INTRODUCTION

This is the fourth and final volume on the avifauna of British Columbia; it completes a discussion of the passerine birds of the province that began in Volume 3. Coming some 10 years following the publication of Volumes 1 and 2 (the non-passerine birds), it is the culmination of over 25 years of effort by the authors and significant contributions from colleagues around the world and thousands of volunteers (Fig. 1) throughout British Columbia.

The methodologies used in the preparation of this work have previously been described (Volume 1, page 146, and Volume 3, page 13) and will not be repeated here.

Because of the length of time between the publication of Volumes 1 and 2 (1990) and this final volume, we have included a chapter called "Additions to the Avifauna of British Columbia, 1987 through 1999." There we list 28 species new to the province that were reported over that period. Some species, such as Manx Shearwater, Crested Caracara, Xantus's Hummingbird, and Least Tern are new occurrence additions to the avifauna of the province. Others, such as Northern Fulmar, Baird's Sandpiper, Franklin's Gull, and Black-legged Kittiwake (Fig. 2), now breed in the province. One species, Pacific Golden-Plover, has been elevated from subspecies to full species status due to taxonomic changes.

Beyond the scope of the chapter are the many new changes in numbers, distribution, and results of research that contribute to our current knowledge and status of birds in the province. For example, the Flammulated Owl, Trumpeter Swan, and Black Tern (Fig. 3), have ranges in the province that are much greater than was previously known. And for others, such as the Barrow's Goldeneye and Marbled Murrelet, research has provided new information significant to the conservation and management of the species. In the case of the goldeneye, mature trembling aspen forest that provides nesting cavities is being harvested at an incredible rate to make hardwood products for the world market. In the case of the murrelet, an ornithological enigma was solved in 1991 with the discovery of the first murrelet nest for British Columbia in old-growth forest along Walbran Creek.

Figure 1. Over 11,000 volunteers contributed information to the data bases that were used to prepare *The Birds of British Columbia.* J.E. Victor Goodwill and Margaret E. Goodwill have been among our most consistent and supportive contributors (Victoria, 15 March 2000; R. Wayne Campbell).

Figure 2. Adult Black-legged Kittiwake with chick at nest ledge (Gjelpruvaer, Norway, 11 July 1994; R. Wayne Campbell).

Figure 3. Over the past 2 decades, the breeding distribution of the Black Tern has expanded northward and westward in British Columbia (south of Prince George, 13 June 1998; R. Wayne Campbell).

A final section, "Synopsis: The Birds of British Columbia into the 21st Century," summarizes significant information on the avifauna of the province from all 4 volumes. Here we discuss aspects of the biodiversity, ecological distribution, and patterns of change we have noted along with rare, threatened or endangered species and those species experiencing long-term changes in numbers. The national and international significance of select species and our responsibilities to ensure that viable populations survive for future generations are also covered, along with future management needs. That is followed by our thoughts on some new philosophies, concerns, and conservation challenges we believe will play a role in the future of the birds of the province.

Finally, we end much as we began, by respectfully reminding the reader

> that this [has truly been] a cooperative work; if he fails to find in these volumes anything that he knows about the birds, he can blame himself for not having sent the information to

THE AUTHORS

Western Tanager

WETA

Piranga ludoviciana (Wilson)

RANGE: Widespread in western North America. Breeds from southeastern Alaska, northern British Columbia, south-central Mackenzie, northern Alberta, and central Saskatchewan south in the western part of the range into Baja California, southern Nevada, southwestern Utah, central and southeastern Arizona, southern New Mexico, and western Texas, and east to eastern Montana, western South Dakota, northwestern Nebraska, central Colorado, and central New Mexico. Winters regularly from southern California and Baja California south through Mexico and Central America to Costa Rica.

STATUS: On the coast, a *fairly common* to *common* migrant, *uncommon* to *fairly common* summer visitant, and *casual* winter visitant in the Georgia Depression Ecoprovince; in the Coast and Mountains Ecoprovince, *uncommon* to *fairly common* migrant and summer visitant on the Southern Mainland Coast, *rare* to *uncommon* migrant and summer visitant on the Northern Mainland Coast, *rare* on Western Vancouver Island, and *casual* on the Queen Charlotte Islands.

In the interior, *fairly common* to *common* spring migrant and summer visitant, *uncommon* autumn migrant, and *casual* in winter in the Southern Interior Ecoprovince; *fairly common* to *common* spring migrant and summer visitant and *uncommon* autumn migrant in the Southern Interior Mountains Ecoprovince; *uncommon* to *fairly common* spring and autumn migrant and summer visitant in the Central Interior, Sub-Boreal Interior, Boreal Plains, and Taiga Plains ecoprovinces; *rare* to locally *uncommon* in the Northern Boreal Mountains Ecoprovince.

Breeds.

NONBREEDING: The Western Tanager (Fig. 181) is widely distributed throughout most of the southern and central portions of the province, including Vancouver Island. The distribution of this tanager in northern areas is more localized and occurrences are more widely scattered. There are few records from the coast between northern Vancouver Island and the mouth of the Skeena River, and only 2 reports from the Queen Charlotte Islands.

Outside the breeding season, the Western Tanager has been reported from near sea level to 250 m elevation on the coast and from 280 to 1,150 m in the interior. During migration, this species uses a wide variety of forested habitats, both deciduous and coniferous, including mature forests, human-influenced forests, flooded wooded lakeshores (Fig. 182), and stands of trees in suburban areas, orchards, parks, and gardens. It occasionally visits garden feeding stations with water sources.

On the south coast, the spring migration begins in mid to late April and reaches its peak a month later (Figs. 183 and 184). The first arrivals reach the Northern Mainland Coast several weeks later, in early May, but identification of a peak is hampered by insufficient data. In the southern portions of the interior, the first arrivals sometimes reach the Okanagan, Kootenay, and Columbia valleys in the second week of April but become regular there by late April and the first week of May (Figs. 183 and 184). In these southern valleys, the number of birds present increases rapidly through May; the greatest numbers are present in late May or early June in the Southern Interior and Southern Interior Mountains.

Figure 181. Adult male Western Tanager (Victoria, 15 July 1996; Tim Zurowski).

The Western Tanager arrives in the Cariboo-Chilcotin areas and the vicinity of Prince George in the latter half of April and in the Peace Lowland in early May. The earliest spring arrival records for the Taiga Plains are from the third week of May.

In the Northern Boreal Mountains, Taiga Plains, and Boreal Plains, the autumn migration appears to unfold gradually, beginning as early as late July. Most tanagers have departed by mid-August (Figs. 183 and 184). In the southern regions of the interior, the migration is usually over by mid-September except for a few stragglers. On the coast, the peak of the southbound migration passes through the Fraser River delta and surrounding mountains from mid-August to mid-September. Only stragglers remain by the first week of October.

In winter, the Western Tanager has been reported at Kamloops in the Southern Interior and from southeastern Vancouver Island and the Fraser Lowland in the Georgia Depression.

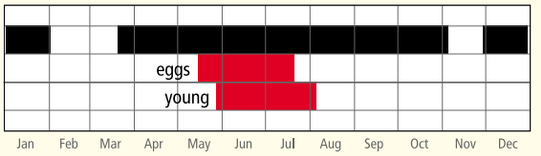
On the coast, the Western Tanager has been recorded throughout most of the year, but regularly only from 15 April to 27 September; in the interior, it has been recorded regularly from 7 April to 27 September (Fig. 183).

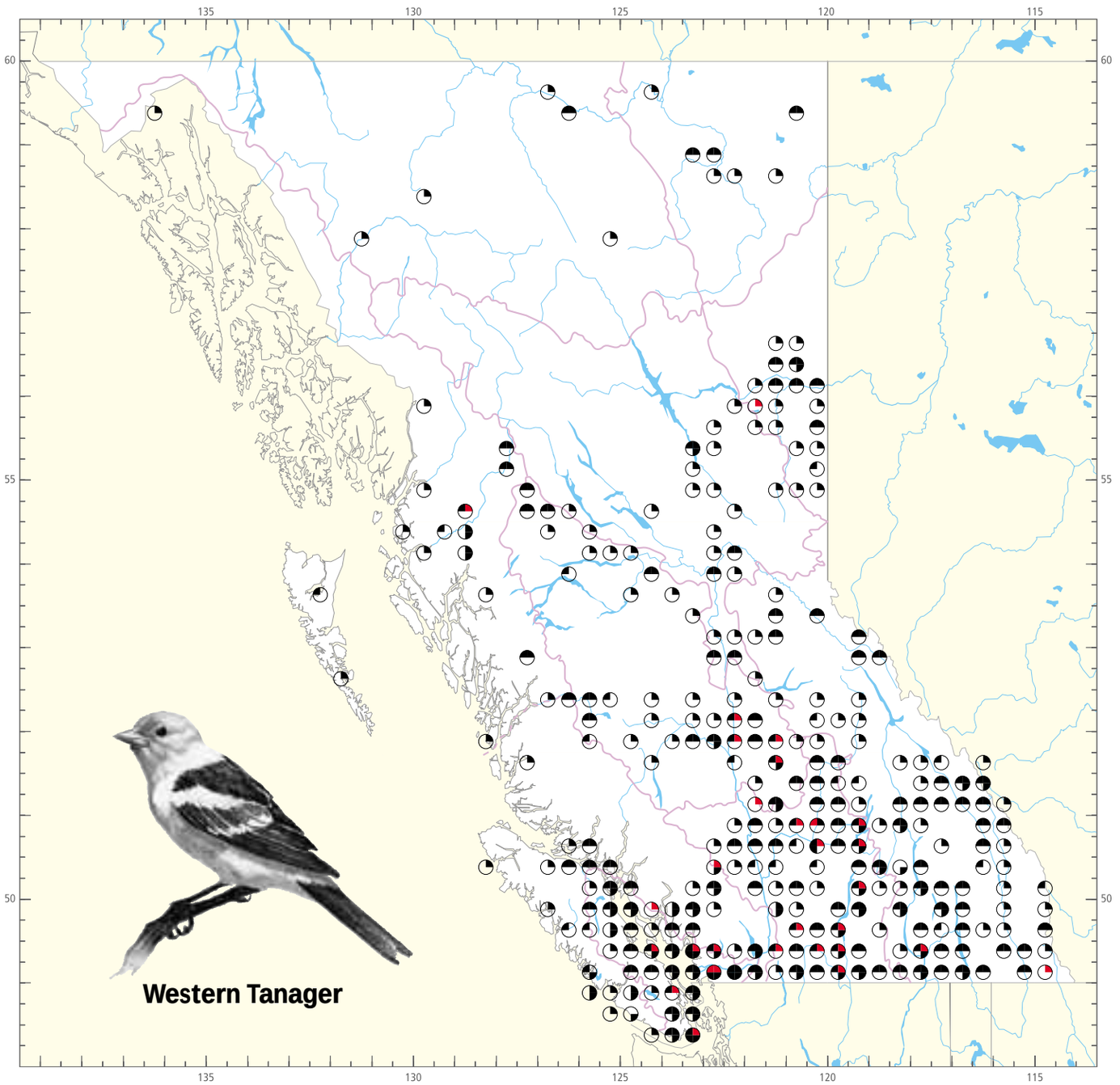
BREEDING: The Western Tanager has a widespread breeding distribution throughout most of British Columbia from the

Nonbreeding **Breeding**

Mar	Apr	May	
Jun	Jul	Aug	
Sep	Oct	Nov	
Dec	Jan	Feb	

Nonbreeding and Breeding Chronology





Western Tanager

Data Base

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Nonbreeding	11	0	3	33	1,163	1,385	732	641	274	12	1	20	4,275
Breeding	0	0	0	0	2	29	19	1	0	0	0	0	51

Peace Lowland southward and including southeastern Vancouver Island. It has not been reported from the Queen Charlotte Islands. Although records are scarce, the species probably breeds locally throughout the northern interior.

This tanager reaches its highest numbers in summer in the Southern Interior (Fig. 185). An analysis of Breeding Bird Surveys in British Columbia for the period 1968 through 1993 could not detect a net change in the mean number of birds on either coastal and interior routes. North American trends for the period 1966 to 1996 were similar (Sauer et al. 1997).

The Western Tanager has been found breeding at elevations from near sea level to 135 m on the coast and from 330 to 1,200 m in the interior. Breeding habitat includes a variety of forest types where it is most numerous in edge or ecotone situations, including a mix of conifers and deciduous trees. These are frequently associated with openings such as beaver ponds, lake margins, rock bluffs, meadows, trembling aspen copses, Douglas-fir and ponderosa pine forests bordering grasslands and shrub-steppes (Fig. 186), and sometimes suburban parks and gardens. In the old-growth and managed forests of western Vancouver Island, consisting of Douglas-fir, western redcedar, western hemlock, Sitka spruce, Pacific yew, and amabilis fir, the Western Tanager occurred only in the oldest age class of the forest (> 200 years; Bryant et al. 1993). In coastal coniferous forests outside British Columbia, a detailed analysis of spring bird communities in the Coast Mountains of Oregon provides comparable data. There Douglas-fir forests of 3 age classes – young forest 40 to 72 years old, mature forest 80 to 120 years old, and old-growth stands 200 to 525 years old – all had Western Tanagers during the

Figure 182. During spring and autumn migration, the Western Tanager forages in a variety of mixed woodlands in British Columbia, including stands of flooded dead trees bordering lakes (Blackwater, northwest of Quesnel, 25 June 1997; R. Wayne Campbell).

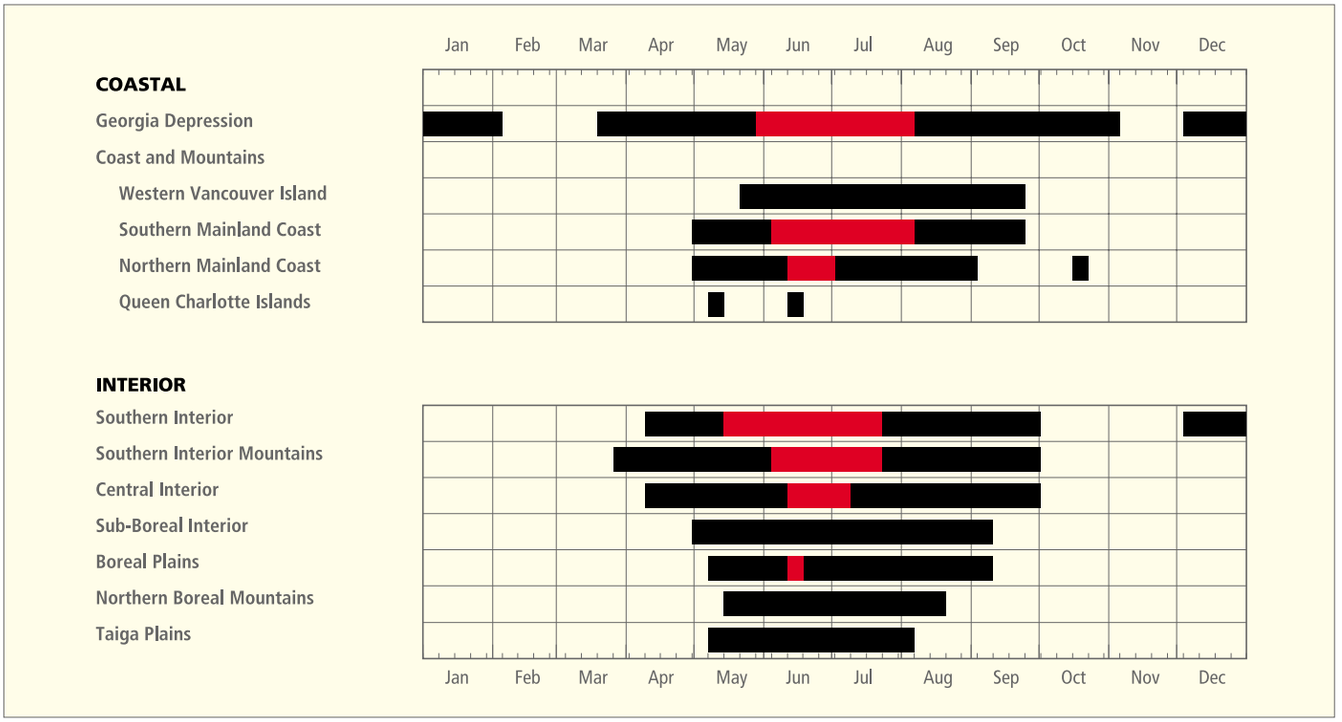


Figure 183. Annual occurrence (black) and breeding chronology (red) for the Western Tanager in ecoprovinces of British Columbia. Records are shown for the week in which they occurred.

Figure 184. Fluctuations in total number of birds (purple line) and total number of records (green line) for the Western Tanager in ecoprovinces of British Columbia. Christmas Bird Counts, Breeding Bird Surveys, and nest record data have been excluded.

study period from late April through June. Numbers were consistently higher in the young age class (Carey et al. 1991).

Further examples of the variety of forest types in which this tanager breeds come from the Rocky Mountains area, where it was a common summer resident in Kootenay National Park and reached its highest density in the Montane ecoregion, and less frequently in the lower subalpine habitats. Here, it inhabited interior Douglas-fir forests as well as other open mature coniferous or mixed forests. It was most numerous in Douglas-fir–hairy wildrye closed forest, and Douglas-fir–ponderosa pine–wheatgrass open forest (Poll et al. 1984). In the trembling aspen forests of the Bulkley valley, repeated census counts between late May and mid-July revealed that the Western Tanager was generally absent from clearcut stands and from the sapling stage but was generally present in stands of mature trembling aspen (trees 50 to 60 years old) and in stands of 100-year-old trees, but was most numerous in mixed conifer–trembling aspen old-growth, where densities ranged from 3.2 to 9.1 singing males per 10 ha (Pojar 1995). The timing of these counts included both migration and early nesting periods. In the Sub-Boreal Interior, the Western Tanager nests in mature trembling aspen and mixed trembling aspen–conifer forests of the Bulkley River region (Pojar 1995). In the vicinity of Mackenzie, the species prefers mature (more than 80 years old) lodgepole pine or lodgepole pine–trembling aspen mixed forests, although it is occasionally found in white spruce–trembling aspen stands 50 to 100 years old (J. Tuck pers. comm.). Further north, in the vicinity of Dawson Creek in the Boreal Plains, the Western Tanager breeds in mature mixed-wood forests and less so in pure trembling aspen forests (Phinney 1998). Along the Liard River drainage basin, this species occurs during the breeding season mainly in mature stands of white spruce (Erskine and Davidson 1976).

In British Columbia, the Western Tanager generally nests in coniferous forests, especially interior Douglas-fir, but also in mixed forests that include western redcedar, western hemlock, spruce, and associations consisting of such deciduous trees as trembling aspen, black cottonwood, paper birch, red alder, and bigleaf maple. Studies of the species in western Montana and adjacent Idaho, not far south of British Columbia, emphasize the relationship between the Western Tanager and interior Douglas-fir forests (Hejl and Wood 1991). In the association between birds and Douglas-fir forests of 2 age classes – old-growth (200+ years) and "rotation age" (80 to 120 years) – the Western Tanager was among the 4 species primarily associated with old-growth forest.

On the coast, the Western Tanager has been recorded breeding from 30 May to 4 August; in the interior, it has been recorded breeding from 15 May (calculated) to 20 July (Fig. 183).

Nests: All nests (Fig. 187) were placed in trees. Nest trees were predominantly conifers (79%, *n* = 43), and most nests were found in Douglas-fir (55%; Fig. 187), followed by western hemlock (7%), spruce (7%), and western redcedar (5%). Ponderosa pine, lodgepole pine, and western larch were each used once. Just 21% of nests were in deciduous trees, with

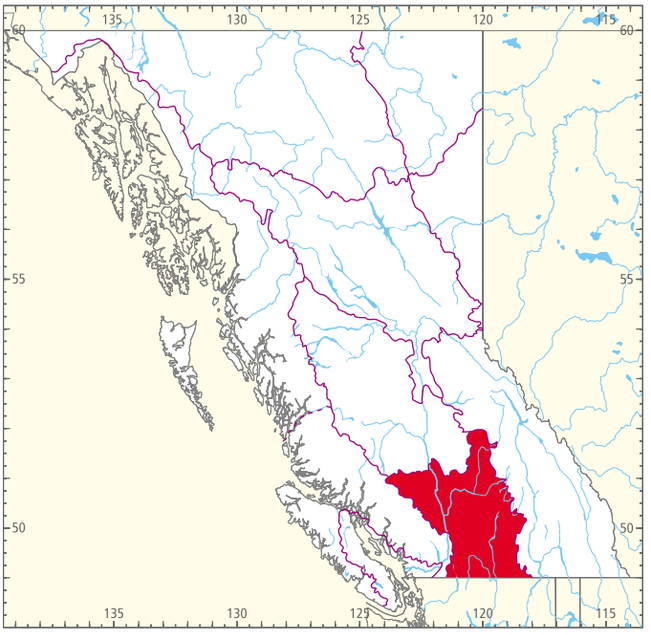


Figure 185. In British Columbia, the highest numbers for the Western Tanager in summer occur in the Southern Interior Ecoprovince.

3 nests each in trembling aspen and willow, and single nests in red alder, domestic apple, and Garry oak.

Nests were mainly constructed of loosely organized twigs and grasses, along with, in descending order of frequency, lichens, mosses, rootlets, animal hair, needles, plant stems, and feathers (Fig. 187).

The heights of 43 nests ranged from 2.4 to 23 m, with 56% between 6.4 and 11 m. Most nests in coniferous trees were placed on top of a branch among the abundant branchlets near the extremity (Fig. 187). The nest location was more variable in deciduous trees, from close to the trunk to the terminal branches.

Eggs: Nests of the Western Tanager are generally placed in such a way that they are difficult to reach or even to see into, so details on clutch size are few. Dates for 22 clutches ranged from 30 May to 20 July, with 59% recorded between 5 June and 27 June. Calculated dates indicate that eggs can occur as early as 15 May. Sizes of 20 clutches ranged from 1 to 5 eggs (1E-3, 2E-1, 3E-3, 4E-11, 5E-2), with 55% having 4 eggs. The incubation period is 13 days (Baicich and Harrison 1997).

Young: Dates for 29 broods ranged from 28 May to 4 August, with 52% recorded between 24 June and 16 July. Sizes of 18 broods ranged from 1 to 4 young (1Y-2, 2Y-3, 3Y-7, 4Y-6), with 72% having 3 or 4 young. The nestling period is about 10 to 13 days (Baicich and Harrison 1997; Ehrlich et al. 1988).

Brown-headed Cowbird Parasitism: In British Columbia, 2 of 39 nests found with eggs or young were parasitized by the cowbird. In addition, there were 13 records of Western Tanagers feeding fledgling Brown-headed Cowbirds; 1 involved 3 cowbird fledglings and another involved 2. This is an unusually high rate of parasitism, as Friedmann (1963) and Friedmann and Kiff (1985) list just 4 instances in North America: 2 from British Columbia and 1 each from Alberta

Figure 186. In parts of the southern portions of the interior of British Columbia, the Western Tanager breeds in mixed forests of ponderosa pine and Douglas-fir bordering grasslands and shrub-steppe habitats (Hat Creek, 7 June 1997; R. Wayne Campbell).

and Montana. Thus, although it is not possible to calculate a rate of parasitism for the province, it appears to be the highest in North America. Our records also include 1 nest deserted by the tanager after a cowbird egg was deposited and 2 others in which both tanager and cowbird nestlings were reared to fledging. Cannings et al. (1987) gives a rate of 33% Brown-headed Cowbird parasitism in the Okanagan valley, but this includes Western Tanagers accompanied by fledgling cowbirds.

Nest Success: Insufficient data. Among the few identified causes of nestling mortality in the province are predation by a Northern Pygmy-Owl and 1 instance of infestation by a blowfly species feeding subcutaneously.

REMARKS: As a nesting species in the province, the Western Tanager is closely associated with interior Douglas-fir forests and is a species of concern to those designing management strategies for such forests. Robbins et al. (1986) refer to declines in the numbers of the Western Tanager in western North America, especially in British Columbia and Montana, between 1968 and 1973. Over the period 1966 to 1979, Breeding Bird Surveys for all of British Columbia did show a decline in the tanager population at an average annual rate of 5.3% ($P < 0.05$); since 1980, however, the population has increased at an average annual rate of 2.1% ($P < 0.10$) (Sauer et al. 1997). For example, the spring of 1996 saw a remarkable migration through parts of the interior of the province that was observed from the Okanagan valley north as far as Prince George (Bowling 1996c). The largest reported flock consisted of 100 birds seen among roadside shrubbery on the east side of Swan Lake, Vernon, on 12 May. The last big flocks were

Figure 187. Many Western Tanager nests in British Columbia are constructed entirely of small twigs and rootlets (Victoria, 7 June 1986; R. Wayne Campbell).

seen in the Vernon area on 20 May, but at Kamloops the migration continued until the end of May. In Prince George, on 19 May, birds were concentrating in trees that still carried the remnants of the previous year's berry crop, as well as foraging on the ground throughout the city. The last flocks reported from the Prince George area were from 25 May. Local reports of the birds' behaviour suggested a food shortage and possibly heavy mortality.

The 1996 spring migration in British Columbia is reminiscent of one that occurred in the San Francisco Bay district of California a century earlier, from 12 to 28 May 1896 (Emerson 1903). Then, the tanagers did serious damage to a cherry crop and large numbers were shot by orchardists.

For a comprehensive summary of current knowledge about this species, see Hudon (1999). Additional information may be found in Bent (1958).

NOTEWORTHY RECORDS

Spring: Coastal – w Sooke 22 Mar 1987-1 male; Saanich 31 Mar 1952-1 (Clay 1953), 6 May 1980-6; Brentwood Bay 11 May 1940-25; Reifel Island 15 Apr 1988-1; Lennard Island 26 May 1978-12; Surrey 30 May 1970-3 eggs; Sea Island 4 May 1995-1 (Elliott and Gardner 1997); Vancouver 18 May 1975-33; North Vancouver 14 May 1984-25; Pitt Meadows 10 May 1976-20; Cheam Slough 27 Apr 1992-1 male; Miracle Beach Park 7 Apr 1962-1 (Westerborg 1962); Gold River 25 May 1974-4; Port Neville 23 May 1975-1; Stuie 22 May 1932-1; Yakoun Lake 13 May 1983-1 (Mattocks and Hunn 1983b). **Interior** – Osoyoos 20 May 1945-40 (90% males); Oliver to Richter Lake 17 May 1959-8 on survey; Balfour to Waneta 27 May 1982-11 on survey; Princeton 18 May 1959-50; Carrs Landing 9 Apr 1967-1; Okanagan Landing 13 May 1937-50; Redstreak 31 Mar 1965-1 male singing (Seel 1965); Ashcroft 15 May 1948-1, (NMC 1852); Peterhope Lake 11 Apr 1976-5; McQueen Lake 28 May 1973-adult feeding nestlings; Celista 28 May 1974-28; Mount Revelstoke National Park 12 Apr 1972-2; North Barriere Lake 7 Apr 1964-1 male; 15 km n Golden 6 May 1996-1 male; Chilcotin River 18 May 1990-39; Williams Lake area 13 Apr 1980-1; Fountain Valley 23 May 1970-100; Willow River 4 May 1966-1, 12 May 1968-25 (mostly males); 25 km s Prince George 9 May 1982-1, 17 May 1975-10; Gagnon Creek 11 May 1997-1; Taylor 10 May 1983-1, 18 May 1985-8; Bear Flat 11 May 1985-1; Beaver Lake (Cassiar) 11 May 1980-1; Fort Nelson 18 May 1987-1; Liard Hot Springs 16 May 1975-1 (Reid 1975).

Summer: Coastal – Sahtlam 30 Jun 1915-nest and 1 egg collected; Goldstream Park 1 Jun 1975-1; Duncan 5 Jun 1971-5; Surrey 20 Jul 1983-4 eggs; Deas Island 20 Jul 1989-5; Alberni 4 Jun 1910-1; Deer Lake (Burnaby) 13 Jun 1971-13; Hope 31 Jul 1993-3 nestlings; Tony Lake 6 Jul 1936-4 nestlings; Campbell River 6 Jun 1980-15; Lost Lake 16 Aug 1946-6; Alta Lake 10 Jun 1945-2; Pemberton 3 Jun 1967-8; Grant Bay 25 Aug 1968-1 (Richardson 1971); Goose Island 1 Aug 1948-1 pair (Guiguet 1953); Bella Coola River 9 Jun 1976-1; De la Beche Inlet 12 Jun 1986-1 male in mixed woods; Terrace 28 Jun 1979-3 nestlings; Haines Highway (Km 35) 18 Jun 1974-1. **Interior** – Creston 20 Jul 1971-young; Kootenay River (Creston) 12 Aug 1948-30 (Munro 1957); 1.6 km ne Big Sand Creek 25 Jun 1974-4 nestlings; Nakusp 7 Aug 1979-3 young; West Bench (Penticton) 26 Aug 1980-8; 5 km ne of Nicola Lake 1 Aug 1980-1 fledgling; Invermere 25 Aug 1983-1 fledgling; Skihist to Lytton 8 Jun 1968-14 on survey; Scotch Creek (Shuswap) 31 Jul 1970-4 nestlings with adults; 15 km n Golden 22 Aug 1997-11, highest count; 100 Mile House 20 Aug 1978-4 young; 32 km n 100 Mile House 12 Jun 1961-2 eggs; Westwick Lakes 30 Jun 1956-1 recently fledged young; Alexis Creek 12 Jun 1976-11 on survey; Bear Lake (Crooked River) 15 Aug 1975-2; Prince George 24 Aug 1982-1; Eaglet Lake 28 Jul 1985-2 fledglings; Youngs Lake 3 Jul 1981-2 fledglings; Pine Pass 17 Aug 1975-1; w Chetwynd 22 Jul 1975-2; Moberly Lake 13 Jun 1984-female incubating; Beatton Park 4 Jul 1981-1 fledgling with parents; Four Mile Creek (Stikine River) 5 Jul 1922-1 female incubating; Clarke Lake 14 Jul 1985-5; 2 km nw Clarke Lake 28 Jul 1985-2 fledglings; Fort Nelson 19 Jun 1976-6, 29 Jul 1968-1; Liard Hot Springs 8 Jul 1992-4 males, 16 Aug 1975-1 (Reid 1975); Coal River 7 Jul 1992-2 males.

Breeding Bird Surveys: Coastal – Recorded from 22 of 27 routes and on 59% of all surveys. Maxima: Squamish 16 Jun 1985-24; Alberni 10 Jun 1969-20; Pemberton 13 Jun 1982-20; Campbell River 14 Jun 1980-15; Kitsumkalum 11 Jun 1978-15; Nass River 21 Jun 1975-15. **Interior** – Recorded from 63 of 73 routes and on 81% of all surveys. Maxima: Beaverdell 20 Jun 1970-63; Canford 4 Jul 1993-46; McLeod Lake 15 Jun 1968-43.

Autumn: Interior – St. John Creek (Fort St. John) 7 Sep 1985-1; Mugaha Creek 9 Sep 1996-1; Riske Creek 11 Sep 1986-1; n side Chilcotin River 27 Sep 1988-1; 15 km n Golden 13 Sep 1997-2; Field 27 Sep 1976-3; Okanagan Landing 30 Sep 1927-1; Revelstoke 11 Sep 1988-1. **Coastal** – Pemberton 10 Sep 1995-4; Harrison Hot Springs 23 Sep 1986-1; Pitt Meadows 27 Sep 1976-1 female; Vancouver 2 Sep 1986-15, 13 Oct 1995 (Elliott and Gardner 1997); Tofino 22 Sep 1983-1; Surrey 28 Sep 1977-50; Victoria 6 Sep 1971-15 (Tatum 1972).

Winter: Interior – Kamloops 28 Dec 1986-1 caught by cat. **Coastal** – Vancouver 3 Dec 1989 to 31 Jan 1990-1 at feeder, 14 Dec 1997 to 13 Jan 1998-1 immature at feeder; Victoria 1 to 31 Dec 1962-1 at feeder all month.

Christmas Bird Counts: Interior – Not recorded. **Coastal** – Recorded from 2 of 33 localities and on less than 1% of all counts. Maxima: Victoria 22 Dec 1962-1; Vancouver 17 Dec 1989-1.

Lapland Longspur

LALO

Calcarius lapponicus (Linnaeus)

RANGE: Holarctic. In North America, breeds from western and northern Alaska, northern Yukon, Banks, Prince Patrick, Melville, and northern Ellesmere islands south to the Aleutians, south-coastal Alaska, northern Mackenzie, southern Keewatin, northeastern Manitoba, northern Ontario, northern Quebec, and northern Labrador. Winters from southwestern British Columbia, southern Alberta, and southern Saskatchewan east to southern Ontario and Nova Scotia, south to northern California, northern Utah, Colorado, Oklahoma, northwestern Texas, Arkansas, Tennessee, and Maryland. Also occurs in Greenland and the Palearctic.

STATUS: On the coast, an *uncommon* to occasionally *fairly common* migrant and winter visitant and *very rare* in summer in the Georgia Depression Ecoprovince, particularly in the Fraser Lowland; in the Coast and Mountains Ecoprovince, generally a *rare* spring and autumn transient on Western Vancouver Island, *casual* there in summer; *rare* spring and autumn transient, *casual* in winter on the Northern Mainland Coast; *casual* spring and *rare* autumn transient on the Queen Charlotte Islands, *casual* there in winter; and *casual* in spring and autumn on the Southern Mainland Coast.

In the interior, *very common* to *abundant* (occasionally *very abundant*) transient in the Boreal Plains Ecoprovince; *common* to locally *very common* in the Taiga Plains and Northern Boreal Mountains ecoprovinces; *uncommon* to locally *fairly common* transient in the Southern Interior and Central Interior ecoprovinces; *rare* spring and *common* autumn transient in the Southern Interior Mountains Ecoprovince; *uncommon* in the Sub-Boreal Interior Ecoprovince. In winter, *casual* in the Southern Interior and Southern Interior Mountains; *accidental* in the Sub-Boreal Interior and Boreal Plains.

OCCURRENCE: The Lapland Longspur (Figs. 403 and 404) is a widespread but sparsely distributed transient throughout much of British Columbia. It is a bird of open, treeless habitats ranging from rocky offshore islets on the coast to low-elevation grasslands and alpine tundra in the interior. This longspur is one of the earliest spring migrants and begins its northward movement through the province at about the same time as the American Pipit and well over a month before the much scarcer Smith's Longspur. A spectacularly large spring and autumn movement occurs east of the Rocky Mountains through the Boreal and Taiga plains and along the British Columbia / Yukon border area of the Northern Boreal Mountains.

In British Columbia, the Lapland Longspur has been recorded at elevations ranging from sea level to 2,660 m on the coast and from 280 to 2,440 m in the interior. During early spring, flocks of Lapland Longspurs begin sweeping north, seeking out the first snow-free areas, including low-elevation grasslands (Fig. 405), agricultural fields, and roadsides in the interior, and agricultural fields, estuaries, and beaches along the coast (Fig. 406). In northern portions of the province, where natural forest openings are less common, it makes greater use of human-created habitats, including fields, road edges, gravel pits and roadside clearings, sewage lagoon dykes, airstrips, gas and petroleum well sites, utility corridors, recent clearcuts, and settlement clearings. During the autumn migration, longspurs use habitats similar to those in spring, but also make use of the alpine areas. In winter, the Lapland Longspur is found primarily on the south coast in open grassy or sparsely vegetated habitats (Fig. 407), including cultivated fields, grazed pastures, roadsides, estuaries, rocky shorelines and islets, beaches, lagoons, jetties, causeways, sedge wetlands, golf courses, playing fields, and airports. On rare occasions it goes to bird feeders.

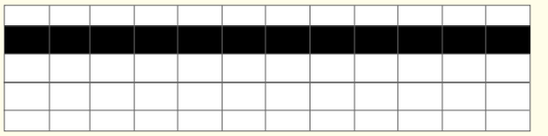
Figure 403. Male Lapland Longspur in breeding plumage (© Brian E. Small/VIREO). The Lapland Longspur migrates through British Columbia to and from its tundra breeding grounds in the far north.

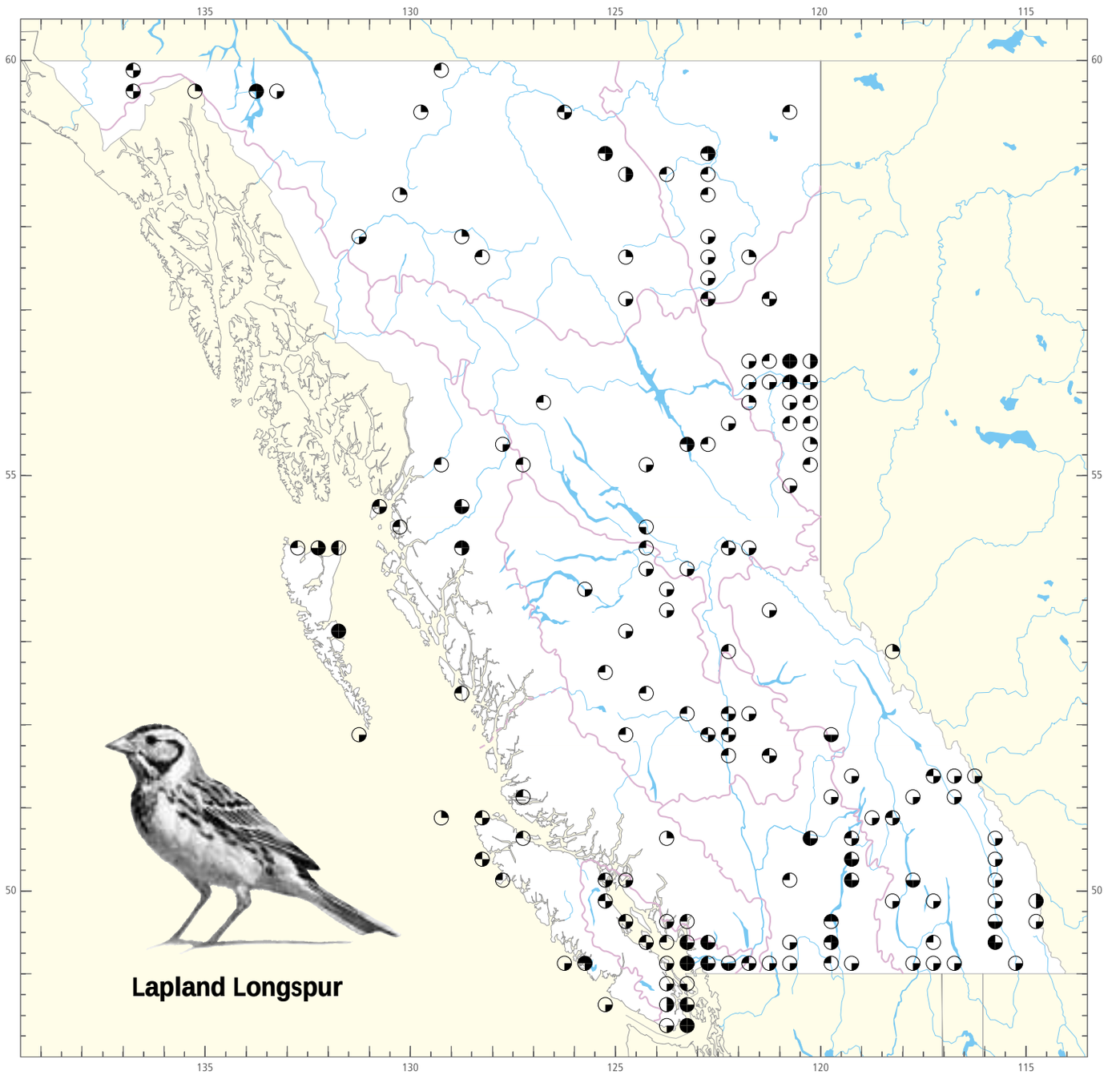
Figure 404. Lapland Longspur in winter plumage (© S. Young/VIREO). A small number of Lapland Longspurs winter most years in extreme southwestern British Columbia.

Nonbreeding **Breeding**

Mar	Apr	May	
Jun	Jul	Aug	
Sep	Oct	Nov	
Dec	Jan	Feb	

Nonbreeding and Breeding Chronology





Lapland Longspur

Data Base

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Nonbreeding	20	26	65	117	139	8	4	36	342	340	68	44	1,209
Breeding	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 405. During spring and autumn migration in the southern interior of British Columbia, the Lapland Longspur frequents low-elevation grasslands (Hat Creek, 4 November 1996; R. Wayne Campbell).

Figure 406. Along the coast of British Columbia, the Lapland Longspur is often found foraging on log-littered beaches during migration (Tlell, 20 May 1996; R. Wayne Campbell).

Figure 407. In winter, small numbers of Lapland Longspurs are most often found in open grassy or sparsely vegetated regions of the Fraser Lowland in the Georgia Depression Ecoprovince (Delta, 31 March 1997; R. Wayne Campbell).

In northeastern British Columbia, the Lapland Longspur is usually reported in large single-species flocks. Elsewhere in the province, it is more often observed in mixed flocks with 1 or more other species, usually Horned Larks, American Pipits, and Snow Buntings. It is also occasionally seen with Western Meadowlarks; Gray-crowned Rosy-Finches; Savannah, White-crowned, Chipping, and American Tree sparrows; and Smith's Longspurs.

The spring migration of the Lapland Longspur along the coast is small. In the Georgia Depression, it is difficult to distinguish migrants from wintering numbers, but migration likely begins in early March; migrants are reported in this ecoprovince throughout April, with a few stragglers recorded into late May (Figs. 408 and 409). Elsewhere on the coast, a very small movement occurs along the Southern Mainland Coast from the first week of March to the third week of April; the timing of arrival and departure is about 1 week later on the Northern Mainland Coast. The first spring migrants do not appear on Western Vancouver Island until the second week of April, and arrive 1 week later on the Queen Charlotte Islands; the last birds have left both areas by the third week of April. The majority of spring records on the coast are of single birds, with the largest flocks reported from the Georgia Depression.

In the interior, the first spring migrants begin to arrive in the Southern Interior during the second week of March and reach the Central Interior about 1 week later. Small numbers move through both areas until about the third week of April, but a few stragglers are reported into late May (Figs. 408 and 409). In the Southern Interior Mountains and Sub-Boreal Interior, single birds and small flocks begin to arrive in mid-March and have passed through by early May.

Further north, the first longspurs begin to arrive in the Boreal Plains in early April, heralding the beginning of a large migratory movement from the prairie and parkland regions of Alberta. From late April through early May, flocks of up to 1,000 birds or more quickly pass through this area; only a few small flocks remain by the third week of May. In the Peace Lowland, where most migrants are recorded, the Lapland Longspur is found in agricultural areas and shows a preference for grain stubble fields (Phinney 1998). Longspurs are also attracted to fields with standing water, small ponds, or water-filled ditches, where they gather to drink. Further north, in the Taiga Plains, the spring migration is less well documented but appears to begin in early May and is largely over by the third week of the month. In the Northern Boreal Mountains, the first migrants generally begin to arrive during the last week of April; by the third week of May the main movement has passed through.

The earliest spring migrants arriving at the Atlin Lake and Chilkat Pass areas of northwestern British Columbia and along the Alaska Highway in southwestern Yukon appear to precede the main "prairie" migration through northeastern British Columbia (Figs. 408 and 409). West et al. (1968) note that the arrival of these first migrants precludes the possibility that they are using the prairie route; they must therefore use alternative routes along the coast and through interior valleys of British Columbia. Although a spring movement is recorded along both routes, our data suggest that they are very minor in extent and do not fully account for the large

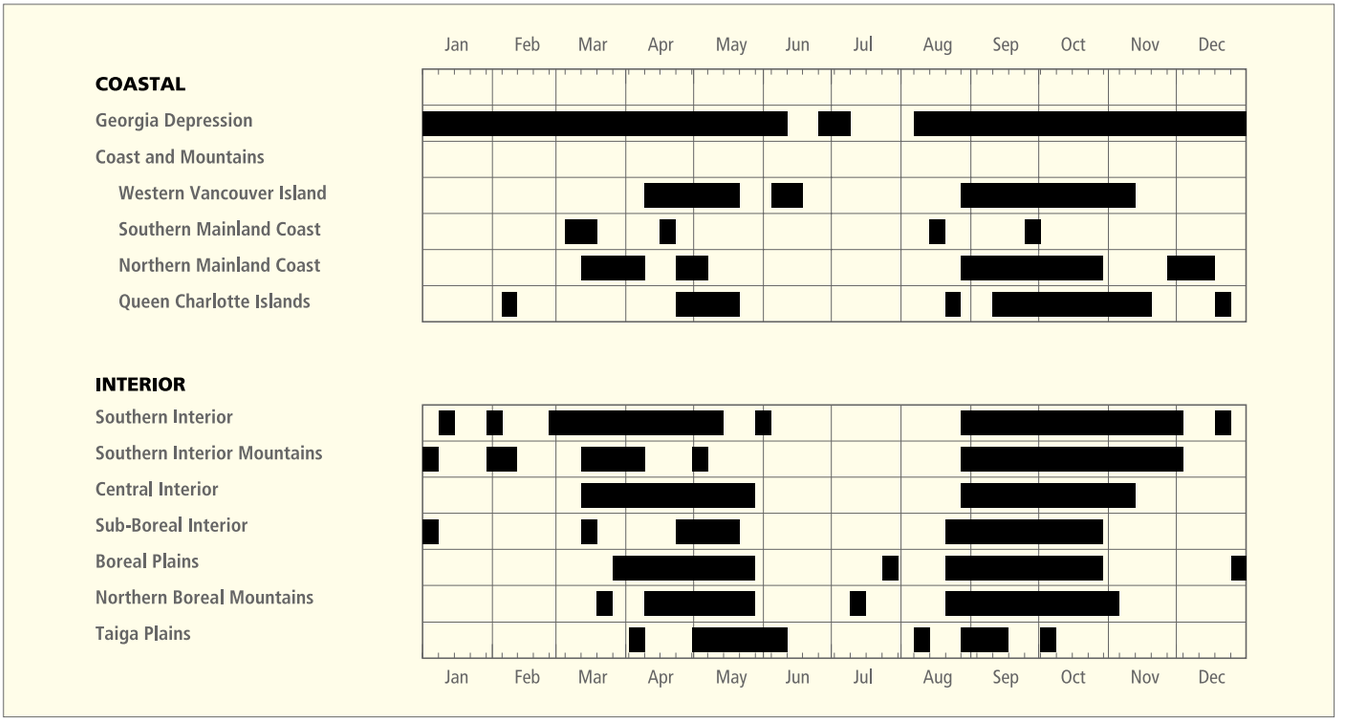


Figure 408. Annual occurrence for the Lapland Longspur in ecoprovinces of British Columbia. Records are shown for the week in which they occurred.

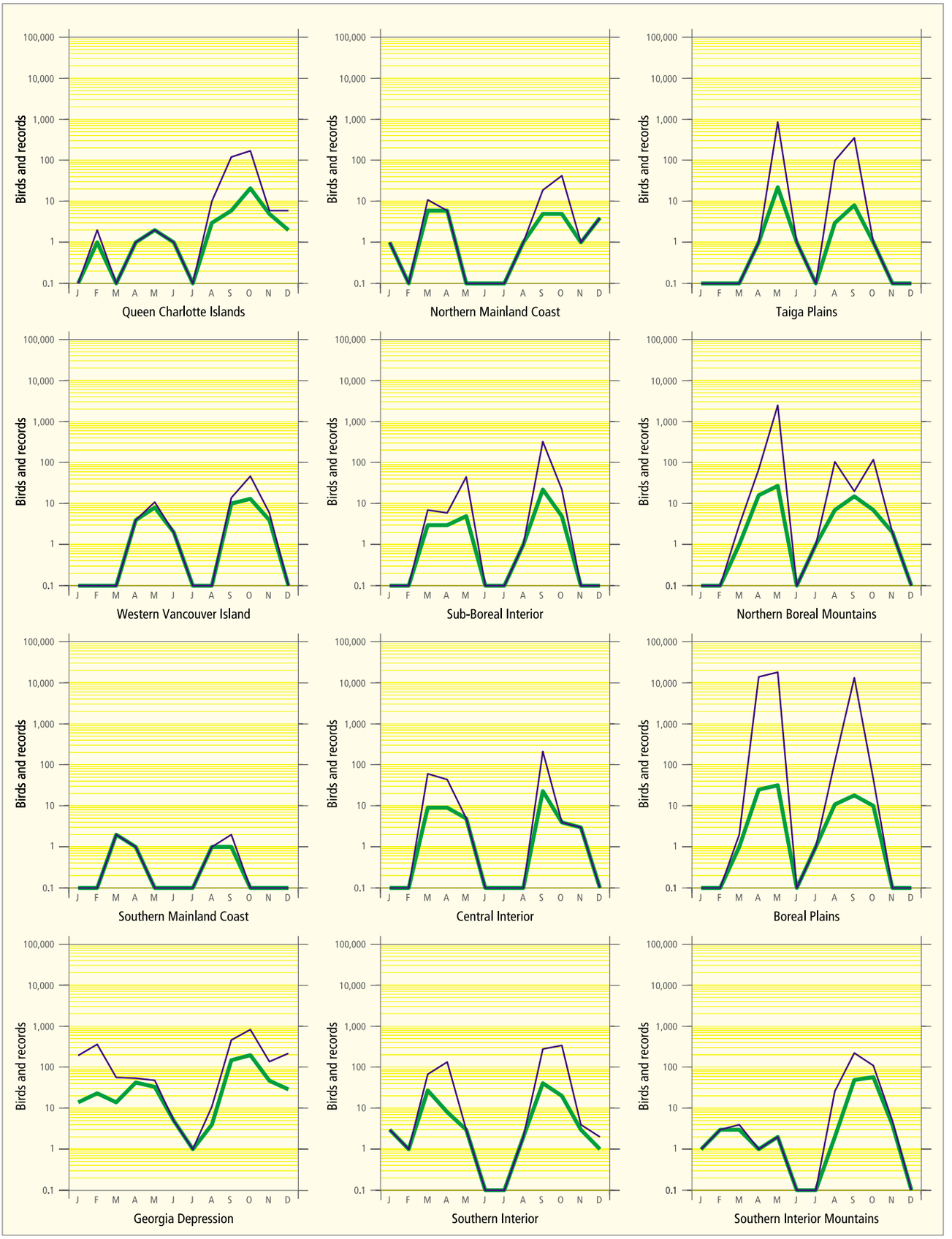


Figure 409. Fluctuations in total number of birds (purple line) and total number of records (green line) for the Lapland Longspur in ecoprovinces of British Columbia. Christmas Bird Count data have been excluded.

numbers that first appear in the extreme northwestern corner of British Columbia. The Lapland Longspur is a strong flier (Rising 1996), however, and may be capable of migrating quickly over these lightly populated areas, thereby avoiding detection. In northern Alberta, longspurs have been noted passing rapidly over forested areas during migration (Salt and Salt 1966).

During autumn, the main movement of longspurs retraces the spring route east of the Rocky Mountains through the Taiga and Boreal plains and into Alberta. A distinct southward movement is also noted along the coast and throughout the southern portions of the interior, where significantly more records and larger flock sizes than in the spring are reported (Fig. 409). There are several autumn records of longspurs using alpine habitats, mostly along the Rocky Mountains. On the coast, there is a single record from the alpine areas in the southern Coast Mountains, but this species was not detected during autumn surveys of alpine areas on Vancouver Island (Ogle and Martin 1997).

On the coast, the first migrants begin arriving in small numbers in mid-August, with the main movement occurring from late September through early October. Only a few stragglers remain after the end of October, except in the Georgia Depression, where some birds overwinter.

In the interior, the first southward movement is noted in most ecoprovinces when a few early migrants appear in late August (Figs. 408 and 409). In northern areas, peak movements probably occur during the first 2 weeks of September, but this is not well documented. In the Boreal Plains, the autumn migration is comparable in magnitude to the spring migration (Fig. 409), but flock sizes tend to be smaller, with most consisting of fewer than 50 birds (C. Siddle pers. comm.). Large aggregations occasionally occur, however, such as a huge gathering of approximately 12,000 longspurs recorded near Prespatou, north of Fort St. John. By mid-September most longspurs have passed through the north; a few stragglers remain into late October. In the southern ecoprovinces, the autumn movement peaks during late September except in the Southern Interior, where large flocks are occasionally reported into mid-October. Most migrants have passed through by the end of October; stragglers are occasionally reported into late November.

The Lapland Longspur is an irregular wintering species in British Columbia. Most winter records come from the Georgia Depression, especially the western portion of the Fraser Lowland (Fig. 407), including Iona, Sea, Lulu, and Westham islands, and the Ladner-Delta areas. A smaller number of winter records come from Greater Victoria on southern Vancouver Island. Elsewhere on the coast, there are a few records of from 1 to 4 birds on the Queen Charlotte Islands, at Terrace on the Northern Mainland Coast, and at the Squamish River estuary on the Southern Mainland Coast. In the interior, there are a few scattered records mostly of single birds near Kamloops and in the north Okanagan valley in the Southern Interior, and near Cranbrook, Nakusp, and Wells Gray Park in the Southern Interior Mountains. There is a single record of 6 longspurs wintering in the Peace Lowland of the Boreal Plains, and a single longspur in winter at Fort St. James in the Sub-Boreal Interior.

On the coast, the Lapland Longspur has been recorded through most of the year but mainly from mid-September through mid-May; in the interior, it is reported regularly from late August to early November and from mid-March to late May (Fig. 408). There are several June and July records in British Columbia, mostly of single birds.

REMARKS: Known in Old World literature as the Lapland Bunting. Of the 3 subspecies found in North America, only *C. l. alascensis* occurs in British Columbia (American Ornithologists' Union 1957). Once known as the Alaska Longspur, this subspecies breeds in the Arctic tundra of western Canada and Alaska, including the islands in the Bering Sea (Rising 1996).

As with many passerines, the initial spring flocks of Lapland Longspurs consist predominantly of males. West et al. (1968) report that the first flocks of longspurs migrating through northern British Columbia and the Yukon into Alaska consist of 90% males, but as the migration progresses, the proportion drops to 25% males. Although the onset of spring migration can vary from year to year, the ratio of males to females provides an easy method for determining the stage of migration. Many records in our data base note the preponderance of males in these early spring flocks.

Phinney (1998) reports that the appearance of the Merlin in the Boreal Plains near Dawson Creek coincides with the spring arrival of the Lapland Longspur. Our data show several instances of Merlin following and preying upon longspurs in this region during both spring and autumn migration.

The Lapland Longspur's habit of foraging along roadsides and flushing at close range makes it vulnerable to vehicle collisions. Irving (1961) reported that while driving to Atlin, he found 15 longspurs that had been killed or injured by a vehicle travelling ahead of him. Similar incidents have been observed near Dawson Creek (M. Phinney pers. comm.) and along the British Columbia portion of the Alaska Highway.

The cryptic plumage of the Lapland Longspur during the nonbreeding season and its habit of mixing in flocks of more abundant species make it an easy species to overlook. Even during spring, the distinctively marked males are seldom in full breeding plumage when they migrate through the province. These factors, combined with its relative scarcity in populated areas of southern British Columbia, have likely resulted in this species being underreported. With experience, observers can readily identify the Lapland Longspur by its distinctive flight calls.

NOTEWORTHY RECORDS

Spring: Coastal – Esquimalt Lagoon (Metchosin) 24 Apr 1985-1; Clover Point (Victoria) 24 May 1971-1 in breeding plumage (Tatum 1973); Central Saanich 5 Apr 1986-2 in field; Tofino 19 Apr 1996-1 on golf course; Delta 9 Mar 1975-22 flying over in 1 large flock; Sea Island 2 May 1965-8 at Vancouver airport; Iona Island 31 May 1971-1; Chilliwack 31 Mar 1888-1 (Cooke 1910); Delta 30 Mar 1980-5 at Brunswick Point; Campbell River 27 Apr 1975-2 on estuary; Cluxewe River 20 Apr 1991-1 on estuary (Dawe et al. 1995); Guise Bay 19 May 1974-2; Point Holmes 21 Apr 1952-1 (RBCM 10072); McInnes Island 25 Mar 1964-1; Sandspit 6 May 1979-1 at airport; Langara Island 23 Apr 1927-1 in muskeg (Darcus 1930); Kitimat River 15 Mar 1980-5 in short grass on estuary; Terrace 23 Apr 1976-1 in schoolyard (Hay 1976); New Aiyansh 30 Apr 1987-1. **Interior** – Christina Lake 20 Apr 1971-1 on dyke at s end (Walker 1996); Okanagan valley 31 May 1914-1; nr Quilchena 1 Mar 1997-1; Knutsford 4 Apr 1982-125 in ploughed field, 17 Apr 1983-1 in grassland; Dog Creek 17 Mar 1991-10, all males with Snow Buntings and Horned Larks (Stewart 1991); Chilcotin (Riske Creek) 13 Mar 1984-1 male at Wineglass Ranch; Farwell Canyon 16 Mar 1985-25 in grassland with Horned Larks; Deer Park (Chilcotin) 10 May 1991-1; Quesnel 15 Mar 1979-1; Giscome 15 Mar 1992-5; Moricetown 13 Mar 1979-1; Tetana Lake 12 May 1938-1 (RBCM 8995); Sunset Hill 27 May 1993-8 in recent clearcut; Dawson Creek 15 Apr 1990-1,000 (Siddle and Bowling 1993), 22 Apr 1994-10,000 (Bowling 1994a); Fort St. John 10 May 1982-2,500 in ploughed field; nw Fort St. John 3 May 1985-2,500, about 85% males; sw North Pine 27 Mar 1982-2 feeding in stubble field, 18 Apr 1988-600; Charlie Lake 21 May 1983-1; Sikanni Chief River 7 May 1992-40 in grassy field; Buckinghorse River 13 May 1982-10; Hyland Post 10 May 1982-10; Steamboat 3 May 1985-100 in mixed flock with White-crowned Sparrows and Gray-crowned Rosy-Finches; Fort Nelson 3 Apr 1987-1, 1 May 1987-250 at airport, 22 May 1982-1; Helmut 15 May 1982-50; Liard River 7 May 1975-3 (Reid 1975); s Cormier Creek 29 Apr 1965-30 along Highway 37 (West et al. 1968); Atlin 21 Mar 1981-3; Atlin Lake 2 May 1958-2,000 between Atlin and BC-Yukon border (Irving 1961); Chilkat Pass 7 May 1957-1 (Weeden 1960); Kusawak Lake 21 May 1977-1 feeding on ground with Snow Buntings, American Tree Sparrows, and 2 Smith's Longspurs.

Summer: Coastal – Esquimalt Lagoon 24 Aug 1980-2 with 6 Horned Larks; Saanich 20 Aug 1979-2; Sidney Island 29 Aug 1987-1; Tofino 10 Jun 1982-1 at airport in full breeding plumage; Iona Island 4 Jun 1990-1, 2 Jul 1985-1; Tsawwassen 7 Aug 1960-6 on beach (Boggs and Boggs 1961a); Meager Mountain 14 Aug 1932-1 in alpine area nr summit (Carter 1933); Triangle Island 13 Jun 1976-1 in breeding plumage; Sandspit 23 Aug 1991-1 (Siddle 1992a); Masset 26 Aug 1957-8 on gravel beach (Mills 1960); Chilkoot Pass 12 Jul 1975-10 feeding on snow patches with Snow Buntings. **Interior** – Naramata 27 Aug 1942-1; Harmer Ridge (Sparwood) 30 Aug 1984-16 on high-elevation, reclaimed mine spoil; Tonquin Ridge 30 Aug 1974-10 in alpine area at 2,440 m elevation (Cannings et al. 1974); Kelly Lake 30 Aug 1981-10 with 25 American Pipits; e Moberly Lake 25 Jul 1930-1 (Williams 1933b); Baldonnel 29 Aug 1982-100; Beatton Park 20 Aug 1988-1; Boundary Lake (Goodlow) 22 Aug 1984-3; nr Ipec Lake 28 Aug 1979-50 (Cooper and Adams 1979); Conroy Creek 9 Jun 1922-1 (Williams 1933a); Spatsizi Plateau Wilderness Park 15 Jul 1959-1; Summit Pass 30 Aug 1943-7 (Rand 1944); Fort Nelson 30 Aug 1987-10 on golf course; Cassiar 25 Aug 1962-44.

Breeding Bird Surveys: Not recorded.

Autumn: Interior – Haines Highway 23 Oct 1981-100; Atlin 1 Nov 1932-1 (RBCM 5760); Summit Lake (Stone Mountain Park) 7 Sep 1943-1 (NMC 29607); Fort Nelson 6 Sep 1986-80 (McEwen and Johnston 1987a); Stikine River 27 Sep 1971-1; 11.8 km n Buckinghorse River 12 Sep 1997-75, on edge of Alaska Highway; Nig Creek (n Prespatou) 15 Sep 1984-12,000 in large fields; Pink Mountain 4 Oct 1981-several small flocks in alpine area; Pesika River 4 Sep 1997-4 in alpine area on s side of valley; ne Fort St. John 5 Sep 1986-500 at sewage lagoons, 23 Oct 1982-1 at sewage lagoons with flock of Snow Buntings; Cache Creek (Peace River) 1 Sep 1985-34, n of Highway 29; Two Rivers 2 Oct 1982-1; Roman Mountain 19 Sep 1998-200 in alpine area; 32 km s Nation River 20 Oct 1973-10 along roadside; Willow River 7 Sep 1983-40; Beverly Lake (Prince George) 23 Sep 1957-20; Giscome 22 Oct 1994-1; Nulki Lake 29 Sep 1951-100 (Munro 1955a); n Ootsa Lake 1 Sep 1997-1 in well-grazed pasture; Indianpoint Lake 23 Sep 1929-1 (MCZ 285803); Mount Davidson 15 Sep 1982-20; Riske Creek 8 Sep 1978-20 with Horned Larks; Williams Lake 1 Nov 1950-1 (Jobin 1952); Buffalo Lake 24 Sep 1933-2 (RBCM 11439-40); lower Blaeberry River valley 7 Oct 1997-7 in cattle pasture; Revelstoke 30 Nov 1988-2; Knutsford 10 Oct 1983-25, 18 Nov 1984-2; Enderby 28 Sep 1954-1 (UBC 7777); Okanagan Landing 16 Oct 1934-100; Nakusp 22 Sep 1980-15; McDonald Creek (Nakusp) 2 Sep 1985-1; Harmer Ridge 17 Sep 1983-40 on reclaimed mine spoil; West Bench (Penticton) 12 Oct 1970-100; Princeton 6 Sep 1890-1 (MCZ 44382); Cranbrook 1 Oct 1940-20 (Johnstone 1949); Newgate 16 Oct 1930-1 (NMC 24639); Duck Lake (Creston) 15 Sep 1980-13; Manning Park 27 Sep 1972-2. **Coastal** – 37 km n Hazelton 8 Sep 1921-1 (MVZ 42269); Terrace 30 Nov 1968-1; Green Island (Dundas Island) 7 Oct 1977-23 at lightstation; Masset 7 Oct 1939-2 (RBCM 10352 to 10353), 4 Nov 1971-2; Sandspit 6 Oct 1991-35 (Siddle 1992a), 8 Nov 1986-1 at airport; Cape St. James 27 Sep 1981-85, 12 Nov 1978-8; Cape Scott 16 Sep 1935-1; Grant Bay 14 Oct 1968-5; Angus Creek (Sechelt) 15 Oct 1992-1; Mission Point (Sechelt) 15 Sep 1992-1; Stubbs Island (Tofino) 17 Oct 1982-14 feeding on grassy beach dune, 9 Nov 1982-1; Chesterman Beach (Tofino) 2 Sep 1983-1; Pitt Meadows 11 Oct 1981-25; Skagit River 29 Sep 1974-2; Iona Island 3 Oct 1981-100; Duncan 8 Sep 1972-10; Pachena Point 23 Sep 1974-4 on gravelly, weedy areas; Oak Bay 17 Sep 1977-17 on golf course.

Winter: Interior – Hemp Creek (Wells Gray Park) 3 Feb 1953-1 in field, collected (Edwards and Ritcey 1967); Knutsford (Kamloops) 2 Dec 1984-2; Vernon 11 Jan 1992-1 with Horned Larks (Siddle 1992b); Okanagan Landing 3 Feb 1922-unknown number with Snow Buntings and Horned Larks; Cranbrook 5 Jan 1937-1 (RBCM 10911). **Coastal** – Terrace 1 Dec 1968-1 (Crowell and Nehls 1969b); Rose Spit 18 Dec 1986-3; Delkatla Inlet 11 Feb 1973-2; Pitt Meadows 28 Jan 1973-8; Iona Island 15 Dec 1992-20 (Siddle 1992b); Lulu Island 1 Feb 1949-30 feeding in field; Westham Island 25 Feb 1985-30; Delta 8 Feb 1975-130 in 2 flocks, with Western Meadowlarks; Chain Islets 23 Dec 1976-22; Victoria 10 Jan 1971-3 (Crowell and Nehls 1971b).

Christmas Bird Counts: Interior – Recorded from 4 of 27 localities and on 2% of all counts. Maxima: North Pine 27 Dec 1986-6; Fort St. James 2 Jan 1994-1 (BC Photo 1713); Vernon 22 Dec 1985-1; Nakusp 3 Jan 1986-1. **Coastal** – Recorded from 6 of 33 localities and on 3% of all counts. Maxima: Ladner 21 Dec 1963-102; Victoria 18 Dec 1976-22; Vancouver 15 Dec 1991-20.

Rustic Bunting

RUBU

Emberiza rustica (Pallas)

RANGE: Occurs annually in North America in the western Aleutian Islands of Alaska and less regularly further east in the Aleutians and on the Alaskan islands in the Bering Sea. Native to northern Europe and Asia, where it breeds from northern Scandinavia, northern Russia, and northern Siberia southeast to southeastern Siberia, northern Sakhalin, the Sea of Okhotsk, and Kamchatka. Winters in eastern China, Japan, and, rarely, the Commander Islands.

STATUS: On the coast, *accidental* in the Georgia Depression Ecoprovince and *casual* in the Coast and Mountains Ecoprovince.

OCCURRENCE: Three records. The first Canadian record of the Rustic Bunting was from the Queen Charlotte Islands, where 2 birds were observed near Queen Charlotte City on 26 October 1971 (Crowell and Nehls 1972a; Godfrey 1986). The second record was of a bird in winter plumage that was present for 88 days at Jordan River, 80 km west of Victoria, from 25 November 1983 to 20 February 1984 (Campbell 1984b; Hunn and Mattocks 1984; Mattocks 1984). It regularly visited a feeder and usually associated with a large flock of Dark-eyed Juncos. It was photographed on 3 December 1983 (BC Photo 883; Fig. 722). On 8 December 1990, a single bird arrived in a backyard in Tofino, on the west coast of Vancouver Island, and remained in the vicinity of a feeder until at least 12 April 1991, when it was last reported (Siddle 1991b; Fig. 723).

The Rustic Bunting occurs annually in small numbers as migrants in the Aleutian Islands and irregularly elsewhere in south coastal Alaska (Roberson 1980; West and Bailey 1986). Recently, the species has been seen with increasing frequency along the Pacific coast of North America from British Columbia to northern California (Gilligan et al. 1994; Small 1994).

Figure 722. Rustic Bunting in winter plumage on southwestern Vancouver Island, in the Coast and Mountains Ecoprovince of British Columbia (Jordan River, 80 km west of Victoria, 3 December 1983; Tim Zurowski).

REMARKS: Two other sightings have been reported. A single bird was found in Coquitlam, east of Vancouver, on 12 December 1988, and another was seen briefly near Port Hardy, on northern Vancouver Island, on 4 January 1991. Both lack adequate details for inclusion here.

Figure 723. During the winter of 1990-91, a Rustic Bunting (centre) visited a feeder almost daily in Tofino, on the west coast of Vancouver Island, in the Coast and Mountains Ecoprovince of British Columbia (Tofino, January 1991; Aurora M. Paterson).

Synopsis:
The Birds of British Columbia into the 21st Century

SYNOPSIS:
THE BIRDS OF BRITISH COLUMBIA INTO THE 21ST CENTURY

In the four volumes of *The Birds of British Columbia,* we have assembled and analyzed data on the patterns of geographic and seasonal occurrence and habitat preferences of all species of birds known to occur in British Columbia. In interpreting the data, we have focused on changes in distribution and abundance with time for individual species and on the basic details of the reproductive performance of all breeding species. For the breeding species we have also looked at trends in their numbers over the years represented by our data.

We are concerned about the unevenness of regional coverage, especially the paucity of data from large parts of northern British Columbia. However, only the efforts of upcoming ornithologists and field-naturalists can remedy that. Our study reveals the areas and types of data most urgently needed. We emphasize the importance of seeking data selectively and to a purpose, and we doubt that gathering thousands of records of common species in areas of abundance is going to advance the sensitivity of our understanding or the cause of bird conservation.

Today there is as much or more focus on ecosystems and their populations than on individual species. But, as a prerequisite to sound conclusions, there is still no substitute for a sound knowledge of the species that compose the populations. Thus, with the species accounts completed, it is now important to search for patterns within the data that will add to our knowledge. Patterns to look for include: the species associated with each ecoregion, ecosection, or biogeoclimatic zone; concentration areas that may indicate sites of special importance for many species; species richness and species density in specific habitats within each ecoregion, ecosection, or biogeoclimatic zone; major migration routes and staging areas of individual species; species with records of consistent decrease or increase; species with expanding or contracting ranges; and especially, changes in species richness and density that accompany human alterations of the environment.

In these final chapters of the work, we examine data from all four volumes and synthesize information on the above and related matters as a contribution to the understanding of bird populations and behaviour. We end with what we believe are some of the "New Philosophies, Concerns, and Conservation Challenges" that will be required in this new millennium to maintain the diversity and viability of the bird populations dependent on the extensive and biologically rich area that is British Columbia.

Table 33. Species showing a decrease ($P < 0.10$) in numbers on coastal or interior Breeding Bird Survey routes summarized from British Columbia. Canadian and North American values are provided for comparison.

	Average annual change (%)			
Species	BC Coast[1]	BC Interior[1]	Canada[2]	Continent[2]
Great Blue Heron	–6.2	i.d.[3]	n.c.[4]	+2.1
Blue Grouse	–5.3	i.d.	–3.6	–3.6
Killdeer	–4.8	n.c.	–2.5	–0.4
Common Snipe	–7.7	n.c.	n.c.	n.c.
Band-tailed Pigeon	–5.8	i.d.	n.c.	–2.7
Mourning Dove	i.d.	–2.7	+1.7	–0.3
Rufous Hummingbird	–5.0	n.c.	n.c.	–2.7
Olive-sided Flycatcher	–5.1	–4.8	–3.7	–3.9
Western Wood-Pewee	n.c.	–1.4	n.c.	–1.5
Willow Flycatcher	–3.7	n.c.	n.c.	–1.2
Pacific-slope Flycatcher	+8.3	–7.3	+4.4	n.c.
Red-eyed Vireo	n.c.	–2.1	+1.0	+1.1
Barn Swallow	–3.7	n.c.	–1.6	–0.3
Black-capped Chickadee	–2.4	n.c.	+1.1	+1.4
Golden-crowned Kinglet	–2.0	n.c.	n.c.	n.c.
Ruby-crowned Kinglet	–0.9	n.c.	–1.2	n.c.
European Starling	–2.5	–4.1	–2.0	–1.1
Yellow Warbler	–2.7	–2.1	n.c.	+0.6
Wilson's Warbler	n.c.	–3.5	n.c.	n.c.
Song Sparrow	–0.9	n.c.	–1.5	–0.6
Dark-eyed Junco	–1.4	n.c.	n.c.	–1.2
Brewer's Blackbird	n.c.	–4.6	n.c.	n.c.
Brown-headed Cowbird	–4.3	n.c.	–1.7	–1.1
Pine Siskin	–8.8	n.c.	n.c.	n.c.
American Goldfinch	–4.1	n.c.	n.c.	–0.8
House Sparrow	n.c.	–7.7	–2.5	–2.2
	Province[5]			
Ruffed Grouse	–7.4		n.c.	n.c.
Black Swift	–9.8		–10.0	n.c.
Purple Finch	–1.5		–2.3	–1.8

1 This study (1968-93).
2 Sauer et al. 1997 (1966-96).
3 Insufficient data.
4 Could not detect a change.
5 Anonymous (1999).

Species Showing Declining Population Trends in British Columbia

Of the 28 species declining in the province (Table 33), the Great Blue Heron (Fig. 748) is certainly the one of greatest concern. The decline in numbers of the Great Blue Heron on its British Columbia range has been discussed by Butler (1997). It is not declining across Canada, and the continental surveys reveal an increase throughout much of its North American range (Fig. 749). The species is resident in British Columbia and there is no doubt that the decline is the result of a local situation. Evidence is strong for predation on nestlings by an increasing population of Bald Eagles as part of the story, but there seem to be contributing environmental problems as well (R.W. Butler, pers. comm.). Loss of old-field habitat and ditches through urbanization is likely playing a role as well.

Ten species – Ruffed Grouse, Common Snipe, Pacific-slope Flycatcher, Red-eyed Vireo, Black-capped Chickadee, Golden-crowned Kinglet, Yellow Warbler, Wilson's Warbler, Brewer's Blackbird, and Pine Siskin – appear to be declining in British Columbia only, which is cause for further monitoring. The Red-eyed Vireo winters in tropical South America and it is always possible that the part of the population that summers in British Columbia has actually encountered problems on the winter range.

Declines for 4 widely distributed species appear to be restricted primarily to western North America and include the Mourning Dove, Willow Flycatcher, Dark-eyed Junco, and American Goldfinch. For these, the cause of the steady decline should also be sought.

Five western species, including the Blue Grouse, Band-tailed Pigeon, Black Swift, Rufous Hummingbird, and Western Wood-Pewee, show declines in British Columbia, an area which constitutes a significant portion of their breeding ranges. The Black Swift, which winters in Mexico and Central America, breeds primarily in British Columbia and shows the greatest decline of all birds detected by the BBS in this province.

Figure 748. The Great Blue Heron, a resident species across southern portions of the province, is 1 of 27 indigenous species of birds in British Columbia showing long-term declines in numbers in either or both of their coastal and interior populations (Vancouver, 1 December 1995; R. Wayne Campbell).

The Blue Grouse is a resident in British Columbia and is declining significantly within the range of the coastal subspecies. The declining entry for all Canada arises from the same data as those for British Columbia. The species is still common locally and is known to increase in the early stages of forest regeneration and decrease as closed canopy situations return. The bird is also open to hunting. Though remedial action is probably within our hands, the continent-wide decline indicates that there are problems in populations in the western American states that may also apply in British Columbia.

In Canada, the Band-tailed Pigeon nests only in southwestern British Columbia. It winters in southwestern United States and adjacent Mexico, so the decline noted for coastal British Columbia and the continent arise from the same regional population (Fig. 750). The cause and location of the decline are unknown. This species was hunted throughout much of its range but is no longer exposed to hunting in British Columbia or Washington, although a limited hunt is still allowed in Oregon and California.

The Ruby-crowned Kinglet is the only species showing declines both in the province and Canada-wide. The remaining 8 species – Killdeer, Olive-sided Flycatcher, Barn Swallow, European Starling, Song Sparrow, Brown-headed Cowbird, Purple Finch, and House Sparrow – all show a downward trend in their numbers continent-wide (Sauer et al. 1997). The causes for the declines may be complex.

The Barn Swallow is a species that has adapted to live in close proximity to humans and it is difficult to imagine environmental sources of impact occurring on its nesting grounds.

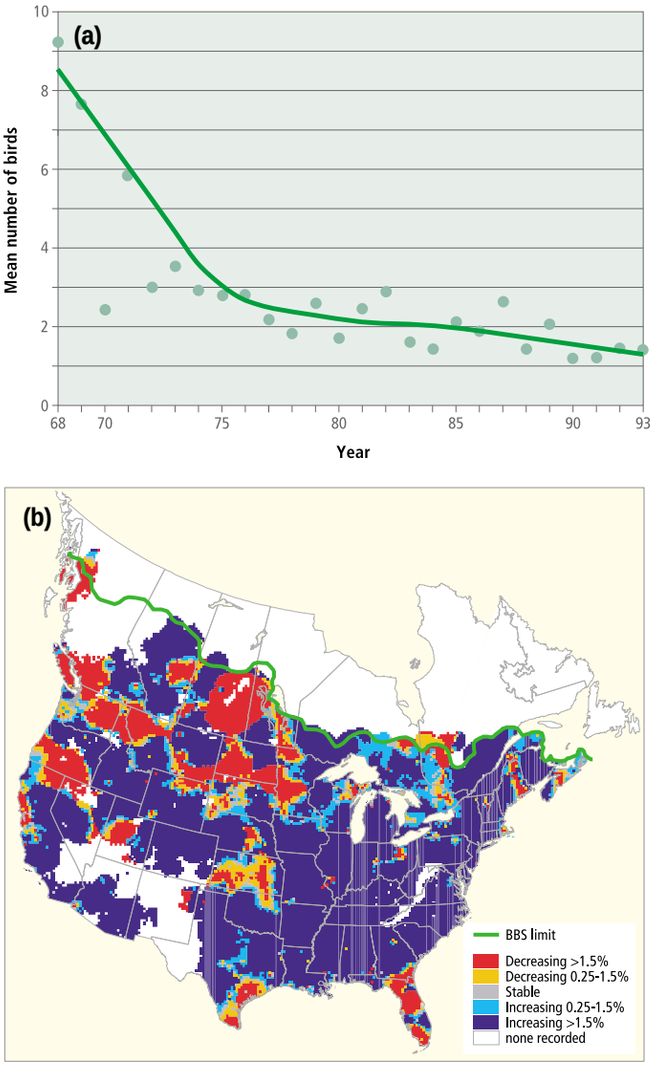


Figure 749. An analysis of Breeding Bird Surveys for the Great Blue Heron in British Columbia shows: (a) The number of birds on coastal routes decreased at an average annual rate of 6.2% over the period 1968 through 1993 ($P < 0.01$); interior routes had insufficient data for analysis (this study). (b) Throughout much of its North American range, however, the Great Blue Heron has exhibited increasing trends (Sauer et al. 1997).

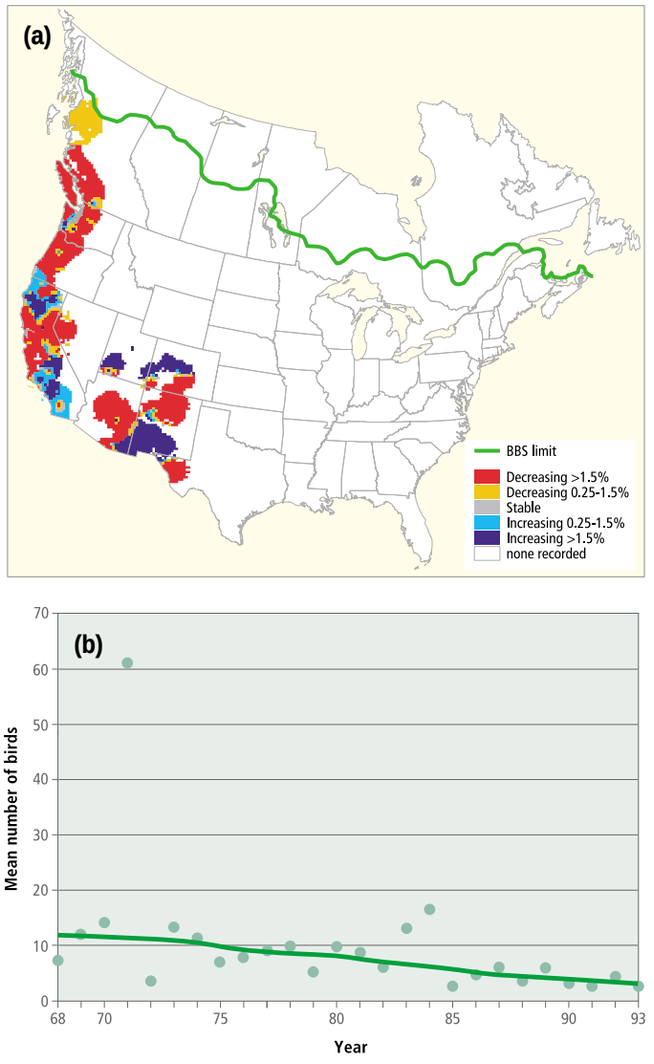


Figure 750. (a) Based on Breeding Bird Survey data, the Band-tailed Pigeon is showing significant declines throughout much of its North American range (Sauer et al. 1997). (b) An analysis of Breeding Bird Surveys for the Band-tailed Pigeon in British Columbia shows that the number of birds on coastal routes decreased at an average annual rate of 5.8% over the period 1968 through 1993 ($P < 0.01$); interior routes had insufficient data for analysis (this study).

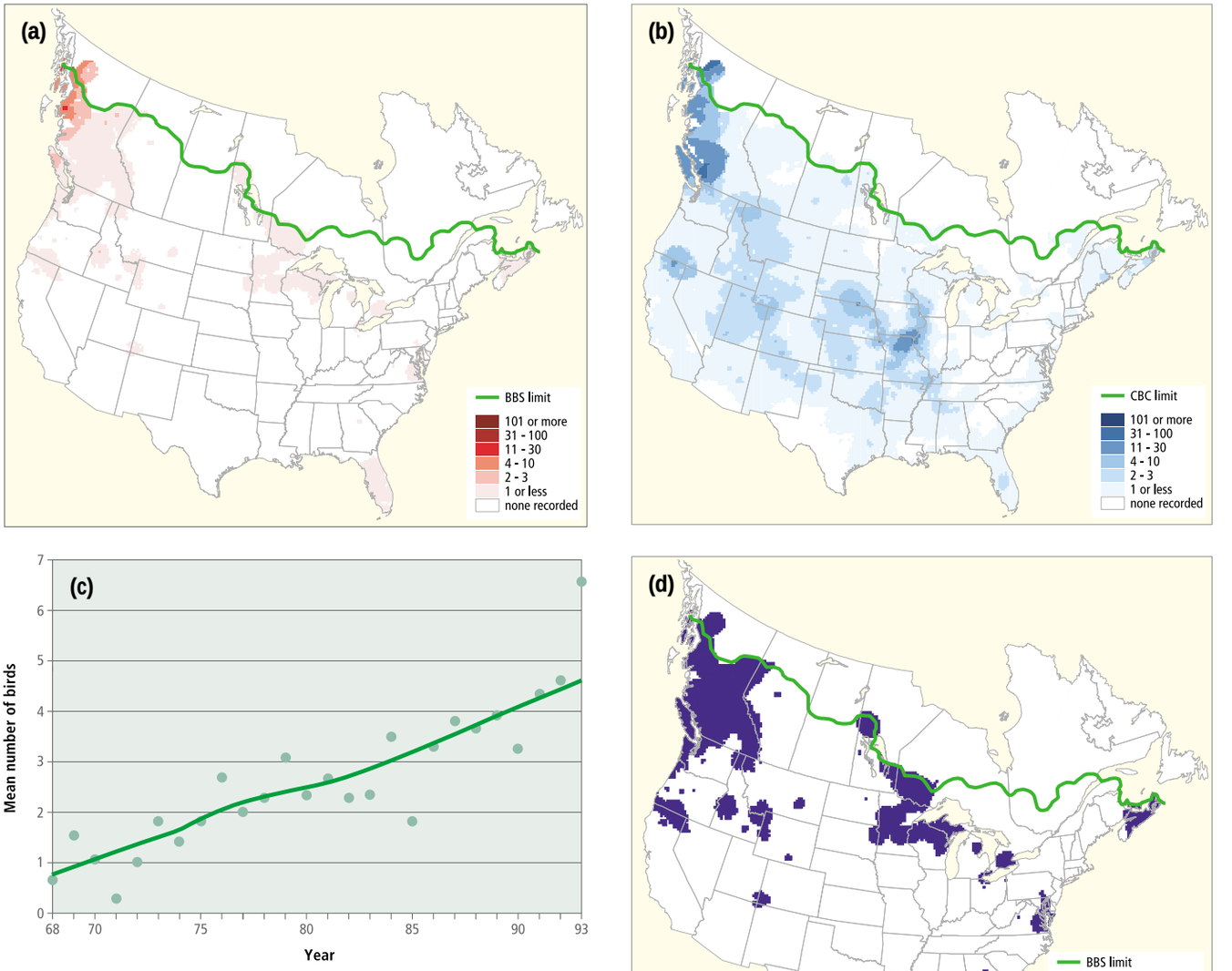


Figure 751. Based on Breeding Bird Surveys, a total of 33 species of birds in British Columbia have shown long-term, increasing trends. For many, such as the Bald Eagle, British Columbia holds some of the highest densities in North America. Shown for the Bald Eagle are (a) summer densities based on North American Breeding Bird Survey (BBS) data (Sauer et al. 1997), (b) winter densities, based on North American Christmas Bird Count data (Sauer et al. 1996), (c) long-term BBS trends (1968 through 1993) for coastal British Columbia showing an average annual increase of 7.6% ($P < 0.001$) (this study), and (d) BBS North American trend data (Sauer et al. 1997).

Dramatic declines of Barn Swallow populations in Alaska since the early 1900s have also occurred, the causes of which are unknown (Kessel and Gibson 1994). Few tears, however, will be shed for the plight of the European Starling, Brown-headed Cowbird, or House Sparrow; however, it would be useful to know whether their declines arise from changes that may also have an impact on some of the scarcer species outside the BBS detection.

For many of these species it is unlikely that there is anything we can do to decrease or reverse the trend each is following. Their nesting populations are widely dispersed across the province in a variety of habitats, and none of them is rare, so seeking to reserve habitat specifically for their maintenance is not warranted. Appropriate action would be to monitor the populations, make further searches for answers, and wait.

Species Showing Increasing Population Trends in British Columbia

Among the 33 increasing species identified by the Breeding Bird Surveys in British Columbia, 13 appear to be part of a continent-wide trend (Table 34). These include the Common Loon, Bald Eagle (Fig. 751), Red-tailed Hawk, Hairy Woodpecker, Pileated Woodpecker, Warbling Vireo, Solitary Vireo, Common Raven, Red-breasted Nuthatch, House Wren, Spotted Towhee, Lincoln's Sparrow, and House Finch. Unfortunately we are no wiser as to the reasons for many of these

fragmented by urbanization. Nearly three-quarters of the Coastal Douglas-fir Biogeoclimatic Zone that occurs in British Columbia lies on the east coast of Vancouver Island and the Gulf Islands; today only remnants of this rare, productive ecosystem exist, with only 15 of the 609 SEI polygons (map units) identified as older forest exceeding 100 ha.

Sparsely vegetated ecosystems: These include naturally rare areas, such as sand and gravel spits. Unfortunately, many of the spits on the east coast of Vancouver Island have been considered as prime building locations and today have extensive development on them ranging from light industrial (Campbell River) to housing (Little Qualicum River) to recreational vehicle resorts, where people live the year around (Englishman River). Campbell River is in the fortunate position of being able to consider moving much of the light industry from Tyee Spit and creating open space; however, few municipalities have demonstrated such foresight and even when they want to, it is often too difficult and costly to completely remove an existing subdivision. Today only 34 of these sites remain unmodified and cover less than 0.1% of the SEI study area. Once ideal nesting habitat for Killdeer, the loss of these habitats may be playing a role in the decline of Killdeer numbers in coastal British Columbia (Fig. 758).

Estuarine and freshwater wetlands: These ecosystems today cover only 1.7% of the SEI study area. By the turn of the 20th century, one-third of the estuarine wetlands along the southeast coast of Vancouver Island had been modified, primarily through dyking (Prentice and Boyd 1988). With the exception of the Campbell River estuary, which gained estuarine marsh habitat through a marsh creation project (Brownlee et al. 1984; Dawe et al., in press), all other major estuaries on the east coast of Vancouver Island have lost habitat. For two – the Nanaimo and Cowichan estuaries – the extent of the loss has exceeded 50% (Levings and Thom 1994). Estuaries are among the most productive of habitats based on net primary production (Krebs 1994); in terms of the ecosystem services they provide, they have the highest value per hectare per year of any ecosystem on the Earth (Costanza et al. 1997). Along the east coast of Vancouver Island, estuaries are critical habitats to hundreds of thousands of water birds that winter or stage along this coastline (see, e.g., Butler and Vermeer 1994; Dawe and Buechert 1995; Dawe et al. 1998). We know of no studies that document the loss of freshwater wetlands on the east coast of the island, but that loss probably follows a pattern similar to the loss of estuarine wetlands.

While some species have been able to adapt to the modified landscape, the impacts on a majority of the ecosystems of the Nanaimo Lowland have placed at least 13 bird taxa at risk on eastern Vancouver Island and the Gulf Islands, including the Double-crested Cormorant, Brandt's Cormorant, American Bittern, Great Blue Heron, Green Heron, Northern

Figure 759. Richmond, British Columbia, in 1930 (left) and 1995 (right), showing the effects of urbanization over a 65-year period on some of the most fertile agricultural lands in British Columbia. The value of the lands to migratory birds has been much reduced as well. Vancouver International Airport is at the top of the 1995 photograph (photographs courtesy of National Air Photo Library A2238-36 [1930] and Triathlon Mapping Corporation [1995]).

Goshawk (*laingi* subspecies), Peregrine Falcon (*anatum* subspecies), Marbled Murrelet, Barn Owl, Western Screech-Owl (*saturatus* subspecies), Northern Pygmy-Owl (*swarthi* subspecies), Hutton's Vireo, and Vesper Sparrow (*affinis* subspecies) (Fraser et al. 1999). Other species as well, such as the Sky Lark and Western Meadowlark, have probably declined locally due to urbanization.

Fraser Lowland

As on the southeast coast of Vancouver Island, significant changes in the ecosystems of the Fraser Lowland have taken place since European settlement of the region began. Around the turn of the century, the lower Fraser River wetland complexes were reduced by nearly 70% through conversion to agricultural lands (Fraser River Estuary Study Steering Committee 1978). Sumas Lake, which once covered an area of some 3,600 ha, was dyked and drained by 1924 (Siemens 1966) and is now called Sumas Prairie. In addition to the loss of the water volume from this area, an additional 8,000 ha of marshland and sloughs were eventually reduced to remnants and along with them, significant populations of ducks and geese disappeared (Leach 1982). Over half of the 64,500 ha of wet meadows and riparian habitats present in the 1890s have been lost (Levings and Thom 1994).

Figure 760. Greenhouses are now beginning to cover the Fraser delta. In the process, the fertile agricultural soils are removed from direct food production and the wildlife values of the agricultural lands, important to millions of migratory birds, are severely reduced (Delta, midwinter 1997-98; W. Sean Boyd).

Conversion of the remaining wetlands is still occurring. Between 1967 and 1982, wetlands in the southwestern Fraser Lowland were converted to other uses at a rate of 109 ha per year (Pilon and Kerr 1984). Impacts on wetlands and their associated riparian edges in the valley have affected a number of species, including the American Bittern, Yellow-billed Cuckoo, and Great Blue Heron (Fraser et al. 1999). Butler (1997), considering the projected growth of the human population on the south coast, concluded that this coastal heron's future "does not look very rosy."

The lower Fraser River valley is the most densely populated region of the province, with an estimated 2.2 million people (55% of the provincial population) (British Columbia Stats 1999). Between 1980 and 1987, about 4,350 ha of once rural land were urbanized – an annual conversion rate equal to the creation of a community about one and one-half times the land area of White Rock every year (Moore 1990). Within that time period (1981 to 1986), the growth rate in the valley was just over 9%. While we could not find any recent land conversion statistics, a growth rate for the valley of over 22% during the period 1991-96 suggests that urbanization continues unabated.

Although agricultural development has played a role in negatively affecting a number of species of birds on the Fraser River delta, such as the Horned Lark (*strigata* subspecies) and Short-eared Owl, others have benefited, such as the waterfowl, some raptors, and shorebirds. This estuarine delta supports up to 1.4 million birds during migration, many of which have now come to depend to some extent on the agricultural lands (Butler and Campbell 1987).

The lower Fraser River valley is also an area of nationally significant agricultural production and contains some of the province's most productive farmlands. However, urbanization is reducing the areal extent of these lands in significant ways. Between 1980 and 1987, agricultural land was second only to undisturbed land for urban development, and any new areas that were created for agricultural production were more likely to be of lower agricultural productivity and capability than the farmland lost to urbanization (Moore 1990).

Thus, aside from covering our most agriculturally productive lands with asphalt, houses, golf courses, and industries, rather than letting the lands produce food for humans, urbanization of these agricultural lands also reduces the habitat for birds. The effects of urbanization on both agriculture and bird habitat is graphically shown in Fig. 759.

Recently, the construction of massive greenhouses, which make use of hydroponics to grow foods, has begun to cover much of the productive soils (Fig. 760). One of the largest operations (including greenhouse, parking, and driveways) covers over 25 ha (Corporation of Delta 2000), with even larger greenhouse complexes being planned. No longer is urbanization the only threat to agricultural lands; industrial agricultural practices themselves now affect the wildlife values of these lands.

These and other impacts on the ecosystems of the lower Fraser River valley have placed at least 10 bird taxa at risk, including the American Bittern, Great Blue Heron, Green Heron,

Table 39. Mean and cumulative numbers of bird species in an urban environment in Vancouver, B.C., in relation to total vegetation cover and habitat diversity.

Urban class	Total[1] vegetative cover (%)	Habitat diversity	Mean no. species (seasonal range)	Cumulative no. species (seasonal range)
Commercial	2.6	0.14	4.08 – 5.25	5 – 7
Industrial	4.3	0.21	3.38 – 4.36	7 – 8
Apartment residential	34.6	0.65	6.50 – 7.67	10 – 12
Typical residential 1	52.0	0.70	5.90 – 7.80	12 – 18
Typical residential 2	57.3	0.69	6.25 – 8.17	13 – 20
Older residential	69.5	1.02	6.31 – 8.83	13 – 21
Woody residential	84.2	1.04	9.09 – 12.17	17 – 25
Mixed woodland	171.3	1.49	8.00 – 12.00	17 – 23

1 Total vegetative cover may exceed 100% due to cumulative results of multiple vegetation layers.
Source: Modified from Lancaster and Rees (1979).

Peregrine Falcon (*anatum* subspecies), Sandhill Crane, Yellow-billed Cuckoo, Barn Owl, Short-eared Owl, Hutton's Vireo, and Horned Lark (*strigata* subspecies) (Fraser et al. 1999).

Another aspect of urbanization is loss of avian biodiversity. Lancaster and Rees (1979), in their study of bird communities in urban habitats of Vancouver, found that the mean and cumulative numbers of species in all seasons were lowest in their commercial and industrial plots and highest in their lightly developed residential and woodland sites (Table 39). In addition, they found that introduced species – the European Starling, House Sparrow, or Rock Dove – dominated the avifauna of all but their wooded residential site and their woodland site. Migrant numbers were highly correlated with components of vegetation cover and foliage height diversity.

Clergeau et al. (1998), in their comparative study of bird abundance and diversity in Quebec City (Canada) and Rennes (France), also found that bird species diversity decreases with urbanization. In both those cities as well, 3 species – House Sparrow, European Starling, and Rock Dove – dominated the avifauna in most of the study plots. The theme of decreasing diversity with urbanization recurs worldwide.

Figure 761. More species of birds depend on habitats in the Okanagan valley for nesting than in any other area of British Columbia. Rapid agricultural development, including ginseng and vineyard operations, such as this vineyard near Vaseux Lake, threaten an already diminished land base (2 September 1998; Richard J. Cannings).

ABOUT THE AUTHORS

From left, top: Ian McTaggart-Cowan, Gary W. Kaiser, Andrew C. Stewart, Michael C.E. McNall, and John M. Cooper. Bottom: R. Wayne Campbell and Neil K. Dawe (Victoria, 21 August 2000; Mark Nyhof)

R. Wayne Campbell was born in Edmonton, Alberta. His fields of interest include zoogeography, feeding and breeding ecology of raptors, marine bird populations, and conservation of birds. He graduated from the University of Victoria in 1976 and received his M.S. degree from the University of Washington in 1983.

After high school, he worked as a seasonal naturalist with the British Columbia Parks Branch, and in 1969 joined the staff at the University of British Columbia as Curator of the Cowan Vertebrate Museum in the Department of Zoology. Over the next 4 years, he established the Photo-Records File, a system to document the occurrence of rare vertebrates in the province, and took over administrative and financial responsibilities for the British Columbia Nest Records Scheme, which he continues to oversee today. He also became very active on the executives of several conservation organizations, including the British Columbia Waterfowl Society and the Vancouver Natural History Society.

In 1973 he moved to the then British Columbia Provincial Museum as Curator of Ornithology. Over the next 20 years, he conducted wildlife inventories of remote areas of the province, including the first complete census of breeding seabird colonies. In addition, he amassed an enormous provincial vertebrate data base that includes details for nearly 2 million specimen and sight records, 300,000 breeding records, and hard copies of nearly 10,000 published and unpublished articles on amphibians, reptiles, birds, and mammals.

Wayne has written over 375 scientific papers, popular articles, and government reports, and has co-authored almost 40 books on higher vertebrates. He has served as British Columbia coordinator for the North American Breeding Bird Survey since 1976, and as a select member of the national ornithology group for the Committee on the Status of Endangered Wildlife in Canada since 1981. He belongs to 23 professional and natural history organizations and is a life member and elected member of the American Ornithologists' Union, life member of the Cooper Ornithological Society, and honorary life member of the Vancouver Natural History Society.

He has received numerous honours and awards for lecturing, writing, and conservation activities. In 1989 he received the Award of Excellence in Biology from the Association of Professional Biologists of British Columbia, and two years later the Lifetime Service Award from the Federation of British Columbia Naturalists. He was appointed to the Order of British Columbia in 1992 and recently received the Commemorative Medal of Canada in recognition of the 125th anniversary of the Confederation of Canada.

Wayne retired from 28 years of government service in May 2000. He is presently a director of WBT Wild Bird Trust of British Columbia and has actively participated in establishing the nation's first provincial wildlife data centre in Victoria.

Neil K. Dawe was born in New Westminster, British Columbia. After graduation from high school his interest turned to the world of finance, and banking became his vocation for the next 7 years. In 1970 he returned to the University of British Columbia, where his interest in natural history was inspired by the enthusiasm and encouragement of Wayne

Campbell. This interest grew into a career in wildlife and habitat research and management.

In 1971 he worked as a seasonal naturalist for the British Columbia Parks Branch. Later that year, he became Chief Naturalist at the George C. Reifel Bird Sanctuary, where he developed interpretation and education programs for the British Columbia Waterfowl Society until 1975. Since 1975, he has worked for the Canadian Wildlife Service on Vancouver Island, managing their National Wildlife Areas and Migratory Bird Sanctuaries and working to protect migratory birds and their habitat.

Neil is a member of a number of professional, conservation, and scientific organizations, including the Association of Professional Biologists of British Columbia, the Society for Conservation Biology, the American Association for the Advancement of Science, and the Federation of British Columbia Naturalists, and is an honorary life member of the Arrowsmith Naturalists. He co-founded the Brant Wildlife Festival and co-chaired the festival for its first five years. He was appointed a member of the Healthy Community Advisory Commission for Parksville, British Columbia. He also served as the first Regional Vice-President of the Federation of British Columbia Naturalists for Vancouver Island and has sat on the executives of the Vancouver Natural History Society, the Mid Island Wildlife Watch Society, the Rosewall-Bonnel Land Trust Society, and the Mount Arrowsmith Biosphere Reserve Foundation.

Neil has been the recipient of Environment Canada's Regional Citation of Excellence Award for his work in promoting the value of wildlife to Canadians and for the Brant Wildlife Festival, plus their National Citation of Excellence Award for outstanding achievement in advancing the goals of conservation and protection. He has also received the Federation of British Columbia Naturalist's Outstanding Service Award, and the Ina Mitchell Award from the Tourism Association of Vancouver Island, for bringing wildlife and people together on Vancouver Island. He is especially proud of being the recipient of Ruth Masters' *Hero Spoon* in 1997.

Much of his work over the past 20 years has involved studies on bird use of estuaries and the restoration and creation of estuarine marsh habitat. His primary interests now, focus on the two limiting factors affecting conservation of migratory birds and other wildlife on the Earth today: human population growth and economic growth.

Neil has written over 75 scientific, technical, and popular papers and articles on birds, ecology, and the environment. He recently authored *The Hummingbird Book and Feeders* and is a co-author of the popular children's book *The Bird Book and Bird Feeder.*

Ian McTaggart-Cowan, born in Edinburgh, Scotland, is a career biologist and educator with special concentration on the systematics, biology, and conservation of birds and mammals. He graduated from the University of British Columbia in 1932 and earned a Ph.D. degree from the University of California (Berkeley) in 1935. He has been awarded D.Sc. degrees by the University of British Columbia and the University of Victoria, LL.D. degrees by the University of Alberta and Simon Fraser University, and a Doctor of Environmental Studies degree by the University of Waterloo.

He was the biologist at the Provincial Museum in Victoria from 1935 to 1940, when he joined the faculty of the University of British Columbia. During 35 years there, he established and taught courses in vertebrate zoology, undertook research in ornithology and mammalogy, and guided the studies and research of some 100 graduate students while serving successively as professor, head of the Department of Zoology, and dean of the Faculty of Graduate Studies. His studies took him to 6 continents and resulted in more than 300 publications, 110 television programs, and 12 teaching films.

His public service related to vertebrate zoology, conservation, and education includes 7 years on the National Research Council of Canada, where he was the first chairman of the Advisory Committee on Wildlife Research, and 14 years on the Fisheries Research Board of Canada. It also includes serving as chairman of such bodies as the Environment Council of Canada, the Advisory Committee on Whales and Whaling, The Habitat Conservation Trust Fund of the Province of British Columbia (19 years), the Board of Governors of the Arctic Institute of North America, The Wildlife Society, and the Pacific Science Association; as vice chairman of the International Union for the Conservation of Nature and Natural Resources; as a member of the Select Committee on National Parks for the United States Secretary of the Interior; and as a director of the Nature Trust of British Columbia and of the National Audubon Society.

Ian McTaggart-Cowan has received numerous honours and awards for his contributions to biology and conservation, including: Officer of the Order of Canada, the Order of British Columbia, Fellow of the Royal Society of Canada, the Leopold Medal of the Wildlife Society, the Fry Medal of the Canadian Society of Zoologists, the Einarsen Award in Conservation from the Northwest Section of the Wildlife Society, the Dewey Soper Award from the Alberta Society of Professional Biologists, the Canadian Environmental Achievement Award (1992), the Doris Huestis Spiers Award of the Canadian Society of Ornithologists (1997), and the Barsby Trophy of the British Columbia Wildlife Federation (1999).

John M. Cooper, born in New Westminster, British Columbia, is a career wildlife biologist. His early interest in birds and the natural world was stimulated by his parents, Jack and Louise Cooper. Each spring, for two decades, the Cooper family travelled throughout British Columbia and Alberta, often with close friends Lorne Frost and Glen Ryder, in search of birds and their nests. His passion for birds, wilderness, and environmental issues was born from those experiences.

John obtained his B.Sc. degree from the University of British Columbia in 1978 and his M.Sc. degree from the University of Victoria in 1993. He worked as a consulting biologist from 1978 to 1981, then joined the Royal British Columbia Museum as the ornithology technician. At the museum he realized his dream of working with Wayne Campbell, and travelled to many remote regions of the province to inven-

tory birds and other wildlife. After 10 years at the museum, John returned to private business with his own consulting company. Since 1991, he has worked on a wide variety of projects for clients in industry, government, and the conservation movement, mainly environmental impact assessments, mitigation of wildlife/development conflicts, wildlife management, biomonitoring, and wildlife inventory.

John is a member of many scientific and conservation organizations but is most active as a fundraiser for Ducks Unlimited Canada, an organization that gave him his first biology-related employment in 1975. For 19 years he has directed or assisted in fundraising activities in Victoria to aid Ducks Unlimited's wetland enhancement programs. His most poignant career moment came in 1993: he joined a Sierra Club research trip to the Tatshenshini River, his most beloved wilderness area, and while he was on the river, the provincial government announced the creation of the new Tatshenshini park.

John has written over 100 technical reports, popular articles, scientific papers, and books on birds and other wildlife. His most significant research projects include a long-term study of breeding shorebirds on the Queen Charlotte Islands, breeding ecology and the effects of logging on woodpeckers, conservation of the endangered Northern Leopard Frog, and an inventory of rare raptors.

Gary W. Kaiser grew up in Ottawa where the Macoun Field Club promoted his early interest in natural history. He is a graduate of Carleton University (B.Sc. 1966, M.Sc. 1972) and joined the Canadian Wildlife Service in 1968. He moved to British Columbia as the regional population biologist in 1974 and has led projects on waterfowl, shorebirds, and seabirds for the past 25 years. In 1984 he undertook a banding project in Sabah, Malaysia, and for 10 years offered annual workshops and training programs in the Philippines, Australia, Colombia, and Peru and has seen many of the participants become important conservationists in their own countries.

Recently, Gary has led two major projects in British Columbia. The first involved obtaining funding from the *Nestucca* oil spill to exterminate rats on Langara Island. The Langara Island Seabird Habitat Recovery Project was successfully completed by the summer of 1999 when the rats were extirpated and the island once again held large numbers of ground nesting birds. The second was to address the biology of the Marbled Murrelet, which had just been added to the list of Nationally Threatened birds.

He marked his retirement from government service in 2000 with the publication of *Seabirds of the Russian Far East*, for which he was the English-language editor. He published a paper on theories for the origin of flight in that same year and is currently working on the physics of the exceptionally fast flight of Marbled Murrelets, the biomechanics of their underwater flight, and the biomolecular evidence for their place in the evolutionary tree. In September 2000, he retired from Environment Canada and undertook the associate curatorship of the Cowan Museum of Vertebrate Zoology at the University of British Columbia.

Andrew C. Stewart was born in Vermilion, Alberta, and grew up in the Peace River region of northeastern British Columbia. There, in the areas around Fort St. John, he spent his formative years pursuing outdoor explorations and developing an early, life-long interest in birds and other wildlife. After graduating from the British Columbia Institute of Technology in 1973, Andy moved to Victoria where he began his career in wildlife habitat inventory with the B.C. Ministry of Environment, Lands and Parks. With the exception of a 1-year stint in Williams Lake, he has been based in Victoria while working extensively throughout British Columbia on a variety of field projects. During the course of his 27 years in government, he has undertaken habitat projects in most regions of the British Columbia, including many of the province's last remaining wilderness areas. Although a comparative newcomer to *The Birds of British Columbia* project, Andy has been a long-term contributor to the data bases upon which this project is based. He brings a wealth of knowledge and field experience to the project as well as biological expertise with respect to British Columbia's northern regions.

Andy is a member of a number of professional and scientific organizations, including the Association of Professional Biologists of British Columbia, Association of Field Ornithologists, Western Bird Banding Association, Cooper Ornithological Society, Raptor Research Foundation, Wilson Ornithological Society, Waterbird Society, Wildlife Society, and the American Ornithologists' Union. He is also a member of the Victoria Natural History Society, Federation of British Columbia Naturalists, and British Columbia Field Ornithologists.

Andy is presently carrying out two bird projects on southern Vancouver Island involving research on the ecology of urban-nesting Cooper's Hawks and on the invasion movements of the Steller's Jay. He has published several articles and scientific papers resulting from these studies and has several other scientific works in progress.

Michael C.E. McNall, born in Wingham, Ontario, spent much of his early life hunting, fishing, and studying nature. He obtained a diploma in Wildlife Management from Sir Sandford Fleming College, Ontario, in 1971, joined the Ornithology Department of the Royal Ontario Museum, and spent the next 3 years on field expeditions in the West Indies, British Isles, Netherlands, Iceland, and throughout North America.

While at the Royal Ontario Museum, he was inspired by artist Terry Shortt to carry out his own research. In 1975 and 1976, with guidance and support from Henri Ouellet and Stewart MacDonald of the National Museum of Canada, he carried out a behavioural study of Parasitic and Long-tailed jaegers in the Canadian Arctic.

After his arctic experience, Michael moved to Victoria, and in 1980 joined the staff of the Royal British Columbia Museum. He has travelled throughout the province collecting data for this book and is currently the Ornithology Collections Manager. In this role, he prepares exhibits and gives talks on bird behaviour and conservation.

Outside of ornithology, Michael is vice president of the Vancouver Island Arms Collectors Association.

CONTRIBUTING AUTHORS

Dennis A. Demarchi was born and raised in Kamloops, British Columbia. He graduated from the University of British Columbia in 1966, where he majored in plant science and zoology. In 1970 he obtained his Master of Science degree in Range Sciences from the University of Idaho; his thesis was on the effects of cattlegrazing on California bighorn sheep forage along the Chilcotin River, near Williams Lake, B.C.

Dennis joined the British Columbia Fish and Wildlife Branch in 1969 and was posted to Fort St. John as a wildlife biologist. In 1970 he moved to Victoria to work on provincial wildlife/livestock issues. For the past 25 years he has worked in Victoria as part of an inventory team, collecting landform, soil, vegetation, and wildlife information on mapping projects across the length and breadth of the province.

One of the products that he developed for British Columbia, the ecoregion classification, provides a way of understanding the province's diverse wildlife resources when used in combination with the Ministry of Forests' biogeoclimatic zone classification. It has become the standard for determining the ecosystem representativeness of B.C.'s protected areas.

In 2000, Dennis retired from his position as the Provincial Habitat Classification Specialist with the Resources Inventory Branch (RIB) of the Ministry of Environment, Lands and Parks. He was responsible for maintaining wildlife habitat, classification, and mapping standards for the RIB's inventory projects.

Dennis received the Professional Biologists Association's Award of Excellence in 1991 for his development of the British Columbia ecoregion classification. He also received the 1993 Shikar Safari International Annual Award as British Columbia's Wildlife Officer of the year for his work on the ecoregion classification and wildlife habitat mapping. He is a member of both the British Columbia Institute of Agrologists and the British Columbia Association of Professional Biologists.

Dennis was responsible for the section "The Environment" in Volume 1.

Richard R. Howie was born in Vancouver, British Columbia, and graduated from the University of British Columbia in 1970 with a bachelor's degree in agriculture, specializing in wildlife management. He then spent 24 years in the field of conservation education in national and provincial parks across Canada. In 1994, he became a Habitat Protection Biologist with the B.C. Ministry of Environment, Lands and Parks in Kamloops, where he currently works to preserve habitats for all species of fish and wildlife.

Rick has served as a subregional coordinator for *American Birds*, has coordinated Christmas Bird Counts in the Kamloops-Shuswap area for the past 22 years, and has participated in several provincial Breeding Bird Surveys each year since 1975. He prepared the first status reports for the Spotted, Burrowing, and Flammulated owls in the province and is involved in regional studies of Ospreys, Long-billed Curlews, and Lewis's Woodpeckers. He is preparing manuscripts for books on *The Birds of Kamloops*, *Bird-finding in the Kamloops Area*, and *Raptors of British Columbia.*

Rick Howie is a Registered Professional Biologist of British Columbia and is a member of many organizations, including the American Ornithologists' Union, Cooper Ornithological Society, Raptor Research Foundation, Association of Field Ornithologists, American Birding Association, and Society of Canadian Ornithologists.

Rick prepared the draft account for the Western Meadowlark.

Chris Siddle was born in Mission, British Columbia, and graduated from the University of British Columbia in 1973 with a Bachelor of Arts degree in English literature.

He served as regional editor for *American Birds*, providing quarterly summary reports on birds in the province (and Yukon Territory) between 1990 and 1993. He regularly participates in Breeding Bird Surveys, Christmas Bird Counts, and the British Columbia Nest Records Scheme. He has prepared reports on the status of the Lewis's Woodpecker, Purple Martin, Le Conte's and Nelson's Sharp-tailed sparrows, and warblers for the B.C. Ministry of Environment, Lands and Parks.

He has served as a regional editor for the *Birds of British Columbia* project since the mid-1980s and is currently preparing manuscripts for books on *Birds of the North Peace River Area, British Columbia Birds: A Complete Guide, Raptors of British Columbia,* and *Bird-finding in the Okanagan Valley.*

Chris prepared draft accounts for the Nelson's Sharp-tailed Sparrow, Baltimore Oriole, Bullock's Oriole, Common Redpoll, and Hoary Redpoll.

Linda M. Van Damme was born in Ontario and graduated in 1974 with a nursing diploma from St. Clair College in Chatham, Ontario. She currently holds a licence with the Registered Nurses Association of British Columbia and is employed as a home care nurse in the interior community of Nelson.

Since 1979, Linda has contributed her bird observations to *The Birds of British Columbia* project and the British Columbia Nest Records Scheme and has served as a regional reviewer of draft species accounts for Volumes 3 and 4.

Linda's publications include the species account for the Sky Lark in *The Birds of North America* and a status report on the Bobolink in B.C. She is working on *British Columbia Birds: A Complete Guide*, *Big Eyes* (Owls) *in the Creston Valley*, and *The Birds of Creston Valley.* Her research interests include the winter ecology of raptors in the Creston valley and food habits of owls in the province.

She is a member of the American Ornithologists' Union, Cooper Ornithological Society, Raptor Research Foundation, Association of Field Ornithologists, Society of Canadian Ornithologists, and the Federation of B.C. Naturalists.

Linda prepared draft accounts for the Black-throated Sparrow, Harris's Sparrow, Bobolink, and Brambling.