

A PRELIMINARY STUDY OF VEGETATION ZONES AND WINTER BIRD DISTRIBUTION IN SASKATCHEWAN*

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The distribution of winter birds varies considerably across the 11 degrees (and 1220 km) of latitude that encompass present day Saskatchewan. This latitudinal spread includes vegetation zones that range from short-grass prairie through deciduous and coniferous forests, to the sub-arctic transition. Comparative information on bird composition among these vegetation zones in all seasons is sparse. The best information for the early winter period is provided by 946 Christmas Bird Counts conducted from 1940 to 1976.

In an earlier analysis of Christmas counts, bird distribution maps based on geographic units (degree blocks) suggested that the frequency of occurrence of most species was markedly influenced by vegetation zones.^{5 6} In this paper we use these counts to assess apparent preferences for specific vegetation zones exhibited by the more regular species, and characterize the species composition of each zone.

Methods

We assigned each count locality to one of the vegetation zones recog-

nized in the *Atlas of Saskatchewan* (see Figure 1).⁷ In addition to these six vegetation zones, we have included the Cypress Hills region as a seventh zone since it has several unique physiographic and vegetational features. Only one count (Fort Walsh) has included extensive mixed wood forest typical of the upper elevations of the hills. However, counts at Eastend, Maple Creek, Piapot and Skull Creek are likely under the influence of the hills because they include streams and their associated riparian habitats that originate in the Cypress Hills; hence, these localities have been included in the Cypress Hills region.

We then calculated the frequency of occurrence, during count periods for each species within each zone (i.e., the percent of total counts recording the species). Forty-six common species are shown in Figure 2. Given this information, it was possible to obtain an index of species richness within each zone (Table 1).

The index used is the number of species recorded on more than 25% of the counts. We felt that, with the modest degree of coverage on most counts, all of these species likely would be recorded on at least half of the counts had the count circles been covered by larger numbers of observers (20+) as in the larger cities

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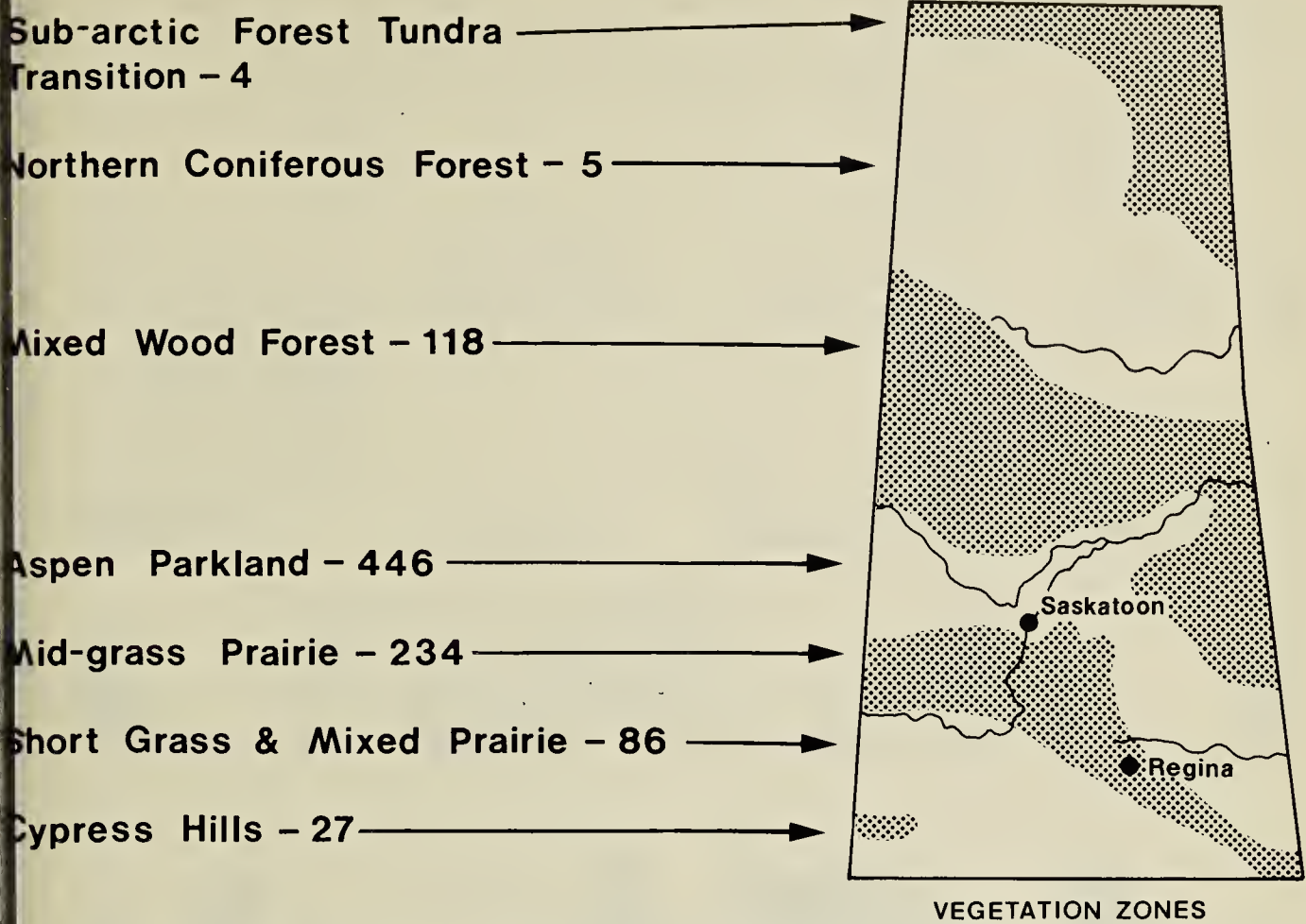


Figure 1: Vegetation zones in Saskatchewan (adapted from Richards and Fung 1969). The total number of counts in each vegetation zone is given behind the name of the zone.

Results

The highest species richness was exhibited by the Cypress Hills region which had an index of 22 species. The Fort Walsh count, located in the West block of the Cypress Hills, has been the only locality other than Saskatoon and Regina where more than 30 species have been recorded in a single day. Twenty-one of the 46 species represented in Figure 2 were recorded at least as frequently in the Cypress Hills as in any other vegetation zone.

Somewhat lower species richness was exhibited by the aspen parkland and the mixed wood zones, each with an index of 17 species. There are numerous examples of small parties in these areas recording relatively good counts. In 1952, four people in two parties observed 25 species on count day and three other species

during count period in the Nipawin-Fishing Lakes area on the aspen parkland/mixed wood boundary. In 1954, five observers recorded 17 species on count day and 13 additional species during count period in the Nipawin-White Gull Creek area. And between 1951 and 1976, two people frequently recorded 20 to 25 species during count period at Somme, a farming community on the southern edge of the mixed wood forest.

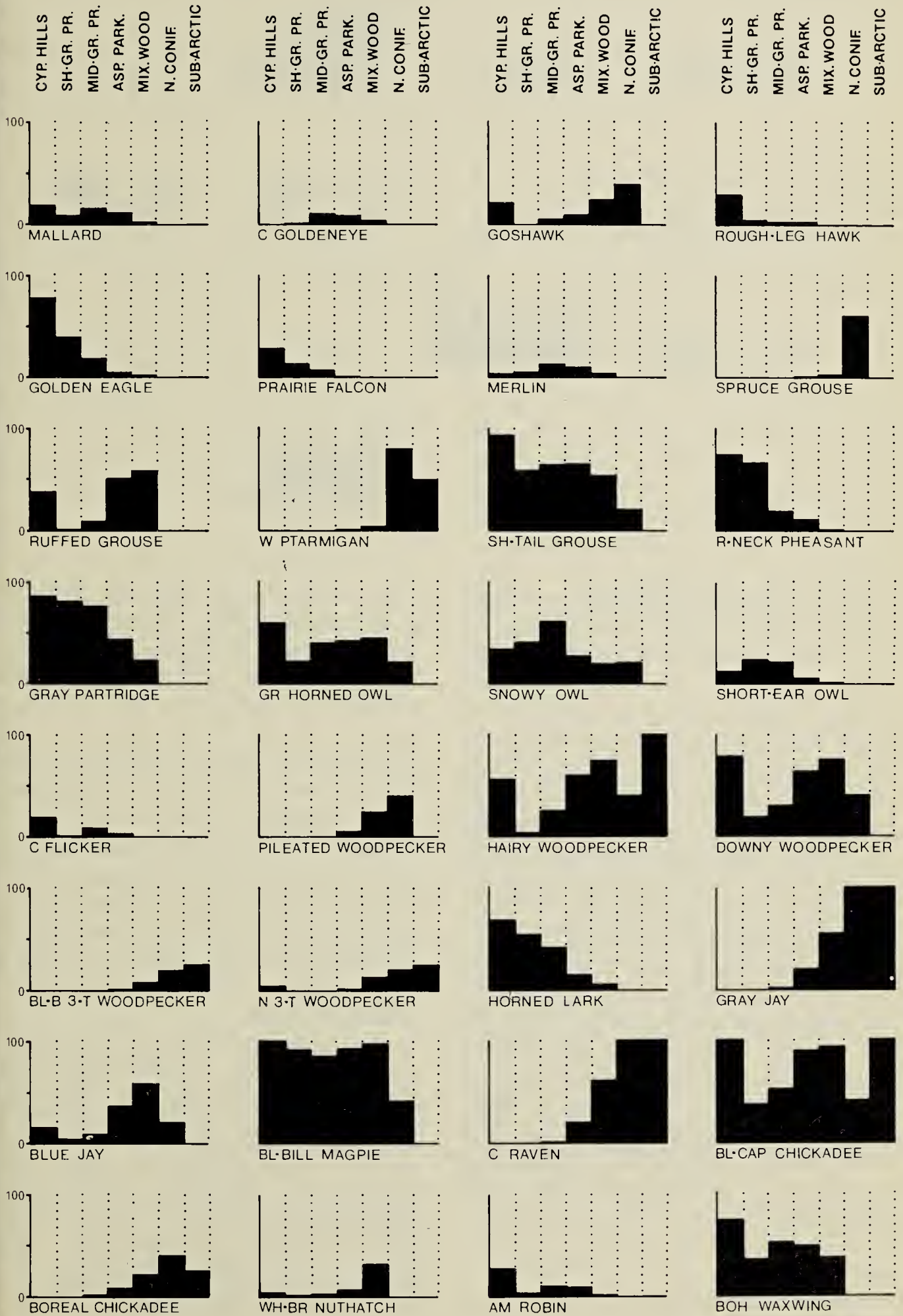
Species richness appeared to be lowest in the sub-arctic forest tundra transition, the northern coniferous forest and in the prairie zones. Although the number of counts in the first two of these zones has been small (5 and 4, respectively), the small number of species observed is in general agreement with the depauperate winter bird life reported for these areas by others.^{2 4}

TABLE 1. Frequency of occurrence of species on Christmas bird counts in major vegetation zones, 1942-1976 (based on 920 counts).
Species are ranked in descending order of frequency.

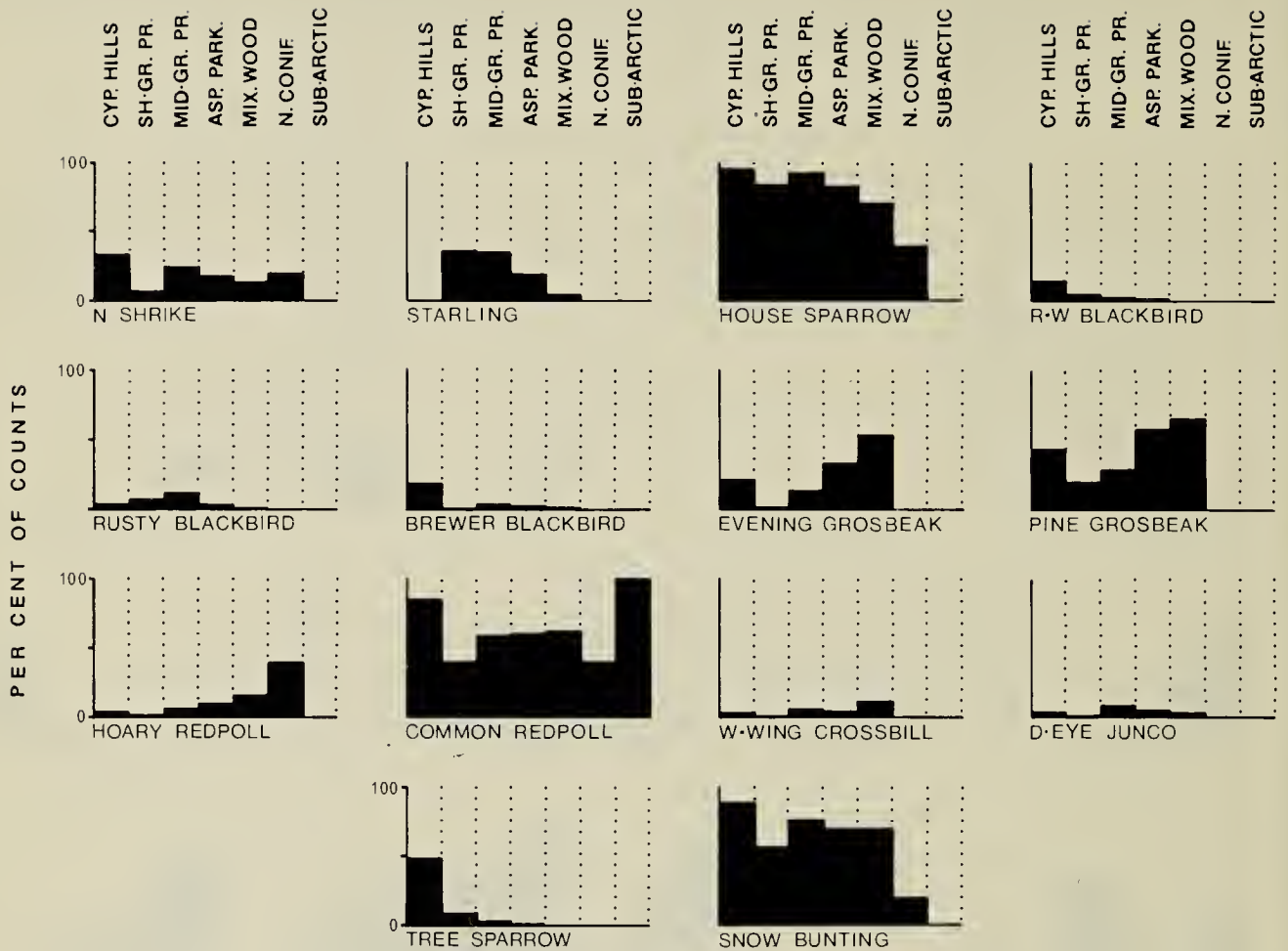
Frequency of Occurrence	Cypress Hills	Short-grass and Mixed Prairie	Mid-grass Prairie	Aspen Parkland	Mixed Wood Forest	N Coniferous Forest	Sub-arctic Forest Tundra Transition
76 - 100% of counts	Bl-bill. Magpie Bl-c. Chickadee House Sparrow Sh-tail. Grouse Snow Bunting Gray Partridge Com. Redpoll Golden Eagle Downy W'pecker	Bl-bill. Magpie House Sparrow Bl-bill. Magpie Snow Bunting	House Sparrow Bl-bill. Magpie Snow Bunting	Bl-bill. Magpie Bl-c. Chickadee House Sparrow	Bl-bill. Magpie Bl-c. Chickadee	Gray Jay Com. Raven W. Ptarmigan	Hairy W'pecker Gray Jay Com. Raven Bl-c. Chickadee Com. Redpoll
51 - 75% of counts	R-n. Pheasant Boh. Waxwing Horned Lark Gr. Horned Owl Hairy W'pecker	R-n. Pheasant Sh-tail. Grouse Snow Bunting Horned Lark	Gray Partridge Sh-tail. Grouse Snowy Owl Com. Redpoll Bl-c. Chickadee Boh. Waxwing Rock Dove	Snow Bunting Sh-tail. Grouse Downy W'pecker Hairy W'pecker Com. Redpoll Pine Grosbeak Ruffed Grouse	Downy W'pecker Hairy W'pecker House Sparrow Snow Bunting Pine Grosbeak Com. Redpoll Com. Raven Ruffed Grouse Blue Jay Sh-tail. Grouse Gray Jay Evening Grosbeak	Spruce Grouse	
26 - 50% of counts	Tree Sparrow Pine Grosbeak Ruffed Grouse N. Shrike Snowy Owl R-leg. Hawk Prairie Falcon Am. Robin	Rock Dove Golden Eagle Snowy Owl Com. Redpoll Bl-c. Chickadee Starling Boh. Waxwing	Horned Lark Gr. Horned Owl Downy W'pecker Starling Pine Grosbeak	Boh. Waxwing Gray Partridge Gr. Horned Owl Blue Jay Evening Grosbeak Rock Dove Snowy Owl	Gr. Horned Owl Boh. Waxwing Wh-br. Nuthatch	Pileat. W'pecker Hairy W'pecker Downy W'pecker Bl-bill. Magpie Bl-c. Chickadee Bor. Chickadee House Sparrow Hoary Redpoll Com. Redpoll	W. Ptarmigan
Total No. Species In All Above Categories	22	14	15	17	17	13	6

Figure 2: Frequency of occurrence of species on Christmas Bird Counts (during count period) in seven vegetation zones. The Rock Dove and all species recorded on less than 0 per cent of counts in all vegetation zones are excluded.

VEGETATION ZONE



VEGETATION ZONE



Ten of the 34 species in Table 1 were seen on more than 25% of the counts in only one vegetation zone. Five of these 10 restricted-distribution species were in the Cypress Hills (Tree Sparrow, Northern Shrike, Rough-legged Hawk, Prairie Falcon, American Robin), four were in the northern coniferous forest (Spruce Grouse, Pileated Woodpecker, Boreal Chickadee, Hoary Redpoll) and one was in the mixed wood forest (White-breasted Nuthatch). Only two species, Black-capped Chickadee and Common Redpoll, were included in the index for each of the vegetation zones. The Black-billed Magpie and House Sparrow were indexed in six of the seven zones (not in sub-arctic), and the Hairy Woodpecker was seen in all seven zones but was seen on more than 25% of the counts in only five zones.

Discussion

Within the province, the frequency

of occurrence of species on Christmas counts differs among vegetation zones. This is probably at least in part a function of the habitat diversity present in each zone. The number of habitats in an area depends upon both the natural environment and the nature and extent of man-induced environmental changes. As long as human activities do not destroy the last examples of any natural habitat, areas modified by human activities would provide a much greater variety of habitat types in which an artificially high degree of species diversity would exist.

In recent years the greatest number of species has been consistently recorded on Christmas Bird Counts in the two largest cities, Regina (located in the mid-grass prairie) and Saskatoon (located on the fringe of the aspen parkland). In the 10-year period, 1967 to 1976, Regina averaged 39 species and Saskatoon averaged 34 species during count period.

Saskatoon, with a river, and Regina, with a man-made lake, both provided open water during the winter. Open water was a factor explaining the local diversity of birds in these areas. This was especially evident at Regina where a maximum of 19 water-associated species and an average of 12 such species were recorded; at Saskatoon a maximum of 8 and an average of 4 species were recorded.

When water-associated species are excluded from each year's total, Saskatoon averaged 30 species and Regina averaged about 27 species during count period. The total at Saskatoon is similar to some of the higher counts taken by smaller numbers of people in typical areas of the parkland, mixed wood or Cypress Hills vegetation zones. The unexpectedly high total for Regina is perhaps attributable to the large number of observers, compared to other localities in the same vegetation zone, and the relatively great diversity of micro-habitats afforded by an "island" of woodland on the otherwise largely treeless plain.

On a broader scale, one could suggest several obvious reasons for the large number of species recorded on individual counts and the higher species index found in the Cypress Hills, aspen parkland and mixed wood zones. The Cypress Hills and aspen parkland naturally encompass habitats ranging from grassland to forests. The mixed wood component of the Cypress Hills forest provides habitats for additional species not regularly found in aspen parkland. The area is a meeting place for species which have both boreal affinities (e.g., White-winged Crossbill, Goshawk, Northern Three-toed Woodpecker) and montane affinities (e.g., Townsend's Solitaire, Red Crossbill, Gray-crowned Rosy Finch) as well as being a prime wintering

area for the more typical prairie species. Most of the boreal and montane species are still infrequently recorded (and hence absent from Table 1); however, as more counts in the Cypress Hills include the extensive mixed wood habitats of the Centre and East Blocks, these species will no doubt become increasingly regular.

The natural diversity of the Cypress Hills and aspen parkland have been further modified by agriculture and other cultural influences. Most counts in the mixed wood zone have been taken along its southern boundary where agricultural practices have resulted in clearing of a part of the forest cover, thus providing openings for species that formerly may have had to travel further south to find suitable winter range (e.g., Snow Bunting). There, as in other more southerly vegetation zones, the presence of farms and towns, with their associated food supplies, have provided yet another micro-habitat which wintering birds have learned to exploit.

Climatic patterns within Saskatchewan probably exert both direct and indirect effects on the number of species that winter in various parts of the province. Climate is an important determinant of the vegetation zones which, in turn, influence species richness. Temperature also affects the distribution of many species through effects on food supplies and energy requirements. With a mean January temperature varying about 22°C. (40°F.) latitudinally across the province,⁷ temperature may determine the limits at which a given species is able to balance its energy requirements with the available food resources, taking into account the north-to-south variation in daylight available to diurnal species.

The small number of species

observed on the prairies is probably the result of the combined effects of low vegetation diversity and exposure. Studies have shown that, even for hardy species like the Snowy Owl and Starling, wind chill significantly increases the energy requirements of the bird.^{1 3}

The wintering bird species of the primeval prairies undoubtedly included fewer species than are present today, since introduced species—primarily the House Sparrow, Gray Partridge and Rock Dove—are now among the most conspicuous winter birds. There is no evidence that any naturally-occurring species have been seriously displaced by introduced species. The growing number of species now occurring locally in southern Saskatchewan (particularly in towns and cities) attest to the new “richness” of these areas.

Summary

The number of species recorded on more than 25% of counts in each of the seven vegetation zones (i.e., “species richness”) was highest in the Cypress Hills, aspen parkland and mixed wood zones, where a high degree of natural and man-induced habitat diversity now exists. Species richness was lower in the northern coniferous forest, the mid-grass prairie, and the short-grass/mixed prairie. Within the mid-grass prairie and aspen parkland vegetation zones, counts in cities invariably recorded the largest number of species; contributing factors included the availability of open water, a great variety of man-induced habitats (including concentrated natural and artificial food and shelter) and usually more observers.

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