

WILDLIFE DATA CENTRE

FEATURED SPECIES - SNOWY OWL (*BUBO SCANDIACUS*)

R. Wayne Campbell¹ and Michael I. Preston²

¹ 2511 Kilgary Place, Victoria, BC V8N 1J6

² 940 Starling Place, Victoria, BC V9C 0B4

For people living south of the Snowy Owl's normal Arctic range (Figure 1), the bird's arrival in southern areas always creates a stir. In his poem "*The Snowy Owl*", Herber A. Kenney captures the somber mood while watching a bird during a bleak Massachusetts winter:

*The ice-locked island lumps the valley snow and
all is sculpture carved by January.*

*The plaster woods are random statuary beneath
a marble sky.*

*The bushes show limp white fingertips that waved
good-bye to the departing day.*

*No rabbits try their wonted paths. No bird is seen,
no breath steams the air.*

*The world is still as death until in that frame of
arctic chastity the snowy owl, on hungered wings,
glides by.*



Figure 1. Snowy Owl is a marvelous bird that visits British Columbia every year, showing its white body, large yellow eyes, and differences in gender plumage to the delight of all wildlife lovers. Dawson Creek, BC. 15 March 2007 (Gary S. Davidson).

More kinds of owls occur in British Columbia than anywhere else in Canada, but of the 15 species, only the Snowy Owl does not breed in the province. It visits open landscapes every year, but when and where it will show up is unpredictable, because the owl's arrival may depend to a large extent on what is happening to prey on its Arctic breeding grounds. When lemmings, voles, hares, and ptarmigan become scarce as a food supply, numbers - frequently "waves" - of Snowy Owls may move southward, some reaching central California on the Pacific coast. Most follow the British Columbia coast after arriving in the province where they are most often encountered in the tidal marshes and estuaries on the southwest mainland. A few also visit widely scattered interior locations of the province but rarely remain in a specific location for the entire winter except in the Peace River region. It is a highly nomadic species that wanders greatly in search of food, even in Arctic regions where it is present year-round.

The long-assumed "cyclic" nature of Snowy Owl related to rodent populations, however, may only be part of the ecology of the winter population in North America. Researchers have recently determined that Snowy Owl is an annual regular migrant to southern Alberta, Saskatchewan, and Manitoba as well as Montana, North Dakota, and South Dakota (*i.e.*, Great Plains region) irrespective of oscillating prey populations in the far north (Kerlinger and Lein 1988a). The traditional "irruptive" interpretation for presence and absence of Snowy Owls in southern areas may be more applicable to broad scale events on the breeding grounds, resulting in differences in wintering populations on the west and east coasts of the continent.

The Snowy Owl's all-white body serves it well as camouflage (Figure 2) in far northern areas but

farther south it becomes conspicuous, especially in snow-free areas. On the wintering grounds, the white plumage is also used in communication.



Figure 2. When snow blankets south coastal British Columbia, the all-white body of the Snowy Owl makes it difficult to spot. This juvenile (centre left), hatched during the preceding breeding season, found a favourite perch above the snow where it spent much of January roosting during the day. Boundary Bay, BC. 5 January 1993 (R. Wayne Campbell).

Snowy Owl is a large, powerful, and opportunistic predator that is not just dependent on a few species of small northern mammals. The owl is capable of catching a wide variety of prey both on land and at sea, and during some winters off southern Vancouver Island it may subsist almost entirely on marine water birds.

It was long believed that Snowy Owls migrating and dispersing south from their Arctic breeding grounds arrived in southern wintering areas in “semi-starved” condition and their chances of survival were slim. Recent research has shown, however, that when dead owls were examined, all had moderate to heavy fat deposits and that starvation was not the reason for death. In British Columbia, the main source of reported mortality is indiscriminate shooting.

Many recent field guides list the scientific name for the Snowy Owl as *Nyctea scandiaca* but based on new genetic evidence the species is considered to be more closely related to the *Bubo* (e.g., “horned owl”) owls and while the common name is retained the new Latin name is *Bubo scandiacus*.

At a Glance

Unmistakable. Very large, all-white, round-headed bird with yellow eyes placed on the front of their face (Figures 3 to 6). Unlike other owl species, the Snowy Owl exhibits sexual colour dimorphism from nearly pure white males to white females marked with brown. Adult males are distinctly smaller than adult females. Also, the plumage of first-year birds also varies from that of the adults. Plumage colour and body size, however, varies considerably between individuals, and some authors (see Bortolotti et al. 2011) have suggested it is not possible to reliably attribute age or sex in the field.

The flight of the owl is more hawk-like than owl-like and Snowy Owl can hover or fly deceptively fast in pursuit of prey. Females are larger than males.

Other Names: Arctic Owl, Great White Owl, Ghost Owl, Tundra Ghost, Cat Owl, and Ookpik.

Similar Species: In British Columbia, only the very rare white-phase Gyrfalcon (*Falco rusticolus*) which has a longer tail and pointed wings, the Barn Owl (*Tyto alba*) with white underparts, tawny upperparts, and a heart-shaped facial disk, and some interior races of the Great Horned Owl (*Bubo virginianus*) which are light-bodied but all show large ear tufts. The Snowy Owl also has ear tufts, consisting of 10 to 12 feathers, but they are small and seldom visible.

See page 108 for a simple key to aging and sexing Snowy Owls.

Adult Male (Definitive Basic Plumage; Figure 3)

- Nearly all-white
- Lightly marked, usually dark brown bars or spots on breast, back, wings, head, and/or tail
- Brow clear, without markings
- Large yellow eyes
- 0–3 cross-bars on tail



Figure 3. The adult male Snowy Owl may be nearly all-white or lightly marked with sparse dark bars. St-Hermas/Mirabel, QC. 22 December 2009 (Richard Dumoulin).



Figure 4. The adult female Snowy Owl is more moderately barred than the male and at times may have extensive barring. Most of the body is predominately white marked with shades of dark brown. Calgary, AB. 22 December 2004 (Michael I. Preston).

Adult Female (Definitive Basic Plumage; Figure 4)

- Mostly all-white, more heavily barred than male
- Extensive dark brown bars or spots on breast, back, wings, head, and/or tail
- Moderate to heavy brow markings
- 4-6 brown cross-bars on tail
- Large yellow eyes

First-year Male (First Basic Plumage)

- Nearly all-white
- White bib of present (2-8 cm); back of head primarily white (Josephson 1980)
- 3 or less rows of bars on upper side and underside of tail (Josephson 1980)

First-year Female (First Basic Plumage; Figure 5)

- Most all-white
- Barring present on body except for white facial disk, tarsi, feet, and wing linings (Josephson 1980)
- 6 rows of bars on upper side and 3 or more rows on underside of tail (Josephson 1980)

Immature (Second Basic Plumage)

- Second-year plumage not well defined.
- Shows mixed characteristics of first-year birds and adults (Josephson 1980).



Figure 5. The young female Snowy Owl is essentially white with dense dark-brown bars below and densely spotted on the top of the head. Saint Barthelemy, QC. 12 February 2010 (Alan D. Wilson).

In flight (Figure 6)

- Large, mostly all-white body with rounded wing tips
- Hawk-like flight pattern



Figure 6. In flight, the head and body of this juvenile Snowy Owl appear as one with no visible neck. The flight is direct and strong, sometimes surprisingly fast, with a slower down stroke than upstroke. The wings are broad, long, and rounded at the tips. Saint Barthelemy, QC. 11 February 2010 (Elaine R. Wilson).

Length

Male: 525-640 mm (average 585 mm [23 in]) (Portenko 1972)

Female: 590-650 (average 617 mm [24 in]) (Portenko 1972)

Wingspan

Male: 384-423 mm (average 405 mm [16 in]) (Dement'ev et al. 1951)

Female: 428-462 mm (average 438 mm [17 in]) (Dement'ev et al. 1951)

Weight

Male: 1,280-2,300 g (average 1,726 g [3.8 lbs]) (Mikkola 1983)

Female: 1,700-2,950 g (average 2,239 g [4.9 lbs]) (Mikkola 1983)

Where and When

World Range

Snowy Owl has a circumpolar holarctic distribution. In North America, it breeds in Arctic tundra regions from the western Aleutian Islands, northern Alaska, Yukon Territory, and Mackenzie, southern Keewatin, northeastern Manitoba, northern Quebec and Labrador north to the Canadian Arctic islands. Elsewhere it breeds from northern Greenland, Scandinavia, Russia, and northern Siberia and southern Novaya Zemlya south to the limits of tundra in Eurasia and the Commander Islands.

Most Snowy Owls winter within their breeding range but due to their nomadic existence they also wander irregularly in North America to the northern United States (occasionally farther south). Only in the Great Plains region of central North America, is the species considered a regular migrant. They also occur in Asia and Europe to Iceland, British Isles, continental Europe, central Russia, northern China, and Sakhalin.

British Columbia

Current Status: Numbers of birds fluctuate from year to year depending on nesting success and the controversial “cycles in prey abundance” theory on their arctic breeding grounds (see Shelford 1945, Newton 2006). In British Columbia, the species is a *rare*¹ to *fairly common*, but irregular, winter visitant on the coast, and *rare* to *uncommon* in the interior. During years of irruptions, it can be *very common* on the extreme southwest mainland coast (especially the Fraser River delta), *fairly common* in the northeastern interior, and *uncommon* in the southern interior (modified from Campbell et al. 1990).

Occurrence: Snowy Owl in British Columbia is considered an irruptive (facultative) migrant in contrast to a regular (obligate) migrant. In the latter

¹ *very common* - 50 to 200 individuals per day per locality; *fairly common* - 7 to 20 individuals per day per locality; *uncommon* - 1 to 6 individuals per day per locality; and *rare* - 1 to 6 individuals per season.

category birds migrate at about the same dates, usually in the same directions, and for similar distances each year with similar breeding and wintering grounds. Irruptive migrants show much greater year-to-year variations in the proportions of individuals that migrate, and greater individual and year-to-year variation in the timing, directions and distances of movements. Also, as is the case with Snowy Owl, site fidelity is poor and few individuals return to the same breeding areas in successive years. These areas may be separated by hundreds or thousands of kilometres (Newton 2006).

Although Snowy Owl is widely distributed along the entire coast of the province, it is most often reported along the inner marine shores of southeastern and southern Vancouver Island and especially in the Fraser River delta. At most other locations it is only seen infrequently and usually for a short period of time. For example, along the west coast of Vancouver Island (Figure 7), Snowy Owl was only reported 20 times during four different winters (e.g., 1916-1917, 1966-1967, 1971-1972, and 1973-1974) for the 57-year period between 1916 and 1974 (Campbell 1967, Hatler et al. 1978). There are no records for alpine habitats.



Figure 7. Snowy Owl is a very rare visitor along the rugged, and at times inhospitable, west coast of Vancouver Island, having been recorded in only four winters over a 57-year period between 1916 and 1974. Brooks Peninsula, BC. (R. Wayne Campbell).

In the interior, Snowy Owl occurs at widely

scattered locations across the south, throughout the southern Peace River region, and more sparingly in the far northwest (Figure 8). Favoured regions include open farmland and range habitats in the vicinity of Fort St. John, Dawson Creek, Riske Creek, and Vernon. Although reported in alpine regions in autumn and winter its status in these areas is unknown.

Habitat

Migration and Winter: Snowy Owl breeds in open landscapes above tree line and during migratory movements and winter generally seeks out similar treeless habitats in rangeland, farmland, agricultural fields, beaches, and other open spaces such as airports and golf courses. At times the species may be found in the most unsuspected of places including offshore ships, on and inside buildings in the middle of urban centres (Figure 9), and fish hatcheries.

On the coast, Snowy Owl frequents log-covered beaches, marine foreshores with logs and stumps (Figure 10), offshore barren islands, sand spits, bare rocky headlands, estuaries, riverbanks, sand dunes, agricultural fields, marshes, and human-made structures such as jetties, log booms, piers and wharves. In urban and residential areas it has been found in airports, parks, golf courses, yards (Figure 11), brackish and fresh-water marshes, marinas, garbage dumps, and school yards (Campbell et al. 1990). It often perches on the ground, a hummock, fence post, rock pile (Figure 12) or low building, and occasionally in trees. Most coastal records in the province are near sea level.

In the interior, habitats include rangeland, grassland, agricultural fields, lakeshores, marshes, edges of woodlands and forests, wide transmission corridors, airports, golf courses, regenerating clearcuts, and alpine tundra to at least 1,830 m elevation. It has also been found, less frequently, in open residential and urban areas (Campbell et al. 1990).

In the vicinity of Fort St. John, in the southern Peace River region, Siddle (in press) describes Snowy Owl habitats as “*open farm fields* (Figure 13), *occasionally edges of Trembling Aspen (*Populus tremuloides*) groves and muskeg next to large open fields*. *The species is most often seen perched on*

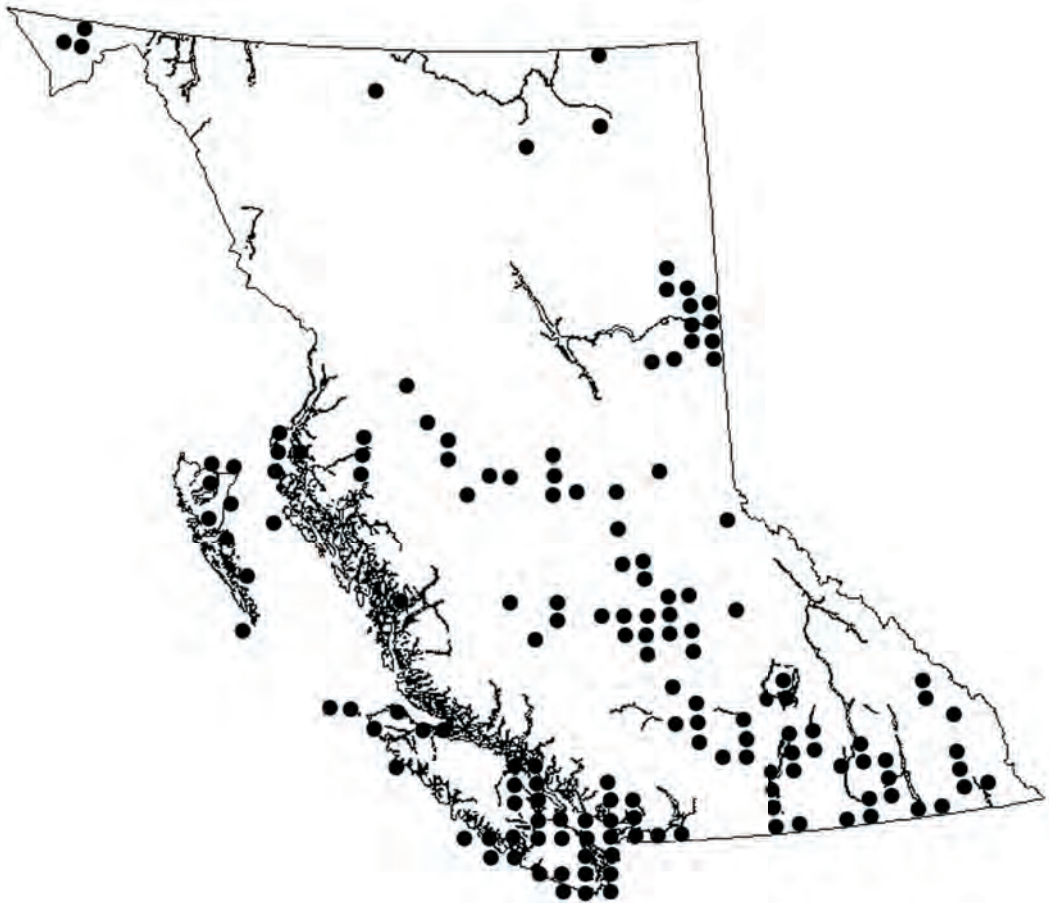


Figure 8. Locations (dots) of confirmed Snowy Owl occurrences in British Columbia, 1896-2009.

any high vantage point, including sheds, telephone poles, haystacks, clods of dirt, Trembling Aspens, and rarely spruce trees.”

The Peace River region is the second most important habitat in the province for migrating and wintering Snowy Owls. It is exceptional agricultural land and accounts for more than one-third of British Columbia’s Agricultural Land Reserve. About 850,000 ha are farmed, mostly for crops and pasture, and accounts for 34% of land farmed in the province (Feinstein 2010). In the Okanagan, Cannings et al. (1987) point out that the “*large open areas of rangeland and farmland*” in northern regions

(Figure 14) are what attracts most Snowy Owls to the valley.

Annual Occurrence

Snowy Owl is an annual but irruptive migrant and winter visitant that arrives in British Columbia at irregular intervals, primarily in autumn, and departs the following spring; it usually spends up to up to five months or so in the province. During invasion years hundreds of birds may be present throughout the province, mostly on the coast, while at other times the species may be rarely seen. There are records for



Figure 9. A Snowy Owl (arrow) roosted inside Louisiana Pacific Oriented Strand Board mill at Dawson Creek, BC, between 8 and 11 January 2007, probably attracted by warmth and Rock Pigeons (*Columbia livia*). It was captured on 12 January in a severely weakened state and delivered to the local animal rehabilitation facility. It died shortly thereafter (Mark Phinney).



Figure 10. The Boundary Bay foreshore, with scattered logs, tree roots and stumps, and hummocks of low vegetation is the most frequented habitat for Snowy Owl in British Columbia. 5 March 1994 (R. Wayne Campbell).



Figure 11. Occasionally a Snowy Owl will take up temporary residence in a private yard in a well-populated residential area, probably attracted by domestic cats or rats at feeders. Victoria (Hollyhill Place), BC. 8 December 1980 (Mark Nyhof).



Figure 12. During the 1980-1981 winter on southern Vancouver Island, Snowy Owls regularly roosted during the day in a stone pile on the Victoria International Airport in North Saanich, BC, February 1981 (Mark Nyhof).

every month of the year except June and July (Figure 17).

There is an exceptional out-of-season record for August. A single bird was reported to Linda Van Damme, with details, on Nicks Island, Creston, BC, on 4 August 2006 by local resident Norman Dyck. He was familiar with the winter species, having lived in northern areas of Canada (Van Damme 2009; L. M. Van Damme pers. comm.). Presumably the same bird,



Figure 13. Overwintering Snowy Owls in the southern Peace River region of British Columbia frequent open farm fields where they often perch on fence posts and hay bales scanning for prey. North Pine, BC, 27 February 1995 (R. Wayne Campbell).



Figure 14. Most Snowy Owls reported in the Okanagan valley are seen on open rangeland and farmland in the vicinity of Vernon, BC, 13 October 1991 (R. Wayne Campbell).

later identified as a female, was photographed across the international border at Bonners Ferry, Idaho, sitting on top of a barn on 26 and 29 August 2006 (The Virtual Birder 2006). No tresses or other human adornments were reported on the bird. Possibly the same bird was photographed on 5 September 2006 along the highway between Bonners Ferry and Sandpoint, Idaho (Figure 15 a and b).

The main visitation period during invasion years is from late November to late February (Figure 16 and 17). Departing stragglers in spring have lingered into late May, and early autumn arrivals have been

spotted on several occasions in September. Extreme dates for the coast, excluding summer records, are 19 September to 14 May (238 days) and the interior 30 October to 22 May (205 days). Most records (71%; n=25,749) are for the winter period December through February with December and January accounting for 72 % of these records.

Irruption Migration, Winter Site Fidelity and Territoriality

From the western part of their breeding range in Arctic Canada, Snowy Owls immigrate into British Columbia, traveling at least 3,000 kilometres to reach the Fraser River delta. Because their sojourns into the province are not a widespread annual event, we do not consider the species a true obligate migrant.

Snowy Owls travel alone but may aggregate at favourite wintering sites. Their arrival is unpredictable and may not be only related to abundance of prey species on the breeding grounds, the classic explanation for irruptions. Other suggestions for the irregular enmasse movements include differences in peak abundance of lemmings at high and low latitudes, the irregularity of lemming abundance over vast areas in the Canadian Arctic, the mosaic of lemming dispersion, the mobile nature of breeding Snowy Owls, and the differences in intensity in winter irruptions south of the breeding range (Maher 1970, Parmelee 1992, Kerlinger et al. 1985, Kerlinger and Lein 1988a). Figure 18 clearly shows that irruptions of Snowy Owls across wintering grounds in North America is not synchronized, reflecting asynchrony in lemming cycles. Parmelee (1992) emphasizes the need for future research in this component of the Snowy Owl's life history.

Migrants in the Great Plains region of the continent exhibit winter site fidelity and defend territories, although this is poorly understood in British Columbia (Oeming 1957, Keith 1964, Follen and Leupke 1980, Boxall and Lein 1982b). Kerlinger and Lein (1986) also noted differences in winter range between age and sex classes of Snowy Owls in North America. They found that immature males winter farthest south, adult females farthest north, with males and immature females inbetween. Non-breeding first-year birds were mainly found during irruptive movements east and west of the northern



Figure 15. It was a surprising coincidence that another photograph of the late summer Snowy Owl originally seen in Creston, BC and later in Idaho, would become known. Patricia Mitchell, one of the editors of this updated account, photographed a female Snowy Owl, presumably the same individual, on a utility pole (a) and on the ground (b) between Bonners Ferry and Sandpoint, Idaho, on 5 September 2006. Apparently the owl did not like being photographed, and quickly flew off into a private field.



Figure 16. Annual occurrence chronology of Snowy Owl in British Columbia, 1886 - 2009, including years of irruption. Thick bar: common during years of irruption; Thin bar: uncommon during years of irruption; Dots: rare anytime; Blank: does not occur.

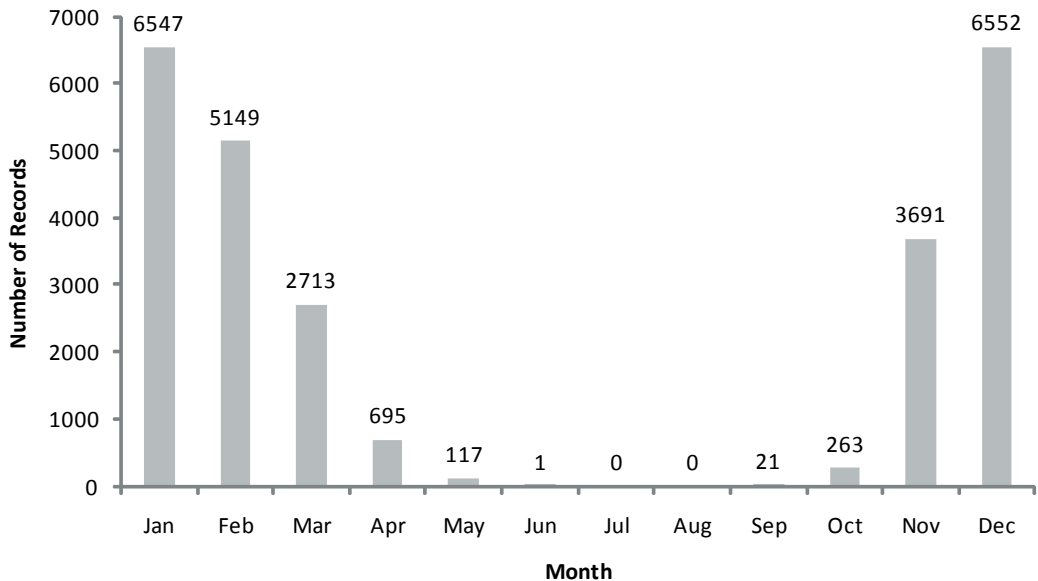


Figure 17. Total occurrence records, by month, for Snowy Owl in British Columbia, 1896-2009.

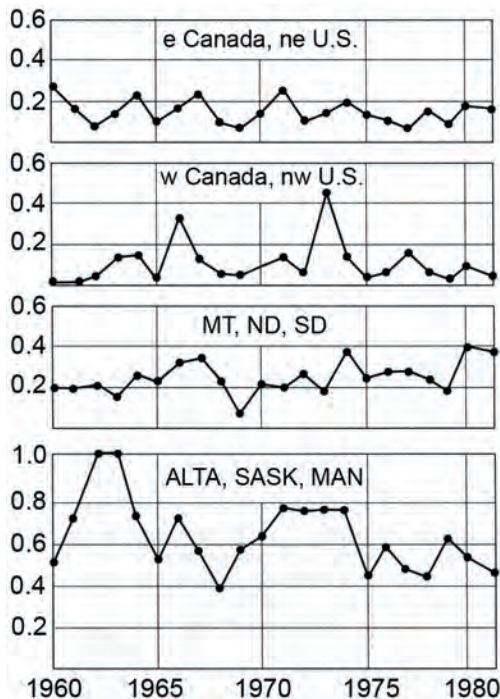


Figure 18. Frequency of Snowy Owl occurrence in two general regions of North America: north-central states of Montana, North Dakota and South Dakota and south-central Canadian provinces of Alberta, Saskatchewan and Manitoba, from Christmas Bird Counts 1960-1981. Reprinted, with permission, from Parmelee (1992).

Great Plains.

During the mid-1960s, William M. Hughes (pers. comm.) banded several Snowy Owls (Figure 19) at the Vancouver International Airport on Sea Island, BC. He suggested that they hunted and roosted in well-defined areas during some winters. They all fed on waterfowl attracted to airport fields. He also mentioned that a bird banded one winter on Sea Island was recovered the following spring at Point Barrow, Alaska, where the species nests.

The magnitude of Snowy Owl irruptions varies considerably, but notable influxes in British Columbia have been documented in the winters of 1889-1890, 1896-1897, 1908-1909, 1916-1917, 1945-1946,



Figure 19. The late William M. Hughes, and his wife Jean, with a banded Snowy Owl prior to release at the Vancouver International Airport on Sea Island, BC. January 1966 (John G. Sarles).

1950-1951, 1953-1957, 1963-1964, 1966-1967, 1973-1974, 1975-1975, 1977-1978, 1984-1985, 1985-1986, and 1996-1997. Notable irruptions have occurred in 1916-1917 ("probably the greatest flight of all"; Jewett et al. 1953), 1966-1967, 1973-1974, 1985-1986, and 1996-1997.

Arrival and Departure Dates

Since the breeding range of Snowy Owl extends over 2,100 km between latitudes 57°N and 75°N (Parmelee 1992) it has been suggested that timing of migration varies with latitude with birds in higher latitudes migrating earliest in autumn (see Geller and Temple 1983, Kerlinger and Lein 1988). Since the origin of owls arriving in British Columbia is unknown, the protracted arrival of birds, especially during non-irruptive years, should be interpreted with caution. Therefore, the reasons for the timing of autumn migration and dispersal are still not fully understood.

With this in mind, Snowy Owls have been reported earlier in autumn in British Columbia than other areas to the south along the Pacific coast. There are 21 September records for the province, all from coastal locations (see Figure 10). The earliest dates for Washington state are 20 October (invasion year) and 30 October (non-invasion year) (Wahl et

al. 2005) and for Oregon, where the species is less common, birds begin to appear in late November (Patterson 2006).

During invasion years there is a noticeable increase in the numbers of Snowy Owls arriving in the province in October, mostly later in the month, but the main influx occurs from late November to early December most years (see Figure 17). By mid-December, the wintering population is usually established and numbers probably peak in January. Spring departure may commence during the latter half of February and by mid-March much of the population has left. Some owls may linger into May some years.

Over the 44 years with information from the Fraser River delta, Snowy Owl arrival dates ranged from 13 October to 12 December (61 days) with an average date of 14 November (Figure 20); departure dates ranged from 28 January to 12 May (105 days) with an average of 22 March (Table 1). Peace River region dates were later in autumn and earlier in spring. Over the 20 years with information, Snowy Owl arrival dates ranged from 24 October to 27 December (65 days) with an average of 23 November; departure dates ranged from 19 February to 18 April (59 days) with an average of 5 March (Table 1).

In autumn, average arrival dates by decade were earlier in the Fraser River delta than the Peace River region by up to 18 days and departure dates were earlier in the Peace River region by up to 34 days

(Tables 2 and 3).

Length of Stay

The length of time Snowy Owls remain in British Columbia varies greatly and may range from part of a day at some locations to most of the autumn, winter, and spring at others. Since individual birds were not identified by plumage, banding, markings, or specific behaviour, the period of residence has been assumed from regular reports of “Snowy Owls” in a particular area between the first and last sighting. In the interior, the area an owl frequents may be large, covering many kilometres. On the coast, birds are more easily visible and restricted, usually along a narrow strip of marine shore.

Eighteen locations in British Columbia have been reported for Snowy Owl at least 30 consecutive days during a single winter that includes earliest arrival and latest departure dates. Seven sites are coastal and 10 are from widely scattered interior regions. The Fraser River delta, with the longest history of documentation, also has the greatest range in length of stay (181 days) and the highest average of 132 days (Table 4). The islands off southern Vancouver Island, with associated wintering waterbirds as available prey, are also important wintering areas with an average of 113 days per annual visit.

In the interior, agricultural fields in the vicinity of Fort St. John, and rangeland and extensive fields in the vicinity of Vernon, in the north Okanagan valley (see Figure 14), are close with 112 and 116

Table 1. Early, late, and average arrival and departure dates for Snowy Owl in the Fraser River delta (coast) and Peace River region (interior) of British Columbia, 1896-2009. The average date was calculated by using Julian days (1 January = 1; 31 December = 365) and then back-converting to a Gregorian (modern) calendar.

Location	Total Years	Arrival			Departure		
		Early	Late	Average	Early	Late	Average
Fraser River ¹	44	13 Oct	12 Dec	14 Nov	28 Jan	12 May	22 Mar
Peace River ²	20	24 Oct	27 Dec	23 Nov	19 Feb	18 Apr	5 Mar

¹Includes the delta and floodplain of the municipalities of Ladner, Tsawwassen, Richmond, and Delta and foreshore areas from Iona Island east to Crescent Beach including all islands and Boundary Bay.

²Includes primarily agricultural land in the vicinity of the municipalities of Dawson Creek, Fort St. John, Pouce Coupe, and Taylor and the communities of Arras, Baldonnel, Cecil Lake, Farmington, Montney, North Pine, Prespatou, Progress, Rolla, and Rose Prairie.

Table 2. Average autumn arrival dates of Snowy Owl in the vicinity of the Fraser River delta and the Peace River region, for decades with two or more years of arrival data. The number of years within each decade are provided in parentheses below each date. The average date was calculated by using Julian days (1 January = 1; 31 December = 365) and then back-converting to a Gregorian (modern) calendar.

Location	1890-1899	1910-1919	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009
Fraser River ¹	13 Nov (2)	20 Nov (2)	26 Nov (5)	10 Nov (8)	17 Nov (9)	12 Nov (6)	1 Nov (3)
Peace River ²	-	-	-	25 Nov (8)	24 Nov (9)	26 Nov (6)	18 Nov (3)

^{1,2} see Table 1

Table 3. Average spring departure dates of Snowy Owl in the vicinity of the Fraser River delta and the Peace River region, for decades with two or more years of arrival data. The number of years within each decade are provided in parentheses below each date. The average date was calculated by using Julian days (1 January = 1; 31 December = 365) and then back-converting to a Gregorian (modern) calendar.

Location	1900-1909	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009
Fraser River ¹	23 Mar (2)	9 Mar (5)	1 Apr (7)	18 Mar (8)	28 Mar (5)	27 Mar (4)
Peace River ²	-	-	27 Feb (7)	14 Mar (8)	1 Mar (5)	8 Mar (4)

^{1,2} see Table 1



Figure 20. The earliest record for Snowy Owl in 1988 in the Fraser River delta region was 13 November at Boundary Bay, BC, a day earlier than the 44-year average (Ervio Sian).

days respectively. Without the intensive coverage that Fort St. John received between 1975 and 1989, Dawson Creek complements the south Peace River region as the most important wintering area for Snowy Owls in the interior of the province. Elsewhere in the interior, Snowy Owl occurs irregularly and rarely stays for any length of time (Figure 21).

Outside their regular wintering grounds, trends in winter residency period are difficult to determine for Snowy Owl. During a century of information, only 18 locations reported wintering Snowy Owls in excess of 30 days and nine of these (50%) were only for a single year. At Comox, where the late Theed Pearse kept daily observations, the length of stay increased by 29 days for the period 1950-1979, but information for the next three decades is insufficient

Table 4. Shortest, longest, and average length of stay for Snowy Owl in seven coastal and 11 interior locations in British Columbia, 1896-2009. All locations are listed from north to south. Minimum length of stay is 30 days.

Location	Habitat	Total Years			Days	
		Shortest	Longest	Average		
Coast						
Sandspit	Marine spit, log beaches and airport	1	30	30	30	
Comox ¹	Marine spit, log beaches, and airport	6	31	71	50	
Nanoose Bay	Estuary and log beaches	1	78	78	78	
Nanaimo River	Estuary	1	113	113	113	
Sandhill Creek ²	Sand dunes, creek mouth, marine beaches	1	54	54	54	
Fraser River ³	Estuary, marine foreshore, and farmland	31	32	212	132	
S. Vancouver Island ⁴	Marine beaches and offshore islands	11	57	171	113	
Interior						
Fort St. John ⁵	Agricultural fields	9	71	146	112	
Dawson Creek ⁶	Agricultural fields	5	66	125	94	
Prince George	Airport fields and shrublands	4	36	92	55	
Celista	Farmland and fields	3	43	63	50	
Hat Creek	Rangeland	1	37	37	37	
Rose Hill	Rangeland	1	33	33	33	
Vernon	Rangeland and agricultural fields	3	94	157	116	
Minnie Lake	Rangeland, lakeshore and shrubby creek	1	73	73	73	
Kelowna	Agricultural fields and garbage dump	2	36	69	52	
Okanagan Landing	Lakeshore and beaches	1	98	98	98	
near Osoyoos ⁷	Rangeland	1	98	98	98	

¹ Cape Lazo, Comox airport (Figure 22), Goose Spit, Kin Beach Park, Kye Bay, and Point Holmes.

² located on Long Beach on the west coast of Vancouver Island.

³ delta and floodplain areas of Ladner, Tsawwassen, Richmond, and Delta, and foreshore areas from Iona Island east to Crescent Beach including all islands, Boundary Bay, and airports.

⁴ southern Vancouver Island marine shores and offshore islands from Esquimalt east to Sidney (North Saanich) including Victoria International Airport.

⁵ primarily agricultural land in vicinity of Fort St. John, including communities of Baldonnel, Cecil Lake, Montney, North Pine, Prespatou, and Rose Prairie.

⁶ primarily agricultural land in vicinity of Dawson Creek, Pouce Coupe, Taylor, Arras, Farmington, Progress, and Rolla.

⁷ probably Richter Pass.



Figure 21. This Snowy Owl, a rare find in the Hat Creek area, remained in the vicinity for 37 consecutive days, a long time for the south-central region of British Columbia. 4 November 1996 (R. Wayne Campbell).



Figure 22. Elevated structures on otherwise open, flat airport fields, are used by Snowy Owl for perching and roosting. Canadian Forces Base at Comox, BC. 29 November 1996 (Doug Innes).

to even suggest a general trend (Table 5). On southern Vancouver Island there appeared to be no clear trend in length of stay as periods of residency fluctuated greatly. In the Fraser River delta, average length of stay for seven decades with data ranged between 107 and 155 days and numbers of days showed a slight increase by the decade 2000-2009 (Table 5). There seemed to be no relationship between lengths of stay in decades with notable years of irruption (*e.g.*, 1910-1919, 1960-1969, 1970-1979, and 1980-1989) and other decades with fewer owls reported.

Monthly Distribution and Relative Abundance

A general synopsis of Snowy Owl autumn and spring migration and populations on wintering grounds in British Columbia, by month, is shown in Figures 23 to 32. Autumn migration occurs mainly in November and December while departure to far northern breeding grounds in spring occurs mostly in February and March. The caption for each figure summarizes details for each month including general distribution, significant arrival and departure dates, unusual occurrences, and occasionally areas of winter concentration. It should be remembered that much of the discussion in the captions are for years of irruptions followed by echo years of less conspicuous movements. Annual occurrence by region is summarized in Figure 33.

Family Life

Annual Cycle

Snowy Owl does not breed in British Columbia but a capsule summary of its general breeding biology in the Arctic is helpful in interpreting when it might be expected to appear in the province. The following brief notes have been extracted from Parmalee (1992).

Snowy Owl is usually monogamous and pairs may form on the wintering ground, which exemplifies the importance of preserving open habitats with suitable prey species and minimizing human disturbances. The nesting season, from nest building to fledging, is May through September. Egg laying may commence in mid-May and be complete by early June. Clutch size varies depending on food supplies.

Snowy Owl nests directly on the ground in a scrape prepared by the female (Figure 35). Incubation, by the female, lasts on average between 31 and 33 days. Young can walk at about two weeks of age and leave the nest between 20 and 30 days old; because they are still unable to fly they remain in the nesting territory. Young may begin preliminary flights at 35 days old, but they do not master flying until they are about 50 days old. Both parents continue to care for the young for at least another 10 weeks. At least two, possibly more years are required for sexual development.

Table 5. Average length of stay in days for Snowy Owl¹, by decade, for seven coastal and 11 interior locations in British Columbia, 1916-2009⁸. All locations are listed from north to south. Minimum length of stay is 30 days.

Location	1910- 1919	1930- 1939	1940- 1949	1950- 1959	1960- 1969	1970- 1979	1980- 1989	1990- 1999	2000- 2009
Coast									
Sandspit	30	-	-	-	-	-	-	-	-
Comox ¹	-	41	-	43	52	71	-	-	-
Nanoose Bay	-	-	-	-	78	-	-	-	-
Nanaimo River	-	-	-	-	113	-	-	-	-
Sandhill Creek ²	-	-	-	-	54	-	-	-	-
Fraser River ³	125	-	138	-	107	147	119	132	155
S. Vancouver Island ⁴	149	-	57	131	115	100	123	-	-
Interior									
Fort St. John ⁵	-	-	-	-	-	97	119	-	80
Dawson Creek ⁶	-	-	-	-	-	-	83	-	102
Prince George	-	-	-	43	71	-	36	-	-
Celista	-	-	43	63	-	-	-	-	-
Hat Creek	-	-	-	-	-	-	-	37	-
Rose Hill	-	-	-	-	-	-	-	-	33
Vernon	-	-	-	-	96	157	-	-	-
Minnie Lake	-	-	73	-	-	-	-	-	-
Kelowna	-	-	52	-	-	-	-	-	-
Okanagan Landing	98	-	-	-	-	-	-	-	-
near Osoyoos ⁷	98	-	-	-	-	-	-	-	-

^{1,2,3,4,5,6,7} see Table 4

⁸ No data for 1920-1929

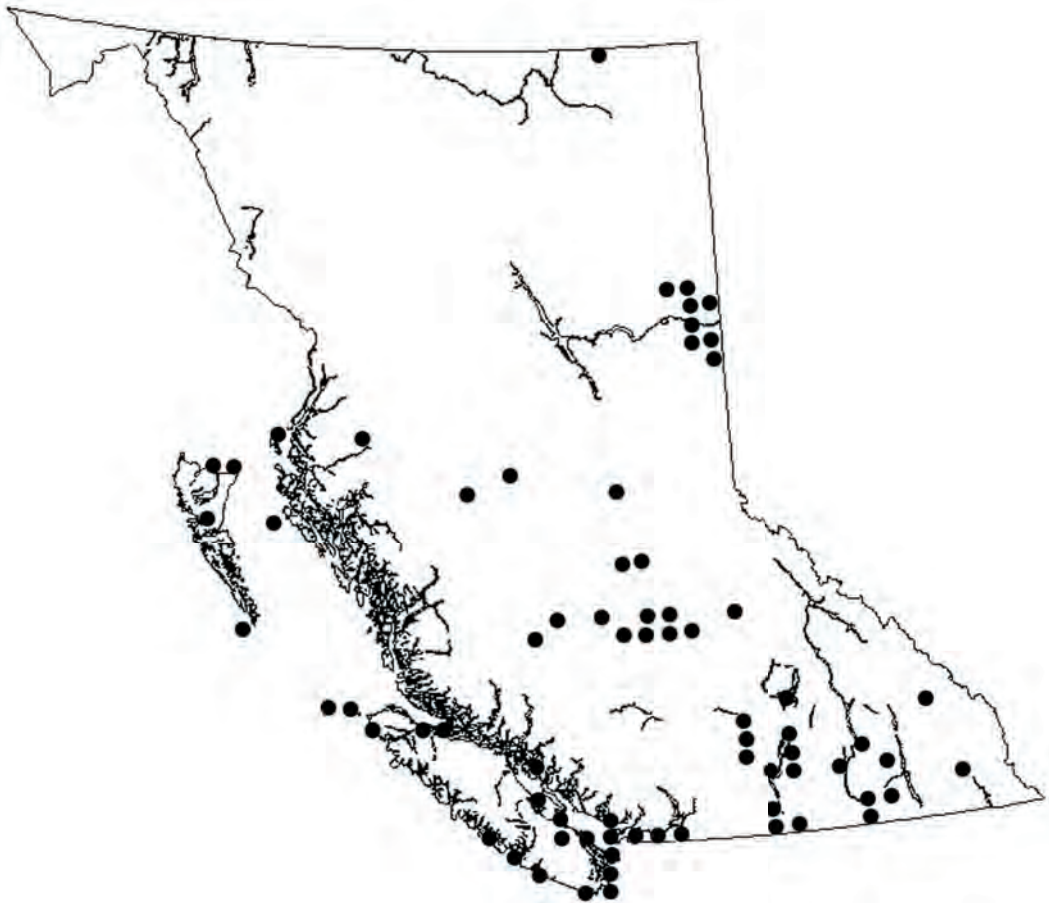


Figure 23. January: 25% of all records (see Figure 17; Table 6). **Coast** – Some Snowy Owls may still be migrating or dispersing during the month as most records for areas outside the southwest coast are of short duration. On the south coast, wintering birds have settled in, but there may be local dispersal related to weather conditions and availability of food. **Interior** – Some migration or dispersal still occurs throughout the month as most occurrences, except in the Peace River region, are short-lived. Exceptions may occur during years of irruption at locations such as Prince George, Celista, and Vernon where Snowy Owls may linger through the month.

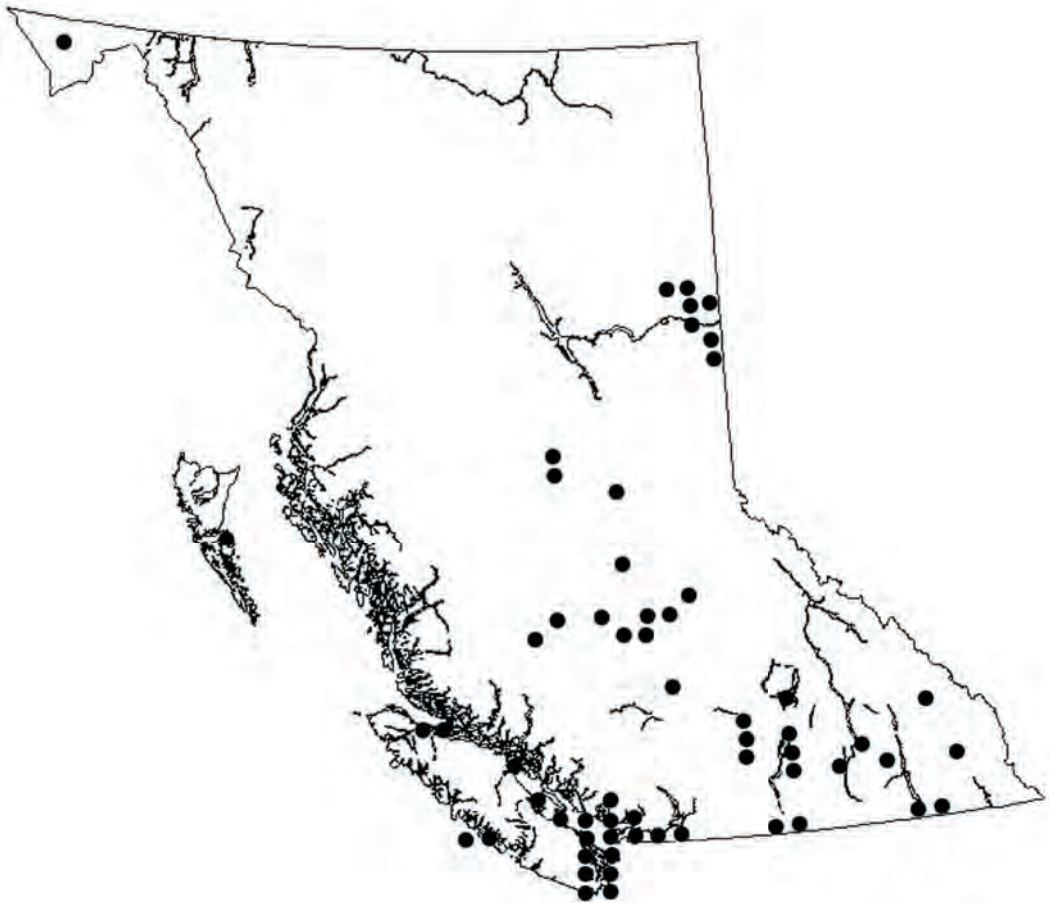


Figure 24. February: 20% of all records (see Figure 17). *Coast* – While much of the winter population has been established, especially in southwestern parts of the province, some owls begin leaving sites towards the end of the month. This general movement may be augmented with a few migrants passing through British Columbia from Washington state. *Interior* – Most interior records are from the latter half of the month, and of short duration, suggesting that some Snowy Owls may be passing through parts of the interior as local dispersants or migrants from southern or north-central regions farther south. In the south, there are only five locations (Celista, Okanagan Landing, Richter Pass, Rose Hill, Vernon) where wintering owls are occasionally recorded. In the Peace River region, however, February occurrences are more common and regular.

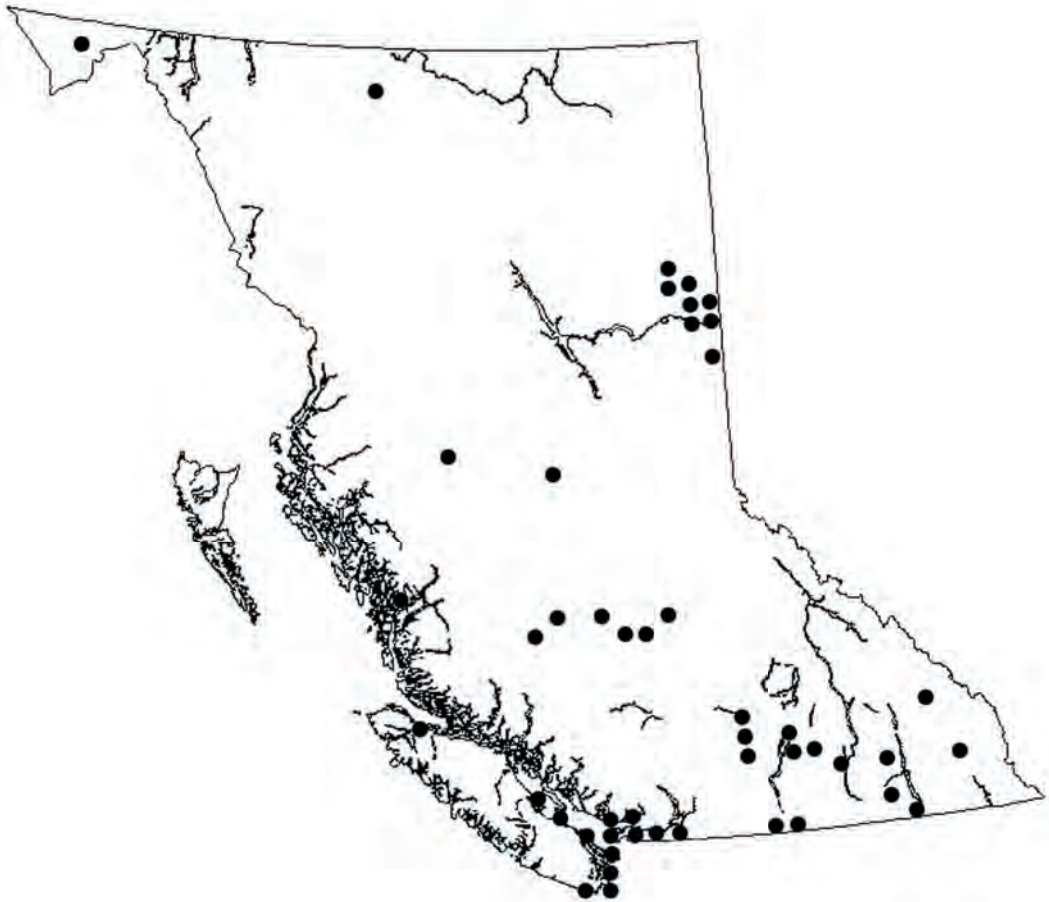


Figure 25. March: 11% of all records (see Figure 17). *Coast* – The northward movement from major wintering grounds in the Fraser River delta, and less commonly southern Vancouver Island, continues. Local populations are much reduced and in most years comprise only a few individual owls. The northward route and migration behaviour to Arctic breeding grounds is not known, as no records have been reported from the mainland coast or Haida Gwaii. *Interior* – Scattered records, usually of single birds, are found throughout the interior and in a few cases represent late departing overwintering birds. Again, some records may be offshoots from birds migrating from the Great Plains.

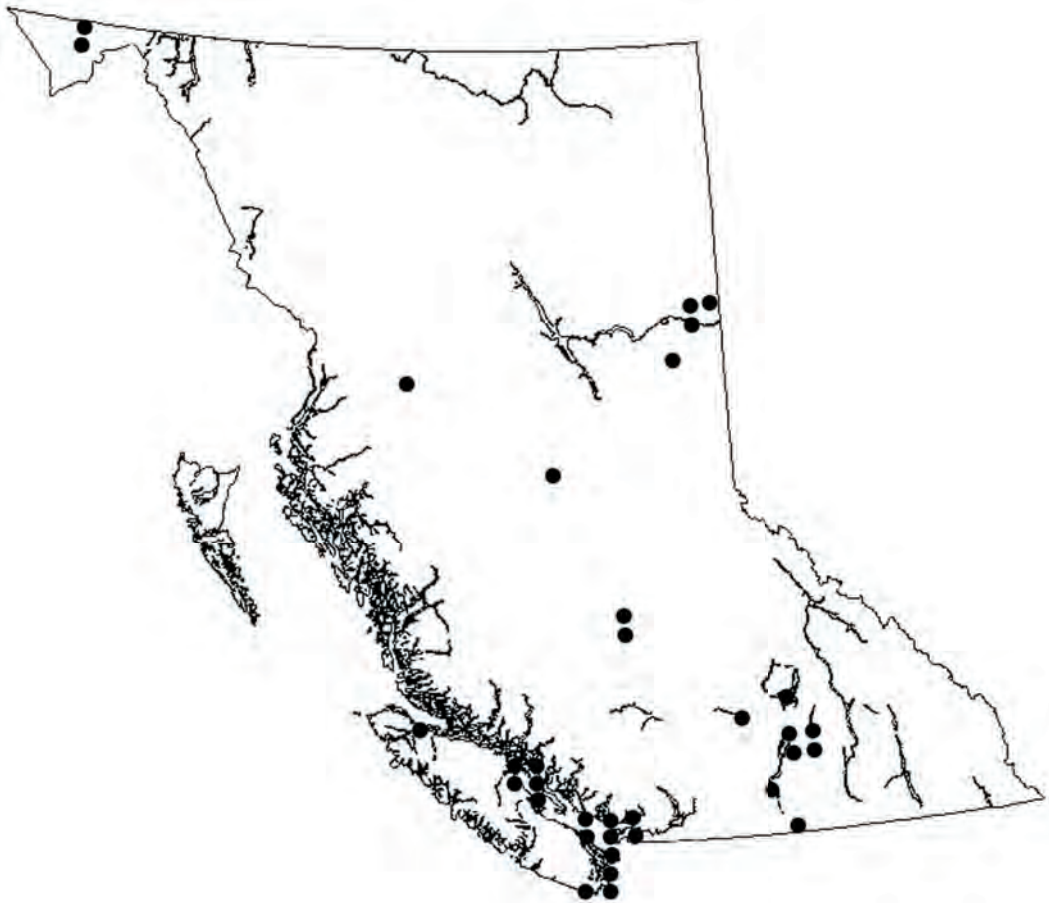


Figure 26. April: 3% percent of all records (see Figure 17). *Coast* – By mid-month most birds, all from the Strait of Georgia region, have departed. All records are of single birds, usually immatures. The latest date for southern Vancouver, from Trial Island, is 20 April 1985. *Interior* – Most interior occurrences are early in the month, of single birds, and immatures and the number of locations reporting Snowy Owls has been reduced by more than half. Latest dates for the Peace River region are 5 April 1988 (20 km east of Chetwynd) and 5 April 1981 (Cecil Lake).



Figure 27: May: Less than 1% of all records (see Figure 17). **Coast** – Occasionally single birds linger in the southwest along inner marine shores of the Strait of Georgia. The latest departure date is 12 May at Ladner. **Interior** – Less than 10 records all-time have been reported from interior locations since 1896, and most of these have been immature owls. The latest dates for three locations in the south are 5 May 1974 at Vernon in the northern Okanagan valley (Cannings et al. 1987), 22 May 2006 at 1,280 m elevation at Highland Valley (the largest open pit copper mine in Canada) located 75 km southwest of Kamloops (R.R. Howie pers. comm.), and Lavington on 26 May 2002 (P. Gehlen pers. comm.).



Figure 28. August: Less than 1% of all records (see Figure 17). *Coast* – not recorded. *Interior* – A single record from Nicks Island (Creston) was reliably reported on 4 August 2006. Presumably the same bird was photographed at Bonners Ferry, Idaho, on 26 and 29 August 2006 about 40 km south across the international border (The Virtual Birder 2006).



Figure 29. September: Less than 1% of all records (see Figure 17). **Coast** – In some years, not necessarily during irruptions, Snowy Owl may appear at locations on the inner south coast including Comox, the vicinity of Courtenay, Cumberland, Fraser River delta (*e.g.*, Sea Island), and southern Vancouver Island (*e.g.*, Uplands Park at Cattle Point), where waterbirds aggregate. Two earliest dates are 13 September 1971 at Sea Island (K.C. Boyce and B. Harman pers. comm.) and 19 September 1970 at Cattle Point (Victoria) (A.R. Davidson pers. comm.). These very early immigrants do not remain at the site but move elsewhere to unknown locations that apparently do not include Washington or Oregon (Wahl et al. 2005, Patterson 2006). In 1970, the Snowy Owl seen at Cattle Point remained for 12 days before leaving. **Interior** – Not recorded.



Figure 30. October: 1% of all records (see Figure 17). *Coast* – Occurrences are widely distributed along the coast including the east side of Haida Gwaii (Queen Charlotte Islands), southeastern Vancouver Island, and throughout the Fraser River delta. In northern regions, owls are transient but a few may remain throughout the month in southern areas. *Interior* – Snowy Owls may appear anytime during the latter part of the month from widely scattered locations. Most are transient and may be migrating southeast to the Great Plains (see Kerlinger and Lein 1988a). The earliest date for the Peace River region is 18 October 1984.

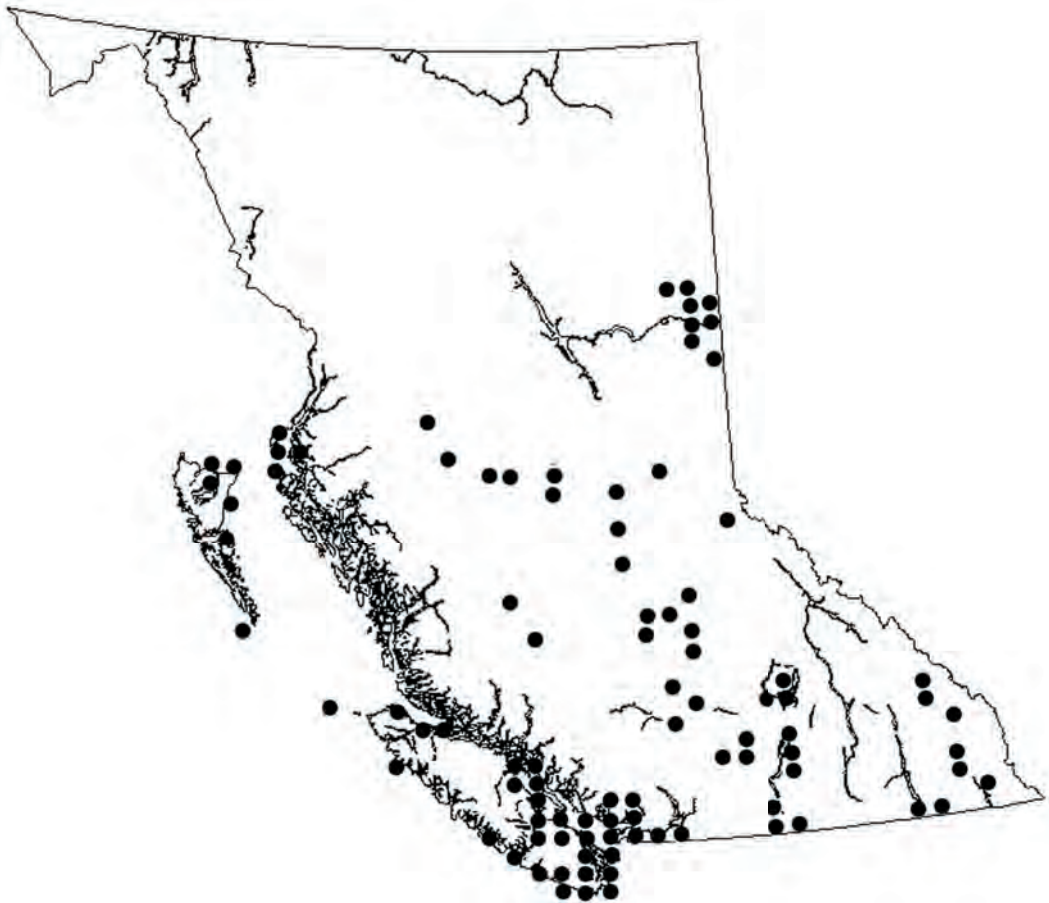


Figure 31. November: 14% of all records (see Figure 17). **Coast** – In most years, Snowy Owls migrate into the province during November, usually during the latter half of the month. The species is more widely distributed along the coast, showing up for the first time on the north mainland coast, west coast of Vancouver Island, Gulf Islands, and many more locations around the shores of the Strait of Georgia. Some birds are transient, moving farther south but many remain at favourite foraging locations. **Interior** – Migrants appear at more locations but most are transient. Some may remain for the winter in some years in the Peace River region, however, but less so in the northern Okanagan valley. In the Kootenay region, where Snowy Owl is casual, single birds may show up during the first and second week of the month (Figure 34).

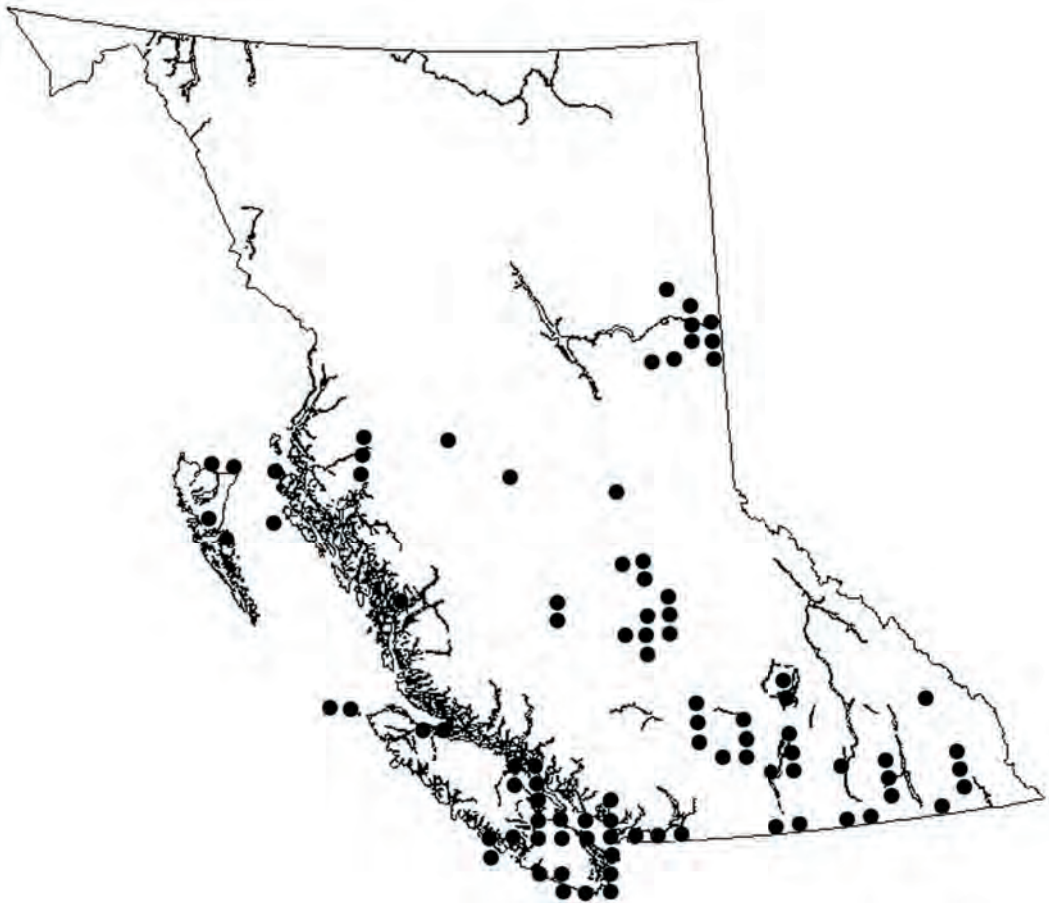


Figure 32. December: 25% of all records (see Figure 17). *Coast* – Migrants are still arriving throughout the month. Distribution is similar to November with a few more locations on the central mainland coast and northwestern Vancouver Island. Owls are transient except for several locations on southeastern Vancouver Island and the Fraser River delta. *Interior* – Migrants are still arriving throughout the month. Distribution is similar to that of November, with most owls being transient except in the Peace River region where winter territories may become established.

Behaviour in British Columbia

There is little information on the behaviour of Snowy Owl during its periodic visits to British Columbia. Most birdwatchers are happy just to see the owl as it roosts on some elevated perch in a sleepy state and seemingly not the least bit interested in what is happening around it (Figure 36). We have included a few miscellaneous observations from field notebooks and correspondence that may be of interest to others.

Chris Siddle (pers. comm.) relates two events from the North Peace River region. "On 4 November 1985, an immature Snowy Owl flew under a

neighbour's porch along 116th Avenue northeast of Fort St. John. Concerned about its welfare, Gerry Paille, Joan Johnston, and I netted the bird and kept it in my living room over night much to my kid's delight. The next morning I took it to Del Parker, a provincial Conservation Officer, for care. Unfortunately the owl would not swallow prey items fed to it and died about 7 November in captivity. A second behavioural note occurred on 21 February 1987. An immature Snowy Owl was perched near the top of a 12 m snag in a Trembling Aspen clump at 259th and 256th roads north of North Pine. A Common Raven (*Corvus corax*) flew in and for 10 minutes perched within 1.5 to 3 m of the owl. The raven fluffed its throat feathers

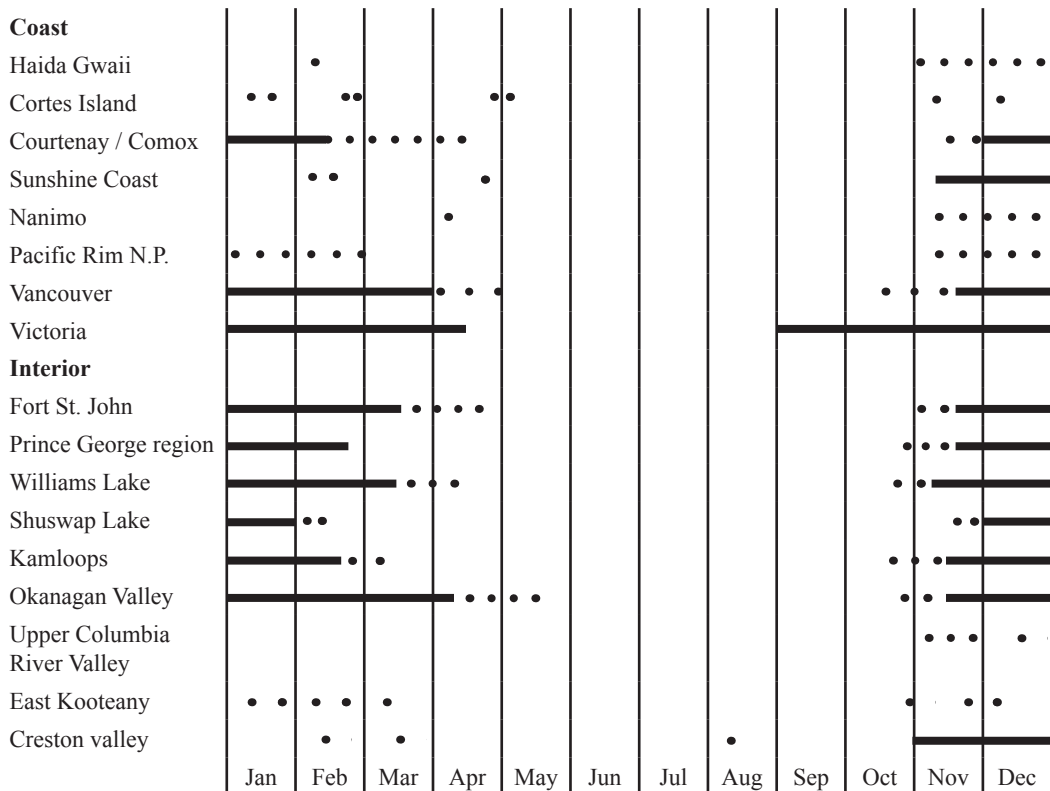


Figure 33. Annual occurrence of Snowy Owl for eight coastal and nine interior locations and regions of British Columbia. Sites and regions are listed from north to south for the coast and interior. Thin bars: uncommon during years of irruption; Dots: rare anytime; and Blank: does not occur. Information was extracted from *The Birds of British Columbia* (Campbell et al. 1990), regional checklists (see Acknowledgements), published and unpublished literature, and electronic databases.



Figure 34. Snowy Owl is a very infrequent visitor to the West and East Kootenay region of the province. This bird, appearing like a statue on a granite rock, was photographed by Karen Pidcock about 1.5 km north of Brisco, BC on 10 November 2008.



Figure 35. Snowy Owl nest is a shallow hollow scraped out on the ground by the female. Southhampton Island, Nunavut Territory, Canada. July 1975 (Michael C.E. McNall).

a lot and called and repeatedly tried to grab the owl's tail from behind it. The owl was always too quick for the raven, turning and facing the tricky corvid, which eventually flew off unsuccessful in dislodging the owl."

On the south coast, several people reported behaviourisms that are worthy of note. The late J. E. Victor Goodwill (pers. comm.) received a telephone call from Glenn Diers, the skipper of a boat travelling



Figure 36. The behaviour of individual Snowy Owls on their winter grounds is virtually unknown, even simple comfort movements such as wing-stretching, preening, and yawning. Saint Barthelemy, QC. 9 February 2010 (Alan D. Wilson).

between Washington and British Columbia on 20 November 1977, about an unusual passenger. Glenn first noticed a Snowy Owl perched among a flock of gulls off the south tip of Whidbey Island, WA. The gulls (mostly Glaucous-winged Gulls) continually harassed the owl until it eventually flew off and landed on his boat as it was passing nearby. The Snowy Owl remained perched on the boat as it passed through Washington state and Deception Pass and into Haro Strait to Discovery Island, off Oak Bay, BC, where it flew off. The trip lasted three hours and forty minutes!

At Comox, on eastern Vancouver Island, the late Theed Pearse made a few behavioural entries into his field notebooks. On 20 December 1950 he wrote: "*The Snowy has a rather striking flight. The wings are lifted high (look vertical; Figure 37), then down giving the bird a real lift and the impression of a powerful flier. This bird is quite at home in daylight. Some crows [Northwestern Crow, *Corvus caurinus*] around seemed alarmed but did not venture too close.*" On 13 November 1930, Theed watched a roosting bird for some time and wrote: "*Perched on a piece of wood, grass hiding it from behind; seemed sleepy as it had recently fed. In this sleepy form it was true to pictures; it looked at me with curiosity then would turn its head around closing its eyes. Later it jumped onto a log and did what a buzzard [e.g., Turkey Vulture, *Cathartes aura*] would do - arch its*

neck and stare at its feet. It was more alert now and took its position at the end of the log and seemed to become interested in birds feeding on shore in the distance. When I worked in behind the owl it lazily flew circling around to the beach.”



Figure 37. Early naturalists and collectors often recorded descriptions of wildlife behaviour in their field notes. Today it is a lost art but from this photograph of the Snowy Owl in flight one can sense the bird’s powerful flight on broad uplifted wings that Theed Pearse described. Saint Barthelemy, QC. 12 February 2010 (Elaine R. Wilson).

For several weeks in December 1973, a “large white owl with yellow eyes” perched on top of a large hotel in the downtown core of Vancouver. The bird disappeared during the day but returned each night and roosted next to a large roof vent. Later it was learned (C. Bryant pers. comm.) that heat was generated from the vent and the owl was taking advantage of a warm spot in the middle of a large city. Needless-to-say, the bird provided evening entertainment for many hotel guests in nearby buildings and on one occasion it was seen eating a pigeon [e.g., Rock Pigeon, *Columba livia*].

Feeding and Diet

Snowy Owl is a diurnal predator that prefers to search for prey during the early or late daylight hours. During the rest of the daytime period it perches at favourite roosts. Snowy Owl is a “sit-and-wait” predator (Figure 38). It uses exceptional vision to spot prey and can catch it in direct pursuit

or by pouncing from a perch or occasionally from a hovering position (Boxall and Lein 1982a).



Figure 38. Snowy Owl is a solitary “sit-and-wait” predator that waits motionless for prey to come within striking distance often using camouflage as an advantage. Dawson Creek, BC. 15 March 2007 (Gary S. Davidson).

Snowy Owl is an opportunistic hunter, feeding on a variety of animals including crustaceans, insects, amphibians, fishes, birds, and mammals (Johnsgard 1988, Parmelee 1992). On the breeding grounds lemmings (*Lemmus* sp. and *Dicrostonyx* sp.), and to a lesser extent voles (*Microtus* sp.), are principal components of the diet; during the non-breeding period in southern regions a much larger prey base is utilized. The species then transcends from being a specialist in summer to becoming a generalist in winter.

Since the large bones and feathers of prey animals remain undigested in Snowy Owl pellets (Figure 39) they can be used reliably to identify prey items (Mikkola 1983). Regurgitated pellets are large, rough-looking cylindrical items often laced with projecting feathers and bones (Figure 40). In southwestern British Columbia, pellets (n= 98) ranged in size for males and females combined, from 39 mm (1.5 in) to 118 mm (4.6 in) long and 18 mm (0.7 in) to 39 mm (1.5 in) (mean) thick.

The daily food requirements of Snowy Owl have been studied for confined and captive birds. Watson (1957) estimated a single owl would require between 150 and 350 grams (0.3 - 0.7 lb) of food per day.



Figure 39. Between 18 and 24 hours after feeding, a Snowy Owl regurgitates an oval pellet containing indigestible bones, teeth, fur, or feathers of its prey. Regurgitation may take place almost anywhere but at regular feeding perches, where dozens of pellets may be found, the contents can be examined to develop a diet profile. Saint Barthelemy, QC. 11 February 2010 (Alan D. Wilson).

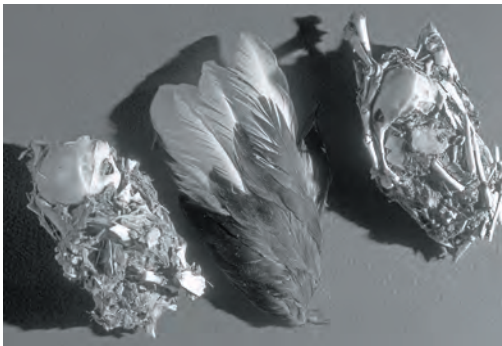


Figure 40. This close-up photograph of three Snowy Owl pellets collected on marine islands off Victoria, BC contain remains of a Horned Grebe. Great Chain Island, BC. 10 March 1974 (R. Wayne Campbell).

Later Gessaman (1972) indicated that daily food requirements were higher, between 200 and 400 grams (0.4 - 0.8 lb). In Finland, a captive owl ate 338 grams (0.7 lb) of laboratory rats and mice per day and of the 26 food items produced 16 pellets at an average rate of 1.3 per day (Mikkola (1983). Parmelee (1992) suggests that with increased activity for a wild bird the daily energy intake would be more than 400 grams, or about the equivalent of the weight of a Horned Grebe (see Figure 41).

The Snowshoe [Varying] Hare (*Lepus americanus*) is a large prey item that is usually taken by Snowy Owls in more northern parts of its range. In British Columbia, it has only been recorded as prey at Celista in the Shuswap Lake area in the late 1940s (Table 7). Since the mammal weighs about 1.34 kilograms (Nagorsen 2005) it is conceivable that the owl might have difficulty securing and killing the hare. Meinertzhagen (1959) describes the method Snowy Owls use to attack and hold the large Arctic Hare (*Lepus timidus*) in Europe. He says “*The owl will grasp the hare with one foot and use the other as a brake in the snow; it will also use its wings as brakes when being dragged.*”

In British Columbia, there are only two articles on quantitative pellet analysis for Snowy Owls, one from a marine environment (Campbell and MacColl 1978) and the other from terrestrial habitats (van Thienen 1979). In addition, there are at least 96 incidental observations of Snowy Owls with prey in the province reported by field naturalists or anecdotal published accounts (Table 8).

During the irruption winter of 1973-1974, up to five Snowy Owls frequented small rocky islets off southern Vancouver Island. Pellets were collected at roost sites every 10 days between 22 December 1973 and 10 March 1974; in the laboratory, bone and feather fragments were compared with museum specimens (Campbell and MacColl 1978). Twenty-two species of birds were identified, of which 16 were marine waterbirds (Table 7). Horned Grebe (*Podiceps auritus*) (34.9%; Figure 41) and Bufflehead (*Bucephala albeola*) (24.0%) were the prey most selected and together accounted for 42% by weight (Table 7). Most of the species identified were new contributions to the diet profile of Snowy Owl during its irregular winter wanderings into southern Canada and the northern United States. Recently Robertson and Gilchrist (2003) reported on the importance of sea ducks in the diet of Snowy Owls wintering in the Belcher Islands, Nunavut, in northern Canada.

Table 7. Prey of Snowy Owls wintering on rocky islands in a marine environment near Victoria, British Columbia, 1973 to 1974.¹

Species	Location				
	Average Weight (g) ²	Mary Todd Island	Greater Chain Island	Percent of total	Percent by weight
Red-necked Grebe	875	2	1	1.4	2.2
Horned Grebe	400	32	42	34.9	24.6
Western Grebe	715	0	1	0.5	0.1
<i>Grebe Subtotal</i>		32	44	36.8	26.9
Mallard	1,100	3	0	1.4	2.7
American Wigeon	750	12	6	8.4	11.8
Greater Scaup	1,000	5	2	3.3	3.7
Lesser Scaup	800	1	0	0.3	0.6
Bufflehead	430	27	24	24.0	17.4
Harlequin Duck	600	1	11	5.7	5.9
White-winged Scoter	1,300	0	1	0.5	1.0
Surf Scoter	950	1	0	0.5	45.8
<i>Waterfowl Subtotal</i>		50	44	44.3	45.8
Killdeer	95	1	0	0.5	0.1
Black-bellied Plover	180	1	0	0.5	0.1
Dunlin	55	0	1	0.4	0.0
<i>Shorebird Subtotal</i>		2	1	1.4	0.3
Glaucous-winged Gull	1,200	5	16	9.9	21.0
Mew Gull	700	3	1	1.9	2.3
<i>Gull Subtotal</i>		8	17	11.8	23.3
Pigeon Guillemot	450	1	4	2.3	1.9
Cassin's Auklet	167	0	1	0.5	0.1
Rhinoceros Auklet	518	0	3	1.4	1.3
<i>Alcid Subtotal</i>		1	8	4.2	3.3
Short-eared Owl	325	0	1	0.5	0.2
American Robin	85	1	0	0.5	0.1
Western Meadowlark	100	0	1	0.5	0.1
Total		53	86	100	100

¹Reprinted with permission from Campbell and MacColl 1978.

²Weights from pre-prepared specimens in Royal British Columbia Museum collection.



Figure 41. In a quantitative analysis of Snowy Owl pellets near Victoria, BC, during the winter 1973 - 1974, Horned Grebe, a common, small, marine water bird, accounted for nearly 35 percent of all identified prey items. Blackie Spit, BC. 27 November 2009 (Alan D. Wilson).

Table 8 lists an additional 122 records, mostly field observations, of Snowy Owls with prey in terrestrial habitats, including coastal and interior locations. Individual owls were either seen holding prey, roosting next to prey, or in the process of eating. Some of the prey reported dead may have been recently killed, or wounded, by hunters (Figure 42) and likely scavenged (*e.g.*, Great Blue Heron). Birds ($n=91$; 74.6%), representing at least 16 species, were the most reported prey, with waterfowl (60.4%) accounting for most of the birds (Figure 43). Mammals ($n=31$; 25.4%), representing seven species, accounted for the remainder of observed prey items. Whereas much of the prey was identified to species (Figure 44), some prey remains were not and are thus listed in groups such as “duck sp.” and “shorebird sp.”

Individual Snowy Owls may defend exclusive hunting ranges during their period of residency on the wintering grounds (Boxall and Lein 1982). This has also been noted in British Columbia where the sex, age, and individual identity of a bird are known. This was the case at Prospect Lake on southern Vancouver Island where an adult female owl killed 12 resident Mallards (Figure 42; *Anas platyrhynchos*) during a 32-day period from 11 November to 12 December 1950 (Table 8). Not all of the ducks were eaten. Unless hunting or being disturbed Snowy Owls are

rarely seen flying, partially due to their crepuscular habits, so documenting prey in the field is a rare event. Unlike owls on other major wintering areas in central North America, where rodents predominate in the diet (see Boxall and Lein 1982), Snowy Owls in British Columbia appear to depend heavily on birds as a source of food, especially on the coast.

Mortality in British Columbia

The following summary of injured and dead Snowy Owls reported in British Columbia has been extracted from our databases, museum catalogues, annual reports of wildlife rehabilitators, published and unpublished literature, discussions with biologists and conservation officers, carcasses brought into various federal and provincial government offices for permits (Figure 45), and taxidermists. Unfortunately many of the birds lacked specific information on location, date, and collector since it is illegal to have a Snowy Owl in possession and many people were reluctant to provide what could be incriminating evidence.

Parmelee (1992) notes that it is mistakenly assumed that Snowy Owls migrating or dispersing southward from arctic regions each year die from starvation. While this may be true for some birds regionally, especially juveniles, recent research by Kerlinger and Lein (1988b) in southern Alberta, suggest other factors are more significant. They performed necropsies on 76 salvaged specimens and found that 45% of the carcasses had moderate to heavy fat deposits and that traumatic injuries such as collisions with automobiles and utility lines, were the main cause of mortality.

The causes of 177 deaths reported or observed in British Columbia, separated into 24 categories, include: shooting (44 birds; 24.9%), starvation (assumed; 23 birds; 13.0%), found dead (22 birds; 12.4%), museum and private collecting (21 birds; 11.7%), unknown (14 birds; 7.9%; Figure 46), broken wing (11 birds; 6.2%), trauma (9 birds; 5.1%), collision with utility (telephone and power) lines (7 birds; 4.0%); collision with airplane (3 birds; 1.7%), trapping (3 birds; 1.7%), collision with vehicle (2 birds; 1.1%), disease (2 birds; 1.1%; see Dawe 1976), electrocution (2 birds; 1.1%), lead poisoning (indirect; 2 birds; 1.1%), lesions (2 birds;

Table 8. Observed prey of Snowy Owls wintering in terrestrial habitats in coastal and interior locations of British Columbia, 1928 to 2009.

Species	Location	Date	Number¹	Source^{2,3,4}
Birds				
American Wigeon	Sea Island	12 Dec 1964	1 (dead)	W.M. Hughes ²
American Wigeon	Iona Island	19 Jan 1965	1 (dead)	R.W. Phillips ²
American Wigeon	Sea Island	2 Jan 1966	1 (dead)	A. Sharpe ²
American Wigeon	Westham Island	12 Dec 1970	1 (m)	W.H. Hesse ²
American Wigeon	Tsawwassen	6 Feb 1971	1 (dead)	K. Kennedy ²
American Wigeon	Sea Island	17 Nov 1971	1 (dead)	R.W. Campbell ⁴
American Wigeon	Delta	14 Jan-16 Mar 1979	1	van Thienen (1979)
Mallard	Prospect Lake	11 Nov-12 Dec 1950	12	M. Oldfield ²
Mallard	Ladner	22 Dec 1966	1 (f)	R.W. Phillips ²
Mallard	Sea Island	13 Dec 1970	1 (f)	R.W. Campbell ⁴
Mallard	Vernon	19 Jan 1985	1	Cannings et al. (1987)
Green-winged Teal	Boundary Bay	26 Feb 1967	1 (m)	R.W. Phillips ²
Lesser Scaup	Iona Island	12 Feb 1965	1	R.W. Phillips ²
Bufflehead	Vernon	8 Dec 1928	1	Munro (1929)
Bufflehead	Delta	14 Jan-16 Mar 1979	1	van Thienen (1979)
Duck sp.	Victoria	9 Jan-3 Mar 1950	7	C.J. Guiguet ²
Duck sp.	Iona Island	13 Mar 1967	1	R.W. Phillips ²
Duck sp.	Tsawwassen	15 Nov 1971	1 (dead)	J.E. Polson ²
Duck sp.	Sea Island	28 Nov 1973	1 (dead)	A. Sharpe ²
Duck sp.	Delta	14 Jan-16 Mar 1979	19	van Thienen (1979)
Ring-necked Pheasant	Delta	13 Feb 1965	1 (f)	R.W. Phillips ²
Ring-necked Pheasant	Westham Island	17 Dec 1970	1 (dead)	B. Davies ²
Great Blue Heron	Tsawwassen	5 Mar 1968	1 (dead)	R.W. Phillips ²
American Coot	Iona Island	14 Nov 1964	1 (dead)	R.D. Harris ³
American Coot	Iona Island	25 Feb 1965	1 (dead)	R.W. Phillips ²
American Coot	Iona Island	23 Dec 1968	1 (dead)	R. W. Campbell ⁴
American Coot	Iona Island	18 Nov 1970	1 (dead)	R.W. Campbell ³
American Coot	Iona Island	18 Nov 1972	1 (dead)	R.W. Campbell ³
Black-bellied Plover	Sea Island	29 Nov 1964	1	W.M. Hughes ²
Dunlin	Sea Island	13 Dec 1964	1	A. Sharpe ²
Dunlin	Iona Island	25 Feb 1965	1	R.W. Phillips ²
Dunlin	Delta	3 Jan 1970	1	R.W. Phillips ²
Dunlin	Iona Island	9 Nov 1970	1	J. Smith ²
Shorebird sp.	Iona Island	12 Nov 1971	1	C. Whitney ²
Shorebird sp.	Iona Island	13 Nov 1971	1	V. Newson ²
Mew Gull	Sea Island	9 Dec 1977	1 (dead)	R.W. Campbell ³
Glaucous-winged Gull	Ladner	1 Feb 1970	1 (dead)	R.S. Jerema ²
Glaucous-winged Gull	Sea Island	12 Dec 1973	1 (dead)	A. Sharpe ²

Table 8 continued

Shorebird sp.	Iona Island	13 Nov 1971	1	V. Newson ²
Mew Gull	Sea Island	9 Dec 1977	1 (dead)	R.W. Campbell ³
Glaucous-winged Gull	Ladner	1 Feb 1970	1 (dead)	R.S. Jerema ²
Glaucous-winged Gull	Sea Island	12 Dec 1973	1 (dead)	A. Sharpe ²
Glaucous-winged Gull	Delta	14 Jan-16 Mar 1979	3 (dead)	van Thienen (1979)
Glaucous-winged Gull	North Saanich	15 Feb 1981	1 (dead)	R.W. Campbell ³
Gull sp.	Iona Island	17 Mar 1971	1 (dead)	W.S. Rae ²
Common Murre	Boundary Bay	27 Jan 1967	1 (dead)	R.W. Phillips ²
Rock Pigeon	Victoria	14-26 Nov 1950	2	C.J. Guiguet ³
Rock Pigeon	New Westminster	5 Nov 1970	1	J. Byres ²
Rock Pigeon	Vancouver	13 Nov 1974	1	R.W. Campbell ³
Short-eared Owl	Sea Island	29 Nov 1964	1 (dead)	W.M. Hughes ²
Short-eared Owl	Boundary Bay	1 Jan 1972	1 (dead)	W.H. Hesse ³
Red-winged Blackbird	Delta	14 Jan-16 Mar 1979	1	van Thienen (1979)
Unidentified bird	Vancouver	7 Nov 1971	1	T.G. Ward ²
Unidentified bird	Delta	14 Jan-16 Mar 1979	4	van Thienen (1979)
<i>Birds Subtotal</i>			91	
Mammals				
Snowshoe Hare	Celista	6-13 Dec 1947	2	G.R. Ryder ²
Snowshoe Hare	Celista	1-29 Jan 1948	3	G.R. Ryder ²
Snowshoe Hare	Celista	8-29 Jan 1949	2	G.R. Ryder ²
Meadow Vole	Separating Lake	Apr 2006	2	K. Andrews ²
Townsend's Vole	Delta	9 and 17 Jan 1965	1	R.W. Phillips ²
Townsend's Vole	Boundary Bay	5 Nov 1970	1	R.W. Phillips ²
Townsend's Vole	Reifel Island	30 Nov-18 Dec 1970	4	B. Davies ²
Townsend's Vole	Westham Island	18 Dec 1970	1	B. Davies ²
Townsend's Vole	Reifel Island	7 Nov-31 Dec 1971	5	B. Davies ²
Townsend's Vole	Delta	14 Jan-16 Mar 1979	1	van Thienen (1979)
Deer Mouse	North Saanich	Feb 1981	2	M. Nyhof ²
Muskrat	Sea Island	26 Dec 1970	1 (dead)	J. Toochn ²
Muskrat	Mud Bay	11 Nov 1971	1 (dead)	G. Arnold ²
Muskrat	Boundary Bay	13 Nov 1971	1 (dead)	R.W. Campbell ⁴
Muskrat	Westham Island	5 Mar 1972	1 (dead)	R. Meyer
Domestic Cat	Victoria	13-18 Jan 1967	2	C.J. Guiguet ²
Ermine	Celista	28 Dec 1947	1	G.R. Ryder ²
<i>Mammals Subtotal</i>			31	
Total			122	

¹Includes (dead) - Snowy Owl observed feeding on carcass, (f) - female, and (m) - male.

² pers. comm, ³ fide, ⁴ pers. obs.



Figure 42. During the 1960s and into the early 1970s, hundreds of American Coots were shot and left abandoned in sewage ponds at Iona Island, BC by hunters. Some of these carcasses were eaten by Snowy Owls. On 29 October 1968, 11 freshly shot coot carcasses were counted along one shore of the outer sewage pond (R. Wayne Campbell).

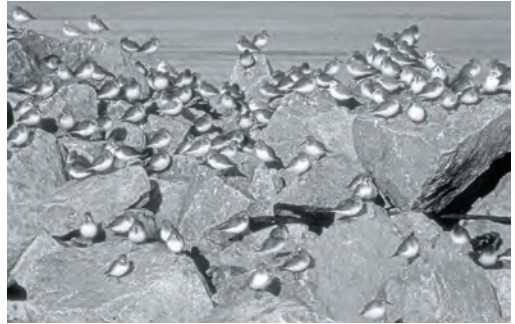


Figure 44. Dunlin, a common wintering species in the Fraser River delta, BC, roosts in the evening on rock jetties, beaches, and spits where it can easily be captured by crepuscular-hunting Snowy Owls. Iona Island, BC. 21 December 1969 (R. Wayne Campbell).



Figure 43. Snowy Owl holding breast feathers of a female Mallard, one of nine species of ducks identified as prey in British Columbia. Sea Island, BC. 13 December 1970 (Ervio Sian).



Figure 45. The British Columbia Conservation Officer Service has been a major source of information on mortality of Snowy Owl in the province. This juvenile, caught in a barbed-wire fence in Creston, was picked up alive on 2 November 1993 and later returned to the wild. (Reproduced with permission *Creston Valley Advance* newspaper; Tim Renneberg).

1.1%), predation (Bald Eagle and possibly Golden Eagle; 2 birds; 1.1%, see Munro 1946), blind in one eye (1 bird; 0.6%), broken leg (1 bird; 0.6%), caught on barbed wire fence (1 bird; 0.6%; see Figure 45), collision with building (1 bird; 0.6%), drowning (1 bird; 0.6%), entangled in fish netting (1 bird; 0.6%), found frozen (1 bird; 0.6%), and inclement weather (storms and heavy rain; 1 bird; 0.6%).

Indiscriminate shooting (44 birds) accounted for nearly one-quarter of all instances of reported mortality and may be higher than reported in other regions in North America. The foreshore of the Fraser River delta, an area with the major concentration for wintering Snowy Owls in British Columbia, is also a popular hunting area. Many Snowy Owls were shot during the hunting season from the late 1950s to the mid-1980s.

Individual owl mortality attributed to starvation likely belongs to other categories as none of the birds was tested in the laboratory for fat condition. Unlike in southern Alberta, where collisions with vehicles was a major source of mortality (Kerlinger and Lein 1988b), only two instances were reported for British Columbia, both from interior locations where the species occurs less commonly and in much lower numbers.

Because Snowy Owl has few natural predators, the observation of a Bald Eagle eating a bird at Boundary Bay may have been one previously wounded or killed by hunters. The Golden Eagle incident was related to James A. Munro by school children near Vanderhoof. He reported "*according to the story told me by a pupil in the lakes District school this owl [Snowy Owl] was eaten, and presumably had been killed by a large raptor, probably a golden eagle. The eagle was flushed from the ground where it had been seen feeding on the owl*" (Munro 1946). In neither case was the predator actually observed killing the Snowy Owl. The finding of a Snowy Owl snagged on a barbed-wire fence appears to be the first incident reported for the species (see Allen 1990, Preston 2007).

Elsewhere in North America, Parmelee (1992) reported that in Alberta, causes of death or injury were collisions with unknown objects (46.5%), automobiles (14.1%), utility lines (4.2%), and

airplanes (1.4%); also gunshot wounds (12.7%), electrocution (5.6%), fishing tackle (1.4%). Only 14.1% was believed due to starvation.

Frequently Snowy Owls were found alive, often in a weakened condition, and were fed and rehabilitated for a short time and later released (Figure 47). These incidents were not included in mortality figures.



Figure 46. This Snowy Owl was found dead at Cluculz Lake, BC at the end of October 2004 of unknown causes. The picture was taken 30 October when she brought it into the British Columbia Ministry of Environment office in Prince George for a permit (Doug Wilson pers. comm.). The specimen ended up at the Mount Robson Park visitor's centre as a mount. Doug also remarked that since working as a civil servant in the central region of the province since 1991, this is the first time a Snowy Owl had been brought in for a permit.

Lifespan

Snowy Owl (Figure 48) may live longer than the maximum age of nine years and five months and 10 years and eight months recorded in the wild (Glutz and Bauer 1980 and Klimkiewicz and Futcher 1989 respectively) because a bird lived for at least 28 years in captivity in Switzerland (Schenker 1978).



Figure 47. Some Snowy Owls not included in the list of mortalities were found in a weakened condition, picked up and fed for a week or so, and later released, apparently able to successfully fend for themselves. One bird, a female that could be identified from plumage, was caught in late November 1966, released in early December 1966 and was last seen in early March 1967 the following spring. Ladner, BC. December 1966 (R. Wayne Campbell).



Figure 48. The life span for a Snowy Owl in the wild may approach 12 years but it could reach nearly three decades, as the known age for a captive bird is 28 years Saint Barthelemy, QC. 9 February 2010 (Alan D. Wilson).

Populations and Trends

Christmas Bird Counts

The Christmas Bird Count (CBC) began in North America on 25 December 1900 as alternative to hunting birds. Since then, more than 2,000 CBCs have been established throughout the world, and more than 53,000 volunteers participate in the annual counts. In British Columbia, the first counts were established in Vancouver (Figure 49) and Ladner during the winter of 1958/1959. Sixteen years later the first interior count was established at Shuswap Lake Park. The National Audubon Society (NAS) and Bird Studies Canada (BSC) jointly oversee the coordination of Christmas Bird Counts and act to store, compile, and make-available the data and results. Christmas Bird Counts registered with NAS and BSC have a permanent and fixed count area (468 km²; 12.2-km radius circle) and a minimum number of participants. There are several “unofficial” counts that undoubtedly provide much enjoyment to the participants, as well as a snapshot of local winter bird abundance, but the results are not collated with “official” count data.

As of the 110th Audubon CBC (winter 2005/2006), 100 “official” count locations have been established in British Columbia. However, the most number of counts surveyed in a single year is 78, with 38 on the coast and 40 in the interior. There are 29 CBCs in British Columbia that have more than 25 years of annual count data; many of these years are consecutive.

In British Columbia, Snowy Owl is by no means a common species on Christmas Bird Counts. Snowy Owl was first detected on the Ladner CBC during the winter of 1962/1963, four years after counts began in the province. Over the next 47 years, Snowy Owl was observed in 41 of those years, but cumulatively on only 22 of the 100 counts. When Snowy Owl was present in a given count-year, the number of counts that reported Snowy Owl ranged from one to eight; the average annual number of counts reporting Snowy Owl was just 1.9 (Figure 50).

Snowy Owl can be highly irruptive, not just in British Columbia, but throughout its summer and winter range elsewhere. Most irruptions correlate with peaks in lemming abundance on the breeding

grounds, which in turn supports high nestling, juvenile, and adult survival. A result of this high reproductive output and adult survival on the breeding grounds is a ‘spike’ or irruption in the number of birds occurring on southern wintering grounds. Population cycles of Snowy Owl occur at three to five year intervals, and average 3.9 years (Parmelee 1992). This trend is evident when looking at Christmas Bird Count results for Canada (Figure 51), but much less so in British Columbia (Figure 52). In British Columbia, notable irruptions have been recorded in the winters of 1973/1974, 1984/1985, 1996/1997, and 2005/2006 (Figure 52). The biggest irruption in British Columbia, resulting in 164 birds on four coastal counts, did not correspond with a spike in Canada, but the other three spikes in the province did. These ‘big’ peaks occurred at intervals of 7, 11, 12, and 9 years (average = 9.75 years), suggesting that the next big irruption in British Columbia is likely to occur between the winters of 2012/2013 and 2017/2018. Notably, however, the trend in the total number of birds that comprise a “big” count

has decreased over time, a possible sign of overall population decline.



Figure 49. During annual Christmas Bird Counts in British Columbia, every conceivable habitat that is accessible, including urban waterways, are searched for birds. Vancouver, BC. December 1968 (R. Wayne Campbell)

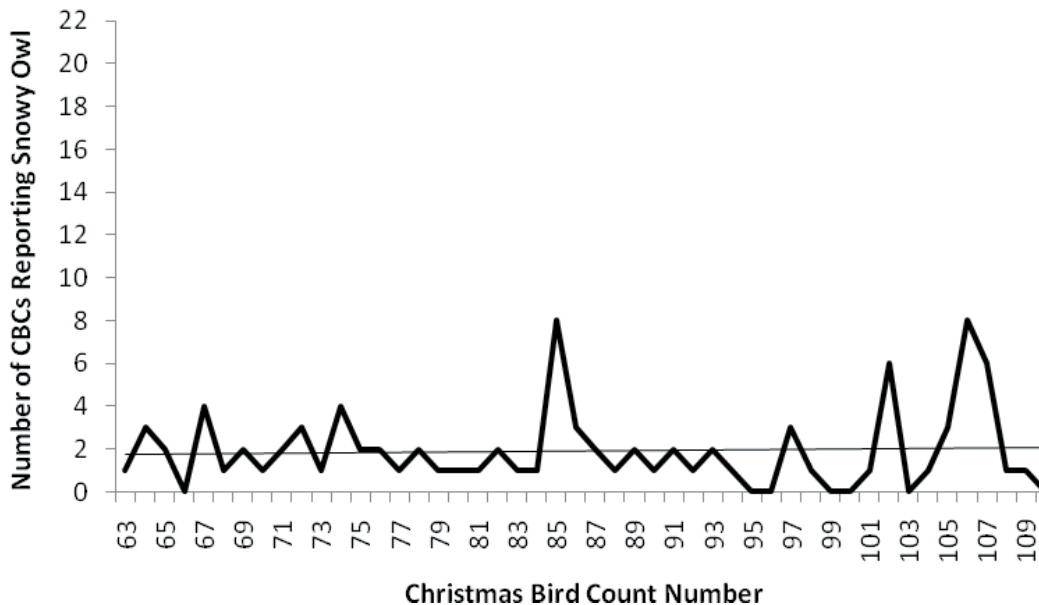


Figure 50. Annual number of Christmas Bird Counts in British Columbia that report Snowy Owl. The maximum y-axis value is the number of Christmas Bird Counts that have reported Snowy Owl in British Columbia.

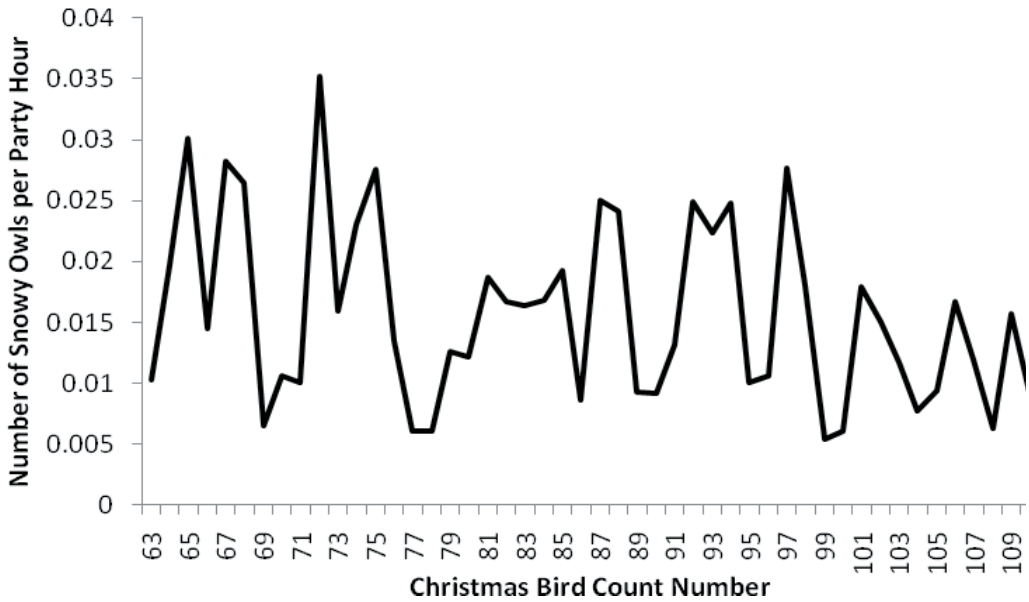


Figure 51. Population fluctuation of Snowy Owl in Canada. Data from the National Audubon Society (<http://birds.audubon.org/christmas-bird-count>).

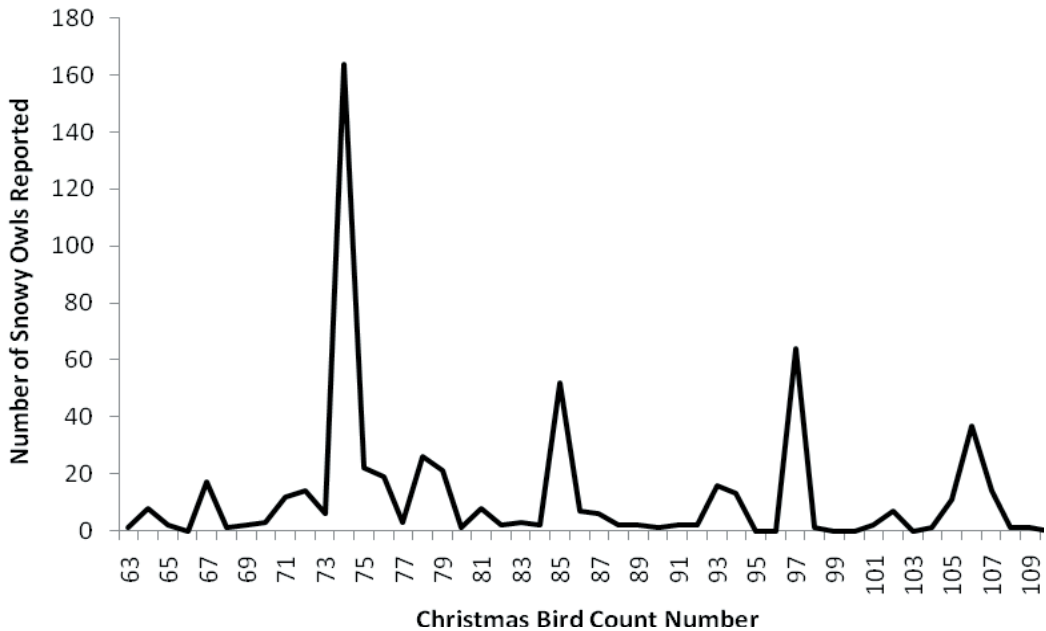


Figure 52. Population fluctuation of Snowy Owl in British Columbia.

Smaller irruptions (≥ 10 birds reported) in British Columbia were reported in the winters of 1966/1967, 1970/1971, 1971/1972, 1974/1975, 1975/1976, 1977/1978, 1978/1979, 1992/1993, 1993/1994, 2004/2005, and 2006/2007 (Figure 52). Among these smaller irruptions, many occurred in two consecutive winters, or in three successive years that included a big irruption. As with the general decline in total owl abundance on big irruption years, there is also a general decline among all years that have peaks. Since Snowy Owl was first counted on a Christmas Bird Count in British Columbia, the first 17 years (1962/1963 to 1978/1979) included eight counts with peak years (47%). Compare this with the last 17 years (1993/1994 to 2009/2010) and the number of years with peaks was only five (29%). The average periodicity (years between counts with ≥ 35 birds) of Snowy Owl irruptions in British Columbia is 2.16 years; when years with small peaks are included (≥ 10 birds) the average periodicity is 3.7 years.

Of the 22 CBCs in British Columbia that have reported Snowy Owl, Ladner stands out as having the count with the most consistent year-to-year observations and the highest counts. Since the winter of 1963/1964, Ladner has conducted 45 CBCs, of which 31 (69%) have had one or more Snowy Owls. Despite large year-to-year variation in abundance on

every count, the average annual number for Ladner was 9.1 birds, which is significantly higher than all other CBCs in British Columbia (Figure 53). In 29 of 45 Ladner counts, Ladner contributed at least half the total number of birds counted in the entire province (Figure 54).

The southwest coast consistently has the most number of Snowy Owls on average, with Ladner, Vancouver and Surrey leading the way, followed by Victoria, White Rock, and Comox (Figure 53). The highest single-year (1973/1974) count for Ladner was 107 birds – more than a quarter of the 410 birds recorded all-time for this count, and 6 times greater than Vancouver’s all-time count of 67 birds. Other coastal single-year high counts include Ladner with 62 birds in 1996/1997 and 40 birds in 1984/1985, and Vancouver with 27 birds in 1973/1974.

In the interior, Dawson Creek has the highest average annual abundance, followed by North Pine and McBride (Figure 53). The Dawson Creek count, which has been running for 11 years (1999/2000 to 2009/2010), was the most productive interior count on average, with birds occurring on four of the 11 counts. The highest single-year (2005/2006) count for Dawson Creek was four birds. All other interior counts have either zero, one, or two birds in a given winter.

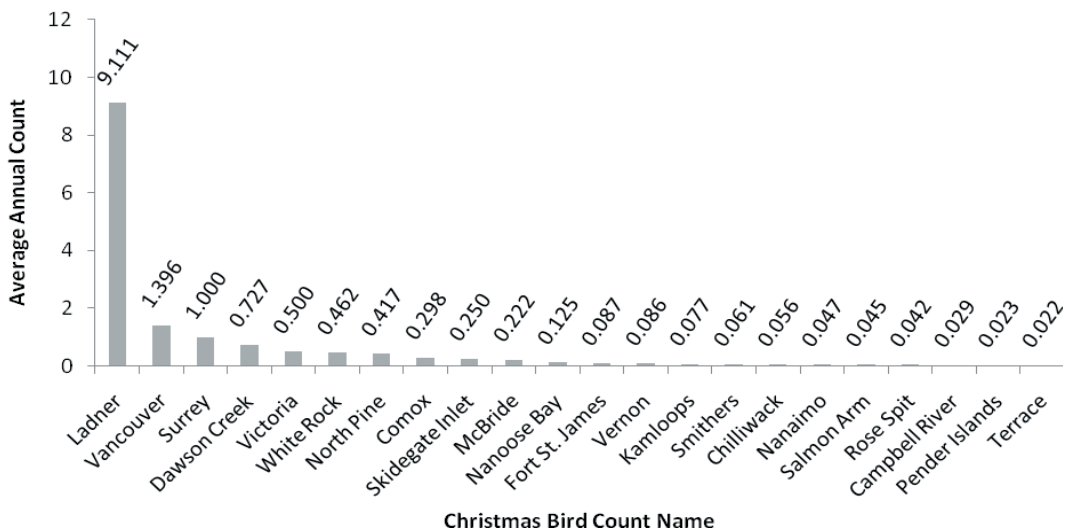


Figure 53. Average annual count of Snowy Owl among the 22 CBCs that have reported the species.

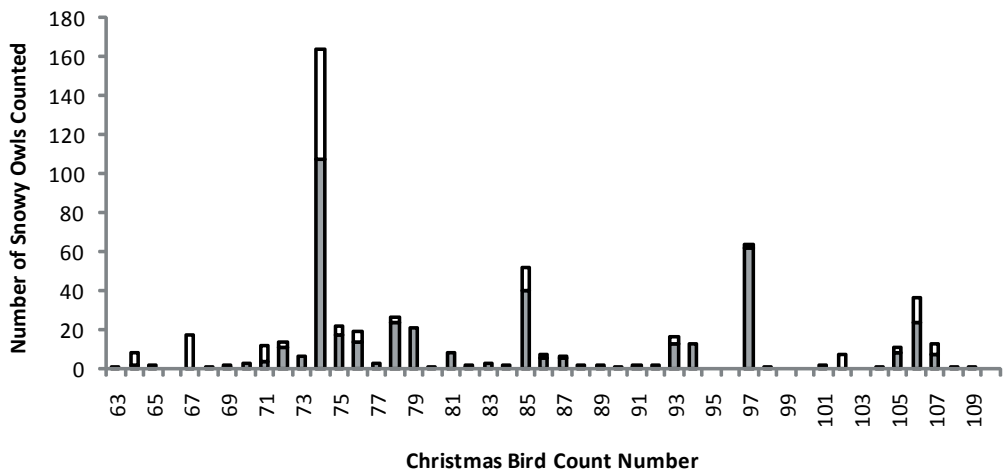


Figure 54. Total number of Snowy Owls occurring on the Ladner CBC (gray bars) compared to the total number of Snowy Owls reported from all other CBCs in British Columbia (white bars).

Conservation and Management

Snowy Owl remains relatively safe and undisturbed on its far northern breeding grounds but faces increasing challenges during its periodic southern irruptions, and in some cases regular migrations, across southern Canada and the northern United States. Human activities, which can be considered harmful or beneficial, appear to have the greatest impact on Snowy Owl during its nonbreeding period in British Columbia. Five categories of interactions with humans have been identified.

Habitat Alteration

This is the single most important issue to be considered in safeguarding Snowy Owls during their period of residence in British Columbia. It is well known that a particular habitat can only support a limited number of owls and there are very few locations in the province where Snowy Owls are found in numbers and seen fairly regularly.

Snowy Owl is not a common or regularly observed species in British Columbia every year. The Fraser River delta, especially the Ladner region, however, is the favourite destination for owls during years of irruption. In 1973, counts of wintering Snowy

Owls along foreshore marshes and beaches and perching in adjacent agricultural land here produced 107 birds, the all-time North American high count for Christmas Bird Counts (Monroe 1974). Other less important, but still significant, winter habitats include agricultural fields in the vicinity of Dawson Creek and Fort St. John. They are found far less frequently in grasslands around Vernon in the north Okanagan valley. Occasionally coastal estuaries are used in winter for lengthy stays.

Since agriculture came to the Fraser River delta in 1868, over 70% of the original wetland habitat has been lost to dyking, drainage, and urbanization. Although the provincial Agricultural Land Reserve (ALR) protected some prime agricultural land, pressure from urban growth, diversifying agricultural practices (*e.g.*, greenhouse farming; Figure 55), and recreational activities (*e.g.*, golf courses) have greatly impacted space and foraging areas for wintering Snowy Owls. The ALR lost 11,547 hectares of land in the last 35 years and by 2008 the entire Lower Mainland region had lost 115.47 square kilometres of agricultural lands since the designation of the ALR in 1974 (Raftis 2009).

The only remaining habitat, foreshore beaches and marshes, have also been altered. Some of



Figure 55. In the 1990s, several large greenhouses were built on farmland in Delta to raise vegetables and flowers and diversify agriculture. By 2001, about 130 ha were “under glass” which represents about 1.6% of the Agricultural Land Reserve in the region (Saddlemeyer et al. 2001). Delta, B.C. 4 December 2009 (Mark Nyhof).

these developments include construction of the Tsawwassen Ferry Terminal in 1959, Vancouver International Airport in 1968 and a new runway in 1996, and Delta Port expansion in the late 1990s.

Despite intense and constant pressure for non-agricultural development, the seaward portion of Boundary Bay - Roberts Bank - Sturgeon Bank - Westham Island and Reifel Island (Alaksen National Wildlife Area) outside the dyke have become part of a Ramsar site during the 1990s as a coastal wetland of international significance. In addition the provincial government has designated 11,000 ha of Boundary Bay and Sturgeon Bank as Wildlife Management Areas.

In short, the amount of foraging and roosting land available to migrant and wintering Snowy Owls and other raptors and waterfowl, has been drastically reduced at one of the prime wintering sites on the continent. In 1993, local farmers and conservationists with an interest in conserving agricultural and wildlife resources in the Fraser River delta founded the *Delta Farmland and Wildlife Trust* (www.deltafarmland.ca). Their mission is to “promote the preservation of farmland and associated wildlife habitat on the Fraser River delta through sustainable farming and land stewardship.” The hunting territories of Snowy Owls are large and fragmentation of habitat will

continue. Retaining current natural habitats (Figure 56), without “clean-up of unsightly logs and other natural marine debris”, is critical to many species as prime wintering habitat is also disappearing rapidly elsewhere in the Pacific Northwest. A recent article by Bortolotti et al. (2011) has shown, for the first time, that wintering Snowy Owl requires perches, on and above ground, for communication and establishing territories.

Winter habitat at other locations in the province appear relatively stable and unaltered except for the loss of large tracts of native grasslands in the interior that once supported large and diverse populations of rodents. Since Snowy Owls feed primarily on small mammals in the interior, poisoning programs to control voles and mice by farmers should be discouraged.



Figure 56. Log-littered foreshores, while unsightly to many humans, provide microhabitats for a host of wildlife species, from insects to small mammals, as well as necessary perch and roost sites for birds of prey. Boundary Bay, BC. 31 March 1997 (R. Wayne Campbell).

Rodenticides

Ingestion of toxic chemicals, whether primary or secondary poisoning, is a potential and insidious threat to Snowy Owl. The birds cannot recognize and avoid chemicals (Postovit and Postovit 1987); insecticides, rodenticides, and other substances may be distributed globally by air and can occur in water, soil and small organisms. Many of these chemicals are also resistant to environmental breakdown.

Because birds of prey are at the top of food chains, these pollutants may bioaccumulate in their prey and the organisms the prey eat.

While direct killings have occurred, most birds of prey become contaminated through secondary poisoning, eating prey that themselves have ingested contaminated food. Pesticides have been linked to long-term declines in raptors, including Snowy Owl (United States Fish and Wildlife Service 2000; Figure 57).



Figure 57. This Snowy Owl, suspected of suffering from secondary poisoning from Warfarin set out to control Norway Rats around a barn in Ladner, BC was picked up in a weakened condition, rehabilitated and two weeks later was banded and released in Boundary Bay. November 1978 (R. Wayne Campbell).

Rodents can have severe impacts on agricultural crops over time as well as on grain storage and harvesting, especially when outbreaks occur. To reduce economic losses and human health risks, many grain-growers and other farmers use

rodenticides mainly for vole, mice, rat, and ground squirrel problems. One of the preferred pest control chemicals is the use of anticoagulant rodenticides, which kill rodents by fatal hemorrhage. However, there are hazards of non-target (secondary) poisoning to other wildlife (Kaukeinen 1982).

The first anticoagulant rodenticide, developed in 1942, was warfarin, and became widely used in the 1950s (Newton and Wyllie 1992). It is still a widely used rodent poison but over time rats began to show genetic resistance and new anticoagulants, more potent, became available. These included difenacoum, bromadiolone, brodifacoum, and flocumafen. In order of magnitude these chemicals are hundreds of times more toxic to rodents and can persist in the bodies for up to several months (Rammell et al. 1984).

In British Columbia and the Yukon Territory, Albert et al. (2009) analyzed 164 dead owls for rodenticide residue information in livers collected between 1988 and 2003. The species involved were Barn Owl (*Tyto alba*), Barred Owl (*Strix varia*), and Great Horned Owl (*Bubo virginianus*). Results showed “that 70% of all species had residues of at least one rodenticide and of these 41% had more than one rodenticide detected.” Six of the owls died indirectly from anticoagulant poisoning. No Snowy Owls were listed but the species has been poisoned in New York with the toxicant diphacinone where a Snowy Owl established temporary residence at a correctional facility that had a rodent control program. An autopsy revealed that the bird’s stomach was full of Norway Rat (*Rattus norvegicus*; Figure 58) remains (Stone et al. 1999). It was suspected that a similar situation occurred in Delta, BC, in winter 1966 when warfarin was put out around a farmyard to control mice where a Snowy Owl was resident and was later found dead (K.C. Boyce pers. comm.). Second-generation anticoagulant rodenticides, such as brodifacoum, bromadiolone, and difethialone that are acutely toxic, can be purchased in Canada without a license (Albert et al. 2009).

Rodenticides, applied as bait (e.g., pellets) in other agricultural regions in British Columbia, may also pose a risk to non-target wildlife from secondary exposure, including Snowy Owls. Bait is applied irregularly when mouse populations are



Figure 58. Norway Rat, one of the targeted animals for control with rodenticides, quickly developed a genetic resistance to early poisons such as warfarin, after which chemists started developing more potent chemicals that were soon being distributed world-wide. Victoria, B.C. 14 March 2008 (R. Wayne Campbell).



Figure 59. Meadow Vole is an abundant and widely distributed rodent in open grasslands and agricultural fields throughout the interior of British Columbia. It is a common prey item for migrating and wintering Snowy Owls and when cycles reach peak numbers, it is often a target species for rodenticide applications. Creston, BC. 7 February 1999 (Linda van Damme).

high, usually in summer and early autumn. In the Creston valley, where Snowy Owl is very rare, but other raptors are very common (van Damme 2009), the weather resistant rodenticide “Ramik Green” and “Ramik Brown” is used to control Meadow Voles (*Microtus pennsylvanicus*; Figure 59). During decades of farming the valley, Cyril Colonel (pers. comm.) has never found a dead raptor after applying the pesticide. It may be likely that any threat to migrating or wintering owls at other areas may be minimal but suspicious deaths should be reported to provincial and federal toxicologists.

Shooting

Over the past century human attitudes towards birds of prey have come full circle from being considered vermin and shot indiscriminately (Figure 60) to revering their presence and being awestruck by their adaptations and role in the ecosystem. Each year, however, some raptors, including owls, are still shot illegally, mostly in rural areas.

The Snowy Owl (Figure 61) is the most instantly recognizable of all 15 owl species that occur in British Columbia and was a treasure for those who wanted a mounted specimen. Today, birdwatchers and photographers who want a mental or digital image have essentially replaced those who want a

mounted bird. In the past, deliberate shooting had accounted for 25% of reported mortalities (of 177) in the province, but most of these occurred during the 1960s and 1970s when much of the Fraser River delta foreshore was open to hunting. Myke Chutter (pers. comm.), Bird Specialist with the provincial government, suggested that while the odd owl may get killed illegally by uninformed citizens, shooting mortality is not currently considered a concern for the Snowy Owl; he has not been notified of a single incident of illegal shooting over the past decade or so.

Snowy Owl is protected under Section 33, 34, and 71 of the provincial Wildlife Act, but does not come under the federal jurisdiction of the Migratory Birds Convention Act. Three sections, “Possession of wildlife”, “Birds, nests and eggs”, and “Requirements to keep records”, apply to having live or dead owls, their parts, nests or eggs, in one’s possession. Section 34, of course, does not apply to Snowy Owl as it does not breed in the province but may refer to unauthorized egg collections. It is illegal to possess a raptor without a permit (Figure 62), and an inspection is required by a qualified government professional to determine the cause of death. If it is determined that the bird was killed intentionally or illegally, a permit will not be issued.



Figure 60. During the 18th and 19th centuries, and well into the mid-20th century, hawks, eagles, falcons, and owls were considered harmful or objectionable animals and in some cases bounties were offered. Bounties on several owl species remained in force until the late 1960s. In 1972, the Migratory Bird Treaty Act of 1918 was amended to include birds of prey; in British Columbia, owls are protected by provincial laws. The change in attitudes towards raptors was welcomed by conservationists and naturalists. Unlike Hamilton Mack Lang, seen here with a Great Horned Owl shot near Princeton, BC, in 1928, collectors today require a permit. Photo courtesy of Provincial Archives of British Columbia, Victoria, BC).

In the past, most information on carcasses brought to Conservation Officers was incomplete. At least 47 such instances were found during compilation of this account including some far at sea occurrences where Snowy Owls landed on ships. None could be used



Figure 61. Snowy Owl is easily recognizable with its beautiful white plumage and large yellow eyes. Its ghost-like appearance always echoes its Arctic origin. Fort St. John, BC. 23 December 2006 (Nikki C. Tyrrell).



Figure 62. Keith Hodson holding a Snowy Owl ready for banding. Burnaby, BC. January 1969 (R. Wayne Campbell). While banders must be experienced in identification, aging, capturing, and banding birds under federal and provincial permits, others cannot possess live or dead wildlife at any time in British Columbia without authorization.

in the present database. However, during the current inspection procedure, government agents now record specific location, exact date, name of observer, and source of mortality (M. Chutter pers. comm.).

Shooting could also have indirect consequences

for Snowy Owls as they could unintentionally ingest lead pellets from their prey, which could lead to lead poisoning (see Clark and Scheuhammer 2003). Even a single lead pellet ingested can be fatal for a raptor as it can lead to sensory and physical impairments that prevent it from being able to catch its prey.

This may have been an issue in the past for Snowy Owls wintering on the Fraser River delta, as they have been found to prey heavily on ducks (Figure 63), and ducks which may have been wounded with lead shot, make an easier target for predators. Some biologists have suggested that late departing Snowy Owls in the Lower Mainland, and unusual summer occurrences, may be due to some level of lead poisoning. However, in 1994, British Columbia led the country by becoming the first province to implement a complete ban on the use of lead shot for waterfowl hunting (M. Chutter pers. comm.). While lead shot from previous waterfowl hunting undoubtedly still exists in the environment, the vast majority of it settles into the substrate and becomes inaccessible to waterfowl. Occasionally, it gets exposed through farmers tilling their fields or may have fallen on more impermeable substrates where longer-necked waterfowl, like swans, can access it. However, in recent years, compliance with the ban has resulted in very few incidences of lead poisoning being reported in British Columbia, with the exception of continuing issue with Trumpeter



Figure 63. In winter, American Wigeon gathers in large feeding flocks in farm fields, flooded agricultural fields, and airports where it becomes more vulnerable to predation by raptors, including Snowy Owl. Reifel Island, BC. 22 November 1970 (R. Wayne Campbell).

Swans (*Cygnus buccinator*) along the United States/ British Columbia border. Thus, the likelihood of Snowy Owls ingesting lead shot and getting lead poisoning is thankfully now very remote.

Collisions

Wildlife strikes to aircraft (Figure 64) are a major concern to public safety as well as to species involved that are protected by federal and provincial regulations. Each year collisions with wildlife cost over \$600 million in damage to civil and military aviation in the United States, and since 1988 at least 219 people have been killed world-wide from this cause (Transport Canada 2003).

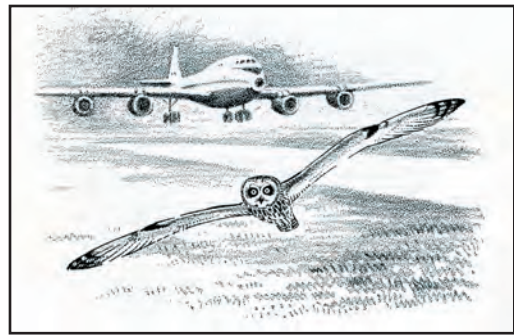


Figure 64. At airports throughout the world, bird strikes with aircraft have become a serious safety issue and many programs have been developed to deal with the problem. In the 1960s, Short-eared Owl and Snowy Owl were listed as a species of concern at the Vancouver International Airport on Sea Island, BC. Careful monitoring, however, showed only three Snowy Owl strikes during the decade, none of which were severe (Drawing on Short-eared Owl/ aircraft reproduced with permission from Taplinger Publishing Company, NY).

In a recent study conducted by MacKinnon et al. (2003), raptors accounted for 10 percent of collisions, with waterfowl (51%) and gulls (20%) being the groups most reported. While airport fields may attract Snowy Owls, aggregations of resting and foraging geese, ducks, and gulls probably attract hunting owls.

During the early 1960s, hawk and owl collisions became a concern for aircraft during take-off and landing at the Vancouver International Airport. (YVR) Like YVR, many airports are constructed near wetlands that support large numbers of waterfowl and gulls with attendant birds of prey. Rather than shoot raptors at YVR, an intensive trap and removal program was initiated. Between 1963 and 1967, more than 500 birds of prey, mostly Short-eared Owl (*Asio flammeus*) were caught using verbal pole traps (Figure 65), banded, and released, sometimes as far away as California. Only a handful of birds were ever retrapped. Since that time, airport officials have increased management of fields by keeping grass



Figure 65. The Verbaile trap is attached to a pole in an open area, such as an airport, and has been used successfully in catching birds of prey for banding and release. The late William M. Hughes has just set the trigger mechanism that releases a noose that catches the bird's legs. Hundreds of birds of prey, including a few Snowy Owls, were caught, banded, and released to distant locations, some as far away as California and Alaska, from the Vancouver International Airport on Sea Island, BC in the 1960s.

short to discourage rodents and filling in low spots that retained water and attracted other birds.

Collisions with power and telephone lines accounted for the deaths of seven Snowy Owls in British Columbia but real numbers are probably under-reported. While utility lines are a potential hazard to many birds, at some locations collisions have been significantly reduced through the use of a variety of devices attached to lines that make them more visible (Figure 66). These areas near coastal wetlands have mainly received attention because of potential threats to wintering Trumpeter Swans (*Cygnus buccinator*). It is likely that Snowy Owls have also benefited from these flight diverters at these locations.



Figure 66. Visible structures placed on power lines can serve as deterrents to flying birds, including Snowy Owl, at favourite foraging areas. Cowichan Bay, BC. 22 February 2001 (R. Wayne Campbell).

Harassment

Eco-tourism, photography, birdwatching, chasing wildlife with a motorized vehicle, human-generated noises, and scuba diving, are all well-known examples of wildlife harassment (Knight and Gutzwiller 1995). The United States Endangered Species Act defines harassment as “an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, feeding or sheltering.” (United States Fish and Wildlife Service

1993). Since this a relatively new topic there are gaps in our knowledge on human impact, especially concerning the bioenergetic effects of harassment (Knight and Gutzwiller 1995).

Over the past decade, research by ornithologists on the effects of stress on birds has received more attention and factors that have the potential to cause physiological stress are being identified. The stressful effects of weather in Arctic-breeding passerines has recently been reported by Romero et al. (2000). Almasi et al. (2009) has shown stress can affect development and growth in early life in wild free-living nestling Barn Owls (*Tyto alba*). Invasive photography may also be considered a stressful event that may not only have an immediate effect but may also shape the phenotype on a longer term scale or even permanently (Stier et al. 2009).

This sensitive and controversial topic is of increasing concern to wildlife managers, conservationists, wildlife-lovers, birders, and professional photographers, especially since human numbers are increasing, habitats are shrinking, and wildlife populations are declining. Digital photography has revolutionized picture-taking and has become increasingly popular. In 2006, total direct expenditures for activities related to wildlife-watching were \$45.7 billion (Leonard 2008). The majority of these expenses were trip-related but cameras and other photographic equipment was the major expense in the category of "Equipment" accounting for 7% of the nearly \$10 billion on direct expenses.

With a growing number of wildlife photographers in the field it is possible that additional stress and disturbance to wild animals occurs, particularly where one individual is "targetted" because of its local "rare" status. The broad market availability of affordable "super-telephoto" lenses (up to 800 mm for as little as \$500) no doubt contributes to a growing number of wildlife photographers. And whereas historically considerable time and energy was spent finding a subject to photograph, the advent of instant communication via e-mail, text-messaging, and cellular phones has no doubt contributed to a concentration of photographers on certain individuals.

After an informal census of birdwatchers, it was

clearly apparent that most people were unaware that there are provincial and federal laws regarding disturbance to birds by photographers and others, especially during the breeding season (Figure 67). Since there is such an increase in the number of birders who now carry cameras it seemed timely to increase awareness of the laws and list some organizational and personal ethics surrounding photographing birds, so informed decisions can be made to greatly reduce disturbance.



Figure 67. While most naturalists, birdwatchers, and photographers are sensitive to disturbing wildlife year-round, many are not aware of provincial and federal laws that protect native animals from being harassed. Invermere, BC. 9 May 1997 (R. Wayne Campbell).

There are many stories, and fewer published accounts, of photographers, both professional and amateur, harassing wildlife. National parks and many federal sanctuaries in the United States, have already established strict guidelines in their conservation plans regarding harassment of wildlife that includes picture-taking and in many cases a permit is required to enter the park for such purposes (United States National Park Service 2008, United States Fish and Wildlife Service 2009). The primary responsibility of managers and staff is to preserve, manage, and protect habitats and wildlife while at the same time allowing some human recreation. Violating the code of ethics can result in revocation of a permit and a fine, as was the case recently of a photographer chasing a sow Grizzly Bear (*Ursus arctos*) and her cubs for photographs in Lake Louise, Alberta (see National Post 2010).

Disturbance to owls, both diurnal and nocturnal species, has also been highlighted recently and has resulted in humans changing their attitudes towards publicly announcing an owl's presence, identifying specific roosting and breeding sites, and restricting or denying human access to popular recreational areas (Ottawa Citizen 2007, Holden 2010).

The ethics of some photographers, both amateur and professional, is regularly being challenged, especially where direct harassment has been witnessed. Some documented disturbances include throwing snowballs, rocks, and sticks to encourage a roosting owl to open its eyes, unnecessarily chasing roosting birds for better images and flight shots, snipping and excessively bending vegetation for a clear photo, using sound recordings of mice and predators to attract attention, trampling vegetation, capturing and holding an owl for "intimate" photos, and remaining too long at a location so as to interrupt normal daily activities.

While such activities are a growing concern worldwide, it is also prevalent in British Columbia, especially in southwestern regions when northern owls, like Snowy Owl, Great Gray Owl (*Strix nebulosa*), Boreal Owl (*Aegolis funereus*), and Northern Hawk Owl (*Surnia ulula*; Pynn 2010), are of high interest when they suddenly appear. This region also has the highest number of would-be photographers.

There are concerns also in "hotspots" for certain species such as Northern Saw-Whet Owl (Figure 68) which roosts fairly low to the ground and within easy viewing of photographers at places such as the George C. Reifel Migratory Bird Sanctuary in Delta, BC. The latter site hosts about 70,000 visitors annually (Kathleen Fry and Varri Raffan pers. comm.). While their main concern is forest owls (e.g., Great Horned Owl, Barred Owl, Long-eared Owl, and Northern Saw-whet Owl), photographers have also been seen stalking and chasing wintering Snowy Owls on private farmland nearby (B. Davies pers. comm.). During the winter, when owls are common at the sanctuary, volunteers and staff stress to visitors the need to avoid disruptive behaviours such as approaching too close, using flash photography, and congregating in sometimes day-long continuous crowds around roosts when owls are spotted. While

this public-awareness approach helps, there are enough incidents of trespass into restricted areas, pruning or disturbing vegetation, noise-making to make owls react, or loitering for hours that it is necessary to monitor visitor behaviour regularly around known roost sites.

This has also been observed and reported at the Conservation Area at Maplewood Flats in North Vancouver, BC with Northern Pygmy-Owl and Northern Saw-whet Owl (J. Grass pers. comm.).



Figure 68. Staff at the George C. Reifel Migratory Bird Sanctuary on Reifel Island, BC, will remind visitors to be considerate of roosting, nesting, and feeding owls. Information will be announced in their newsletter, on their website (www.reifelbirdsanctuary.com), or through signage at the refuge to address time-specific problems such as when a roosting Northern Saw-whet Owl is discovered. Some suggestions will also be applicable to watching and photographing other owl species including Snowy Owl that infrequently visits adjacent farmlands. Reifel Island, BC. 14 December 2010 (Kathleen Fry).

Bev Day (pers. comm.), Executive Director of OWL (Orphaned Wildlife Rehabilitation Society) in Delta, BC has received numerous complaints over the years of photographers chasing Snowy Owls at nearby Boundary Bay, a major wintering area in British Columbia, to get better close-ups and flight shots. She is also aware that these unprincipled individuals are in the minority and impact others who are more sensitive to the needs of the owls.

Harassment of Snowy Owls in Boundary Bay, BC by photographers has recently been discussed in open forum (see www.birding.bc.ca) and in some cases names of photographers harassing Snowy Owls, accompanied by photo evidence, are being posted on birding websites (“More Snowy Owl Harassment”; see www.birdforum.net). Accompanied by these discussions is mention of the number of birders who also visited and walked around the site, likely causing additional disturbance.

Robert Winkler, in “*A Wildlife Photography Primer*” states: “*Responsible wildlife photographers observe a strict code of ethics. The cardinal rule: if anything you do directly or indirectly endangers, restricts or harasses an animal, stop and leave the animal alone. The integrity of a wildlife photograph evaporates if the subject was not free to come and go, if it shows fear or anxiousness, if it has been provoked to attack or to defend itself.*”

It is possible to obtain outstanding photos of Snowy Owls without unduly stressing an individual bird. Alan and Elaine Wilson have posted their personal ethics for photography and have suggested that it is up to the individual to make informed decisions regarding ethical behaviour. Their inspired photographs are scattered throughout this account (see Figures 5, 6, 37, 39, 41, 48, 77, 78, 93, and 102).

A useful list of recommendations to ethical behaviour and nature photography, issued by the Ethics Committee of the 3,000-member North American Nature Photography Association (NANPA; see www.nanpa.org), is as follows:

Principles of Ethical Field Practices

NANPA believes that following these practices promotes the well-being of the location, subject and photographer. Every place, plant, and animal, whether above or below water, is unique, and cumulative impacts occur over time. Therefore, one must always exercise good individual judgment. It is NANPA’s belief that these principles will encourage all who participate in the enjoyment of nature to do so in a way that best promotes good stewardship of the resource.

Environmental: knowledge of subject and place

- Learn patterns of animal behaviour – know when not to interfere with an animal’s life cycle (Figure 69).
- Respect the routine needs of animals – remember that others will attempt to photograph them too.
- Use appropriate lenses to photograph wild animals – if an animal shows stress, move back and use a longer lens.
- Acquaint yourself with the fragility of the ecosystem – stay on trails that are intended to lessen impact.

Social: knowledge of rules and laws

- When appropriate, inform managers or other authorities of your presence and purpose – help minimize cumulative impacts and maintain safety.
- Learn the rules and laws of the location – if minimum distances exist for approaching wildlife, follow them.
- In the absence of management authority, use good judgment – treat the wildlife, plants and places as if you were their guest.
- Prepare yourself and your equipment for unexpected events – avoid exposing yourself and others to preventable mishaps.

Individual: expertise and responsibilities

- Treat others courteously – ask before joining others already shooting in an area.
- Tactfully inform others if you observe them engaging in inappropriate or harmful behavior – many people unknowingly endanger themselves and animals.
- Report inappropriate behaviour to proper authorities – don’t argue with those who don’t care; report them.
- Be a good role model, both as a photographer and a citizen – educate others by your actions; enhance their understanding.

*Adopted February 3, 1996 by the
NANPA board of directors.*

A useful reference of recommendations to ethical behaviour and nature photography, issued by the 3,000-member North American Nature Photography Association, is available on their website (www).



Figure 69. This Snowy Owl, looking away and at ease (left), does not seem to be disturbed by the photographer's presence. When the bird turned its head, opened its eyes (right), and shifted its body it was time to leave. Calgary, AB. 12 December 2007 (R. Wayne Campbell).

nampa.org). Additional guidelines that provide more specific information such as minimum distances for photographing various animal groups, is available for Denali National Park in Alaska at www.nps.gov/dena/parkmgmt/propho.htm. Associated with harassment by photographers is that from birdwatchers. The American Birding Association (www.aba.org), aware of public concerns, has prepared a well researched "Code of Birding Ethics" that most conscientious birders follow and in many cases can be adapted to photography in the field.

Richard Dumoulin, a wildlife photographer from Quebec, recently posted his personal experiences, and code of ethics, for photographing Snowy Owls to minimize disturbance (www.richarddumoulin.com). He has obtained some superb images using the following guiding principles that are simple to understand and effective (see Figure 3):

Snowy Owl and Bird Photography Ethics

For those wondering what my approach is to photographing wild birds (and other wild animals) - it is based on respect and knowledge.

First you have to know the Snowy Owl. The average lifespan of the Snowy Owl is five years, based on estimates required to maintain a stable population given the amount of food available as well as the very high mortality rate in the first year of life. A more reasonable estimate of lifespan in the wild is between nine and 12 years.

Snowy Owl must eat to survive. It lives in the cold and snow; for them (like for us) food is energy.

To get food, they must hunt and it takes energy and time. If a Snowy Owl is not good at hunting (which is often the case in the first winter) it may die.

What am I getting at? As photographers (and birders), if we don't understand this, and respect the Snowy Owl, it may interfere with its hunting which means less food and energy or needless disturbance that costs energy to fly away. This could be life threatening for the owl over a long period of time.

My approach to Snowy Owl photography is based on the following principles:

1. I don't use food to get a better picture (I don't give them a mouse, real or fake). It's a personal choice, but I must admit that I love a mouse and a squirrel as much as a Snowy Owl.

2. I will always try to take photos from a comfortable distance, using the appropriate equipment (example: Canon 500 mm lens with a 1.4 X teleconverter).

3. I approach them quietly and silently and monitor their response to my presence. I want to avoid disturbing them so they do not fly away because of me (energy thing - remember!).

4. If the Snowy Owl goes away because it does not like to be disturbed, I may have failed to detect their comfort zone. I will then stop photographing and come back another day.

5. I don't photo-hunt the snowy. PERIOD. If the bird wants to be alone and fly away, do not follow it from spot to spot. Some people like to take pictures of the bird in flight and will start a pursuit. Remember, that while you do that, the snowy is not hunting. Worse than that, it is spending energy not to survive but to avoid a photographer.

6. I don't scare birds or other animals to get a better picture. If everybody starts considering that, it will make the birds and other animals harder to approach for the photographers and in some cases, like the Snowy Owl, may be life threatening.

7. I also recommend that if you join other photographers in the field, that you respect them: talk quietly, verify with them if you can join their group, don't scare the bird that everybody is watching just to get your own photos of the bird flying away.

Nature photography is about respecting and imaging the subject.

*Richard Dumoulin
Quebec, Canada*

Richard, and others, are also concerned about the increasing number of photography workshops and field trips being offered in North America by eco-tourism companies and professional photographers specifically to capture images of nesting, roosting, and flying Snowy Owls. Photography at nests on Arctic breeding grounds may be an issue in some years especially when lemming populations are low. Snowy Owls may not breed or numbers are very low and nesting pairs are widely scattered (2007, 2009).

In regions of Scandinavia, Willgohs (1977) stated that in southern Norway "photography at the nest and disturbance by tourists and by birdwatchers is already leading to the bird's demise." In Finland, Snowy Owl breeds only when lemming populations are very high, during which time it is strictly protected and a government permit is required to photograph birds at a nest site (Peltomäki 2010; www.finnature.fi/owls/html). Hudson (1975) considers the species endangered in west European countries where it breeds and further reiterates that the species cannot be photographed at the nest in Scotland and Iceland

without a special license.

In the United Kingdom, photography of wild birds is already limited by law where it involves the disturbance of 82 listed species of rare breeding birds (Royal Society for the Protection of Birds 2010). The group emphasizes that the bird's welfare must always come first and should not disturb their normal activity. At times this will mean not taking photographs. While there is some overlap in the RSPB considerations for photographers (mainly at the nest) with those listed above we have reproduced them in full below.

1. Ensure you have the landowner's permission.

2. Keep the nest site secret. Choose a site away from public view, and if a hide [blind] is used, camouflage it well. Leave no tracks or signs that may lead predators to the site.

3. Keep visits to the nest as few as possible. Changes of photographer should be kept to a minimum and should not take place in bad weather.

4. Leave the nest as you find it. Any "gardening" of a nest should be kept to a minimum to avoid exposing the nest to predators or adverse weather.

5. When using a hide, erect it some way off, moving it closer over a period of days so the birds grow used to it. Ensure at each stage that the hide has been accepted. If there is any doubt, move it back. Many species will need at least a week's preparation.

6. The use of a friend is recommended as a "walk-away" accompanying the photographer to and from the hide. Certain species may require two people for this purpose. This is often the only responsible method to minimize disturbance.

7. Fingers and lenses suddenly poked out of a hide, flapping cloth and loud noises scare birds. Get them used to small sounds, talk to them perhaps, before taking pictures.

8. Remember that public opinion generalizes actions, and that the thoughtlessness of one bird photographer may damage the reputation of others.

9. To protect rare breeding birds, the law prohibits intentional disturbance of any species. This applies while such a bird is building a nest, or is in, on or near a nest containing eggs or young. It is also illegal to intentionally disturb dependent young birds.

Krages (2006) has produced a useful reference for all photographers concerned about legal aspects of photographing wildlife and other subjects such as accessing public, government, and private land (Figure 70).

It should be noted that an increasing number of moderators of bird chat lines, internet bird information sites, personal bloggers (e.g., Freiday 2011), and sanctuary managers in North America are not listing specific sites for roosting or breeding owls for fear of harassment by wildlife viewers and photographers.

Climate Change

Snowy Owl, a top Arctic bird predator and a key indicator species of northern ecosystems, is vulnerable to climate change. Some of these changes are linked to temperature that may affect both their year-round habitat and prey. On Wrangel Island, for example, some specific changes already noted during a 7-year study (1998-2004) consisted of higher yearly average temperatures, prolonged warm autumns, lower average winter temperatures, and prevalence of late springs (Menyushina 2007). Recent research by Therrien and Gauthier (2008) has shown, through satellite tracking, that some Snowy Owls spend the winter far at sea on pack ice, possibly feeding on seabirds. Now that the species has become part of the marine ecosystem there are additional concerns that previously unknown habitat may also disappear if the earth gets too warm.

While this issue continues to be of concern globally, an important resolution was passed by participants in 2007 at the World Owl Conference held in Groningen, Netherlands, for Snowy Owl. It read: “*Considering the circumpolar range of snowy owls, the possible strong effects of climate change on*



Figure 70. In December 2010, a rare Northern Hawk Owl showed up on private property on Westham Island in the Lower Mainland region of southwestern British Columbia. Over the next five weeks, over 300 professional and amateur photographers from all parts of the province and Washington State visited the site to photograph the bird. What is not understood yet is the physiological response of the bird to such activity as well as the energetic demand required daily to remain healthy. Birders and animal-lovers, however, were more concerned that the owl might be hit by a passing vehicle when being distracted during a hunting foray. Westham Island, BC. 4 December 2010 (Mark Nyhof).

snowy owl populations, and their value as indicators of such change, and the completely unknown status of the world's snowy owl population, we call upon national governments and the IUCN [International Union for Conservation of Nature] to financially support the World Working Group on Snowy Owls, which was formed during the World Owl Conference 2007. We call upon national governments to make an assessment of industrial development on snowy owl populations before the development takes place and to monitor the effects afterwards.”

As a result, intensified research programs are gathering momentum and support, not only for Snowy Owl, but also for Arctic ecosystems in general (see www.arctic.atmos.uiuc.edu).

Research and Monitoring in British Columbia

Research

Very little is known about the winter population ecology of Snowy Owl in British Columbia and other non-breeding regions in southern Canada and northern United States. The results of recent research carried out by Kerlinger and Lein (1988) contrasted so much with earlier studies (*e.g.*, Shelford 1945, Gross 1947) that they recommended that further research was needed to “clarify the population and migration dynamics” of Snowy Owl and that “future studies of winter raptor populations select multiple study sites to permit detection of patterns that occur over areas larger than a single study site.”

The origin of Snowy Owls immigrating into British Columbia is unknown, as is the size of winter territories and site fidelity, especially in the Fraser River delta, on southern Vancouver Island, and in the Peace River region. This long-term research would require individual banding (Figure 71) and marking so owls could be identified quickly in the field. Parmelee (1992) notes that information is lacking for long-term shifts in numbers and distribution of Snowy Owl in North America.

Studies on winter territory occupancy, size, overlap, and fidelity demand considerable effort and generally require skillful recognition of individual birds or intensive mark-recapture programs (Figure 72). Such studies are usually expensive to implement and often are limited in geographic scope. However, similar to Christmas Bird Counts and the BC Breeding Bird Atlas program, public participation, also known as citizen science, is one option that could contribute to the knowledge gap in Snowy Owl territoriality. For example, in Alberta, co-author M. Preston spent one full day watching a single female Snowy Owl just a few kilometres east of Calgary. In just 8 hours he observed 18 territory movements and a single prey capture of a Gray Partridge (*Perdix perdix*). Half of the observation points were represented by boundary observations, or points that



Figure 71. The first part of research involving territorial studies for Snowy Owl is to capture a bird and apply a regulation band to its leg. This adult female has been captured using a ground bal-chatri trap and is ready for banding. Calgary, AB. 5 February 1999 (Michael I. Preston).



Figure 72. Studies of territoriality of Snowy Owls in winter requires recognition of individual birds as they move about an area in search of food. Often, individual owls are colour-marked with a non-toxic and short-lived feather dye that allows detection hundreds of metres away. Langdon, AB. (M. Ross Lein).

fell on the edge of a minimum area point-to-point polygon (Figure 73). While this single day study may not necessarily reflect the actual winter territory size, it is an indication of what can be accomplished with just one day of dedicated observation.

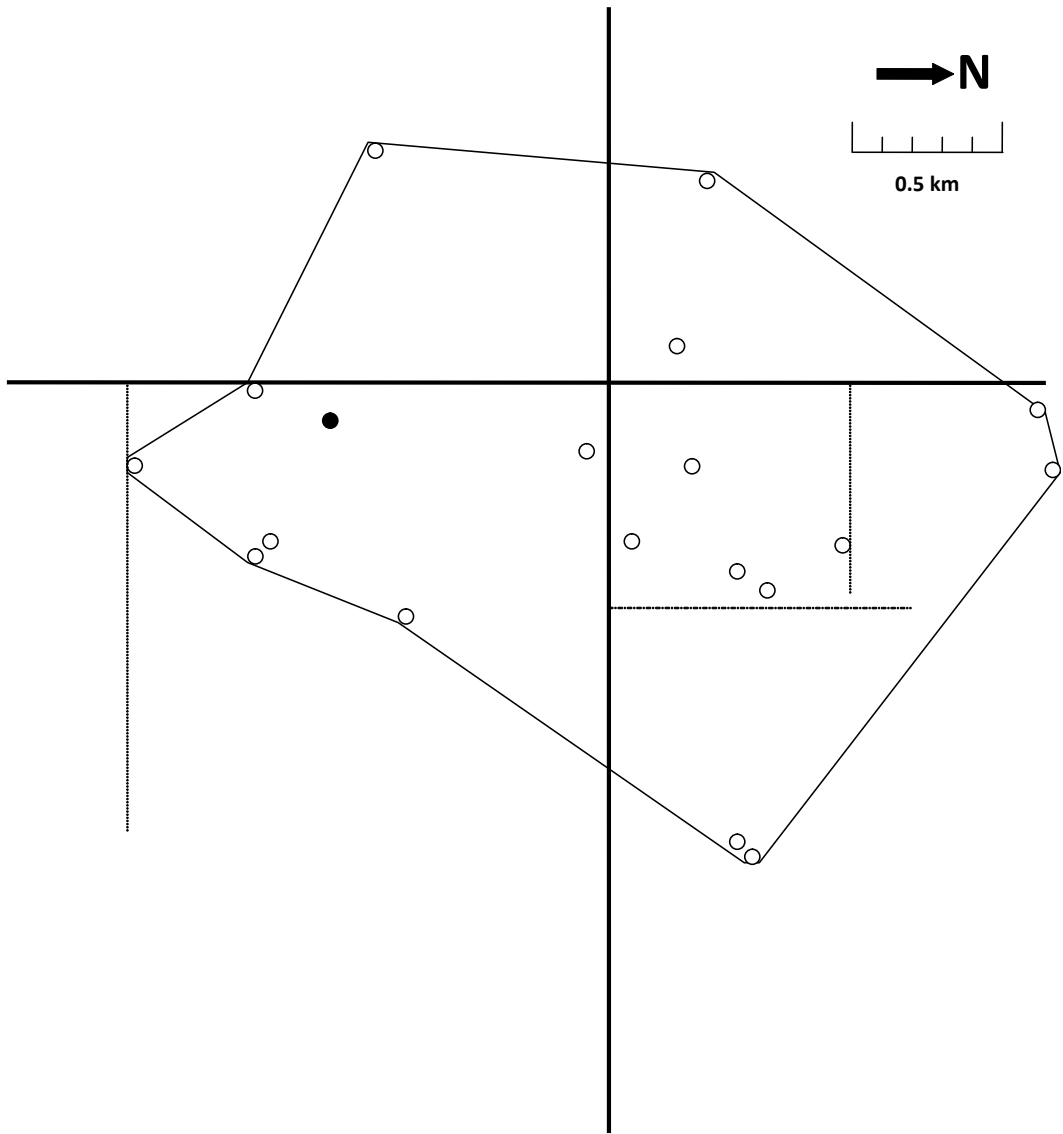


Figure 73. A single-day territory, delineated by a minimum area point-to-point polygon, of a female Snowy Owl from just east of Calgary, AB on 18 December 1996. Open dots = observation; solid dot = prey capture; solid lines = gravel roads; dashed line = fence rows. Data courtesy Michael I. Preston.

Monitoring

Decades of information from Christmas Bird Counts (CBC) in British Columbia indicate that this single-day count is largely ineffective at detecting long term changes in Snowy Owl abundance. Because Snowy Owl is so geographically restricted (from a CBC perspective), and highly variable from one year to the next, an effective monitoring program is not likely to exist given the expected return per unit of effort invested. A program similar to the CBC (fixed area or fixed route), but sampled three or five times in a season, may be the only improvement that can be made.

In Alberta, five-minute stop-and-scan surveys have been used in agricultural and grassland regions, stopping at every quarter section until a grid measuring 8 x 8 miles (12.9 x 12.9 km) is covered. This approach allows surveyors to have a fixed area search with the flexibility to account for movements within territories. A similar approach could be set up in British Columbia, especially on the coast, or in the Dawson Creek or Fort St. John regions. The challenge, especially on the coast, would be to cover the land base effectively.

In the Great Plains region, a road-count method to determine abundance and distribution of Snowy Owl has been used with some success (Fuller and Mosher 1981, Kerlinger and Lein 1988).

Determining Age and Sex Classes

Records of geographic differences in age and sex classes of migrant and wintering Snowy Owls in British Columbia are relatively unknown (< 5% of 25,749 records), because identification, in some cases, can only be obtained reliably from close examination of an individual or actually examining an owl in the hand (see Bortolotti et al. 2011). If more records were available, the information would improve understanding of the structure of the population visiting the province and its significance to different sexes and age classes.

Kerlinger and Lein (1986) determined that in North America, immature males wintered farthest south while adult females wintered farthest north. They also found that most birds regularly wintering in the Great Plains region in the central part of the continent were mostly adults suggesting that areas to

the east and west were mostly irruptive in nature and were composed of mainly first-year birds. We do not have similar information, gathered consistently, for British Columbia.

Josephson (1980) prepared a simple key to aging and sexing Snowy Owls that can be used in the field as well as the laboratory. The 12 identification steps are provided in Table 9. Figures 74 to 77 provide examples that match the key.



Figure 74. Immature female Snowy Owl showing barred body and unmarked tarsi, feet, and wing linings. Langdon, AB. (M. Ross Lein).



Figure 75. Adult male Snowy Owl showing sparse barring on breast, wing linings, and head. Indus, AB. (M. Ross Lein).

Table 9. Key to aging and sexing Snowy Owl. Reproduced with permission from Josephson (1980).

1a. Barring present on all areas of plumage except for white facial disk, tarsi, feet and wing linings	FIRST-YEAR FEMALE	
1b. Barring absent from parts of head or breast or other areas besides facial disk, tarsi, feet & wing lining		2
2a. Plumage entirely white or white except for narrow, sparse, pale gray or brown barring on breast, back, wings, head, and/or tail	ADULT MALE	
2b. Moderate or extensive barring present on breast, wings, head, and/or tail		3
3a. Moderate or extensive mottling present on distal portions of greater and/or median secondary coverts		4
3b. Mottling absent from distal portions of greater and/or median secondary coverts or very slight mottling present		5
4a. White bib of 2-8 cm present and back of head primarily white	FIRST-YEAR MALE	
4b. White bib, if present, less than or equal to 4 cm and back of head primarily barred	FIRST-YEAR FEMALE	
5a. White bib of less than or equal to 8 cm present and/or back of head primarily white	ADULT FEMALE	
5b. White bib absent or less than or equal to 4 cm and back of head primarily barred		6
6a. Crissum [undertail feathers] with greater than 6 bars	FIRST-YEAR FEMALE	
6b. Crissum [undertail feathers] white or with few (less than or equal to 6) bars or spots	FEMALE, AGE UNDETERMINED	

Kerlinger and Lein (1988) suggested that general field observations would be more helpful if the timing of autumn arrival and spring departure was noted and reported annually, the age-sex class carefully determined for individual owls, even when present in large numbers, and dispersal to adjacent areas during the winter visits documented.

Foods and Diet

The feeding ecology and diet of Snowy Owl during its nonbreeding period in British Columbia is not well studied. Only two articles, one a quantitative study from a marine bay near Victoria (Campbell and MacColl 1978) and the other a student project from agricultural fields in Delta (van Thienen 1979), have been completed. All of the other information on foods is anecdotal (see Table 8).

Since smaller prey is swallowed whole, and larger prey such as hares and waterfowl have remains of long bones and feathers, analysis of pellets is a reliable method to determine the owl's diet (Figure 78). Over time, additional research on pellets would contribute significantly to knowledge of the variation in geographical, seasonal, and annual diet of Snowy Owl. The value of food studies for conservation and management would be to protect preferred habitat such as the marine and brackish foreshores of the Fraser River delta, the major wintering site. For example, uninformed people have suggested "cleaning up" log-littered areas (see Figures 10 and 56), which are critical roosting and foraging areas for wintering Snowy Owls and other raptors, because they are "unsightly", "dangerous to public safety", and a "potential fire hazard". These suggestions



Figure 76. Immature male Snowy Owl showing barring on dorsal surface with primarily white on the back of the head. Airdrie, AB. (M. Ross Lein).



Figure 77. Adult female Snowy Owl showing heavy barring with much of the back of the head white, sometimes forming a large clear patch. Langdon, AB. (M. Ross Lein).

largely result from an exponential growth in human recreation in the area including jogging, hiking, cycling, horseback riding, wildlife viewing, and dog walking.

Databases

It has been two decades since the Snowy Owl account was published in *The Birds of British Columbia* (Figure 79). At that time nearly 1,900 records were compiled manually (Table 10), mostly from field observations of naturalists. Locating Snowy Owl records for this updated account has been time-consuming because the species' presence cannot be predicted each year, hence there are fewer records. Records in published reports, books, and scientific papers are far fewer in number than for a widely distributed and often encountered species like the Common Loon (see Campbell et al. 2008).



Figure 78. Analysis of these 16 Snowy Owl pellets, collected at a roost site at the Victoria International Airport in North Saanich, BC. in February 1981, showed that the main prey item was Deer Mouse (Mark Nyhof).

The present database, consisting of 25,749 single occurrence records for the 114-year period 1896 through 2009 (Table 9), took about five months to complete. Maintaining the database in future, however, will be a far less onerous task.

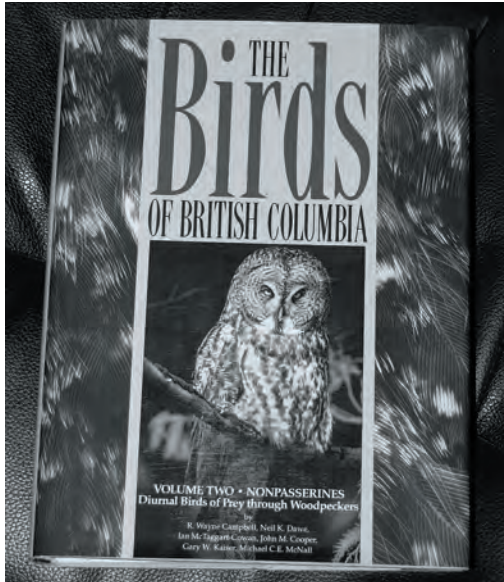


Figure 79. The second volume of “*The Birds of British Columbia*” (Nonpasserines - Diurnal Birds of Prey through Woodpeckers) published in 1990 still remains the source document for owls in the province. Expanded and updated databases, such as what has been developed for Snowy Owl, allows for a more detailed account that can incorporate world concerns for the species while retaining a regional importance of relevant information for conservation.

Table 9. Differences in distribution information, and size of databases used in the Snowy Owl account published in *The Birds of British Columbia* (BBC; see Campbell et al. 1990) with the current account from updated databases housed in the Wildlife Data Centre (WDC) in 2009.

	Distribution ¹		Database	
	Occurrence	Breeding	Occurrence	Breeding
BBC	86	n/a	1,886	n/a
BCFWS	153	n/a	25,749	n/a
% Increase	77.9	n/a	1,265	n/a

¹Based on the total number of 1:50,000 National Topographic System grids occupied.

Did You Know?

White for a Reason

Birds are the most colourful terrestrial vertebrates; they may use colour for camouflage, attracting a mate, territorial defense, or identifying themselves as individuals in a flock. Research on white-plumaged birds has concentrated on heat-loading effects of solar radiation rather than how white acts as an effective long-distance signal, especially in open habitats.

Recently, Bortolotti et al. (2011) studied how the white plumage of Snowy Owls is used in communication on wintering grounds in Saskatchewan. Generally, the proportion of the body covered by black spots varies from zero to about 50%, although the face (Figure 80), throat, and upper breast are invariably white. The team discovered two important functions of white bodies: 1) Owls appear to display by adopting a posture that emphasizes the bright white and unspotted face, throat, and upper breast by facing the sun (Figure 81), no matter what time of day; and 2) heavily spotted owls prefer the tallest perches while all-white owls signal from the ground. Their research suggests that through visual displays there is a strong signaling function of the white plumage of Snowy Owls between conspecifics.

A Star of Screen

Hundreds of millions of people around the world were first introduced to Snowy Owl in the fantasy novels and movies of the adventures of the adolescent wizard Harry Potter. Hedwig, the owl’s name, helped bridge the magical world by delivering messages and packages and providing companionship when



Figure 80. The pure unmarked face and throat of Snowy Owl is used in visual communication both on the breeding and wintering grounds (Mark Nyhof).



Figure 81. The unmarked white face, throat, and upper breast of Snowy Owl is used for visual displays that are intensified by perching birds always facing into the sun, no matter what time of day. Saint Barthelemy, QC. 11 February 2010 (Alan D. Wilson).

Harry needed it. This sudden universal interest has prompted people to learn more about Snowy Owls not only in England, where Harry lives, but also in other parts of the world.

While Hedwig spends most of his time in the film in a cage, most birders know that some owls, including Snowy Owl, may fly long distances searching for food. Birders also probably noticed that on the silver screen Hedwig is a male but in J.K. Rowling's books the bird is a female. Despite artistic license, a huge awareness in owls has been kindled worldwide.

Ookpik

Ookpik is the Inuktitut word for Snowy (or Arctic) Owl and was a popular Inuit handicraft toy. It is made from sealskin and was first created at the Fort Chimo Eskimo Co-operative in Quebec in 1963. The bird's large head, with big eyes, dark beak, and small black talons instantly became a popular souvenir with many people throughout the world and soon became a symbol of handicrafts in Canada. The Centennial of Canada in 1967 propelled the cute, fuzzy doll to even more fame.

Frankie Rodgers, a fiddler from Mission, British Columbia, first composed the "Ookpik Waltz" and published it in a tune book of his compositions. While rumours still exist about its source, the song became quite popular among North American fiddlers after it surfaced as a contest waltz played by a group of Spokane, WA fiddlers in the early 1970s.

Ook, a shortened version of Ookpik, was chosen as the mascot of the Northern Alberta Institute of Technology (www.thecanadianencyclopedia.com).

Living in a Harsh Environment

For most of the year the sedentary, but nomadic, Snowy Owl must live in a land of snow, temperature extremes, shortages of food, and habitats that are not as varied as regions farther south. To maintain a constant body temperature the bird's plumage is unusually dense and downy and the feather cells are filled with air, an excellent insulator. As well, dense feathers cover most of the bill and all of the legs, which extend down to the black talons.

How Many Arctic Owls Are There?

Snowy Owls are conspicuous, but obtaining reliable estimates for the breeding population in the vast regions of the Arctic is nearly impossible, even for a smaller region such as a large island. The irruptive and nomadic behaviour compounds the problem even if aerial surveys were used to cover areas. A "best guess" has been published by Manning et al. (1956) for Banks Island where an estimated 15,000 to 20,000 owls occurred in high reproductive years and 2,000 birds in low years.

Pellets and Owls - Not Unique

Owls are not the only birds that form pellets. Many other groups also regurgitate pellets, or castings, containing indigestible prey remains. Some of these include grebes, herons, hawks, eagles, rails, shorebirds, gulls, skimmers, terns, shrikes, crows, and ravens. Study of pellets is often a good way to determine food preferences for a species.

Snowy Owl on Pop culture

The “Great White Owl” has become a symbol in popular culture in North America. It is the official bird of Quebec (Figure 82), the official mascot of the International Fraternity of Phi Gamma Delta, represents cold-weather and camping programs of the Boy Scouts of America, is a popular plaything for children in Canada called “*Ookpik*”, has appeared in the 1994 movie “*Dumb and Dumber*”, sits atop the Coat of Arms of the Statistical Society of Canada, and in 1986 was depicted in the series of \$50 Canadian bills (http://www.bankofcanada.ca/en/banknotes/general/character/1986_50.html).

Recently it has become an Internet phenomenon referred to as “O RLY? Actually, the acronym stands for “Oh, really?” and is often referred to as a sarcastic response to a question or statement. Images of Snowy Owl, dressed in a wide variety of make-up and attire, including moustaches, is often the species chosen for such communication.



Figure 82. The Snowy Owl became the avian emblem of Quebec in 1987 as part of a major national movement to enhance the quality of the environment and save wild species. Saint Barthelemy, QC. 12 February 2010 (Elaine R. Wilson).

Snowy Owl On-line

Worldwide, people are fascinated with owls as a group and thousands of on-line sites have been established to share information, photographs, conservation concerns, and to discuss life history strategies. Although many of these are entertaining and informative, we have listed below only a few on-line sources where specific summary information on Snowy Owl in North America, including British Columbia, can be found. A couple of additional sites, however, have been included as an overview for general conservation issues of international significance.

Biodiversity Centre for Wildlife Studies (www.wildlifebc.org). Established in 2004 to “create and maintain a permanent central repository in British Columbia for historical and current information on wildlife.” Currently, electronic databases and nest cards combined are approaching 238,000 individual records for the 15 species of owls in the province. Bi-annual journal “*Wildlife Afield*” contains online, peer-reviewed articles on owls and other wildlife in the province for free download.

Birds of North America (www.bna.birds.cornell.edu). A ten-year project started in 2002 to produce comprehensive life history accounts for all regularly occurring species in North America. The paper copy consisted of 18 volumes and over 18,000 pages. An electronic, often updated, version is available on-line [Figure 83].

Global Owl Project (www.globalowlproject.com). A multi-year worldwide project to resolve foundational aspects of taxonomy and conservation for the world’s owls. Owl citations, many as PDF downloads, are being added regularly.

North and Central American Owls (www.owling.com). The largest United States website totally dedicated to owls, based in Minnesota. The site contains checklists, a multimedia section, a brief species biology write-up, regular updates on invasions, and photographs.



Figure 83. The 20-page summary of life history information for the Snowy Owl in North America in “The Birds of North America” series is the most comprehensive single source to start research for provincial and state species accounts.

O.W.L. (Orphaned Wildlife) Rehabilitation Society (www.owlrehab@dccnet.com). Dedicated to public education and the rehabilitation and release of injured and orphaned birds of prey. Their on-sight facility, located in Delta, BC, specializes in short and long-term primary care. Presently three Snowy Owls are permanent residents and are being cared for by trained volunteers. They include Kermit (hit by a car in Sarnia, Ontario), Piggy (see Figure 106) and Serenity (hit by an airplane at the Boundary Bay Airport in November 1992).

Owl Research Institute (www.owlinstitute.org). Established in 1985 to “study the ecology of owls and their communities, both nationally and internationally, providing information about their ecology and natural history, as well as their distribution, abundance,

survival, and breeding success.” A research centre is located in western Montana but major research projects are being carried out on Snowy Owl on their Arctic breeding grounds in Alaska.

Patuxent Wildlife Research Centre (www.mbr-pwrc.usgs.gov). Brief introduction and summary information for North America’s species of birds including identification tips, life history, Christmas Bird Count maps, taxonomy, and a glossary of scientific terms.

Raptor Research Foundation (www.rrf.org). Organized in 1966, the RRF is primarily concerned with the accumulation and dissemination of scientific information about raptors (hawks, eagle, falcons, and owls), primarily in North America. Its goals are achieved primarily through publication of research reports in The Journal of Raptor Research, which contains many peer-reviewed article on owls.

The Owl Pages (www.owlpages.com). An electronic source of information on owls (Figure 84) of the world for educational and non-commercial purposes that was first uploaded in 1998. Site pages include information for species by genus, common name, and location; an owl’s physiology; full galleries on sounds and photos; latest scientific literature; and mythology surrounding owls [Figure 84].

World Owl Trust (www.owls.org). Based in the United Kingdom, the WOT exists to advance wildlife conservation by primarily focusing on all owl species and their ecology. Through the promotion of habitat management and restoration, research, captive breeding programs, and its own education policy, the Trust intends to bring an awareness of conservation and environmental sustainability to all levels of society. Provides a worldwide overview for conservation of owls, including construction of nest boxes, updates on world status provided by the International Union for Conservation of Nature, new species, and owl first aid.



Figure 84. The Owl Pages provides a useful general overview of the taxonomy, life, and ecology for 222 owl species in the world, including Snowy Owl. This adult male was photographed near Calgary, AB. 20 January 1998 (Michael I. Preston).

Acknowledgements - Your Data at Work

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Figure 85. Bill Anderson (right) receiving the Vancouver Natural History Society “Bird of the Year” award from Michael Shepard for finding a Black-necked Stilt (*Himantopus mexicanus*). Vancouver, BC. December 1972 (R. Wayne Campbell). Both birders contributed significant numbers of Snowy Owl records to this account during the 1970s through their involvement in annual bird reports and student research on raptors in the Sea Island-Iona Island area.



Figure 86. Barbara Begg, a member of the Victoria Natural History Society and an active birder for many decades, contributed to developing the seasonal status of the Snowy Owl on southern Vancouver Island. Victoria, BC. April 2006 (R. Wayne Campbell).

Briault, British Columbia Fish and Game Branch, Allan Brooks, Doug Brown, Marion Brown, Chris Bryant, Roger Burrows, Clyde Burton (Figure 87), Robert W. Butler, Colin Butt, John Byres, Elmer



Figure 87. Snowy Owl is a very rare bird on the Sunshine Coast. The only records for the Powell River region were supplied by long-time resident Clyde Burton. Powell River. BC. 23 February 2007 (R. Wayne Campbell).

Callin, Jim Cameron, Eileen C. Campbell, R. Wayne Campbell, Canada Department of Transport, Peter Candido, Robert A. Cannings, Richard J. Cannings, Russell Cannings, Sydney G. Cannings, G. Clifford Carl, Donald Carruthers, Wendy Cassel, Rob Catchpole, Donald G. Cecile, John Chandler, Chris Charlesworth, Deborah Chesilvy, Myke Chutter, George Clulow, M. Coavelier, D. Code, Teresa E. Colby, J. Mary and Tom Collins, R. J. Contabaris, Doug Cooper, John K. and Louise Cooper, John M. Cooper, Audrey Cootz, Adeline and Pascal Cortez, A. Couvington, Larry Cowan, Creston Valley Wildlife Management Area (Wildlife Centre), Vic and Cecile Cousineau, Roger Craig, J. B. Crowell, Ray Crowther, H.H. Currie, Dorothea Curtis, Ryan Cutler, Chris Dale, Mike Darney, Mike Darney, Gary S. Davidson, Brian and Dorothy Davies, Karen and Neil Dawe, Thomas Deasy, Joe Denham, Brian and Dorothy Davies, Richard Davis, Neil K. and Karen Dawe, Gwen De Camp, Anna Dean, T. Deasy, Brent Diakow, Glenn Diers, H. Donald, John J. Dorsey, Adrian Dorst, Rudolf H. Drent, Terry Dugdale, David Dunbar, Patty Dunsmuir, Davey Dyck, Norman Dyck, Maureen Dyck, Margaret Ebl, Cameron D. Eckert, Ron Eckman, Barry Edwards (see Figure 91), R. Yorke Edwards, Mel Elias, Klaus Emmaneel, Anthony J. Erskine, Lloyd Esralson, Steve Fairbairn,

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Figure 88. Although Snowy Owl was not seen during a hike along the West Coast Trail of Vancouver Island in autumn/winter 1976, Bob Foottit (centre) contributed records from the Fraser River delta while a member of the Vancouver Natural History Society (R. Wayne Campbell).



Figure 89. The late Vic Goodwill with his wife Peggy compiling bird records in Victoria, BC. 15 November 2000 (R. Wayne Campbell). The team left an incredible record of documented bird occurrences for southern Vancouver Island from the 1970s through the 1990s. Vic's personal field notes contain over 600,000 individual records.



Figure 90. Barry Harman (right) holding a Semipalmated Sandpiper (*Calidris pusilla*) ready for banding by Michael Shepard on Sea Island, BC. September 1971 (R. Wayne Campbell). Both individuals monitored foreshore areas in Delta and Ladner in the late 1960s and early 1970s for Snowy Owls.

Haras, Jenny Hards, Barry C. Harman (Figure 90), Robert D. Harris, E. G. Hart, F. Gordon Hart, John Harvey, Sharon Hassell, David F. Hatler, David and Myrnal Hawes, Robert Hay, Margo Hearne, Simon Henson, Werner H. Hesse (Figure 91), Hildegard Hesse, Doug and Marian Innes, Fred Hobson, Keith Hodson (see Figure 62), Bonnie Hooge, Tracey D. Hooper, Dorothy Horn, Harold Hosford, Suann Hosie, G. F. Houston, Richard R. Howie, Janet Hudson, William M. Hughes (see Figure 19), Eugene S. Hunn, Arthur Hurn, Jack and Eileen Husted, John Ireland, Peggy Irving, Angus Jack, Paul James, Ross D. James, Russ Janes, Doug Janz, Len Jellicoe, Dale A. Jensen, Richard S. Jerema, Daryl Johnson, Joan Johnston, Winnie Johnston, Ruth Jones, Fritz Karger, Brian M. Kautesk, Lee E. Kelsey, Bruce Kennedy, Ian Kennedy, Ken Kennedy (see Figure 47), Francis Kermodé, Deborah Kerr, Joan Kerr, George Kinkade, Bill Kincaid, Sandra Kinsey, Alan R. Kitson, Richard Knapton, John and Gladys Knezevich, Burke Korol, W. Douglas Kragh, John Krebs, Daronne Krown, Xavier Lambin, Bill Lamond, Laird Law, Barry Leach (Figure 92), Douglas Leighton, Enid K. Lemon, Moira Lemon, Dick Lindstrom, Marcia Long, Betty Lothian, Kevin Louth, Rosemary Love, Don Low, John Luce, Mr. and Mrs. Brian Ludlay, Robert E. Luscher, Michael



Figure 91. During his tenure as regional compiler for the Ladner Christmas Bird Count in the late 1960s, Werner Hesse always isolated raptor records, including Snowy Owl, for the Vancouver annual bird reports that were started in 1970. Metchosin, BC. 26 September 2008 (R. Wayne Campbell).



Figure 92. During his conservation activities, especially with the early establishment of the George C. Reifel Migratory Bird Sanctuary on Reifel Island, BC, Barry always recorded his favourite birds, one of which was Snowy Owl. Delta, BC. April 1970 (R. Wayne Campbell).



Figure 93. In the winter of 1980-1981, Mark Nyhof analyzed Snowy Owl pellets collected at the Victoria International Airport, the first such study for Vancouver Island. In this self photograph, Mark is examining a fledged Long-eared Owl during a banding program in the southern Okanagan valley. 31 May 1984.

and Fritz Luz, Tex Lyon, Ruby Macbeth, Michael D. MacColl, Bruce A. Macdonald, Murray MacDonald, J. Mack, Dave Martin, Fay Matthews, Inga-Jean Mattson, Peter McCallister, Jack McGill, Jo Ann and Hue MacKenzie, Alan L. MacLeod, April McLeod, John Manley, Ed McMackin, Phil W. Mattocks, Eric McAlary, Peter McCallister, W. Eric McBean, Marjorie McFeat, Barb and Mike McGrenere, Glen R. McInnes, Jean D. McInnes, Rosina McKay, Alan and Donna McKenzie, Craig McLaughlin, George McLean, Leslie McLean, April McLeod, Ed McMackin, Michael McMann, Martin K. McNicholl, Michael C.E. McNail, Andrew McPhail, Joe Meche, Arthur L. Meugens, Roger Meyer, Thomas Miller, Kirsten Mills, Steven Mlodinow, W. B. Monteith, Ed Moody, Dwight Moore, H. Moore, Mike Morrell, Bill Morris, Ken P. Morrison, Robert Moutal, Allister Muir, Martin Myers, James A. Munro, Deane Munro, Williams Lake Field Naturalists, Harry B. Nehls, Dennis Nelson, R. Wayne Nelson, Vic Nelson, Wendy B. Newman, Verna Newson, Gwen Nicol, Elizabeth North, Phil Nott, Monica Nugent, Mark Nyhof (Figure 93), Dave G. Odlum, G. C. Odlum, Penny Ohanjanian, Viveka Ohman, Michael Oldfield, Lowell Orcutt, Robin Owen, Gerry Paille, Fred Paine, Del Parker, John Parry, Mary and Trudy Pastrick, W. Adrian B. Paul, Marilyn Paul, Dennis R. Paulson, Theed Pearse, Mike Perrone, Mary Pete-



Figure 94. Requesting information on various species, like Snowy Owl, requires time and effort for individuals to sift through thousands of records in field notebooks. Here Mark Phinney, and his daughter Veronica, are working together to extract observations for the Dawson Creek area. Arras, BC. 13 December 2010 (Joanna A. Phinney).

Leslie, Dan Peterson, Roy W. Phillips, Mark Phinney (Figure 94), Barb and Bill Phipps, Dirk Pidcock, Lynn Pollard, John E. Polson, Ilya Povalyayev, G. Allen Poynter, David Price, D. Michael Price, Ron

Prince, William S. Rae, Phil Ranson, Bob and Joyce Reed, William Reed, Dan Rempel, Tim Renneberg, Louise Rice, Derek Richardson, Jean Rimmington, Anna Roberts (Figure 95), Leila G. Roberts, Syd Roberts, Ian Robertson, Dave Robinson, Robin D. Robinson, Steve H. Robinson, Wilma D. Robinson, Laurie Rockwell, John Rodgers, Thomas H. Rogers, Greg Ross, Royal British Columbia Museum [formerly British Columbia Provincial Museum], George Russell, Noel Russell, Don Ryder, Glenn R. Ryder, June Ryder, Jack and Rosamond Sarles, Ron



Figure 95. Anna Roberts (left) with daughter Gina birdwatching on Wineglass Ranch near Riske Creek, BC. 27 April 1990 (R. Wayne Campbell). For over four decades Anna kept track of noteworthy bird sightings in the Cariboo-Chilcotin region providing early information on the occurrence of Snowy Owl.

Satterfield, Greg Saxon, Jack Schick, Zella M. Schultz, Brent Schmor, Madelon A. Schouten, Gary Searing, Barbara Sedgwick, Brian G. Self, Al Sharpe, Chris D. Shepard, Michael G. Shepard (see Figures 80 and 85), Teresa E. Shepard, Jack Schick, F. M. Shillaker, Ervio Sian, Chris Siddle, Paul Simpson, Ed and Kay Sing, George P. Sirk (see Figure 91), Vi Skapski, Alan Smith, Allan Smith, Gertrude Smith, Jamie Smith, Jane Smith, Jeremy Smith, Kay Smith, Marilyn Smith, Muriel Smith, Richard C. Smith, Daphne Solecki, Rita Sparling, Win Speechly, Michael Spencer, Brue and Bernie Spitman, Barry Steeves, Gordon Stewart, Bob Straith, Kenneth R. Summers, Marion Sutcliffe, William Sutton, D. Sveinson, Andrew Stepniewski, Tom Stevens,

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Figure 96. The keen young naturalist team of Ian Yule (left), Barry Edwards (centre), and George Sirk added many records of Snowy Owl from regions in the Lower Mainland that were not explored by others. Burnaby, BC. January 1969 (R. Wayne Campbell).

The regional bar checklists of birds, with clearly defined statuses and occurrences, have been invaluable as a general reference for various regions for Snowy Owl in British Columbia. These areas include Cariboo (Roberts and Gebauer 1992), Greater Vancouver (Toochin 1988; see Figure 105), Cortes and Mitlenatch islands (Sirk et al. 1993; see Figure 103), Creston Valley (Van Damme 2009), Haida Gwaii/Queen Charlotte Islands (Hamel and Hearne 2002), Kamloops (Howie 2003; see Figure 98), Nanaimo (Baille 1996; see Figure 92), North-central British Columbia (Prince George Naturalists Club 1996; see Figure 101), Okanagan Valley (Charlesworth et al. 2002), Sunshine Coast (Greenfield 2010; see Figure 97), and Victoria and southeastern Vancouver Island (Gates 2001).

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Figure 97. Ross M. Lein holding an adult male Snowy Owl prior to release. Indus, AB. Dr. Lein and his graduate students have been studying the population ecology, behaviour, and causes of mortality of Snowy Owl in the prairie region of southern Alberta during the 1980s and early 1990s.

Literature Cited and Useful References

The following list of citations is only a sample of the hundreds of articles that were used to develop our databases and write this account. We have included only literature that was a direct source of records and biological information or a significant contribution to developing the conservation and management section.

Only information for specific supporting statements, or direct sources of data, is cited in the text.

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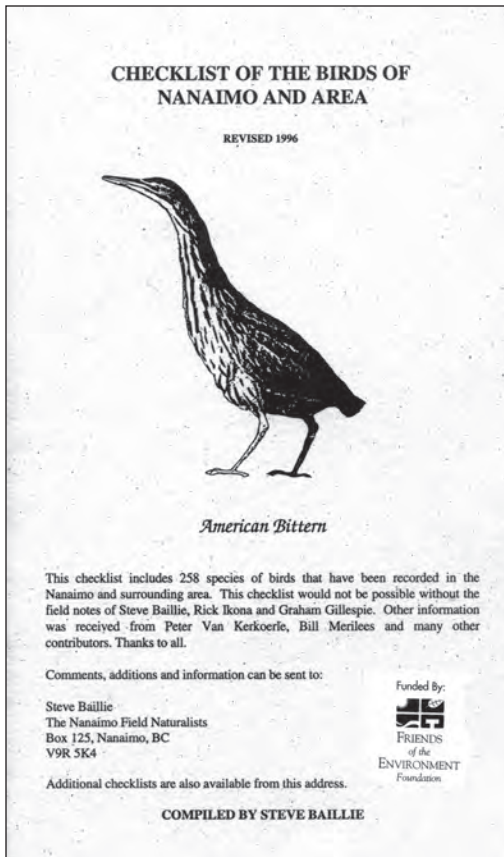


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Figure 99. Near Calgary, AB, wintering territorial Snowy Owls spent 98% of daylight hours perched but showed spikes of activity in early morning and late afternoon. Saint Barthelemy, QC. 9 February 2010 (Alan D. Wilson).

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Figure 100. Recording abnormalities and injuries by photograph, like this throat wound in this immature male Snowy Owl, are important to catalogue and file with full details. (M. Ross Lein).

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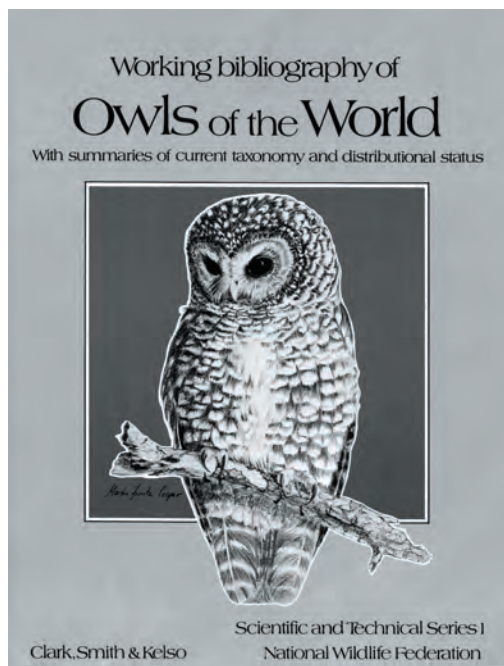


Figure 101. This useful compilation, long out-of-print, lists titles for 6,590 publications for owls of the world. Several hundred are included for Snowy Owl separated into nine different subjects. This bibliography was the start for the literature search for this account.

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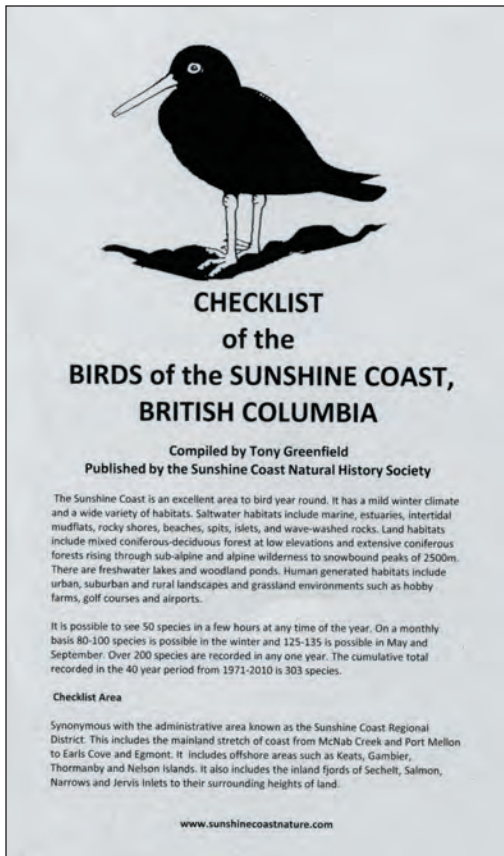


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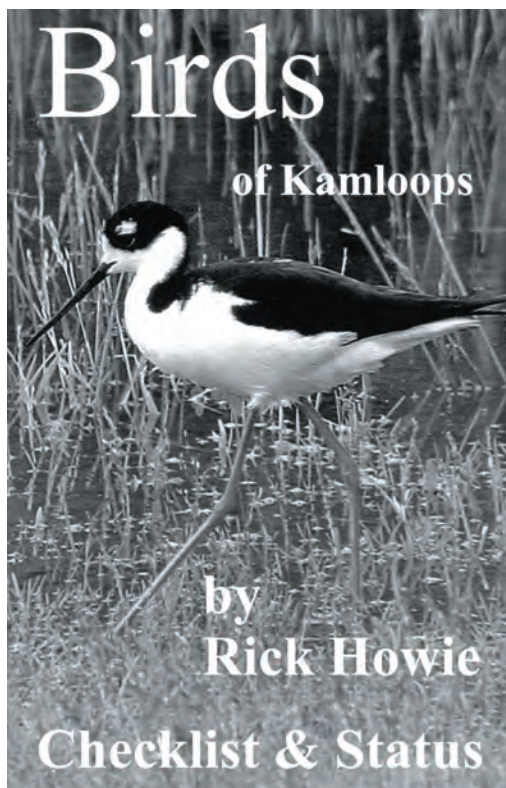


Figure 105. Regional checklists, such as Kamloops, can highlight significant arrival or departure dates that may required follow-up for details.

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Figure 107. Some Snowy Owls in British Columbia have been picked up in what appears to be in good condition, fed and kept overnight, and released the following day, seemingly without any associated trauma. This Snowy Owl, held by Ken Kennedy, was picked up in “apparent healthy” condition, on Iona Island, BC, in December 1966 (R. Wayne Campbell).

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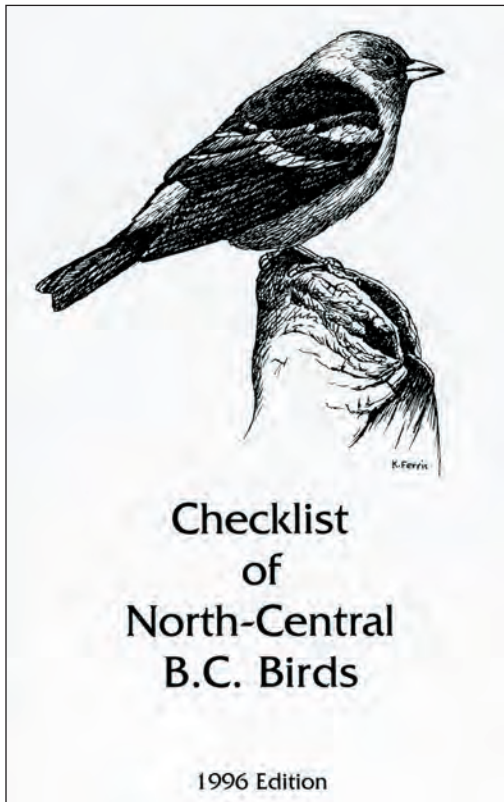


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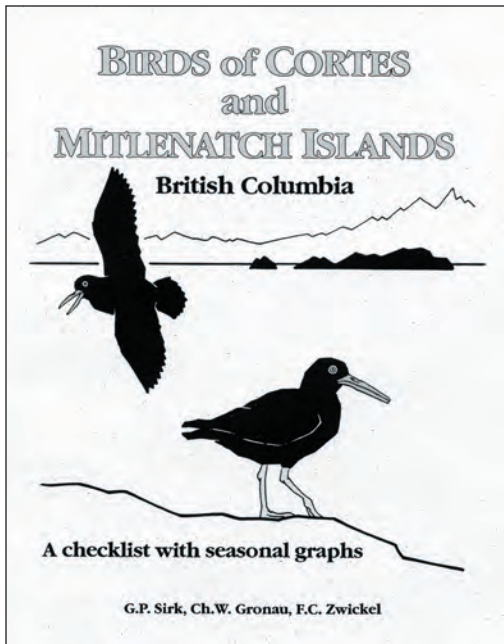


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Figure 113. The death of a single Snowy Owl is of concern to many people so caution should be exercised even when setting out Warfarin to control rodents in urban and residential areas, especially along the south coast of British Columbia in the vicinity of bird feeders. Victoria, BC. 8 December 1980 (Mark Nyhof).

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Figure 114. The 12 different categories for the 406 species compiled for the checklist on the status and occurrence of birds in the Greater Vancouver region was very helpful in designating the most important wintering region in the province for Snowy Owls.



Figure 115. This male Snowy Owl collided with an airplane at the Vancouver International Airport, on Sea Island, BC., in November 1992. The wing was broken near the joint and since it cannot fly again O.W.L. (Orphaned Wildlife Rehabilitation Society) is caring for the bird affectionately known as “Piggy.” (O.W.L. volunteer).

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Figure 116. During years of irruption, like the winter of 1973-1974, Snowy Owls could be found perching together on foreshore logs, an important component of their habitat while visiting southwestern British Columbia. Sea/Iona Island, BC. December 1973 (William J. Anderson).

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About the Authors

Wayne Campbell (see www.wildlifebc.org for a biographical summary)

Michael is a wildlife biologist who works as a consultant for Stantec in Sidney, BC. He is a co-founder of the Biodiversity Centre for Wildlife Studies and for ten years (1999-2009) was the society's Data Manager. Michael grew up in Calgary, Alberta, and from 1988-2000 he often spent his winter weekends prowling the prairies in search of Snowy Owls and other winter birds. Since moving to the west coast in January 2001 his observations of Snowy Owl have diminished substantially – but whenever he visits his family in Calgary in winter, he always makes time to search for the great snow bird.