | |
| Common Raven | 9 | 60 | 10 | 56 | 10 | 42 | 14 | 45 | 5 | 23 | 5 | 28 | 6 | 32 |
| Golden Eagle | 4 | 27 | 1 | 6 | 2 | 8 | 6 | 20 | 4 | 18 | 2 | 11 | 4 | 21 |
| Robin | 2 | 13 | 13 | 72 | 7 | 29 | 1 | 3 | 3 | 14 | | | | |
| Lincoln's Sparrow | 1 | 7 | | | 1 | 4 | 1 | 3 | | | 1 | 6 | 2 | 11 |
| Prairie Falcon | | | 3 | 17 | 1 | 4 | 6 | 20 | 3 | 14 | 3 | 17 | 3 | 16 |
| Rock Wren | | | 1 | 6 | 6 | 25 | | | | | | | | |
| <i>Regular visitors to the study area</i> | | | | | | | | | | | | | | |
| Mountain Bluebird | 9 | 60 | 10 | 56 | 3 | 13 | 3 | 10 | | | | | 3 | 16 |
| Clark's Nutcracker | | | 3 | 17 | | | 1 | 3 | | | | | | |
| Baird's Sandpiper | | | | | 2 | 8 | 8 | 26 | 6 | 27 | 11 | 61 | 10 | 53 |
| Marsh Hawk | | | | | 2 | 8 | 1 | 3 | 4 | 18 | 3 | 17 | 2 | 11 |
| Pine Siskin | | | | | 2 | 8 | 7 | 23 | 6 | 27 | 2 | 11 | | |
| Rufous Hummingbird | | | | | 1 | 4 | 7 | 23 | 1 | 5 | | | | |
| Chipping Sparrow | | | | | | | 2 | 7 | 4 | 18 | 2 | 11 | 1 | 5 |
| Vesper Sparrow | | | | | | | | | 3 | 14 | 1 | 6 | 1 | 5 |
| Rough-legged Hawk | | | | | | | | | 1 | 5 | 1 | 6 | | |
| Great Horned Owl | | | | | | | | | | | 2 | 11 | | |
| Long-eared Owl | | | | | | | | | | | 1 | 6 | | |

headed Junco (*Junco caniceps*). In table 1 all the birds observed on the study area only are listed (see fig. 1) by frequency and monthly occurrence. The Robin and the Rock Wren, which breed elsewhere on the plateau, are regular visitors on the study area. The table shows the gradual increase of species toward the end of the summer among the regular visitors and vagrants. The two owls are probably more common than is indicated, since we often found their feathers.

A typical feature of a late-summer alpine bird fauna is the influx of raptors. Except for the Golden Eagle and the Prairie Falcon no raptors were seen before 25 July. The influx is probably a result of seasonal population increase at lower elevations and a premigratory wandering phase. The raptors feed on the abundant supply of insects, immature and mature birds, and a population of rodents augmented by summer breeding.

SUMMARY

This study was conducted in the alpine regions of the Beartooth Plateau on the border of Wyoming and Montana during the summers of 1961 to 1964 and for shorter periods in the summers of 1958 to 1960. A general description of the geology and

TABLE 1 (Continued)

| Days of observation | June | | July | | August | | Sept. | |
|-----------------------------------|-------------------|----------------|------|------|--------|------|-------|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | |
| | 15 | 18 | 24 | 31 | 22 | 18 | 19 | |
| | Days ^a | % ^b | Days | % | Days | % | Days | % |
| <i>Vagrants on the study area</i> | | | | | | | | |
| White-throated Swift | 1 | 7 | | | | | | |
| Solitary Sandpiper | | | 1 | 4 | | 2 | 9 | |
| Tree Swallow | | | 1 | 4 | | | | |
| Killdeer | | | 1 | 4 | | | | |
| Mallard | | | 1 | 4 | | | | |
| Pigeon Hawk | | | | | 1 | 3 | | 1 |
| Ferruginous Hawk | | | | | 1 | 3 | | |
| American Goldfinch | | | | | 1 | 3 | | |
| Brewer's Blackbird | | | | | 1 | 3 | | |
| Sparrow Hawk | | | | | | 2 | 9 | 1 |
| Green-winged Teal | | | | | 2 | 9 | 1 | 6 |
| Night Hawk | | | | | 2 | 9 | | |
| Common Snipe | | | | | 1 | 5 | | |
| Sharp-shinned Hawk | | | | | 1 | 5 | | |
| Savannah Sparrow | | | | | 1 | 5 | | |
| Brown-headed Cowbird | | | | | 1 | 5 | 1 | 6 |
| Townsend's Solitaire | | | | | | | | 1 |
| Audubon's Warbler | | | | | | | | 1 |
| Yellow-headed Blackbird | | | | | | | | 1 |
| West. Meadowlark | | | | | | | | 1 |
| Oregon Junco | | | | | | | | 1 |
| Red-tailed Hawk | | | | | | | | 1 |
| Species total | 10 | 11 | 19 | 20 | 24 | 17 | 22 | |

^a Total days observed.^b % of total days.

topography of the plateau is given. Six vegetation stand types were recognized, and the location, dominant plants, and their importance to the avifauna were described. Sixty-one species of birds were observed, and the status of each is described.

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