



Adult male goshawk



Northern Goshawk

Fraser, D.F., W.L. Harper, S.G. Cannings, and J.M. Cooper. 1999. Rare birds of British Columbia. Wildl. Branch and Resour. Inv. Branch, B.C. Minist. Environ., Lands and Parks, Victoria, BC. 244pp.

Northern Goshawk *laingi* subspecies

Accipiter gentilis laingi (Taverner)

ORDER FALCONIFORMES

FAMILY ACCIPITRIDAE

B-NOGO-LA

TAXONOMY

Two subspecies of *Accipiter gentilis* occur in British Columbia: *A. g. atricapillus* throughout the interior and *A. g. laingi* on the Queen Charlotte Islands, Vancouver Island (Cannings 1998), and probably on other coastal islands. *A. g. laingi* has darker colouration, more intensive black crown, shorter and rounder wings, and is smaller in size (Taverner 1940; Johnson 1989). Recent morphological studies have confirmed and clarified the differences between the two subspecies (Whaley and White 1994; D. Doyle, pers. comm.).

STATUS

Global Rank: G5T2

COSEWIC: Vulnerable

CITES: Appendix II

Provincial Rank: S2B, SZN

Provincial listing: Red List

GLOBAL RANGE

Resident: on coastal islands and the panhandle of se. Alaska, the Queen Charlotte Islands and Vancouver Island (Cannings 1998), and possibly on the Olympic Peninsula of Washington. There is some debate about the range of this subspecies. Jewett et al. (1953) classify all coastal birds as far south as Oregon to be *A. g. laingi*, whereas the AOU (1957) restrict it to the Queen Charlotte Islands and Vancouver Island (Cannings 1998). Squires and Reynolds (1997) give the range of *A. g. laingi* as "Vancouver Island northward through insular British Columbia (Alexander Archipelago) and coastal mainland Alaska north to Icy Strait and Lynn Canal."

ECOPROVINCES

GED, COM

BIOGEOCLIMATIC ZONES

CDF, CWH, MH

BIOLOGY

A. g. laingi is a forest raptor that breeds in mature and old-growth coastal coniferous forests. It hunts in forests, along edges of openings, in riparian areas, and above the canopy. Foraging habitat may include a diversity of

landforms and forest cover types but areas with larger trees, high canopy coverage, and open forest floors tend to be preferred (Squires and Reynolds 1997). It preys mainly on medium-sized forest birds such as grouse, jays, thrushes, woodpeckers, Northwestern Crows, and Sharp-shinned Hawks, or mammals such as Red Squirrels (Beebe 1974; Iverson et al. 1996). On Vancouver Island and parts of the Queen Charlotte Islands, Red Squirrels may be a critical food during the spring period (McClaren 1997).

Eggs are laid in April and early May. Clutches usually contain 2–4 eggs and are incubated for about 30 to 32 days. Young fledge after 6–7 weeks, but remain dependent on adults for a few weeks afterward. Fledglings then disperse to unoccupied habitat. Nesting success is highly dependent on prey availability, and breeding may not occur during years of low food supply.

Northern Goshawks have a high degree of nest area fidelity; nearby alternative nests are often used in successive years (Squires and Reynolds 1997).

GLOBAL RANKING

Rank: G5T2

Comments: A sparsely distributed bird, assumed to have a narrow range along a considerable length of coast. Its primary habitat is threatened by logging of old-growth forests.

PROVINCIAL RANKING

Rank: S2B, SZN

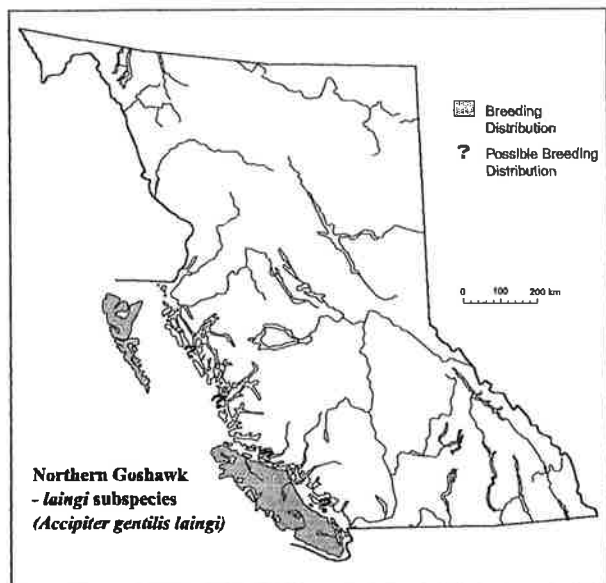
Comments: A sparsely distributed bird. Its primary habitat is threatened by logging of old-growth forests.

Range in British Columbia: B

Resident on the Queen Charlotte Islands and Vancouver Island (Campbell et al. 1990b). It also occurs on other coastal islands, e.g., West Cracroft Island (McClaren 1997), and possibly on the coastal mainland.

Estimated occurrences: C

Intensive surveys in recent years have located 30 active nests: 27 on Vancouver Island and West Cracroft Island, and 3 on the Queen Charlotte Islands (Chytky et al. 1997; McClaren 1997; D. Doyle, unpub. data; T. Ethier, pers. comm.).



Abundance: B?

One estimate, based on habitat availability, was 1,700 pairs in coastal British Columbia (Crocker-Bedford 1990). More recently, this number has been said to be much too high. Alaskan estimates were reduced by 75 to 88%, but a revised figure for B.C. was not given (Crocker-Bedford 1994). Populations appear to occur at higher densities on Vancouver Island than on the Queen Charlotte Islands.

Trend: U

Using a habitat model that evaluated loss of old-growth forest, Crocker-Bedford (1990) suggested that about 40% of the Alaska and British Columbia populations had been lost. Even if that estimate is inaccurate, it is reasonable to conclude that populations are declining, rather than stable or increasing, since goshawks select productive old-growth and mature forests and avoid early seral stages (Iverson et al. 1996). There are no data at present to confirm the model.

Protected occurrences: C

Several known nesting territories are protected within provincial parks or reserves (e.g., Strathcona Provincial Park, Carmanah Walbran Provincial Park, Gwaii Haanas National Park, Naikoon Provincial Park). As an Identified Wildlife species under the Forest Practices Code, a limited number of Wildlife Habitat Areas could be established around nesting areas at the discretion of the Chief Forester.

Threats: B

The primary threat is logging of old-growth and mature second-growth coniferous forests, especially the low to

mid-elevation productive stands that most goshawks use, and where timber values are concentrated. Clearcuts remove specific areas as useful goshawk habitat for considerable periods of time (several to many decades), but also contribute to fragmentation which may lower the overall usefulness of a landscape for goshawks. At logging rotations of, for example, 60 years, previously logged forests would never be suitable for nesting goshawks. Like other raptors, goshawks are sensitive to human disturbance at nest sites during the breeding season.

CONSERVATION NEEDS

Research: Known sites should be monitored to provide valuable data on productivity, prey fluctuations, home ranges, and habitat use. Effects of logging practices on productivity and occupancy of known sites can then be linked.

The subspecific taxonomy of Northern Goshawks needs to be thoroughly examined using modern morphological and genetic techniques.

Inventory: Active territories should be monitored annually to determine occupancy and productivity. Protected areas (e.g., Strathcona Provincial Park, Gwaii Haanas National Park, Naikoon Provincial Park) should be surveyed using standardized methods (Resource Inventory Committee 1997b) to determine how many nesting pairs have protected habitat.

Management and Stewardship: The species is listed in the Identified Wildlife Management Strategy under the *Forest Practices Code of British Columbia Act*. Procedures for establishing Wildlife Habitat Areas on critical habitats, and General Wildlife Measures to determine appropriate forest practices within established areas should be made available to resource managers.

Under the Identified Wildlife Management Strategy (MOF 1998a), goshawk habitat needs have been partitioned into four elements. The nest site includes the nest tree and an adjacent 1 ha of habitat. Nest trees are usually live conifers that are larger than others in a stand, but dead conifers and deciduous Red Alders are also used. The nest area is a 12-ha area centred on the nest tree, which usually includes stands with larger trees than in the surrounding landscape. These are usually on gentle slopes at the bottom third of the slope, and generally face west or east on Vancouver Island and southwest on the Queen Charlotte Islands. The post-fledging area is a 240-ha area around the nest tree which provides adequate foraging habitat and protection for dependent young after they leave the nest. The foraging area is a 2,400-ha area that is presumed to encompass the home range of an individual goshawk. The *Forest Practices*

Code of British Columbia Act gives the Chief Forester discretionary authority to conserve habitat when active nests are located.

The focus of stewardship efforts should be on studying the effects of logging on habitat quality and estimating the long-term population trend based on forecasts of the extent and impacts of logging. Forest management prac-

tices should be modified accordingly to ensure long-term stability of *A. g. laingi* populations.

In order to protect all nest sites from direct and indirect human disturbance, exact locations of nest sites should be kept confidential unless release of information is in the best conservation interests of the birds.

REFERENCES

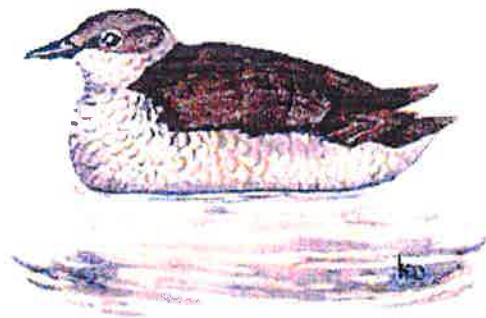


Photo by Brad Bergstrom



cdtg file photo

Marbled Murrelet

Marbled Murrelet

Brachyramphus marmoratus (Gmelin)

ORDER CHARADRIIFORMES

FAMILY ALCIDAE

B-MAMU

TAXONOMY

The Asian species *B. perdix* was previously considered to be a subspecies of *B. marmoratus*, but was recently separated based on molecular genetic evidence (AOU 1997; Nelson 1997). With this recent taxonomic change, there are no subspecies of *B. marmoratus* recognized (Cannings 1998).

STATUS

Global Rank: G3G4

COSEWIC: Threatened

Provincial Rank: S2B, S4N

Provincial listing: Red List

GLOBAL RANGE

Breeds: from the Aleutian Archipelago in Alaska south to c. California.

Winters: within the breeding range and south to extreme nw. Mexico (Nelson 1997).

ECOPROVINCES

COM, GED

BIOGEOCLIMATIC ZONES

CDF, CWH, MH

BIOLOGY

Marbled Murrelets typically nest in trees in coastal old-growth coniferous forests, sometimes in mature forests with certain old-growth characteristics. Northern populations occasionally nest on sea-facing talus slopes or cliffs (e.g., an estimated 3% of the Alaskan population). Since adults do not build nests, they depend on large diameter tree limbs and natural platforms created by damage or disease, with a thick substrate of moss, needles or lichen, on which to lay their egg (Nelson 1997). Details of known tree nests in North America are summarized by Nelson (1997). Breeding habitat in British Columbia is generally at low elevation, in old-growth western hemlock and Sitka spruce forests, particularly moist stands with a well-developed epiphytic moss component (Burger 1995).

Marbled Murrelets forage for small schooling fish and invertebrates in bays, inlets, fjords, and on the open ocean. Despite foraging singly or in small groups the distribution at sea is clumped. Highest use is in areas where prey are concentrated, such as up-welling areas, mouths of bays, over underwater sills, tidal rips, and narrow passages between islands, shallow banks, and kelp beds. Major food items include both fish, such as Pacific Sand Lance (*Ammodytes hexapterus*), Viviparous Seaperch (*Cymatogaster aggregata*), Pacific Herring (*Clupea harengus*), and Walleye Pollock (*Theragra chalcogramma*), and invertebrates such as euphausiids, mysids, squid and shrimp. Euphausiids are important in the winter and spring, while fish are important in the breeding season. Marbled Murrelets will occasionally feed on juvenile Sockeye Salmon (*Oncorhynchus nerka*) in freshwater lakes during the breeding season (Campbell et al. 1990b; Ewins et al. 1993; Nelson 1997).

Only one egg is laid. In British Columbia, the incubation period ranges from early May to mid-July, and nestlings are present from early June to early September (Hamer and Nelson 1995). The incubation period is estimated at 28–30 days, and chicks leave the nest at 27–40 days. Newly fledged young have been observed at sea in British Columbia between June 26 and October 5, with peak returns occurring in late July to mid-August. Hatching success is 67%, and of that, only 45% of chicks survive to fledge. Most nesting failures are the result of egg and nestling predation (Nelson 1997).

Although not migratory in the usual sense, there are some seasonal shifts in distribution. Long-distance movements can occur after the breeding season when many birds move from northern and outer coasts to southern and inland waters such as Hecate Strait, Strait of Georgia, Juan de Fuca Strait, and Puget Sound (Nelson 1997).

GLOBAL RANKING

Rank: G3G4

Comments: Extensive range (Alaska to California) and apparently high population numbers (200,000 to 758,000) in Alaska (Nelson 1997). However, declines are documented or suspected throughout most of the range where old-growth breeding habitat is being removed by logging, and populations are at risk from oil spills and gill-net fisheries. Demographic analyses suggest populations are declining throughout their range by as much as 4–7% per year (Beissinger 1995).

U.S. populations outside Alaska are considered threatened under the U.S. Endangered Species Act, and critical habitat has recently been designated on 1.55 million ha of primarily federal and state lands in Washington, Oregon, and California.

PROVINCIAL RANKING

Rank: S2B, S4N

Comments: Declines of 20–40% have been documented in Clayoquot Sound. Breeding habitat loss continues. This species is difficult to conserve because its breeding population is widely dispersed. Vulnerable to oil spills and gill-net mortality.

Range in British Columbia: B

Breeds along the entire coast of British Columbia, ranging up to 75 km inland in some areas (Carter and Sealy 1984).

Estimated occurrences: D

Widely but sparsely distributed along the entire coast. Unlike other alcids that nest colonially, Marbled Murrelets nest solitarily, but more than one pair can occur in a single forest stand. Breeding occurrences likely number over 100, the exact number will depend on how occurrences are defined. Specific nesting and foraging areas are only now beginning to be described.

Abundance: D

The size of the population is not known with certainty (Rodway 1990; Rodway 1991), but has been estimated at 25,000 to 50,000 breeding individuals in British Columbia (Ralph et al. 1995).

About 1000 breeding pairs are estimated to remain in the southern Strait of Georgia (Sealy and Carter 1984) and an estimated 9700 breeding pairs occur on the west coast of Vancouver Island (Rodway et al. 1992a).

Trend: B

Based on detailed counts ten years apart (1982 and 1992/1993), Kelson et al. (1995) documented declines of up to 40% in Clayoquot Sound. Burger (1995) documented similar declines further south, but concluded that part of the decline could be attributed to fluctuations in distribution caused by changes in local sea surface temperature. However, he concludes that, overall, a real decline is embedded within these fluctuations (A. Burger, pers. comm.). Data are lacking on a provincial scale (Rodway et al. 1992a), but numbers are widely believed to be declining in most areas due to loss of breeding habitat from logging (Marshall 1988; Nelson 1997).

Protected occurrences: C

Many breeding sites are likely protected in various national and provincial parks and ecological reserves; however these are unlikely to protect a sufficient proportion of the provincial breeding population to prevent further declines.

Threats: A

Logging of breeding habitat has been identified as the greatest threat to the Marbled Murrelet in North America (Kaiser et al. 1994; Nelson 1997). The exact implications of loss of nesting habitat to large scale forest harvesting in coastal British Columbia have not yet been determined, but are thought to be significant to population viability. As well, fragmentation of forests can increase nest predation rates and may explain the high rate of nest failure (Nelson 1997).

Marbled Murrelets are also vulnerable to oil spills (Burger and Fry 1993); their habit of feeding close to shore makes them one of the most vulnerable species to this threat (King and Sanger 1979; Nelson 1997).

Inshore gill-net mortality can have significant impacts on local populations (DeGange et al. 1993). In Barkley Sound an estimated 175–250 birds (about 6% of the population) were captured in gill-nets in a single season (Carter and Sealy 1984) and similar impacts have been noted in Alaska (Nelson 1997).

CONSERVATION NEEDS

Research: A number of strategies are outlined in the National Recovery Plan (Kaiser et al. 1994) including research into the basic ecological requirements of the species, defining habitat use patterns, developing population monitoring programs, evaluating the significance of mortality associated with gill-net fisheries, and developing criteria to measure effectiveness of conservation activities. Much of this work is ongoing and is being coordinated by the National Recovery Team and the Pacific Seabird Group Marbled Murrelet Committee.

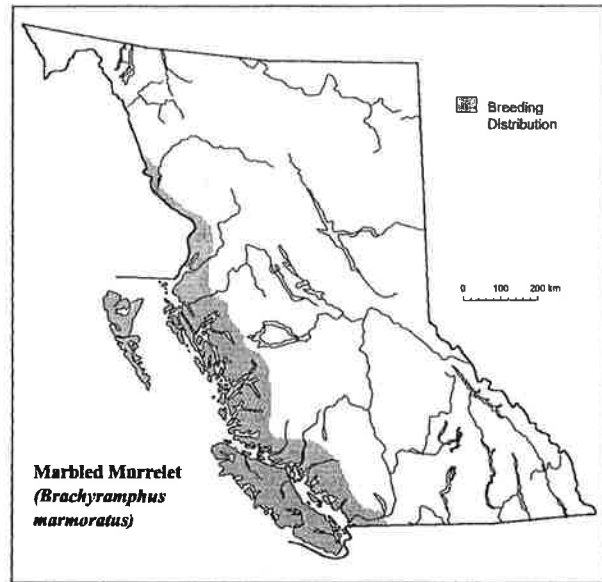
Inventory: The remaining old-growth coastal forests suitable for breeding Marbled Murrelets should be inventoried and mapped according to standard methodologies (Resources Inventory Committee 1998e). This mapping can be used to guide surveys (Resources Inventory Committee 1997a) to locate breeding birds and remaining nesting habitat. Important marine habitats should also be identified and mapped (Kaiser et al. 1994).

Management and Stewardship: The species is listed in the Identified Wildlife Management Strategy under the *Forest Practices Code of British Columbia Act*. Proce-

dures for establishing Wildlife Habitat Areas on critical nesting habitats, and General Wildlife Measures to determine appropriate forestry practices within established areas should be made available to resource managers and implemented as soon as possible. Recommendations in the Identified Wildlife Management Strategy will require evaluation periodically in light of new research findings. Some nesting habitats should also be protected under legislation other than the *Forest Practices Code of British Columbia Act*.

Marine oil spill response plans should be evaluated and amended as necessary to address the needs of Marbled Murrelet populations. Gill-net fisheries should be regulated and managed to reduce the threat of by-catch. Maintenance of a ban on the use of mono-filament nets should be encouraged.

The National Recovery Plan (Kaiser et al. 1994) should be updated in light of new scientific information and conservation initiatives.



REFERENCES



Wolverine

Wolverine *vancouverensis* subspecies
***Gulo gulo vancouverensis* Goldman**

ORDER CARNIVORA
FAMILY MUSTELIDAE

M-GUGU-VA

TAXONOMY

There are three subspecies of *Gulo gulo* recognized in North America; two occur in British Columbia: *G. g. luscus* and *G. g. Vancouverensis* (Nagorsen 1990, 1998b). Few specimens exist of *G. g. vancouverensis*, and in her examination of them, Banci (1982) found little evidence for separating *G. g. vancouverensis* taxonomically from *G. g. luscus*. DNA analysis may aid in this, but it would have to be done using historical pelts.

STATUS

Global Rank: G4T1Q

COSEWIC: Not Addressed

Provincial Rank: S1

Provincial listing: Red List

GLOBAL RANGE

The Wolverine ranges across Eurasia and North America; *G. g. vancouverensis* is confined to Vancouver Island.

ECOPROVINCES

COM

BIOGEOCLIMATIC ZONES

CWH, MH, AT

BIOLOGY

Little is known of the biology of this very rare subspecies of Wolverine, which probably occupies alpine tundra, subalpine parkland, and mountain forest on Vancouver Island. The biology of the Wolverine is poorly understood with only five completed major field studies in North America (Hornocker and Hash 1981, Gardner 1985, Magoun 1985, Banci 1987, Copeland 1996). None of these studies are in British Columbia; but two major studies are currently underway (E. Lofroth, pers. comm., J. Krebs, pers. comm.).

The Wolverine is a solitary and wide ranging carnivore. Food availability is the primary factor determining the movements and range of Wolverines (Hornocker and Hash 1981, Banci 1994). Large herbivores, probably obtained as carrion, are an important food item in the

diet, particularly during the winter when they may have been hampered by deep snow (Rausch and Pearson 1972, Banci 1994).

Geographic features, such as mountain ranges and large rivers are not barriers for Wolverines to the same extent that they are for many species (Hornocker and Hash 1981, Banci 1987). Cover is probably important in selection of travel corridors in areas of human activity (Austin 1998, E. Lofroth, pers. comm.). Individuals tend to travel similar routes through their home ranges from year to year (Koehler et al. 1980). Home ranges of adults vary from less than 100 km² to over 900 km². The variation may be related to the abundance and distribution of food. Males typically have the largest home ranges and females with kits having the smallest (Banci 1994). Wolverine natal dens in Idaho (Copeland 1996) and British Columbia (E. Lofroth, pers. comm.) have been found predominantly in sub-alpine cirques, on north- or northeast-facing slopes in large boulder talus where Hoary Marmots are an important food source. On Vancouver Island this subspecies may have fed on Vancouver Island Marmots.

Proximity to cover appears to have been important as natal dens were located in small talus sites, less than 100 m wide, surrounded by trees (Copeland 1996). Natal den sites may be re-used in subsequent years by the same female (Copeland 1996). Seclusion appears to be the most important factor in the selection of natal den sites (Copeland 1996). The breeding season is usually in summer, but implantation is delayed so that kits are born the following spring, after a gestation of 30-40 days. Average litter size is 3 kits (Hatler 1989).

GLOBAL RANKING

Rank: G4T1Q

Comments: Very rare with few sight records since 1970.

PROVINCIAL RANKING

Rank: S1

Comments: Very rare with few sight records since 1970.

Range in British Columbia: A

Restricted to Vancouver Island (Nagorsen 1990). Formerly ranged coast to coast on Vancouver Island, but

MAMMALS

now confined to the inaccessible areas of the central mountain ranges and the west coast (Banci 1994).

Estimated occurrences: A

Only 4 sightings since 1980 (B.C. Conservation Data Centre 1998).

Abundance: A

This species is difficult to census, but extreme paucity of sightings indicates a very small population.

Trend: B?

No trend data available; undoubtedly fewer than in historic times.

Protected occurrences: B

Most parks are not large enough to protect the full home range of a Wolverine; Strathcona Park is presumed to protect some.

Threats: B

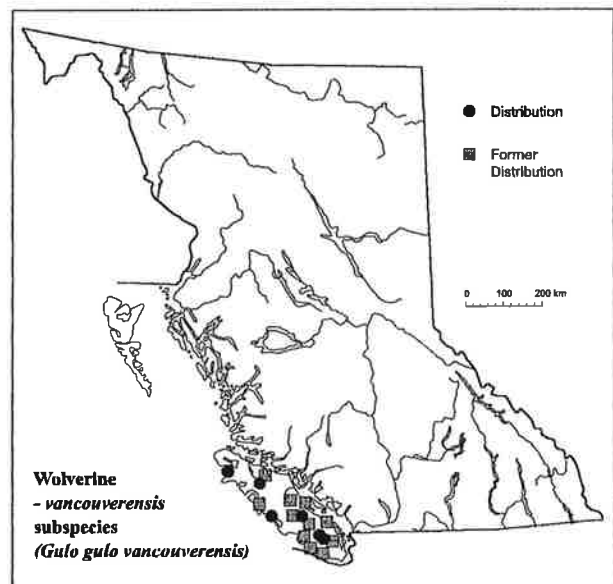
The effects of large-scale timber harvest on movement and survival is not known. However, the abundance of deer and elk, an important food source, in the mountains of Vancouver Island is directly related to the presence of old-growth forests as critical winter range (Nyberg and Janz 1990). Wolverines are thought to be negatively affected by human activity and habitat alteration and are generally found in more remote areas (Krott 1960, van Zyll de Jong 1975, Whitman et al. 1986, Banci 1994). They also appear to be reluctant to cross active transportation corridors (Austin 1998).

CONSERVATION NEEDS

Research: Little is known of the basic ecology of this subspecies, including habitat preferences and prey interactions. The impact of forest harvesting and related activities on movement patterns and landscape utilization needs to be better known.

Inventory: Past surveys (including ones with remote cameras) have been unsuccessful in detecting these animals. Routine inventories should be completed to get a more accurate population estimate (E. Lofroth, pers. comm.). Techniques developed in surveying and monitoring *G. g. luscus* in the interior of British Columbia could perhaps be used to increase our knowledge of the distribution of *G. g. vancouverensis*.

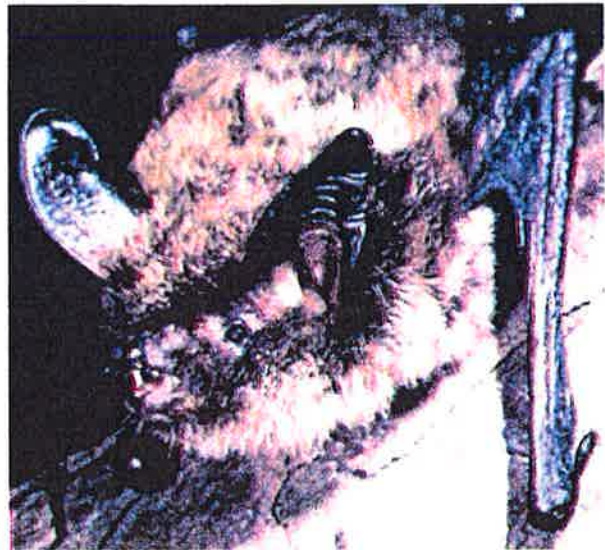
Management and Stewardship: Deer and elk populations on Vancouver Island should be managed with the health of Wolverine populations in mind. Design of leave strips and highway corridors in Wolverine habitat should take into account this species' needs. High elevation winter recreational activities may need to be limited in areas where Wolverines breed, especially snowmobiling and helicopter-accessed activities.



REFERENCES



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**Keene's Long-eared
Myotis**

Keen's Long-eared Myotis
Myotis keenii (Merriam)

ORDER CHIROPTERA
FAMILY VESPERTILIONIDAE

M-MYKE

TAXONOMY

There are no recognized subspecies of *M. keenii*. This species formerly included its e. sister taxon, but a study by van Zyll de Jong (1979) concluded that the latter should be classified as a separate species, *M. septentrionalis*. The two taxa were formally recognized by van Zyll de Jong (1985) and Jones et al. ([1986] 1997). Van Zyll de Jong and Nagorsen (1994) analyzed specimens of *M. keenii* and *M. evotis* and found some morphological intermediates; however, based on distributions, it was determined that these likely represent intraspecific variation, but this cannot be determined unequivocally without molecular data.

STATUS

Global Rank: G2G3

COSEWIC: Vulnerable

Provincial Rank: S1S3

Provincial listing: Red List

GLOBAL RANGE

Keen's Long-eared Myotis is restricted to the west coast of North America, where it ranges from Washington to sw. Alaska (Nagorsen 1990, Van Zyll de Jong and Nagorsen 1994).

ECOPROVINCES

COM, GED

BIOGEOCLIMATIC ZONES

CDF, CWH, MH

BIOLOGY

Little is known about the life history of the species given the few confirmed observations. Keen's Long-eared Myotis appears to be a solitary species associated with coastal forest habitat, where tree cavities, rock crevices, and small caves are suspected to be typical summer roosting sites. One has been found hibernating in a cave at 900 m on Vancouver Island (D. Nagorsen, pers. comm.). Keen's Long-eared Myotis have been observed foraging above salal shrubs and hot springs on Hotspring Island in Haida Gwaii (Queen Charlotte Islands) for moths and other insects. Limited evidence suggests that

mating occurs in autumn, and the young are born the following June or July (Nagorsen and Brigham 1993).

GLOBAL RANKING

Rank: G2G3

Comments: Regional endemic; population size and trends unknown. Potential threats include habitat loss and fragmentation through clear-cut logging (B.C. Conservation Data Centre 1998).

PROVINCIAL RANKING

Rank: S1S3

Comments: Few occurrences known. Ecology is poorly known, but it is apparently sparsely distributed, and may be vulnerable to large-scale logging practices.

Range in British Columbia: B

Apparently restricted to coastal coniferous forests (Firman et al. 1993, Nagorsen and Brigham 1993).

Estimated occurrences: C

Fifteen are known; undoubtedly more exist (B.C. Conservation Data Centre 1998).

Abundance: U

Unknown.

Trend: U

Unknown.

Protected occurrences: B

Hotspring Island in Gwaii Haanas National Park, Queen Charlotte Islands.

Threats: BC

Possibly dependent on tree cavities associated with old-growth or mature forests for roosts (Nagorsen and Brigham 1993), and therefore vulnerable to large-scale logging practices. If forested areas are important for foraging, logging may have a further impact (Firman et al. 1993). The disturbance of karst by recreationalists or mineral extraction may be a threat, as these areas may be critical as hibernacula (T. Chatwin, pers. comm.).

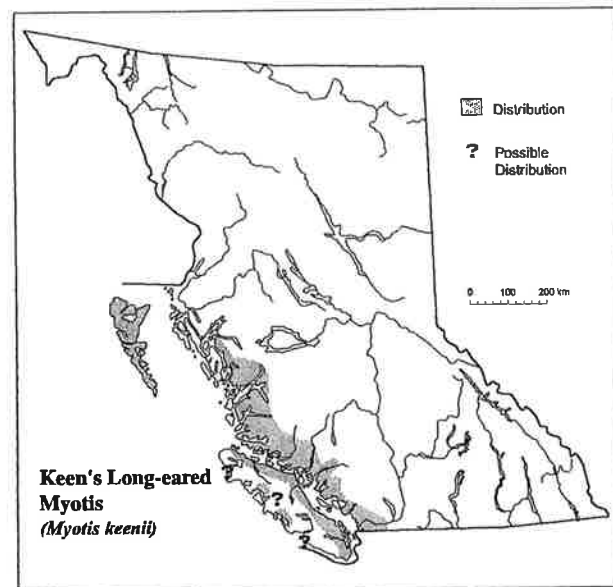
MAMMALS

CONSERVATION NEEDS

Research: Little is known of the biology and ecology of this species. Research is needed into various life history parameters such as reproductive cycle, food habits, roosting sites, migration, and hibernation ecology. Additional morphological and genetic studies are needed to aid in field identification of this and related species.

Inventory: Intensive surveys are needed to more precisely determine the distribution, abundance, and habitat needs of this species (Firman et al. 1993). However, because of the problems of identification and taxonomy, inventories must include voucher specimens and, if possible, should be postponed until identification can be done with more certainty or be done in conjunction with identification development.

Management and Stewardship: Areas of mature forest should be protected to ensure an adequate supply of roosting sites. Access to caves where maternity roosts or hibernacula occur should be controlled to prevent unnecessary disturbance (Firman et al. 1993). Any known sites should be protected.



REFERENCES