Best Management Practices for Raptor Conservation during Urban and Rural Land Development in British Columbia

31 March 2005

Prepared by:

Mike W. Demarchi, MSc, RPBio
and
Michael D. Bentley
LGL Limited environmental research associates
9768 Second Street
Sidney, BC V8L 3Y8

Revised by:

Lennart Sopuck, RPBio
Biolinx Environmental Research Ltd.
1759 Colburne Place
North Saanich, BC V8L 5A2

For:

B.C. Ministry of Environment
Ecosystem Standards and Planning
Biodiversity Branch

BRITISH COLUMBIA

This page has been intentionally left blank

Acknowledgements

Grant Bracher of the B.C. Ministry of Environment (MOE) served as the contract monitor, and provided important guidance and comments on drafts of this document. Original text for the provincial document was completed by Mike W. Demarchi and Michael D. Bentley, LGL Limited environmental research associates. The document was revised in 2005 by Lennart Sopuck, Biolinx Environmental Research Limited. Marlene Caskey (MOE) and Erica McClaren (MOE) provided important materials and advice, and commented on a draft of this document. Michael Chutter, Karen Morrison, Margaret Henigman and Susan Latimer of MOE reviewed all or portions of this document. Jared Hobbs of Hobbs Photo Images Company, Susan Latimer, Erica McClaren and Don Doyle of MOE kindly provided photos of raptors used in this document. Gary Searing (Wildlife Biologist with LGL Limited) provided additional information on raptor conservation and management. Peter Wainwright (Biologist with LGL Limited; Councillor with the Town of Sidney) provided insights to municipal government processes. Lucia Ferreira (GIS Technician with LGL Limited) assisted with mapping. This document is based on a template prepared by Debbie Webb, formerly with MOE. Some of the information herein builds upon that presented in a BMP guide for raptors on Vancouver Island (Manning, Cooper and Associates 2003).

Cover photos (left to right): a juvenile Osprey at its nest, residential and transportation developments near raptor habitat (in background), an adult Barn Owl, and a Townsend's vole (an important prey species for raptors). Photos provided by LGL Limited.

Preface

British Columbia is recognized globally for its exceptional wildlife, diversity of ecosystems and its rich natural resources. The Ministry of Environment (MOE) works to maintain these valuable natural assets, which are at the heart of many recreational and economic activities enjoyed by British Columbians in all regions of the province.

MOE has responsibility for the protection and **stewardship** of British Columbia's environment. To achieve this **goal**, the Ministry develops policy and legislation, regulations, codes of practice, environmental contracts and covenants (legal agreements). In addition, the Ministry sets science- and **results-based objectives** and **standards** for activities that affect biodiversity. It monitors and reports on selected species and habitats, and acquires information on habitat and species health.

Clear goals, objectives, meaningful performance measures and science-based tools guide Ministry actions in improving environmental management.

Regulatory frameworks allow headquarters and regional staff to set and report on standards for environmental quality, and for discharges and emissions to air, land and water. Regulatory compliance is addressed through policy development, enforcement and publicly **reporting** the results of **compliance monitoring**.

An Increasing Role for Stewardship

While the Ministry takes a leading role in the protection of British Columbia's natural resources, species, and habitats, environmental protection and stewardship is the responsibility of all British Columbians. Stewardship of natural resources is key to maintaining and restoring the province's natural diversity, and achieving the Ministry's important environmental mandate. A stewardship approach involves all British Columbians taking responsibility for the well being of the environment by acting to **restore** or protect a healthy environment.

The Ministry is actively pursuing opportunities for sharing the responsibility of environmental protection. As a Ministry, MOE looks to establish vital partnerships and move forward together to protect the environment and the health of all British Columbians. MOE is listening to and developing partnerships with governments, First Nations, communities, academic institutions, industries, volunteer organizations, and citizens. The involvement of these partners in the shared environmental protection and stewardship of British Columbia's resources is essential because of their local knowledge, resources and expertise. The environment will benefit as a result of an increased level of responsible environmental stewardship ethics, immediate and long-term improvements to environmental health and an increased awareness of ecosystem needs among the partners.

A Changing Process

Over the next several years, the Ministry will be making strategic shifts (changes in business practices) towards:

- Shared stewardship between the Ministry and other stakeholders;
- Clear roles for gathering environmental information and achieving environmental objectives;
- Integrated MOE program delivery based on the best available science and an ecosystem-based approach; and
- Clear, reasonable environmental outcomes, with discretion as to how to achieve these outcomes.

This is an interim document that will likely change in the future. Changes to the delivery model of this information are also expected, through the movement towards Internet-based access.

What will this document do for me?

This document will assist you in being a steward of the environment. The information herein will help to ensure that proposed development activities are planned and carried out in compliance with the various legislation, regulations, and policies. This document focuses on the conservation of raptors (birds of prey) and their habitat during land development within municipalities and regional districts.

Table of Contents

Acknowledgements iii
Preface iii
Table of Contents vi
1 Introduction 1
2 Purpose 1
3 How to Use This Document 2
4 Background 3
4.1 What are Raptors? 3
4.2 Why Raptors are Important 5
4.3 The Role of Local Government in Raptor Conservation 6
5 Key Issues of Concern and Conservation Opportunities 7
5.1 Vancouver Island/Lower Mainland 8
5.2 Thompson/Okanagan 8
5.3 Kootenays 9
5.4 Cariboo 9
5.5 Omineca/Peace 10
5.6 Skeena 10
5.7 Range-Wide Concerns for Migratory Species 11
6 Legal Requirements 11
7 How to obtain Information on Raptors in your Area 13
8 Best Management Practices 18
BMP 1. Retain Existing Habitats and Features; Minimize Loss of Natural Vegetation 24
BMP 2. Protect raptor nest sites 28
BMP 3. Protect raptor roosting/perching sites and foraging areas 32
BMP 4. Avoid disturbance of sensitive habitats during and after development 32
BMP 5. Manage, restore or enhance raptor habitat and features 34
BMP 6. Minimize the risk of accidental mortality 36
BMP 7. Avoid the use of pesticides and herbicides 37
BMP 8. Educate the public about the importance of maintaining raptors in urban and rural environments 37
9 Monitoring and Reporting 38
9.1 Why is monitoring necessary? 38
9.2 What is involved in setting up a monitoring program? 38
10 Species Accounts 41
10.1 Turkey Vulture (*Cathartes aura*) 42
10.2 Osprey (*Pandion haliaetus)* 45
10.3 Bald Eagle (*Haliaeetus leucocephalus*) 48

10.4 Northern Harrier *(Circus cyaneus)* 52
10.5 Sharp-shinned Hawk *(Accipiter striatus)* 55
10.6 Cooper's Hawk (*Accipiter cooperii*) 57
10.7 Northern Goshawk (*Accipiter gentilis*) 60
10.8 Swainson's Hawk (*Buteo swainsoni*) 63
10.9 Red-tailed Hawk *(Buteo jamaicensis)* 65
10.10 Rough-legged Hawk *(Buteo lagopus)* 68
10.11 American Kestrel *(Falco sparverius)* 69
10.12 Merlin *(Falco columbarius)* 72
10.13 Peregrine Falcon *(Falco peregrinus)* 74
10.14 Prairie Falcon (*Falco mexicanus*) 78
10.15 Barn Owl (*Tyto alba*) 79
10.16 Flammulated Owl *(Otus flammeolus)* 82
10.17 Western Screech-Owl *(Megascops kennicottii)* 83
10.18 Great Horned Owl *(Bubo virginianus)* 86
10.19 Northern Pygmy-Owl *(Glaucidium gnoma)* 88
10.20 Spotted Owl (*Strix occidentalis*) 91
10.21 Burrowing Owl (*Athene cunicularia*) 93
10.22 Barred Owl (*Strix varia)* 94
10.23 Long-eared Owl (*Asio otus*) 97
10.24 Short-eared Owl *(Asio flammeus)* 98
10.25 Northern Saw-whet Owl *(Aegolius acadicus)* 101
10.26 Other Species 103
11 Glossary 110
12 References 113
13 Additional Information Sources 121
14 Appendices 125
14.1 Legislation 125

1 Introduction

Many species of raptors (birds of prey) have been adversely affected by urban and rural land development in British Columbia (Campbell et al 1990). However, raptors can often coexist with people in human-modified landscapes if certain practices are adopted. This Best Management Practices (BMP) document was produced to assist local government staff, the development community, and landowners with the conservation of raptors and their habitats in urban and rural areas of the province. It is a companion document to Environmental Best Management Practices for Urban and Rural Land Development in British Columbia prepared for the British Columbia Ministry of Environment (MOE).

Raptors are valuable components of terrestrial ecosystems and occur in nearly all terrestrial habitats of British Columbia. Historically, people have held strong, often polarized views about raptors, resulting in actions ranging from reverence to persecution. Currently, raptors are recognized as an integral part of ecosystems in much of the world, including British Columbia, and are legally protected. In British Columbia, conflicts between habitat requirements of raptors and urban and rural developments have been frequent because the valleys and shorelines that are ideal for settlement also contain important raptor habitat. Logging, agriculture, urbanization, mining and hydroelectric developments have greatly modified landscapes over large areas, often adversely affecting raptors. The cumulative effects of small-scale human activities, ranging from simple disturbance to cutting down a nest tree, can also reduce the abundance and number of species of raptors in an area. In many cases, critical habitat features required by raptors can be protected or restored during land development, so that opportunities to maintain or enhance raptor **biodiversity** in urban and rural environments can be realised.

Preserving and managing raptor habitats within urban and rural landscapes benefits more than just the birds. Many of the habitat features required by raptors add aesthetic and market value to real estate developments, and the presence of wildlife, including raptors, enhances the quality of life for residents (see Section 4.2 for more information on the ecological and social values of raptors).

2 Purpose

This document provides guidance on how to help maintain raptor populations and their habitats during and after land development in urban and rural environments. The information is pertinent to all MOE Regions

and, in particular, to southern areas of the province where urbanization and other developments have greatly reduced the quantity and quality of raptor habitats. The target audience includes municipal and regional governments, land developers, naturalist groups and other non-government organizations (NGOs), and individual landowners. The document provides non-biologists with a basic understanding of raptor conservation and the tools available to help maintain raptor populations and to protect, restore or enhance their habitats. This document will also be of interest to biologists and scientists, but it is not meant to be a comprehensive treatise on the ecology and conservation of raptors in British Columbia.

The specific objectives of the document are to:

- Explain what raptors are, their value to society and the roles they play in ecosystems (Sections 4.1 & 4.2).
- Explain why it is important for local governments and the development community to participate in the shared stewardship of the environment and to incorporate raptor conservation measures in urban and rural land development (Sections 4.2 & 4.3)
- Describe the roles and responsibilities of local governments, developers, and the public in the shared stewardship of raptors and their habitats (Section 4.3 & 6)
- Describe the key conservation issues and opportunities for conservation in urban and rural areas for raptors in each region of the province (Section 5)
- Describe Best Management Practices (BMPs), applicable to all regions of British Columbia, that help maintain raptor populations in urban and rural environments and protect or restore key habitat features during and after land development (Section 8).
- Provide monitoring strategies for MOE, local governments and NGOs to see if BMPs are being followed and to determine if they are effective in maintaining raptor populations and habitats (Section 9)
- Provide current information on raptor ecology and conservation status in various regions of the province (Section 10).
- Describe the relevant provincial and federal legislation that protects raptors and their habitat (Sections 6 & 14.1).

3 How to Use This Document

This document provides easy-to-follow guidelines and measures to help ensure that developments in urban and rural areas are sensitive to the ecological needs of raptors. In many cases, a developer or landowner can make a significant contribution to the biodiversity of an area if the relatively simple guidelines in this document are followed. There are also limitations to this guidebook. Interactions of raptors with their environment, including

human developments, are very complex, and the measures presented in this document should not be viewed as a comprehensive description of all possible management actions. For large or complex projects, a developer is encouraged to seek advice from a **professional biologist**.

The document is organized as follows: Important background information is presented in Sections 1 through 5, and Section 6 summarizes legal requirements and limitations pertaining to raptor habitat protection in British Columbia. BMPs intended to protect, enhance or restore raptors and their habitats in urban and rural environments are presented in Section 8. Recommended **monitoring** and reporting strategies to evaluate the effectiveness of BMPs are presented in Section 9. Species accounts in Section 10 provide information on the life history and conservation status of the raptors of British Columbia. Important technical terms are highlighted within the body of the text and defined in the Glossary (Section 11). Scientific information upon which this document is based is presented in Section 12. Additional information available on the Internet, covering a wide range of raptor-related topics is presented in Section 13.

Hyperlinks (indicated by words underlined and in blue) to related information in the document or on the World Wide Web occur throughout the document. For example, the first hyperlink in each species account connects to a raptor photograph on the Internet. To return to the BMP document after visiting an external link, click your Internet browser's "back" button.

Figure 1. The Bald Eagle is an impressive raptor often used as symbol of power and freedom. It nests in large trees close to fish-bearing waterbodies and prefers undisturbed foraging areas free of harassment by humans and pets.

4 Background

4.1 What are Raptors?

Raptors are predatory birds that include eagles, hawks, falcons, and owls. The term "raptor" is from the Latin word *rapere* meaning, "to take by force". Predators kill the animals they eat. Scavengers find and eat animals that are already dead, or nearly dead. Raptors typically hunt and kill their prey, though some species regularly scavenge too. An example is the Bald Eagle, which commonly kills birds and fish, but also feeds on the dead and dying bodies of spawned-out salmon. Raptors are equipped with sharp talons (claws) and a hooked beak that assist them in their predatory way of life. Sharp talons assist with the capture and holding of prey, while the beak helps tear flesh and other tissues.

The Turkey Vulture, a scavenger rather than a predator, was once considered to be related to hawks and eagles, but is now placed in the same group as herons and storks. They are included in this document because they have similar requirements as some true raptors and sometimes occur in urban and rural environments.

Falcons, hawks, and eagles are active primarily during daylight hours, whereas owls are mainly active at night. However, there are exceptions to this pattern, since the Northern Pygmy-Owl, Northern Hawk Owl and Short-eared Owl may be commonly seen during the day.

Figure 2. In contrast to most owls, the Northern Pygmy-Owl (shown holding a mouse) commonly hunts during the day. It nests in tree cavities such as those created by woodpeckers.

Figure 3. Fish-bearing lakes, large trees near the shoreline, and coniferous woodlands provide raptors and their prey with important habitats. LGL Limited photo.

4.2 Why Raptors are Important

Figure 4. Barn Owls often nest in old farm buildings in agricultural areas. They consume large numbers of small mammals such as voles, mice, rats and shrews.

Raptors play important roles in ecosystems and are valued by society in several ways:

Aesthetic Values—*A species' natural beauty and artistic appreciation*. Raptors have many attributes admired by the public including a striking, noble appearance, remarkable flying ability and keen senses. The aesthetic values of raptors are often portrayed in the work of artists and photographers.

Spiritual Values—*A species' relation with and role in human culture, spanning scales ranging from an individual to an entire society*. Bald Eagles, Golden Eagles and other raptors play a significant spiritual role in many Native American societies. Throughout history, raptors have been an emblem of strength, courage and freedom, and are frequently the namesake of sports teams, automobiles, and aircraft. Humans first landed on the moon in a module named "Eagle" (Link). By viewing wild raptors in urban and rural areas, people are able to maintain an important psychological connection with nature.

Recreational Values—*Qualities stemming from recreational pursuits associated with the species. Economic and non-economic aspects are included.* Examples of recreational values of raptors include bird-watching and falconry. Raptors are renowned for their ability to attract bird-watchers (e.g., the annual gathering of Bald Eagles near Squamish, British Columbia; Link, and concentration of migrating raptors at Beechy Head on the southern tip of Vancouver Island).

Educational and Scientific Values—*The study of raptors allows a better understanding of the world around us. This understanding may simply add to our knowledge base or be used to improve the quality of human life and ecological conditions.* Because of their top position in the food-chain, raptors serve as barometers of environmental change and overall ecosystem health. They typically require large areas and healthy prey populations for survival. As such, measures that conserve raptors can provide an umbrella of protection for many other plant and animal species. The quality of raptor health is a measure of environmental health. For example, environmental contamination with DDT resulted in adverse effects on many species of raptors. By discontinuing the use of that pesticide to conserve raptors (and other species), environmental conditions for humans and other animals have improved.

Ecological Values—*The roles that species play in the ecosystems they occupy.* Raptors consume a wide variety of prey including small mammals, birds, reptiles, amphibians, fish, and insects. Hence, they play a role in regulating prey populations and in nutrient cycling. Raptors are also important components of biological diversity. The variation among different species and the genetic variation within individual species of raptors (i.e., the "gene pool") contribute to the biodiversity of a region. Because research into raptors is ongoing, the full range of ecological values will not likely be known

for many years. Thus, it is prudent to conserve raptors to retain both their known and presently unknown ecological values. Such an approach follows the **precautionary principle**.

Economic Values—*How raptors affect the lives and livelihoods of people.* By helping to control prey populations, raptors can directly benefit humans by reducing pest species (many of which are non-native) such as rats, mice, rabbits, starlings, house sparrows, pigeons, and grasshoppers. Eagles and Vultures help reduce the spread of disease by cleaning up dead and rotting animal carcasses. Travelling birdwatchers spend considerable amounts of money on food, drink, lodging, gasoline and other local services. Raptors are highly sought by birders and communities with large raptor populations can benefit economically. The Bald Eagles of Brackendale near Squamish are a significant source of tourist revenue for the surrounding community (Link). The presence of raptor habitat (wooded areas, wetlands, old fields) can add to the economic value (marketability) of a property. Falconers use raptors to scare other birds from airports to reduce the risk of birdstrikes and aircraft damage, reduce crop damage, disperse pest species at landfills, and reduce pollution of urban parks by keeping geese away from sports fields and swimming beaches.

4.3 The Role of Local Government in Raptor Conservation

Local governments are well positioned to conserve raptors using provisions in the *Local Government Act and Community Charter*

Current legislation at the provincial level protects birds, their nests and eggs, but provides little, if any, protection for their habitats—especially on private, municipal and regional lands. This poses a problem for raptors in urban and rural environments where most land is privately owned. So, while the Province retains jurisdiction over raptors in British Columbia, local (municipal and regional) governments are often in a better position to serve as stewards of raptor habitat in urban and rural areas. Through the *Local Government Act and Community Charter*, local governments have the authority to regulate development within their jurisdiction. The role of local governments in the maintenance of raptor populations is vital because much of British Columbia's best land for development also contains critical raptor habitat used for breeding, migrating/staging and wintering. This overlap typically occurs in the lowlands and valley bottoms, which contain productive raptor habitats. Such land is relatively rare in British Columbia; a province dominated by high, rugged mountains with harsh climates, and limited food supply for raptors.

The role of local governments and the development community in protecting raptors is expected to expand in the future. For example, the *Community Charter* empowers municipalities with the ability to take a leading role in wildlife stewardship. Local governments need to address the habitat needs of raptors and other wildlife when regulating development. The responsibility for stewardship is shared among several parties, including the Provincial Government.

Many opportunities exist for local governments to protect raptors and their habitats:

- Local development regulations and **guidelines** can be adopted based on information obtained by identifying and mapping important raptor habitats, which can be carried out together with other governments and NGO groups. This approach not only benefits raptors, but it also provides developers with a degree of understanding and certainty regarding what developments might be acceptable in a given area, so saving time and money for developers.

- Official Community Plans (OCPs) can be used to delineate Urban Containment Boundaries, Environmentally Sensitive Areas, and Development Permit Areas. Zoning can dictate acceptable land uses and by-laws can provide habitat protection (e.g., stream set-backs and wildlife tree protection). OCPs can be used as a mechanism to protect important raptor habitat features, including nest sites, foraging areas, roosting sites and surrounding protective buffers.

- Local governments can facilitate the establishment of Conservation Covenants, which protect habitats. Density transfers and density bonuses can be used to reduce urban sprawl and allow the establishment of wildlife conservation zones.

- As guided by this document and/or as assisted by expert advice, local government staff unfamiliar with raptor ecology can gain confidence to assess, amend, approve, or reject a development application.

Further information on how local governments can help conserve wildlife habitats and natural ecosystems is presented in *Best Management Practices for Urban and Rural Land Development* and Nowlan et al. (2001; Link). Henigman (2004) describes in detail how local governments can protect raptor nest sites, using Bald Eagle nest trees on Vancouver Island as an example.

5 Key Issues of Concern and Conservation Opportunities

A major threat to raptor habitat in British Columbia is the large-scale conversion of agricultural lands and natural areas to land uses that typically involve impermeable surfaces (i.e., pavement and asphalt) and buildings. Between 1971 and 2001, the total area of urban land in B.C. increased from about 1750 km^2 to 4050 km^2 (Statistics Canada 2005), resulting in the loss or degradation of productive agricultural land, valley bottom habitats and greenspaces. Intensive agricultural practices, such as expansive greenhouse developments, are also reducing raptor habitats. The Lower Fraser Valley and

Delta traditionally supported some of the highest densities of wintering raptors in Canada (Butler and Campbell 1987), but populations and habitats have been greatly reduced as a result of human activities over the past century. Development continues in this area of rapidly expanding human population, further shrinking habitats for raptors and other wildlife. The situation unfolding in the Fraser Valley and Lower Mainland is being repeated throughout urban and rural areas of the province, particularly southern and eastern Vancouver Island and the Southern Interior valleys of British Columbia, albeit on smaller scales.

The future of raptor populations in British Columbia depends on actions taken now. Improved urban development planning to conserve raptor habitats is a crucial part of raptor conservation in British Columbia.

5.1 Vancouver Island/Lower Mainland

Figure 5. The Merlin sometimes breeds and forages in urban and rural environments, provided large nest trees, old fields and shrubby areas are available.

The main threats facing raptors on Vancouver Island and the Lower Mainland regions are urbanization, agriculture, and forestry. Old-growth forests have been depleted, especially at low to moderate elevations, and coastal habitats have been greatly modified. On southern and eastern Vancouver Island and the Gulf Islands, raptor habitats within low-elevation coastal habitats (Coastal Douglas fir Biogeoclimatic zone) have been degraded by human developments. On the Lower Mainland, the Fraser River Delta is a nationally significant wintering area for many species of birds, including raptors. However, habitats in this area have been greatly modified and continue to be threatened by urbanization, land clearing, pollution and changing agricultural practices.

Raptor species most affected by these threats include the Spotted Owl, Northern Goshawk (*laingi* subspecies along the B.C. coast), Peregrine Falcon, Merlin, Bald Eagle and Western Screech Owl.

The species that are relatively compatible with human activity and are most likely to benefit from BMPs in urban and rural environments include the Bald Eagle, Osprey, Cooper's Hawk, Sharp-shinned Hawk, Red-tailed Hawk, Rough-legged Hawk, Merlin, Great Horned Owl, Barred Owl, Barn Owl, and several small, cavity-nesting owls (Western Screech-Owl, Northern Saw-whet Owl, and Northern Pygmy-owl).

5.2 Thompson/Okanagan

In the Thompson/Okanagan region, low elevation valley bottoms and riparian habitats are diminishing due to urbanization and changing land uses. Wildlife habitats in the Okanagan and Similkameen Valleys are particularly at risk due to a rapidly increasing human population and conversion of productive wildlife habitats into vineyards and orchards. Riparian and wetland habitats and antelope brush ecosystems are severely threatened in these areas. Forestry, ranching and tourist developments in these regions also have altered large areas of both grassland and forest habitats. Greatest

Figure 6. The Western Screech Owl, a secondary cavity nester, often uses thickets and riparian areas for roosting and nesting. The larger Barred Owl is expanding its range in BC and may be partly responsible for recent declines in Screech Owl numbers

concerns for raptors in these regions include shortage of tree cavities and undisturbed grasslands for nesting purposes and degradation of foraging areas.

Raptor species most affected by these threats include the Burrowing Owl, Western Screech Owl (*macfarlanei* subspecies), Flammulated Owl, Short-eared Owl, Prairie Falcon, Swainson's Hawk, and Ferruginous Hawk.

The varied habitats of the Thompson-Okanagan region including arid grassland, shrub lands, open forests, cliffs, lakes and riparian areas support a particularly diverse raptor fauna. The Burrowing Owl, Interior Western Screech-Owl, Flammulated Owl, Swainson's Hawk, Ferruginous Hawk, Prairie Falcon are unique to the Region or occur only occasionally elsewhere in the Province. Species that are relatively compatible with human activity and are most likely to benefit from BMPs in urban and rural areas include the Osprey, Bald Eagle, Great Horned Owl, Barred Owl, Long-eared Owl, Cooper's Hawk, Sharp-shinned Hawk, Red-tailed Hawk, Swainson's Hawk, Ferruginous Hawk, Merlin, American Kestrel, and several small, cavity-nesting owls. The Western Screech Owl and Flammulated Owl, in particular, would benefit from the protection and restoration of riparian and valley bottom habitats.

5.3 Kootenays

Forestry, mining and hydro-electric development have altered vast areas of raptor habitat in the region, although a considerable amount of natural habitat remains unaltered. Some valley bottom habitats have been altered by urbanization, agriculture, and forestry.

Species of concern in this region include the Peregrine Falcon and Northern Goshawk. Ospreys are common in the region, attracted to the many large fish-bearing reservoirs, lakes and rivers. They frequently use the wooden cross members of power poles for nesting, where they may be at risk of electrocution.

Species that are relatively compatible with human activity and are most likely to benefit from BMPs in urban and rural areas in the Kootenays include the Osprey, Bald Eagle, Great Horned Owl, Barred Owl, Cooper's Hawk, Sharp-shinned Hawk, Red-tailed Hawk, American Kestrel, and small, several cavity-nesting owls (Northern Saw-whet Owl, Boreal Owl, and Northern Pygmy-owl).

5.4 Cariboo

Forestry and ranching have altered raptor habitats over large areas of the Cariboo Region. Some low-elevation valley bottom habitats, especially within the Bunchgrass and Douglas Fir Biogeoclimatic zones, are also affected by urbanization, but not to the degree of more southerly areas of the province. Wetlands and lakes are common in the region, but logging, ranching and

tourist developments are reducing the quality of shoreline habitats for raptors.

Raptor species of concern in the Cariboo Region include the Flammulated Owl, Peregrine Falcon, and Prairie Falcon.

Species that are most likely to benefit from BMPs in urban and rural environments include the Bald Eagle, Osprey, Great Horned Owl, Barred Owl, Long-eared Owl, Cooper's Hawk, Sharp-shinned Hawk, Red-tailed Hawk, Merlin, American Kestrel, and several small, cavity-nesting owls (Northern Saw-whet Owl, Flammulated Owl, Western Screech-Owl, Boreal Owl and Northern Pygmy-owl).

5.5 Omineca/Peace

Although vast areas of forest still occur in these regions, these habitats are being rapidly altered by forestry, oil and gas development and mining. Urbanization, ranching, agriculture, and hydro-electric developments have modified some river valleys, particularly the Peace River in the northeast.

Species of concern in this region are the Peregrine Falcon and Northern Goshawk.

Species that are most likely to benefit from BMPs in urban and rural environments include the Bald Eagle, Osprey, Great Horned Owl, Barred Owl, Sharp-shinned Hawk, Red-tailed Hawk, Merlin, American Kestrel, and several small, cavity-nesting owls (Northern Saw-whet Owl, Northern Hawk Owl, Boreal Owl and Northern Pygmy-owl).

5.6 Skeena

The Skeena Region is probably the least impacted by human activity in British Columbia. The remote, mountainous regions in the northwest support the highest concentrations of Golden Eagles and Gyrfalcons in the province. The Queen Charlotte Islands (Haida Gwaii) also support high densities of Bald Eagles and the Peregrine Falcons (*pealei* subspecies). Nevertheless, forestry and mining activities are becoming a threat in some areas.

The raptors of concern in the Skeena region are the Northern Saw-whet Owl (*brooksi* subspecies) which occurs only in the Queen Charlotte Islands and the Northern Goshawk (*laingi* subspecies), which occurs only on the Queen Charlotte Islands, Vancouver Island and along the mainland coast west of the coast mountains. Their habitats may be impacted by forest harvesting.

Although the extent of urban and rural environments in the Skeena region is limited, several species could potentially benefit from BMPs in these areas. These include the Bald Eagle, Osprey, Red-tailed Hawk, Great Horned Owl,

Barred Owl, Western Screech-Owl, Northern Hawk Owl, Northern Pygmy-Owl, and Northern Saw-whet Owl.

5.7 Range-Wide Concerns for Migratory Species

Some serious threats to raptors occur outside the province during migration and on wintering grounds; these threats are beyond the control of management efforts in British Columbia. Raptors are subject to a degradation of wintering and staging habitats, which can reduce their survival and ability to migrate and breed successfully. Being top predators in the food web, raptors are also very susceptible to pesticides, particularly to contamination by heavy metals and other chemicals that accumulate in their bodies. They are also susceptible to harassment and poaching. A catastrophic loss of Swainson's Hawks occurred in Argentina (up to 5% of the worldwide population, Link), as a result of pesticide use to control grasshoppers, which form a major part of their winter diet. Some migratory songbirds and shorebirds are also threatened by the degradation of wintering areas. Reduction in numbers of smaller birds affects the food supply of those raptors that feed on them on their wintering ranges and on summer ranges in British Columbia

6 Legal Requirements

At the provincial level, raptors and most other birds are protected in British Columbia under Section 34 of the *Wildlife Act* (Link). Under this Section, a person commits an offence, if he/she possesses, takes, injures, molests or destroys a bird or its egg, or a nest that is occupied by a bird or its egg. Subsection 34 (b) provides protection year-round to the nests of the Bald Eagle, Golden Eagle, Peregrine Falcon, Gyrfalcon, Osprey and Burrowing Owl, whether the nests are active or not. However, the habitat immediately surrounding the nest site (other than the nest tree), or habitats needed for foraging, roosting, or wintering, may not be protected unless they occur in a protected area such as a park. If it can be shown that an activity or development will "molest, injure or destroy" a nest site as defined by the *Wildlife Act*, protective buffers may need to be established to reduce disturbance of the nest, although the degree of protection required is not specified by the Act. This uncertainty and lack of adequate habitat protection has considerable implications for raptor conservation during urban and rural land developments, particularly on private land.

The *Wildlife Act* also gives the provincial government authority to protect habitat through the creation of Wildlife Management Areas, designation of Critical Wildlife Areas (for threatened and endangered species), and creation of regulations governing use of land and wildlife. However, these provisions

have limited applicability to urban and rural environments where the amount of provincial Crown land is limited.

The *Forest and Range Practices Act*, *Park Act*, *Protected Areas Act*, and *Ecological Reserve Act* provide a considerable degree of habitat protection for lands designated under those acts, but such acts usually have little application in urban and rural environments. For example, the *Forest and Range Practices Act* provides some additional protection for raptors and other wildlife on provincial Crown lands where industrial forestry and/or cattle grazing are prevalent. These include the Identified Wildlife Management Strategy 2004, which presently include management measures for the following raptors: Northern Goshawk, (*laingi* subspecies), Prairie Falcon, Ferruginous Hawk, "Interior" Western Screech-Owl, Flammulated Owl, Spotted Owl, Short-eared Owl, and Burrowing Owl.

The *Environmental Management Act* and *Pesticide Control A*ct provide legislation that prevents or minimizes exposure to toxins. The provincial and federal government have banned the use of lead shot for waterfowl hunting in British Columbia, in part over concerns of lead poisoning in Bald Eagles that feed on waterfowl carrying shot in their bodies.

At the Federal level, raptor species officially designated as "at risk" are also protected under the new *Species at Risk Act* (SARA; Link). Federal protection for raptors at risk under Schedule 1 of SARA, including their residences and critical habitats, is mandatory on federally owned land (such as federal forestry lands, Indian Reserves; airport lands owned by Transport Canada; and military lands owned by the Department of National Defence). The goal of the *Species at Risk Act* is to prevent endangered or threatened wildlife from becoming extinct or lost from the wild, and to help in the recovery of such species. Those species listed as being of "special concern" will be managed so as to prevent them from becoming endangered or threatened. The role of the federal government in raptor conservation may expand beyond federal Crown lands, if safety net legislation is imposed. Under this legislation, the federal cabinet may, at the recommendation of the Minister of Environment, order that protective measures be applied to provincial lands as well as federal lands.

Due to the lack of protection of raptor habitats in urban and rural environments afforded by legislation at the provincial and federal levels, local governments and the development community have a vital role to play in the protection of raptor habitat and shared wildlife stewardship on private and municipal lands. As discussed in Section 4.3, the *Local Government Act* and *Community Charter* empowers local governments to expand their role in conservation of raptors and other wildlife. The responsibility for stewardship will be shared among several parties, including the provincial government.

An expanded summary of provincial and federal legislation relevant to raptor conservation is presented in Section 14.1.

7 How to Obtain Information on Raptors in Your Area

Decisions on conservation issues require good information and judgement. Often raptor information already exists for a proposed development area (e.g., Wildlife Tree Stewardship Atlas; Link), however, new nests are built each year and existing nests may be destroyed by storms and trees blowing-down. It is recommended that pre-development inventories be conducted for raptor nests and important raptor habitat features (see Table 4), especially in areas likely to be used by raptors for nesting (old growth forest, older second growth forest, riparian areas and cliffs). Information on general habitat inventory and mapping is presented under Heading 1.3 in Section III of the document "Best Management Practices for Urban and Rural Land Development". Recommended provincial inventory techniques for raptors in British Columbia can be viewed online at: Link 1; Link 2.

Several potential sources of information on raptors and their preferred habitats in your area are available. The following options are useful for accessing this information:

- Contact the Conservation Data Centre of the B.C. Ministry of Environment (Link)
- Use the B.C. Species and Ecosystem Explorer for lists of raptors in your area and for information on their status and ecology (Link).
- Contact local naturalist, conservation and habitat stewardship groups in your area; they can also refer you to knowledgeable bird-watchers who may have very specific information for your area

Several wildlife or raptor-specific inventory databases are available, including the following:

- Wildlife Tree Stewardship Program (Link)
- Conservation Data Centre database for raptors at risk (Link)
- Sensitive Ecosystem Inventories (SEIs; Ward et al. 1998; Link)
- SARA registry for species listed at risk federally (Link)

Figure 7. Fields or pastures, hedgerows, and tall trees in urban areas are commonly used by raptors. LGL Limited photo.

Figure 8. Wetlands, shrubs, conifers and deciduous trees provide important habitats for raptors and their prey in urban environments. LGL Limited photo.

Figure 9. Raptor nest (possibly a Red-tailed Hawk nest) near Vernon in the BC Interior. Stands of tall trees in agricultural areas make good nest sites for open-country raptors such as Red-tailed and Swainson's hawks.

Figure 10. A group of Bald Eagles roosting in an agricultural area near the Coldstream River in the BC Interior. Large trees such as these Black Cottonwoods are commonly used for nesting, perching or roosting by raptors. Shrubs (foreground) provide excellent habitat for many species of raptor prey, including small birds and

Figure 11. In agricultural areas of BC, barns, sheds, and other buildings with permanent openings provide potential roosting and nesting habitat for Barn Owls. LGL Limited photo.

Figure 12. Areas with long grass are important for raptors that nest and roost on the ground. Human activities and pets such as dogs and cats in and near such areas can substantially reduce habitat suitability. LGL Limited photo.

Figure 13. Construction projects can disturb raptors occupying adjacent habitats (in background). LGL Limited photo.

Figure 14. Northern Goshawk nest located close to the trunk of a large Western Hemlock. Goshawks may nest on the periphery of rural areas provided large tracts of mature forest are nearby.

Figure 15. A typical nest site of a Peregrine Falcon on a cliff ledge with overhanging cover. Some Peregrines that have habituated to human activity can nest in urban and rural areas. Since adults and young may flush from the nest if humans approach too closely, a disturbance-free buffer zone needs to be established around the nest.

8 Best Management Practices

BMPs are measures that help to achieve the goal of maintaining raptors and their habitats in urban and rural environments. The BMPs in this document (summarized in Table 1) are based on ecological needs and behavioural traits of raptors and are generally applicable to urban and rural landscapes found in all regions of the Province. However, the selection of BMPs may differ according to local knowledge of the behaviour, life history, habitat use patterns and conservation needs in each region of the province. For more specific information on how to proceed with raptor protection measures in your area, landowners may wish to seek advice from professional biologists and local naturalist/conservation groups familiar with raptor ecology (see Section 7).

An extensive literature search indicated that while there is an abundance of recommended approaches to raptor management and conservation (particularly in regard to industrial forestry and agricultural practices), formal documents presenting a range of BMPs for raptors in urban and rural environments are lacking. In this regard, British Columbia is leading the way.

A summary of the species of raptors present and the timing of breeding in each MOE Region of British Columbia (see Link for map of Regions) is presented in Table 2. BMPs should focus on, but not be limited to, species that breed in each region. Habitats that provide foraging and resting areas for over-wintering or migrating raptors are also important to maintaining raptor biodiversity of an area. It is important that protective measures account for species differences in breeding chronology. For example, the Bald Eagle and most owls nest very early in the spring, whereas others (such as the Osprey and Cooper's Hawk) nest later in the season. Measures to reduce disturbance of nest sites should be implemented over the entire breeding season, not just when young are in the nest. During the early stages of nest initiation, for example, raptors are particularly sensitive to disturbance and may seek alternative nest sites or delay nesting, if harassed. A relatively large number of nest records exist for raptors in the province (Table 2, based on Birds of B.C., Vol. 2; Campbell et al. 1990). A low number of nest records can reflect either scarcity of a particular species (such as Spotted Owl) or the difficulty in locating nests because of their cryptic nature or occurrence in remote areas (such as Boreal Owl and Sharp-shinned Hawk). Further information on the life history and distribution of raptors is provided in Section 10.

The provincial conservation status of different species of raptors and their ability to coexist with humans in urban and rural environments are summarized in Table 3 (see Section 10 for more details on compatibility of raptors). The compatibility rankings are estimates meant to show the wide ranges in tolerances of human developments among species. Generally, the least tolerant species are those with strict habitat requirements or that require

large areas of undisturbed land. Birds that prefer old-growth or mature forests (Spotted Owl and Northern Goshawk) or remote mountainous areas (Golden Eagle) are good examples. BMPs are most likely to be successful for those species with a high compatibility with human activity. Where possible, BMPs should also try to address the requirements of less tolerant species or species that are at risk. However, such efforts should be planned with particular care and should not compound the problems faced by these species by attracting them to unsuitable habitats where their survival or productivity are compromised. Whenever protective measures are designed for species that are officially listed to be at risk, additional advice and information should be obtained from a professional biologist.

The BMPs and other parts of this document strive to address the following principles of raptor conservation in urban and rural areas:

1. *Where possible, retain existing, natural habitats suitable for raptors*

The best way to conserve raptors in urban and rural environments facing possible developments is to ensure that an adequate amount of suitable habitat is left undisturbed.

2. *Strive to retain, restore, or enhance key habitat features for raptors, so that no net loss of habitat occurs*

These features consist of nesting, roosting, and other sites that are essential for raptors. Provincial and federal laws provide legal protection for nests of some species of raptors, most unoccupied nests are not protected when not in use or outside the nesting season. Perches and roosts are not afforded legal protection on private land. In cases where known habitat features cannot be retained, **mitigation** is recommended through habitat restoration or enhancement. The best option is always to retain existing, natural features.

3. *Use caution when attempting to restore or enhance raptor habitats.*

Some methods for habitat enhancement are simple, such as providing artificial nest sites. Others are more complex and involve restoring key habitat features required to fulfil various life history functions and ecological needs of raptors. Caution must be used to prevent attracting raptors to otherwise unsuitable areas where survival and productivity may be reduced.

4. *Avoid disturbing raptors at nesting, roosting, and feeding sites.*

In some cases, it is possible to establish undisturbed buffers around active raptor nests, known roosts, and feeding sites, such as salmon-spawning areas. Specific minimum sizes of buffers are suggested in this document, but larger buffers may be required depending on the conditions at each site.

5. *Be able to demonstrate that urban and rural land developments comply with Provincial laws (see Section 6 and 14.1).*

In British Columbia, the active nests of all raptors are legally protected; inactive nests of the Bald Eagle, Golden Eagle, Peregrine Falcon, Gyrfalcon, Osprey or Burrowing Owl are also similarly protected. The destruction of any aforementioned nest (or nest tree) requires authorization from the Province. All developments must exercise due-diligence in attempting to identify nests and in avoiding or mitigating impacts on them.

6. *Try to ensure that decisions regarding urban and rural land developments are credible and are based on adequate information on any raptor habitats that might be affected*

   Shared stewardship of wildlife implies that expert advice and information can be sought from a variety of sources, including naturalist groups, and local wildlife experts. Landowners may also wish to seek advice from professional biologists familiar with raptor ecology.

The BMPs for raptors presented here complement the BMPs presented in the Environmental Best Management Practices for Urban and Rural Land Development in British Columbia. Sections II & III of that document contain higher-level planning information that is essential in order that the BMPs presented in this document be successful. More information on management of raptors can be found by investigating the internet links in Section 13 of this report (Additional Information Sources).

Table 1. Summary of BMPs intended to help conserve raptors in urban and rural environments.

SUMMARY OF BMPS (see text for details)
1. Retain Existing Habitats and Features; Minimize Loss of Natural Vegetation • *Preserve all trees and snags used or suspected of being used by raptors as nesting sites* • *Where possible, retain groups of trees rather than isolated single trees to provide an inter-locking canopy* • *Maximize retention of woodlots, shelterbelts, hedgerows, brushy thickets and old field habitat* • *Preserve riparian areas including large trees (living and dead)* • *Maintain natural shoreline vegetation adjacent to the ocean, estuaries, large lakes, and rivers* • *Retain undisturbed grasslands, old fields, pastures and natural forest openings* • *Where feasible, retain old farm buildings such as barns and sheds that are attractive to barn owls*
2. BMP 2. Protect raptor nest sites • *In urban areas, maintain a minimum buffer of 1.5 tree lengths, consisting of undisturbed natural vegetation, around nest sites in trees* • *In rural areas, maintain a 100 m undisturbed natural vegetation buffer around eagle nest trees and a 200 m buffer in undeveloped landscapes; for the nests of other raptor species leave 200 and 500 m buffers for rural and undeveloped environments, respectively* • *For cliff nesting species such as Peregrine Falcons, maintain a buffer of at least 50 m, 200 m and 500 m from the base of cliffs in urban, rural and undeveloped areas* • *In addition to the recommended vegetated buffers, maintain even larger areas (100 m for eagles; 200 m for other raptors) free of loud noises and other human disturbances around occupied nests* • *Protect existing and potential nest sites, including veteran recruit trees and trees with natural cavities*
3. Protect raptor roosting/perching sites and foraging areas • *Protect any trees, cliffs, or other specific sites that raptors regularly use for roosting, perching or feeding; good foraging sites include shorelines, wetlands, shrubby areas, old fields, hedgerows, and riparian areas*
4. Avoid disturbance of sensitive habitats during and after development • *Locate new trails, buildings, and roads away from raptor nesting, roosting and foraging areas* • *Keep machinery, people, and pets away from nesting, brood rearing, roosting, and foraging areas*
5. Manage, restore or enhance raptor habitat and features • *Replace raptor nest sites that are damaged or lost* • *Pruning mature trees can make them more attractive to Bald Eagles, Red-tailed Hawks and other raptors* • *Provide artificial perches such as poles and platforms, if natural perches have been damaged or lost* • *Restore habitats where natural vegetation has been removed or altered, preferably by using native plants*
6. Minimize the risk of accidental mortality • *Protect raptors from electrocution from power lines and collisions with wires, windows and sundeck enclosures*
7. Avoid the use of pesticides and herbicides • *Use traps rather than poisons when controlling rodents or other pests to avoid secondary poisoning of raptors through ingestion of contaminated prey* • *Use integrated pest/weed management and avoid use of chemical pesticides*
8**. Educate the public about the importance of maintaining raptors in urban and rural environments** • *Use interpretative materials such as signs and brochures to make the public aware of the need to protect raptor habitats and to prevent disturbances to nesting and roosting sites*

Table 2. Occurrence and timing of nesting by raptors in each region of the province. Data from Campbell et al. (1990); dates will vary within the range indicated according to year and location. Shaded box indicates that breeding occurs in Region.

Species	Breeding Occurrence by MOE Region(s)							Breeding Chronology		
	Vancouver Island-Lower Mainland	Thompson-Okanagan	Kootenay	Cariboo	Omineca	Peace	Skeena/Queen Charlotte Islands	Eggs Present	Young present at nest	# nest records
Turkey Vulture	■	■	■	■				April 10-June 21	May 10-Aug 31	16
Osprey	■	■	■	■	■	■	■	April 21-July 5	May 25-Sept 5	477
Bald Eagle	■	■	■	■	■	■	■	Feb 5- June 25	April 1-Aug 31	629
Golden Eagle	■	■	■	■	■	■	■	April 1- June 10	May 1-Aug 31	58
Northern Harrier	■	■	■	■	■	■	■	Apr 15-June 30	May 10-Aug 7	79
Sharp-shinned Hawk	■	■	■	■	■	■	■	May 30- June 5	July 1- Aug 15	14
Cooper's Hawk	■	■	■	■	■			1 May-July 21	June 5-Aug 31	107
Northern Goshawk	■	■	■	■	■	■	■	April 7-June 10	May 20- Aug 21	33
Swainson's Hawk	*	■	*	*	*		■	May 2-June 30	June 5-Aug 15	24
Red-tailed Hawk	■	■	■	■	■	■	■	Feb 26-June 30	April 10-Aug 10	352
Ferruginous Hawk		■						May 1-31	July 1-31	1
Rough-legged hawk	*	*	*	*	*	*	*			
American Kestrel	■	■	■	■	■	■	■	April 5 – July 20	May 5- Aug 27	300
Merlin	■	■	■	■	■	■	■	April 17 – July 4	May 20 – Aug 12	45
Peregrine Falcon	■	■	■	■	■	■	■	March 30 – June 30	May 2- July 20	410
Gyrfalcon	*	*		*			■	April 1 – May 30	May 2 – July 18	15
Prairie falcon	*	■	*	■		*		Mar 30 – April 30	May 21-Aug 4	20
Barn Owl	■	*	*			*		Year round	Year round	249
Flammulated Owl		■	*	■				April 25-July 25	May 15 – Aug 17	35
Western Screech-Owl	■	■	*	■			■	March 17-June 1	April 20-Aug 25	102
Great Horned Owl	■	■	■	■	■	■	■	Feb 10 – May 18	March 20 – Sept 6	247
Snowy Owl	*	*	*	*	*	*	*			
Northern Hawk Owl	*	■	■	■	?	■	■	April 21-May 31	May 27 – Aug 8	16
Northern Pygmy-Owl	■	■	?	■	*	*	*	April 15 – June 15	June 9 – Aug 27	23
Burrowing Owl	**	■	*	*				March 25 – May 20	May 2 – Sept 30	21
Spotted Owl	■							Mar 18 – June 26	April 25 – July 27	3
Barred Owl	■	■	■	■	■	*	■	March 21 – April 7	April 20 – Aug 14	39
Great Gray Owl	*	■	■	■	■	■	■	March 27 – May 15	April 30 – Aug 12	29
Long-eared Owl	■	■	*	■	■	*	*	March 11- June 12	April 11-Aug 1	127
Short-eared Owl	■	■	■	■	*	*	*	March 28 – July 10	April 12 – Sept 15	60
Boreal Owl	*	■	?	*	*	■	■	April 1 – May 1	May 1 – July 15	3
Northern Saw-whet Owl	■	■	■	■	■	■	■	March 1 – May 31	April 4 – Aug 14	90

* non breeding, migratory or over wintering records only

? Possible breeding record or breeding recorded immediately adjacent to region boundary

** Old records from Fraser River Delta

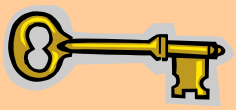
Table 3. Provincial conservation status (colours correspond to red-, blue-, or yellow-listed) of raptors and their relative ability to co-exist with humans in urban and rural environments. See Section 10 for additional information on habitat requirements and compatibility with human landscapes for each species and definitions of red, blue and Yellow-listed species.

Species	At risk?	Ability to co-exist[7]	Remarks
Turkey Vulture	No	Mod	Forages in urban and rural settings; requires remote nesting and roosting sites
Osprey	No	High	Readily nests on human-made structures; tolerant of human activity
Bald Eagle	No	Mod-high	Requires large nest trees near coast; tolerant of human activity
Golden Eagle	No	Low	Usually found in remote mountainous areas
Northern Harrier	No	Mod-high	Forages in old-fields and marshes in urban and rural areas; ground nests susceptible to disturbance and predation from domestic pets and humans
Sharp-shinned Hawk	No	Mod	Requires secure forest cover for nesting; tolerant of human activity;
Cooper's Hawk	No	Mod-high	Can nest in close proximity to human developments; prefers an area of interlocking tree canopy for rearing young; Greater Victoria contains one of the highest nesting densities of this species in North America.
Northern Goshawk	Yes [1]	Low	Requires large tracts of forest for nesting and foraging; may use rural areas, especially during winter
Broad-winged Hawk	Yes	Mod	Inconspicuous and secretive; occasionally seen during migration in B.C.
Swainson's Hawk	Yes	Mod-high	Can nest and forage in close proximity to human developments and farmland; requires undisturbed grasslands with adequate food supply
Red-tailed Hawk	No	High	Very tolerant of human activity; nests and forages in urban and rural settings.
Ferruginous Hawk	Yes	Low-Mod	Rare breeder in Southern Interior; prefers undisturbed grasslands and desert-shrub; little is known about its habitat requirements in B.C.
Rough-legged Hawk	No	Mod	Tolerant of human activity; commonly winters on farmland in Lower Mainland and Southern Interior; does not breed in B.C.
American Kestrel	No	Mod-high	Forages and nests in urban and rural settings; tolerant of human activity
Merlin	No[2]	Mod-high	Forages and nests in close proximity to human developments, provided songbird prey is available. Requires secure tree cover for nesting
Peregrine Falcon	Yes[3]	Mod	Some birds can nest in close proximity to human developments including tall buildings and bridges; cliff nesting birds may be susceptible to human disturbance; prefers to hunt over large wetlands, estuaries and along undisturbed coastlines
Gyrfalcon	Yes	Low-mod	Some birds winter in open fields and marshes fairly close to human developments; nest in remote mountainous regions of northwestern B.C.
Prairie Falcon	Yes	Mod	May forage close to human developments, but requires remote cliffs for nesting
Barn Owl	Yes	Mod-high	Fairly adaptable; will nest and roost in old farm buildings (currently being lost to development) and artificial nest structures; requires old-fields and abundant supply of voles for foraging
Flammulated Owl	Yes	Mod	Requires relatively large dead or dying trees for nesting; mainly dependent on woodpeckers to create cavities; susceptible to forest clearing activities
Western Screech-Owl	Yes[4]	Mod	Populations, particularly in Okanagan Valley, are very susceptible to land use changes and loss of woodlands and shrubby areas in valley bottoms; requires relatively large dead or dying trees for nesting; mainly dependent on woodpeckers to create cavities; susceptible to forest clearing activities; expansion of Barred Owls into man-altered landscapes appear to have negative consequences for B.C. populations
Great Horned Owl	No	High	Very tolerant of human activity; nests and forages in urban and rural settings
Snowy Owl	No	Mod	Some birds winter in open field s and marshes relatively close to human developments; do not breed in B.C.
Northern Hawk Owl	No	Mod	Requires large dead or dying trees for nesting; dependent on woodpeckers to create cavities; susceptible to forest clearing activities
Northern Pygmy-Owl	Yes[5]	Mod	Requires large dead or dying trees for nesting; mainly dependent on woodpeckers to create cavities; susceptible to forest clearing activities

Species	At risk?	Ability to co-exist[7]	Remarks
Burrowing Owl	Yes	Low	Can nest close to human developments but nesting burrows are susceptible to predation and disturbance; requires undisturbed grassland for foraging
Spotted Owl	Yes	Low	Requires large tracts of old-growth forest for foraging and nesting
Barred Owl	No	High	Expanding its range in B.C.; implicated in the decline of other owl species including the Western Screech Owl and Spotted Owl
Great Gray Owl	No	Mod	Tolerant of human activity but requires large tracts of forest habitat
Long-eared Owl	No	Mod-high	Can nest in close proximity to human developments
Short-eared Owl	Yes	Low-mod	May forage in marshes and old-fields close to human developments; ground nests are very susceptible to predation by domestic pets and disturbance by humans
Boreal Owl	No	Mod	Normally found at higher elevations away from human developments; requires large dead or dying trees for nesting; mainly dependent on woodpeckers to create cavities; susceptible to forest clearing activities
Northern Saw-whet Owl	Yes[6]	Mod-high	Requires relatively large dead or dying trees for nesting; mainly dependent on woodpeckers to create cavities; susceptible to forest clearing activities

[1] *A. g. laingi* (Red-listed); *A. g. atricapilus* (Yellow-listed)
[2] Black Merlin may be at risk is this *Falco columbarius*? If so, the scientific name should be given and the correct English name is Merlin, which is what you have in the table above
[3] *F. p. tundrius* (Red-listed); *F. p. pealei* and *F. p. anatum:* (Blue-listed)
[4] *M. k. macfarlanei* (Red-listed); *M. k. kennicotii* (Blue-listed)
[5] *G .c. swarthy* (Blue-listed)
[6] *A. a. brooksi* (Blue-listed)
[7] defined as the degree to which raptors successfully engage a significant portion of their annual life cycle within or in close proximity to areas which have been altered by human activity; rated as High, Moderate (Mod) and Low.

The Key to Raptor Conservation is the protection of existing Habitat



It is better to conserve habitats in the first place than to have to restore them later.

BMP 1. Retain Existing Habitats and Features; Minimize Loss of Natural Vegetation

One of the most effective management practices to benefit wildlife is to retain existing habitats and habitat features (Lane 1996). Raptors and their habitats are no exception. It is much more practical and economical to conserve habitats in the first place than to have to **restore** or **rehabilitate** them later.

As documented in the species accounts (Section 10), important raptor habitats and key features in urban and rural areas of British Columbia include nesting, perching and roosting sites, and foraging areas (see Table 4 for a comprehensive list). Wherever possible, these habitat features should be retained using the measures described below. The size of the habitat area should be as large as possible. Species that would benefit from the conservation of these features in the urban and rural landscapes are listed in Table 5.

Retain natural forest and understorey vegetation wherever possible; this provides habitat for prey animals and nesting cover for raptors

The following measures are recommended to protect existing habitat features:

- Preserve as many large trees and snags as possible (living and dead), which can be used by raptors for nesting and perching; trees adjacent to water are particularly valuable; dead trees are very important for attracting woodpeckers that create nest cavities for small owls and other wildlife; large trees with broken tops are also used for nesting

- Trees that provide important wildlife habitat should be identified as such in order to protect them from harm or destruction. Signs such as those produced by the provincial government (Figure 16) are an effective means of identifying "Wildlife Trees". The signs also educate the public about the important wildlife habitats and conservation issues. For further information on wildlife trees and wildlife tree signs, refer to the following Internet links: Link1; Link 2, Link 3, Link 4

- Because older, veteran trees are subject to blow-down and are sometimes felled due to safety concerns, it is important to maintain a number of veteran recruit trees in an area

- Where possible, retain groups of trees rather than isolated single trees to provide an inter-locking canopy; this approach maximizes secure cover for nesting birds

Figure 16. Wildlife tree sign.

- Maximize retention of woodlots, shelterbelts, hedgerows, and brushy thickets; keep these areas as natural as possible by preserving native trees and understorey plants; these areas provide habitat for prey species and are attractive nesting, hunting and roosting areas for many raptors

- Retain wetlands and keep riparian habitats as natural as possible; riparian habitats are productive for a wide variety of wildlife, and raptors use these areas for hunting and potentially for nesting; fish-bearing water bodies are particularly attractive to eagles and ospreys; riparian habitats in arid regions of the Interior of British Columbia are critical to the survival of many raptor species in these regions

- Retain undisturbed grasslands, old fields, pastures and natural forest openings; such areas add habitat diversity and attract raptors that prefer more open habitats. Try to keep the openings undisturbed so that secure cover is available to prey species and as a potential nesting area for ground nesting raptors, such as the Short-eared Owl and Northern Harrier; avoid mowing of fields during the nesting season

- Maintain natural shoreline vegetation adjacent to the ocean, estuaries, large lakes, and rivers; such areas are used by eagles and ospreys for

feeding and nesting, and are attractive to migrating raptors such as Peregrine Falcons

- Where feasible, retain old farm buildings such as barns and sheds that are attractive to barn owls

Table 4. Important features of raptor habitat and the values they confer.

Critical Habitat/Feature to Retain	Key Values for Raptors
1. Large, wind firm trees (living and dead) and veteran recruit trees, particularly within 500m of large water bodies	Nesting and roosting
2. Dead and dying trees suitable for use by woodpeckers which create nest cavities for small owls	Nesting and roosting
3. Stands of coniferous or deciduous forest cover, preferably with an inter-locking canopy	Nesting, perching (hunting/resting); rearing of young, roosting
4. Woodlots, shelterbelts, shrubby areas, hedgerows, and natural forest openings	Nesting, perching (hunting/resting), prey habitat
5. Riparian and valley bottom areas with trees and dense thickets	Nesting, perching (hunting/resting), prey habitat
6. Undisturbed grasslands and scrubland	Nesting, hunting, prey habitat
7. Agricultural "old-fields" and pastures	Nesting, hunting, prey habitat
8. Natural forested and open habitats adjacent to fish bearing water bodies, including ocean shorelines, estuaries, lakes, reservoirs, and rivers	Nesting, perching (hunting/resting), prey habitat
9. Cliffs, steep terrain and rocky areas	Nesting, perching, hunting
10. Marshes, swamps, wet meadows and other wetlands	Nesting, hunting, prey habitat
11. Barns and buildings with permanent openings in agricultural areas	Nesting and roosting

Table 5. Raptor species likely to benefit from the protection of key habitat features in British Columbia. Shaded cells indicate a benefit.

Species	1. Large wind firm trees near water	2. Dead "wood-pecker" trees	3. Inter-locking forest canopy	4. Wood-lots, hedge-rows, natural forest openings	5. Riparian areas; valley bottoms	6. Undisturbed grasslands and scrublands	7. Old-fields	8. Fish bearing water bodies	9. Cliffs	10. Wet-lands	11. Old farm build-ings
Turkey Vulture	■								■		
Osprey	■				■			■			
Bald eagle	■							■			
Golden Eagle	■				■				■		
Northern Harrier				■	■	■	■			■	
Sharp-shinned Hawk			■	■	■	■	■			■	
Cooper's Hawk			■	■	■	■	■			■	
Northern Goshawk			■	■	■						
Broad-winged hawk			■		■						
Swainson's Hawk				■	■	■	■			■	
Red-tailed Hawk											
Ferruginous Hawk				■	■	■	■			■	
Rough-legged hawk				■	■	■	■			■	
American Kestrel		■		■	■	■	■			■	
Merlin			■	■	■	■	■			■	
Peregrine Falcon				■	■	■	■	■	■	■	
Gyrfalcon				■	■	■	■			■	
Prairie falcon				■	■	■	■		■	■	
Barn Owl				■	■	■	■			■	■
Flammulated Owl		■	■	■	■	■	■			■	
Western Screech-Owl		■	■	■	■	■	■			■	
Great Horned Owl			■	■	■	■	■			■	■
Snowy Owl			■	■	■	■	■			■	
Northern Hawk Owl		■	■	■	■					■	
Northern Pygmy-Owl		■	■	■	■					■	
Burrowing Owl					■	■	■				
Spotted Owl			■		■					■	
Barred Owl		■	■	■	■	■	■			■	
Great Gray Owl			■	■	■	■					
Long-eared Owl			■	■	■					■	
Short-eared Owl						■	■			■	
Boreal Owl		■	■	■	■					■	
Northern Saw-whet Owl		■	■	■	■					■	

Maintain undisturbed natural vegetation within a minimum distance of one and half tree lengths from the nest site for all urban nesting raptors

BMP 2. Protect raptor nest sites

Nests of Bald Eagles and Ospreys are conspicuous and receive repeated use over many years. Databases of nest locations for these species are available (see Section 7). Nest sites of some other raptors are less obvious (e.g., buildings used by Barn Owls; cliffs used by Turkey Vultures and Peregrine Falcons; tree nests of smaller raptor such as sharp-shinned hawks, nesting boxes or cavities used by small owls or kestrels). Whenever raptor nest sites, actual or potential, are present within an area slated for development, it is always preferable to seek ways of avoiding the loss of these sites and associated habitat. A description of the natural nest sites used by raptors in British Columbia is summarized in Table 6.

Nest sites of other raptors may also be known, but such nests are not necessarily used by the same birds in consecutive years. A good example is the Cooper's Hawk, which often uses an alternate nest in the general vicinity of its nest used in the previous year. Many other raptor species use alternate nest sites or use different nest sites each year. Protecting stands of suitable nest trees is just as important as protecting an individual nest tree for the long-term interests of such species.

It is important that nesting raptors be protected from unnecessary disturbance. The literature contains many examples of recommended buffer sizes to provide such protection (e.g., see summary in Richardson and Miller 1997). A single buffer size for all species and situations is not feasible. Some raptor species are more tolerant of human disturbance when nesting than others. Also, raptors habituated to the urban environment tend to be more tolerant of disturbance when nesting than raptors living in rural and undeveloped environments. The buffers suggested in this document (see measures below) are minimums, and additional protection may be required under certain circumstances, depending on the nature of disturbance and other factors. For example, if the bird consistently flushes when using the minimum buffer, an increased buffer zone should be used. Flexibility in defining buffer distances around active raptor nests has been recommended by others (e.g., USDA 1997). Examples of how protective buffers around raptor nest sites can be implemented on private, municipal and regional lands using the *Local Government Act and Community Charter* in B.C. are presented in Henigman (2004).

The following measures are recommended to protect raptor nest sites:

- Preserve all trees used or suspected of being used by raptors as nesting sites, including presently unoccupied trees that have been used in the past.

For some raptors, **individual** nest sites are critical (e.g., Bald Eagle, Osprey, Red-tailed Hawk)

For others, **forest stands** of potential nest trees are more important than individual sites (e.g., Cooper's Hawk, Sharp-shinned Hawk, Merlin, cavity-nesting owls)

- In urban areas, maintain undisturbed natural vegetation within a minimum distance of one and half tree lengths from the nest site for all tree-nesting raptor species; this buffer area of undisturbed vegetation (measured using the dominant tree at or near the nest site) not only provides protection for the nest site but also improves the safety of residents should the nest tree or limbs fall. The presence of people, dogs, or machinery should be discouraged within the buffer.

Figure 17. Raptors such as the Spotted Owl (shown here), Great Horned Owl and Barred Owl sometimes use the bowl-shaped depressions in the broken tops of large snags for nesting.

- Cliffs used by Peregrine Falcons, Prairie Falcons, Golden Eagles, and other raptors for nesting should be protected by locating buildings away from the cliff edge and maintaining natural vegetation around the nest. Recreational activities such as rock climbing and hang gliding should be restricted during the nesting period. Maintain a protective buffer, consisting of undisturbed natural vegetation, of at least 50 m, 200 m and 500 m from the base of cliffs used by raptors for nesting in urban, rural and undeveloped areas, respectively.

- Try to maintain an even larger area (100 m for eagles; 200 m for other raptors) free of human disturbance during the nesting season; this extends from February – August for Bald Eagles and several owl species, April – August for ospreys, and May – August for most other raptors (Table 2). Local governments have the power to use Development Permit bylaws to reduce disturbance around provincially identified nest trees.

- Reduce disturbance around the nest site by locating new trails, buildings, and roads away from raptor nesting habitat and by limiting access to existing trails and facilities.

Table 6. Characteristics of natural nest sites of raptors and corresponding nesting replacement or enhancements in British Columbia.

Species	Natural Nest Site	Nest Replacement or Habitat Enhancement Options	Links to Information
Osprey	Bulky stick-nest at or near the top of large (mostly dead) trees (conifer or deciduous) near fish-bearing water bodies	Platform on top of pilings, poles, or towers near water; see Figure 7	Osprey 1 Osprey 2
Bald Eagle	Massive, stick-nest usually in the crotches or on branches next to the trunk of living or dead large trees; often within 1 km of rivers, lakes, or the ocean	Prune large trees so that crotches are accessible to eagles; Ensure recruitment of new nest trees over time by retaining veteran, wind firm trees in nearby areas; place platforms on trees or poles	Bald Eagle 1 Bald Eagle 2
Red-Tailed Hawk Swainson's Hawk Ferruginous Hawk	Fairly large, compact to loosely organized nests of twig and sticks in deciduous or conifer tree crotches or on branch near trunk, often near the top of large trees (isolated trees or woodlands); Swainson's Hawk prefer dense thickets of trees	-Platform on a pole -Transplanted trees to provide nesting cover and as future nest sites -prune large trees so that crotches are accessible for nesting	Platform 1
Great Horned Owl*	In broken treetops and in tree crotches in coniferous or deciduous woodlands; often use abandoned nests of other species	-Platform on a pole -Transplanted trees to provide nesting cover and as future nest sites	Platform 1
Barn Owl	-Attics and lofts of barns and buildings -Cavities in trees growing in woodlands near agricultural areas	-Nest boxes in woodlands near agricultural areas or in old buildings in agricultural areas	Nest Box 1 Nest Box 2 Nest Box 3 Nest Box 4
American Kestrel Western Screech-Owl Northern Saw-Whet Owl Boreal Owl Northern Pygmy-Owl Barred Owl* Flammulated Owl Northern Hawk Owl	Conifer or deciduous tree cavities in riparian, forested, and agricultural areas; all are "secondary cavity nesters", using cavities created by other animals (mainly woodpeckers); also use natural cavities and holes (non-animal made) in the side or on the top (Barred Owls and Northern Hawk Owls only) of large trees	These species readily use artificial nest boxes in riparian, forested, and agricultural areas; nest boxes in riparian areas are especially important for Western Screech Owls, where natural tree cavities are lacking; Barred Owls also may use artificial platforms on poles (see Great Horned Owl above)	Nest Box 1 Nest Box 2 Nest Box 3 Nest Box 4
Peregrine Falcon	Nests on cliffs or rocky areas, often on ledges with overhanging cover; cliff often adjacent to large lakes, rivers or the ocean	Restrict access and avoid building homes or other structures near potential cliff nesting areas; urban nesting birds would benefit from artificial nesting platforms and overhead shelter or nest boxes	
Prairie Falcon	Nests on cliff ledges with overhangs; cliffs are often adjacent to open areas used for hunting, especially lakes and river valleys	Avoid disturbance of nesting cliffs	
Turkey Vulture	Nests on cliffs, boulder-strewn areas or rarely in open forest.	Avoid disturbance of nesting cliffs and boulder areas	
Golden Eagle	Nests most often on cliff ledges and occasionally in trees on steep, rocky slopes	Avoid disturbance of nesting cliffs and trees	
Cooper's Hawk Sharp-shinned Hawk	Relatively large nest of twigs and bark usually in coniferous trees and placed on branch or crotch near trunk; occasionally re-used in consecutive years	Maintain stands of conifer and deciduous trees with inter-locking canopy	
Merlin	Nests mainly in conifer trees, often using abandoned stick nests of other species	Maintain woodlands adjacent to open areas; coniferous trees for nesting	
Long-eared Owl	Mostly in deciduous trees on abandoned nests of other species	Maintain dense thickets of deciduous trees and shrubs	

Species	Natural Nest Site	Nest Replacement or Habitat Enhancement Options	Links to Information
Great Gray Owl	Uses natural platforms, such as abandoned nests, in conifers or deciduous trees	Maintain stands of conifer and deciduous trees	
Northern Harrier	On ground (or over water) in marshes, wet meadows, and old-fields	Minimize disturbance and access to potential nesting areas; avoid mowing during nesting period	
Short-eared Owl	On ground in shrubby, grassy fields; often in agricultural areas	Minimize disturbance and access to potential nesting areas; avoid mowing during nesting period	
Burrowing Owl	Nests in abandoned underground (or bank) burrows of marmots, badgers, skunks, Kingfishers or natural crevices in ground	Artificial nesting burrows and captive breeding now being used; minimize disturbance near nest burrow	
Northern Goshawk	Relatively large nest of sticks, twigs and bark placed in crotch or on branch against trunk of conifer or deciduous trees	Maintain large areas of mature forest in rural areas	
Spotted Owl	Nest in tree cavities or on natural platforms or abandoned nests of other species in old growth conifer forest	Maintain large areas of mature forest in rural areas	

*Note that Bosakowski and Smith (2002) identify the Great Horned Owl as a potential threat to raptors for which there may be a greater conservation concern and recommend that actions taken to enhance nesting habitat specifically for Great Horned Owls should be questioned. The same might be said of the Barred Owl. These concerns are best evaluated by an experienced raptor biologist on a site-specific basis.

Figure 18. Nests of Ospreys can be removed from one site, placed onto a platform, then secured atop a nearby structure such as a pole or tree. Such operations require trained professionals.

BMP 3. Protect raptor roosting/perching sites and foraging areas

Protecting roosting and perching sites and foraging areas is an excellent way to help maintain raptor populations in urban and rural environments. Roosts are secure areas used by raptors for resting and preening and may be used year-round by one or more individuals. Turkey Vultures and Bald Eagles are examples of species that roost in larger groups. Suitable perching sites and foraging areas allow raptors to obtain adequate food for reproduction and survival.

The following measures are recommended to protect these sites:

- Preserve any trees, cliffs, or other specific sites that raptors regularly use for roosting, perching or feeding; good foraging sites include shorelines, estuaries, wetlands, shrubby areas, old fields, hedgerows, and riparian areas

- Avoid placing new trails, roads, or buildings in the immediate vicinity of above sites

BMP 4. Avoid disturbance of sensitive habitats during and after development

Without careful planning, disturbance from construction activities can be potentially harmful to raptors. The presence of large machinery, work crews, blasting and other activities can disturb raptors. These activities should be scheduled to avoid the breeding period of raptors, and care is required to prevent physical damage to the vegetation and key habitat features.

Careful planning is also required to ensure that activities after the construction phase are not impacting breeding, roosting or foraging areas. Structures, facilities, and roads should be located away from raptor habitats. In addition, public access to sensitive areas should be restricted using fencing, re-routing of trails, or posting signs.

The following measures are recommended to minimize disturbance:

- Avoid loud noises and human activity adjacent to nest sites during the entire breeding period; for many species, the nest initiation and incubation period is the most sensitive time (See Table 2 for details of timing of nesting in different regions of British Columbia)

- Minimize disturbance to natural vegetation and avoid creating unnecessary human access to raptor habitats

- Keep machinery, people, and pets away from important habitats including nesting, brood rearing, roosting, and foraging areas

- For large properties, locate recreational facilities, trails and access points away from sensitive habitats; discourage rock climbing activities on nesting cliffs and camping/picnicking near riparian habitats and shorelines used by breeding, roosting or foraging raptors

Developments near protected areas such as parks and refuges pose a unique problem. While the developments themselves may not harm raptor habitat, the amount of human and pet use of the protected area can increase. Dogs and cats can disturb raptors and can kill or injure them, their young, and their prey. Intensive use of an area for hiking, bicycling, horseback riding, and motorcycling all have considerable potential to reduce the habitat suitability for raptors. It is important that people understand how they can minimize adverse effects on wildlife and their habitats. Signage and fencing can be effective means of directing activities to appropriate areas.

BMP 5. Manage, restore or enhance raptor habitat and features

Artificial structures are not a long-term substitute for retaining natural habitat features

Northern Saw-Whet Owl nesting in a cavity in a Ponderosa Pine tree. LGL Limited photo.

In highly modified landscapes, such as urban areas, restoration and enhancement measures are often required to maintain viable populations of raptors. Habitat restoration includes re-establishing habitat features and ecological conditions that have been modified by human activities. Habitat restoration for raptors can be carried out at different spatial scales and can range from restoration of habitat connectivity at a broad scale to landscaping practices and individual actions by residents in their backyards. To be successful, both large- and small-scale restoration projects require careful planning and knowledge of the requirements of the target organisms. The replacement of natural habitat features with artificial structures (such as nest boxes) should be considered a temporary solution. The goal of restoration and enhancement should be to re-establish natural habitat features.

The following restoration and enhancement measures for raptors are recommended:

- Replace raptor nest sites that are damaged or lost; this may include nest boxes for owls (see specifications for each species-Link 1, Link 2, Link 3, Link 4), nesting platforms for Osprey (Link 1, Link 2, Ewins 1994), or pruning mature trees to make them more attractive to Bald Eagles, Red-tailed Hawks and other raptors (Link 1, Link 2); if large trees need to be felled for safety reasons, consider replacing them with artificial nest structures; remember that natural nest trees are more effective over the long term, artificial structures should be considered a temporary solution until suitable nesting habitat is restored

- Provide artificial perches such as poles and platforms, if natural perches have been damaged or lost (Link)

- Restore habitats where natural vegetation has been removed or altered; use native species of trees, shrubs and grasses and control introduced, invasive plants; creation of shrub thickets and hedgerows provides excellent foraging habitat for raptors

- Maintain an area of uncut lawn or pasture near forest edges to increase prey abundance

- Manage open fields to provide sufficient escape cover to prey (native small mammals) populations and improve access to prey by raptors; prevent encroachment by shrubs and trees to old field habitats (note that mowing should occur outside the nesting season of any ground-

nesting raptor that might occur in the area); where possible, retain existing "old-field" habitats in their natural state

- Reduce potential impacts of grazing animals (e.g., on hobby farms in rural areas) on prey populations and ground nesting raptors

- Transplant larger trees and create snags for perching, roosting, and nesting. Snags can be created by retaining lower portion of a tree that is to be felled. Artificial perching poles can be strategically placed within the habitat (Link)

Raptor Perch Created from Topped tree

LGL Limited photo.

Table 6 describes natural nest sites used by raptors and the corresponding nest replacement options for species known or suspected to use such replacements in urban and rural environments. Other enhancement or protective measures for breeding sites are provided in Table 6. Information on breeding distribution in British Columbia, suitable habitats, and nest sites can be used to tailor nesting replacements to specific species (see Section 10 for species accounts).

In the case where loss of important raptor habitat features is inevitable, replacement structures should be created or erected in suitable nearby habitats prior to the onset of nesting activity. Always check with the provincial government whether permits are needed, before undertaken any activities that destroy key habitat features for raptors. Replacement of lost structures can compensate for the losses to some extent and is in accordance with the principle of no net loss of habitat. However, replacement structures should never be used as an excuse to destroy natural habitat features, which usually provide higher quality habitat for raptors and over longer term.

All tree felling, vegetation clearing, or building removal should occur from mid-September to January to minimize the risk of destroying active raptor nests. If clearing or demolition must occur outside this timing window, a thorough nest search should be conducted.

BMP 6. Minimize the risk of accidental mortality

Electrocution poses a serious threat to raptor safety in areas where power-lines are used as perches or nesting platforms. Large raptors can be electrocuted by power transmission lines if they make simultaneous contact with two conductors or contact one conductor while perched on a structure that is earthed. Wires also pose collision hazards, particularly for young birds learning to fly or where raptors are concentrated such as at salmon-spawning streams or migration/staging areas. Further information on raptors and power-lines can be viewed at: Link 1; Link 2.

The following measures are recommended to minimize the risk of accidental mortality:

Figure 19. Ospreys commonly nest atop electrical poles and towers. Nests in such locations pose hazards to the birds and often result in costly power outages. LGL Limited photo.

- In high-risk areas, retro-fit power lines so that the risk of electrocution of raptors is minimized (Link); in new developments locate transmission lines underground
- For osprey nests on top of power poles, a cost-effective approach to reduce the risk of electrocution is to build a second platform over the existing nest (M. Chutter, pers. comm.). When the birds return the next year, they will build a new nest safely above the wires
- In areas where raptors are concentrated (such as Bald Eagle roosting sites), minimize the risk of collisions with power transmission lines by using large floats and other markers to make wires more visible and prevent collisions with raptors (Link)
- Minimize the risk of mortality of raptors due to collisions with windows and clear panel railings on sundecks; use non-reflective substitutes, awnings, screens, tinted films or apply decals generously onto windows or clear panels; relocate bird feeding stations away from windows and decks; in new construction, use non-transparent materials for sundeck railings

BMP 7. Avoid the use of pesticides and herbicides

As top predators, raptors are particularly susceptible to a variety of environmental contaminants. The following measures are recommended to minimize risk of mortality or reduced productivity due to pesticides and herbicides:

- Use traps rather than poisons when controlling rodents or other pests to avoid secondary poisoning of raptors through ingestion of contaminated prey

- Use integrated pest/weed management and avoid use of chemical pesticides, which can be harmful to raptors and other wildlife (Link)

BMP 8. Educate the public about the importance of maintaining raptors in urban and rural environments

- Use interpretative materials such as signs and brochures to make the public aware of the need to protect raptor habitats and to prevent disturbances to nesting and roosting sites

- Where possible, encourage volunteers and local residents to collect data and make observations when conducting effectiveness monitoring of raptor conservation projects using BMPs (See Section 9)

- Landowners should be informed about raptors using their property and should be encouraged to observe and record their activities. Education programs can lead to stewardship agreements, land covenants, and habitat management initiatives

- Educating the public about the value of raptors would make it easier for local governments to include provisions for raptor conservation in Official Community Plans, which would require community support

9 Monitoring and Reporting

9.1 Why is monitoring necessary?

Encourage volunteers and local residents to collect data and make observations when conducting effectiveness monitoring of raptor conservation projects

It is important to find out whether particular measures taken to protect raptors are effective. Monitoring consists of follow-up activities undertaken to address this issue. Monitoring is very important for several reasons. First, time and resources may be wasted on measures that are ineffective or even counter-productive; monitoring can detect problems at an early stage and prevent the waste of resources. Second, refinements of mitigation measures are often needed to adjust them optimally to particular settings; monitoring will help direct these adjustments and identify problem areas; this process is known as adaptive management. Third, much can be learned from each individual project; this information will help in the design of other similar projects. Monitoring programs often offer excellent opportunities for involving residents of housing developments, natural history groups, and other community members in conservation activities, so promoting awareness and stewardship of raptors and their habitats within urban/rural areas.

9.2 What is involved in setting up a monitoring program?

Follow-up monitoring should be incorporated into each project, and a plan should be prepared on how monitoring is to be accomplished. The plan should address the following questions: What are the specific issues that need to be addressed, and what does the monitoring program hope to achieve? What information will be collected and how frequently? Who will carry out the monitoring activities? How will the results be incorporated into mitigation or management practices?

Monitoring of the effectiveness of BMPs can focus either on the condition of the habitat or on the raptors themselves. Examples of monitoring questions focusing on habitat condition include the following: Were potential nesting trees, hedgerows, shrub thickets and other raptor habitat features retained during development, as planned? Do these features continue to remain in their original condition immediately after development and over the long term? Has the natural vegetation in buffer zones around raptor nesting trees remained undisturbed, and are people or pets regularly breaching restrictions within these buffer zones? Examples of monitoring questions that focus on the raptors themselves include the following: Do raptors continue to use the retained habitat features, what time of the year, and how frequently? Do raptors regularly use artificial nest sites and other structures provided? Do the nest sites produce surviving young? Do collisions of raptors occur with windows and railings on sundecks and what

mitigation measures were implemented? Are Barred Owls and Great Horned Owls affecting the use of habitats by small owls in project areas?

The level of detail required and the length of monitoring will depend on specific projects and objectives. Monitoring can simply include recording continued presence of a habitat feature (such as a roosting tree), its condition, and the use of this feature by raptors over time. Also, artificial nesting platforms and other structures may deteriorate over time, and their periodic inspection is necessary to ensure that they remain in a functional condition. The above types of monitoring are often all that is required and may be carried out by trained volunteers. In special situations, it may be necessary to engage in more elaborate monitoring activities. For example, it may be important to know whether birds raise broods successfully in artificial structures or whether these structures increase productivity of the local population. In cases where birds need to be banded or active nests inspected, the monitoring is to be conducted by biologists with specific training and appropriate permits to avoid inadvertently disturbing or harming birds.

Whether monitoring activities are to be undertaken by volunteers or biologists, it is important that observations are collected and recorded in a standard way, according to a monitoring plan. To ensure that the data are useful, volunteers should be provided with datasheets and told exactly what information they are to record and how often.

Standard survey methods have been prepared for raptors in British Columbia (RISC 1998. Inventory Methods for Raptors, Version 2.0; Link 1; Link 2; Link 3). Some of these methods, particularly those describing methods for "presence/not detected" intensity of effort, can be useful in monitoring the effectiveness of best management practices for raptors. It should be noted, however, that methods involving broadcast of recorded vocalizations should be used diligently and only when needed; their inappropriate use can disrupt behaviour of raptors and other birds. Many excellent field guides are available to help with accurate identification of raptor species in British Columbia and will help volunteers to record data accurately.

Monitoring programs often involve intensive follow-up efforts initially after the implementation of mitigation measures, and periodic monitoring thereafter. Monitoring activities should be carried out over multiple years to ensure that potential longer-term effects are detected and possible problem areas are identified as they arise.

Steps to monitoring raptors in urban and rural areas:

- Prepare a monitoring plan that includes objectives, detailed methodology, and reporting requirements
- Design monitoring programs with clear long- and short-term objectives
- Determine who will conduct the monitoring activities (volunteers, biologists, other)

- Establish and maintain good rapport with volunteers and provide clear guidance on data collection and recording
- Summarize results at periodic intervals (for example yearly); share results with and encourage feedback from other jurisdictions, provinces and countries conducting similar studies
- Apply results of monitoring to refinement of mitigation and management measures on a continuing basis, as needed
- Report observations of listed species to the Conservation Data Centre (Link) to help with broader-scale conservation and population monitoring efforts

10 Species Accounts

The following accounts provide relevant information on the ecology and conservation of raptors in British Columbia. Raptors that are most likely to occur in urban and rural habitats or are of special conservation interest are presented first, followed by those that seldom occur there. An excellent reference for additional information is *Raptors of the Pacific Northwest* (Bosakowski and Smith 2002). Hyperlinks provide connections to photographs and vocalizations. See Section 3 (page 2) for further information.

Range maps were largely prepared using a basemap of the Ecoregions and Ecoprovinces of British Columbia (see Link1; Link2). By adopting an approach to mapping a species' distribution that is based on Ecoregions and Ecoprovinces, there is an ecological basis for delineating a species' range. For each species, published information such as that in Blackburn and Harestad (2002); Campbell et al. (1990); Cannings et al. (1987); Chaundy-Smart (2001); Fraser et al. (1999); Hooper (1997); and van Woudenberg (1999) was used to determine the likelihood of a species' presence in a given Ecoprovince: during a species' breeding season; during spring and fall migration periods; during the winter period; and/or year-round (indicating that both breeding and wintering likely occurs there). For some raptor species, published data for parts of British Columbia are scant or lacking. Additional information about the presence of a species in a particular area can be obtained from local naturalist organizations.

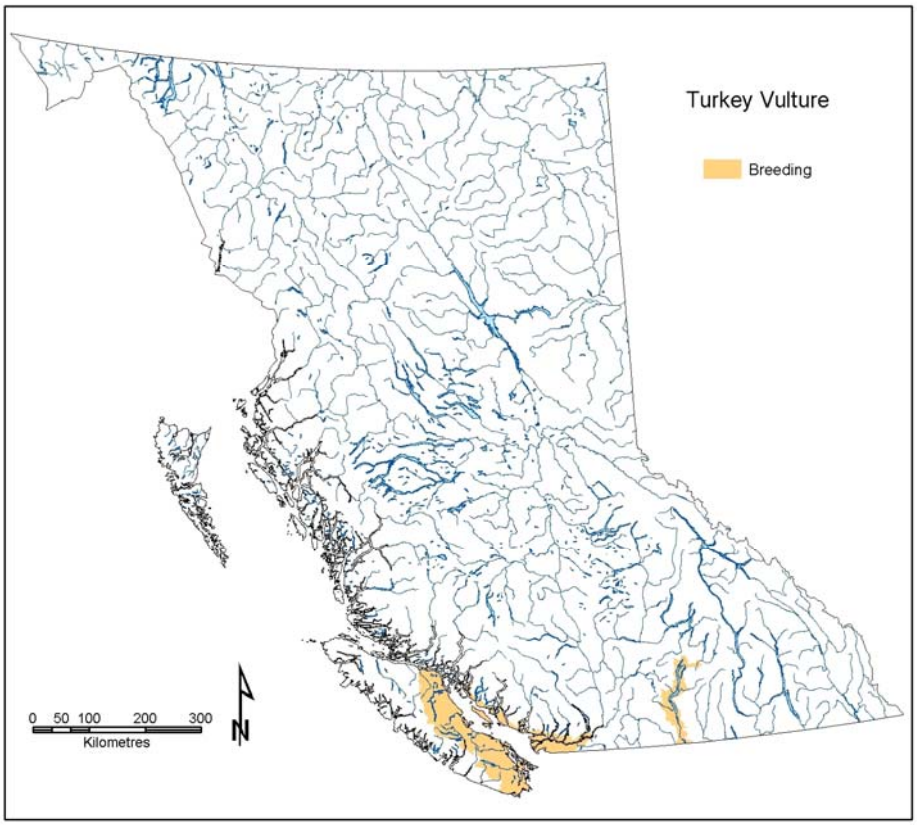
The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) tracks the status of flora and fauna in Canada. Listing categories applicable to the species presented in this section are defined as:

- **Endangered—**A species facing imminent extirpation or extinction.
- **Threatened—**A species likely to become endangered if limiting factors are not reversed.
- **Special Concern**—A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
- **Not at Risk**—A species that has been evaluated and found to be not at risk.
- **Not Listed**—A species for which there is no present need for evaluation.

In British Columbia, flora and fauna conservation concerns are assessed by the provincial Conservation Data Centre (CDC). Listing categories are as follows:

- **Red-listed**—Indigenous species, subspecies and natural plant communities that are extirpated, endangered or threatened in British Columbia. Red-listed species and sub species have or are candidates for official Extirpated, Endangered or Threatened status in B.C. Not all Red-listed taxa will, necessarily become formally designated. Placing taxa on these lists flags them as being at risk and requiring investigation.
- **Blue-listed**— Indigenous species, subspecies and natural plant communities of special concern (formerly vulnerable) in British Columbia.
- **Yellow-listed**— Indigenous species, subspecies and natural plant communities which are not at risk in British Columbia.

10.1 Turkey Vulture (*Cathartes aura*)



COSEWIC: Not Listed **B.C. status: Yellow-listed**

Identification (Length 67-80 cm; Wingspan 170-175 cm)

- Originally classified as a raptor in the Order Falconiformes, but are now placed in the same order as herons and storks (Order Ciconiiformes).
- Large, dark, hawk-shaped with long wings and tail.

- Adults: Small unfeathered red head. Body and upperside of wings blackish or brownish-black. Underwing distinctive in flight; flight feathers silvery-grey, the rest of the wing is very dark. Under side of tail is grey. Beak is yellow.
- Immatures: Like adults but head and bill grey. First fall bird more brownish cast.
- Most often seen in flight. Perches in trees overnight and during early morning. On the ground only when feeding.
- Usually soars or glides, rocking from side to side, with rare wingbeats. Wings held upward in a broad "V". (Note that several other raptors hold their wings in a "V"– though normally more horizontal than in Turkey Vulture). Steady flapping flight is uncommon, mainly during takeoff or adverse soaring conditions.
- Sexes similar in size and plumage.
- Turkey Vultures are not likely to be heard vocalizing.
- Most likely to be confused with eagles due to its large size (though smaller than eagles) and dark color. All Bald Eagles and immature Golden Eagles should show some white on the wings or tail. Two-toned underwings separate from all-dark appearing adult Golden Eagles. Rocking motion in flight is different than the steady flying of either eagle as is the dihedral (V-shaped) position of the wings, and also the relatively "headless" appearance dictated by the lack of feathers on the head.

Distribution
Turkey Vultures breed from southern Canada to southern South America and winter from the southwestern United States south. Although seen occasionally nearly everywhere in southern British Columbia south of about 50° N latitude from spring to fall, it is only known to breed on southern Vancouver Island, the south-coastal Mainland and in the Okanagan Valley (Campbell et al. 1990).

Population Status
The Turkey Vulture is not a species at risk. Its extensive range and large population outside of Canada, its distinctive appearance, and the ease of observing it, make it one of the most recognized birds in the New World. The Canadian population is roughly 5,000-20,000 pairs (Kirk and Hyslop 1998). In British Columbia, however, it has a relatively small breeding range, but its numbers and range appear to be increasing, probably as a result in the greater availability carrion along an expanding and busier highway system in the province.

Movements
A few spring migrants arrive on the south coast by late February; larger numbers arrive later in spring and move farther north. During September and October most of the coastal population gathers on extreme southern Vancouver Island, particularly around Rocky Point, waiting for the right weather conditions to make the flight across Juan de Fuca Strait. Most leave

the province by mid-October. A handful of birds don't make the crossing in some years and (apparently) successfully overwinter. In the Okanagan, most Turkey Vultures arrive in April and are gone by October (Cannings et al. 1987; Campbell et al. 1990).

Habitat

In general, open areas at fairly low elevation are the preferred foraging habitat of Turkey Vultures in British Columbia. On the coast they are seen flying over a variety of agricultural lands, rural areas, woodlands mixed with open areas, cliffs and other steep rocky terrain. They are also seen over a variety of rural and urban lands including golf courses, playing fields, and housing developments.

At night Turkey Vultures often roost in groups. Communal roosts are usually located in large trees, preferably with fairly large horizontal branches (for ease of perching) and often in somewhat sheltered locations. This group roosting behaviour is thought to be important for social interactions and as a means of obtaining information about the foraging success of other vultures. Communal roost trees are located in relatively remote spots, undisturbed by humans (Kirk and Mossman 1998).

Turkey Vultures are quite specialized in their choice of breeding habitat. In western North America, the vast majority of nests found are in steep, rocky terrain, the remainder occur in a variety of treed habitats. Only a few nests have been found in British Columbia with about 90% on steep cliffs or rocky slopes and the rest in treed areas (Cannings et al. 1987; Campbell et al. 1990: Kirk and Mossman 1998).

Breeding

The most important requirement for nesting habitat appears to be that the area be isolated from human disturbance (Kirk and Mossman 1998). The nest is built in an inaccessible location such as a small cave or crevice in a cliff, or amongst a pile of boulders. The eggs are usually laid directly on the substrate of rock, soil or wood, although some rudimentary nest-building may be done. The clutch size is 2 with 1-3 days between eggs. A wide range (28-41 days) of incubation length has been reported. The most likely period is near the high end of that range. Parents regurgitate well-digested food to feed the chicks. The young start to fly when they are about 60 days old though they stay near the nest, being fed by parents for another few weeks (Kirk and Mossman 1998).

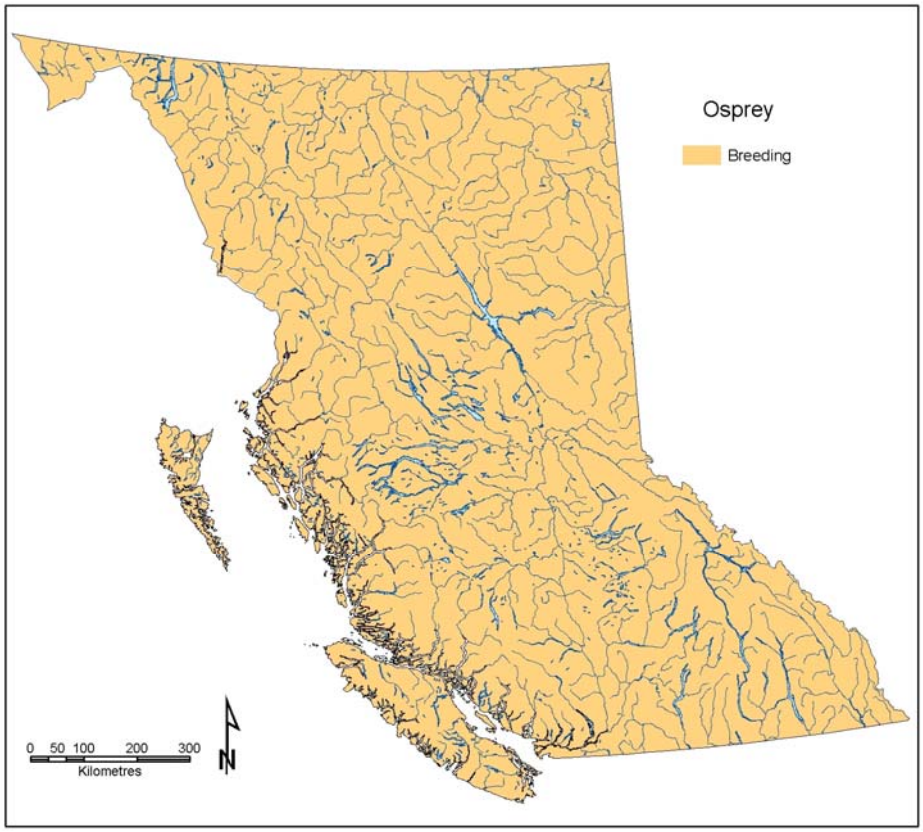
Food Habits

Turkey Vultures locate their food from the air. They soar and glide over open areas using their keen eyesight and sense of smell to locate dead animals. They are one of the few birds proven to have a sense of smell. The principal food of Turkey Vultures is carrion. Any type of dead animal appears to be scavenged by these birds including domestic animals, road-killed animals, offal at slaughterhouses and fish plants, spawned-out salmon, animal parts discarded by hunters, and beached marine mammals. In some

situations, vegetable matter, and insects are eaten. Small, live animals may be taken in rare instances.

Compatibility with Human Landscapes
Turkey Vultures are commonly seen flying over urban and rural areas on Vancouver Island and the Gulf Islands. They also occur during the non-winter period in developed areas in the Okanagan and Kootenay valleys. Much of the food they find in developed areas is a result of human activities, including road-killed animals, rodents killed during haying, offal in garbage dumps, and domestic animal carcasses. Although often seen in developed areas, Turkey Vultures need undisturbed areas for nesting. They are vulnerable to disturbance at roosting sites. Very few nesting sites are known in the province, making it difficult to protect nests.

10.2 Osprey (*Pandion haliaetus*)



COSEWIC: Not Listed **B.C. status: Yellow-listed**

Identification (Length 56-64 cm; Wingspan 147-183 cm)

- Fairly large, long-winged raptor mostly white below, chocolate-brown above.
- Adults: White head with prominent dark eye-line. Upperparts dark brown. Underside of body white, throat variably streaked. Undersides of wings have conspicuous dark patches at the wrist. Flight feathers and tail barred brown and white.

- Juveniles: Like adults, but light-buff fringes on upperparts giving scaled appearance, buff fringes fade over first winter throat often more heavily streaked.
- Sexes nearly alike; females larger; often with heavier streaking on neck.
- In flight wings are angled-back at the wrist, unique among raptors of British Columbia. Soars with wings held in shallow arc.
- Their ability to hover while hunting is unusual for a raptor of this size
- Vocalizations: A sample of vocalizations can be heard at: Link .

Distribution
Ospreys occur on every continent except Antarctica. In North America, Ospreys breed nearly throughout the continent south of the treeline. In British Columbia, Ospreys are widespread breeders, common in the south, rare in the north. Rare visitors to the Queen Charlotte Islands, they are not known to breed there (Campbell et al. 1990). Most North American Ospreys move to Central and South America for the winter (Poole et al. 2002).

Population and Status
The Osprey is not a globally threatened species. The world population is unknown, but thought to be fairly large. The North American population is likely more than 30,000 pairs and increasing. Canada is home to more than 10,000 pairs (Poole et al. 2002).

Movements
Most Ospreys that breed in western North America, winter in Central and South America; very small numbers stay as far north as Oregon and California. The majority leave the province by early October and return in April. On the coast some spring migrants arrive as early as late February and some stay in the fall as late as November (Campbell et al. 1990). In the interior, Ospreys arrive later in the spring and leave earlier in the fall compared to the coast

Young Ospreys often linger in British Columbia for a couple of weeks longer in the fall than adults do before migrating south. Young birds remain at their wintering areas until their second or third calendar year before returning north (Poole et al. 2002). When the young birds return north they generally return to the area where they were hatched (Poole et al. 2002).

Habitat
Suitable Osprey habitat only occurs in areas with accessible, live fish. Salt, brackish and fresh water in many habitats are used for foraging. Ospreys capture their prey near the surface of the water. As a result, they are most abundant in areas with shallow waters that improve access to fish (Poole et al. 2002).

In British Columbia, breeding Ospreys are concentrated in valley bottoms, although some pairs nest at higher elevation lakes (Steeger 2003). Ideal nest

sites are close to water, and the air space around the nest is open, giving the birds' clear access for landing and take off, and a good view of the surrounding area while on the nest. In British Columbia, natural nest sites are trees; in other parts of their range they also use cliffs or the ground. Ospreys readily nest on artificial platforms erected specifically for that purpose or on many other man made structures not intended for them such as power poles, pilings, and channel markers (Poole et al. 2002). Ospreys nest in loose colonies in areas with good foraging opportunities and abundant nesting structures, such as near the Williston Reservoir (Steeger 2003).

Breeding

In the spring, adult Ospreys usually return to their nest site of the previous year, the males arriving earlier. Nests are reused year after year (Poole et al. 2002). Eggs are laid soon after a new nest is built or the old nest refurbished. Ospreys lay 1 to 4 eggs; 3 is the most common clutch size (Poole et al. 2002). The incubation period is variable. In one study, it was 36-42 days (Steeger et al. 1992). Females do most of the incubation while the male provides her food (Poole et al. 2002). The young fledge when they are about 50-55 days old (Poole et al. 2002). After leaving the nest the young stay in the area, and are dependent on the adults for food for at least 10-20 days, often returning to the nest where the adults bring food for them (Poole et al. 2002).

Food Habits

Ospreys use two hunting techniques, hunting on the wing or hunting from a perch. When hunting from the air, Ospreys fly about 10-40 m above open water searching for prey. When prey is spotted, the bird dives feet first to the water and grabs it with its talons and carries it off (Poole et al. 2002). Hunting from a perch (rarely seen in British Columbia) is similar except prey is spotted while the Osprey is perched on a structure with a good view of feeding habitat.

Ospreys feed nearly exclusively on live fish, at least 80 fish species have been recorded in their diet. Prey fishes usually weigh about 150-300 grams and are about 25-35 cm in length. Other foods, though very rarely noted, include; snakes, birds, small mammals, amphibians and carrion (Poole et al. 2002).

Ospreys have highly modified, large feet with long, sharp curved talons. The fourth toe is reversible, allowing the bird to position two toes forward and two backward when grasping prey. Additionally, the bottoms of the feet are covered in rough scales that are modified into sharp points (spicules). This unique foot structure helps the bird to grip slippery prey (Poole et al 2002).

Compatibility with Human Landscapes

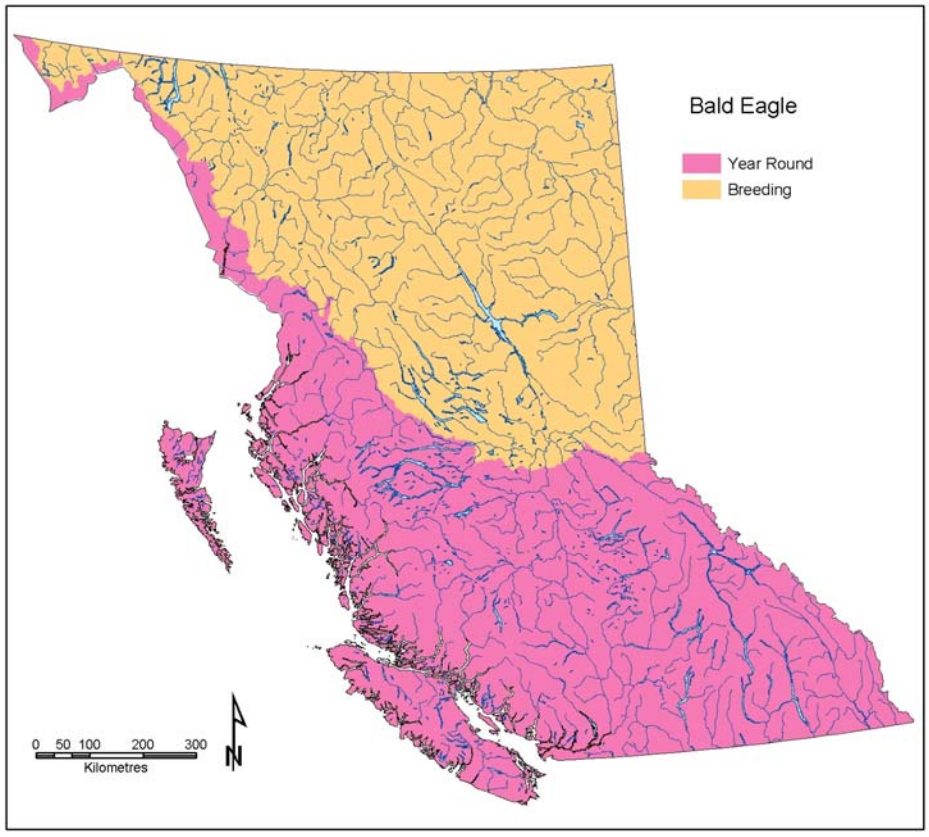
Ospreys readily build nests on human-made structures, often in close association with human activity. Their frequent use of power poles at some locations for nest sites has spurred the placement of alternate poles with nesting platforms attached so as to avoid electrocutions and interference with power supplies. Local declines of fish resources may also impact local populations of Ospreys.

Competitors of Ospreys in British Columbia include Bald Eagles and Great Blue Herons, which can compete for fish, and Canada Geese which can compete for nests. A study in southeastern British Columbia showed that about 50% of returning Osprey pairs found Canada Geese already using their nest. This resulted in delayed laying, reduced clutch size, reduced brood size and a reduced number of fledglings (Steeger 2003).

Several human-induced factors benefit Ospreys, including the following:

- The creation of reservoirs has increased Osprey habitat and populations in some regions
- Intensive fisheries management programs that stock lakes with trout or that bolster natural productivity (e.g., lake fertilization)
- Erection of artificial nest platforms in suitable areas
- Improved water quality and clarity in fish-bearing lakes
- Nest guards to deter predators
- Maintaining large trees with nest-site potential

10.3 Bald Eagle (*Haliaeetus leucocephalus*)



COSEWIC: Not at Risk **B.C. status: Yellow-listed**

Identification (Length 79-94 cm; Wingspan 178-229 cm)

- Very large, mostly dark, broad-winged raptor.
- Adults: Head and tail white, body and wings dark brown-black. The eyes, bill, legs, and feet are yellow.
- Immatures: Gradually attain adult plumage over 4-6 years. During that time they are mostly dark brown with variable irregular whitish patches and isolated pale feathers especially on the undersides.
- As is the case with virtually all raptors, females are larger than the male.
- Soars with wings held flat. Flapping flight is powerful and steady.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Bald Eagle has a larger head, shorter tail, and straighter trailing-edge to wings than Golden Eagle. White areas on underside of immature Golden Eagle more sharply defined, regular and symmetrical. Both eagles are larger, shaped differently and have a steadier flight than Turkey Vulture.

Distribution

Bald Eagles breed from extreme northern Mexico, north to the treeline. Their centre of abundance is the northwest, especially Alaska and British Columbia. In British Columbia, nesting Bald Eagles are abundant near the coast, common in the southern interior and uncommon in the northern interior. They winter abundantly on the coast and fairly commonly in the interior where water remains ice-free (Campbell et al. 1990).

Population Status

An estimated 100,000 Bald Eagles live in North America which is the entire world population (Buehler 2000). About 4500 pairs of Bald Eagles nested annually in British Columbia during the early 1990s (Blood and Anweiler 1994). About 20,000-30,000 Bald Eagles spend the winter in British Columbia (Farr and Dunbar 1988 in Blood and Anweiler 1994). The population has been increasing since the 1960s. In British Columbia, the population is close to carrying capacity and is stable (Buehler 2000).

Movements

Bald Eagles move between nesting and wintering areas and between seasonal sources of abundant food. Some pairs on the coast are resident at their nesting sites. Bald Eagles that breed in northern and interior parts of the province migrate south to the United States for the winter. Many of the Bald Eagles that winter on the British Columbia coast breed in Alaska. Many Bald Eagles from the south coast and other areas move during summer to Alaska to take advantage of the earlier salmon spawning season. These birds will move south again gradually as the spawning season progresses to more southern rivers.

Habitat

Bald Eagles are nearly always near water although they use many habitats over their large range. Good breeding areas can be in a variety of forest and landscape types but usually have two things in common, large trees for

nesting and abundant food. These two requirements are present nearly everywhere along the coast. Abundant food sources are not a feature of the interior of the province, and consequently, Bald Eagles are not as abundant there. In the interior most nests are close to rivers, lakes, marshes or other wetland areas.

Bald Eagles spend a lot of time perched in tall trees affording a good view, usually located along shores. These trees probably serve as a lookout station while watching prey or other eagles as well as a resting spot for preening and other activities. They congregate in fairly large numbers in the winter at abundant food sources such as salmon, herring, and eulachon spawning areas; and garbage dumps.

During the winter, Bald Eagles may roost communally during the night (Yackel Adams et al. 2000). The same trees, usually old-growth conifers, are typically used for many years and are located in the vicinity of an abundant food source. The trees used for communal night roosts are often larger than surrounding trees. The purpose of communal roosting is likely as a sheltered location as the roosts are more used during cold weather and shortages of food. During very poor weather, the eagles may stay in the roost all day. Communal roosting may also be important for various social and non-social activities as well (Yackel Adams et al. 2000). A good example of this is around the Squamish/Brackendale area where some land has been set aside to protect eagle winter roosts.

Breeding

Bald Eagles use a variety of sites for nesting including cliffs, the ground, and small to large trees. In British Columbia, with very few exceptions (on treeless offshore islands), Bald Eagles build their nests in tall sturdy trees usually within a few metres of the top (Blood and Anweiler 1994). The structure of the tree, its location and the arrangement of surrounding landscape features are the most important factors an eagle uses to determine if a tree is suitable. The tree may be alive or dead, coniferous or deciduous. Bald Eagle nest trees generally are located close to water and a food source and must be strong enough to hold their heavy nests. The nest site must have clear air space around it, giving a good view of the surrounding area and be approachable from different directions for easy access during different wind directions (Blood and Anweiler 1994). Nests are built of dead sticks with a nest cup lined with grasses, bark, fresh conifer boughs and moss. Nests may be used for many years, additional branches and other material being added each year.

One to four alternate nests may be in a single nesting territory and different nests may be used in different years. In good habitats such as coastal areas of British Columbia, a territory radius of approximately 2.5 km is typical (USFWS 1986). Bald Eagles begin nest-building activities several weeks before egg-laying. One to 3 eggs are laid, but most often the clutch is of 2 eggs. In British Columbia, eagles start laying as early as February on the south coast, later in the rest of the province. Incubation starts with the first

egg and takes about 35 days. Thus the eggs hatch at one to four day intervals, resulting in chicks of uneven age. Both adults bring food to the young. Young birds leave the nest at 8 to 14 weeks of age and associate with parents for several weeks more (Buehler 2000).

Food Habits

Bald Eagles locate food while perched or flying. Often the tallest tree in an area is chosen by Bald Eagles as a perch tree. From a tall tree on the shore, eagles are capable of spotting food floating in the water a long way offshore (many hundreds of meters).

Bald Eagles are strictly carnivorous and are able to exploit a great variety of food sources. In British Columbia the primary food is fish. Many different species of fish are captured live, scavenged dead from the shore or water, or stolen from other birds. Birds of various types, particularly waterfowl and seabirds are the second most important source of food. Mammals make up the next most important type of food from live capture of rabbits and other small mammals to the carcasses of whales, sea lions and large ungulates. Eagles also feed at landfills on human garbage (Blood and Anweiler 1994).

Compatibility with Human Landscapes

Considerable progress has been made throughout North America to return Bald Eagles to historical numbers after the devastating effects of contamination during the DDT-era and persecution under predator control programs. Bald Eagle numbers in British Columbia and Alaska were not as seriously affected by the adverse effects of DDT as in other locations in North America, and populations in British Columbia are healthy and increasing. Poisoning, trapping, shooting, electrocution, and collisions with stationary objects or vehicles contribute to mortality in urban/rural landscapes. A recent ban on the use of lead shot for hunting waterfowl was instigated, in part, due to the documented mortality of eagles that ingested waterfowl with lead pellets in their bodies. The removal of nestlings and eggs at the nest by corvids (e.g., crows, ravens, jays), hawks and owls, and mammalian carnivores has been documented and may also impact populations. The loss of shoreline nesting, perching, roosting and associated aquatic foraging habitat to human development represent the most significant components of habitat loss to Bald Eagles throughout their range. Tolerance of human disturbance varies throughout the range of the Bald Eagle and is likely increasing in British Columbia as a result of decreasing human persecution of the species. Bald Eagles are increasingly found nesting in urban parks or woodlots and close to housing as populations increase and citizens provide better stewardship of nest sites.

A substantial threat to Bald Eagle nesting habitat in the urban/rural areas is the possible future removal of large trees used for nesting primarily due to safety considerations and for land-clearing and logging. Many veteran Douglas-fir trees are infected with fungal root diseases (Allen et al. 1996) and may be rated as dangerous by current safety standards for some work activities around them (Wildlife Tree Committee 2001). Recruitment of

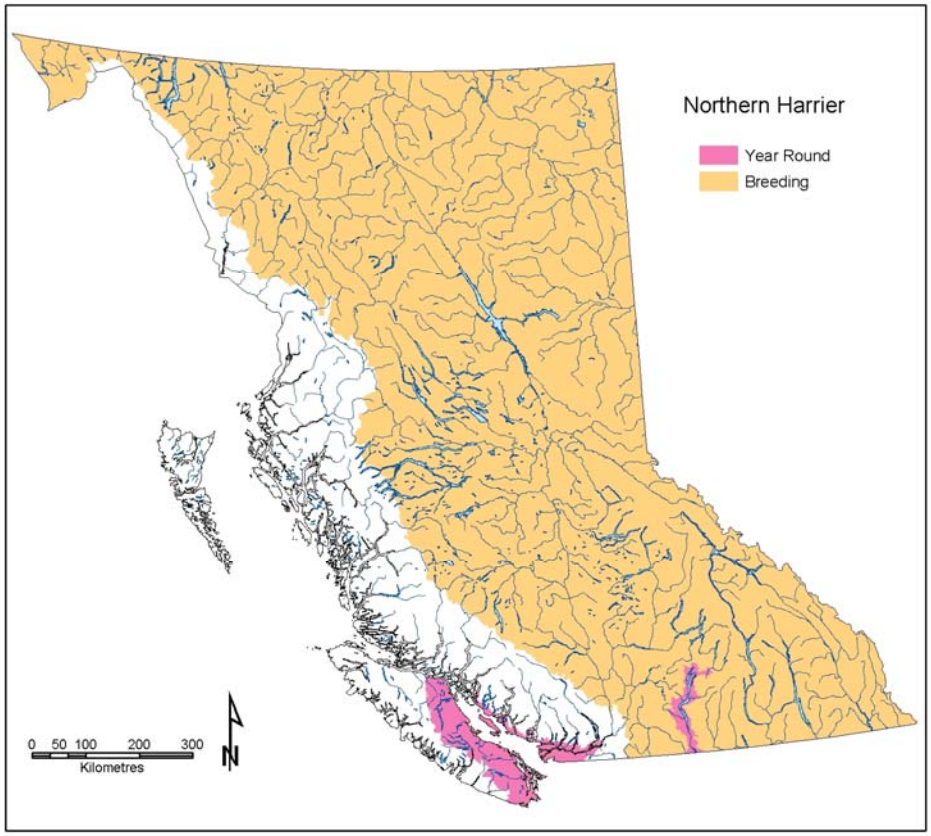
similarly large replacement trees will take decades, so the quality of nest site availability will decrease in urban/rural areas over the short term.

Bald Eagles often select mature and old-growth coniferous forests for roosts, usually along rivers or lakes, because of the energetically advantageous microclimate afforded by conifer roosts. Winter food shortages could naturally limit eagle numbers, and associated food stress could also lower the birds' reproductive performance after they leave the wintering grounds.

Several factors benefit Bald Eagles:

- Maintenance of large, veteran trees—particularly those within 200 m of a marine or lake shoreline—to serve as nest sites and perching sites
- Fisheries conservation measures that maintain stocks of salmon, eulachon, and herring
- Wetland enhancement that increases the number of waterfowl and other prey

10.4 Northern Harrier *(Circus cyaneus)*



COSEWIC: Not at Risk **B.C. status: Yellow-listed**

Identification (Length 41-58 cm; Wingspan 97-122 cm)

- Medium-sized, slim-bodied hawk with long narrow wings and long tail.
- Adults: Owl-like facial disk. Distinctive white-patch on rump in all plumages. Male has grey head, back, upper wings. Underside of body white lightly spotted on breast. Underwings white except tip of wings and trailing edge black. Long tail is banded. Eyes are yellow.
- Females: Very different from adult males. Brown on head, back and upperwings, underparts are buffy, with heavy brown streaks. Underwings mostly brown.
- Immatures: Similar to adult females but underside of body rufous, streaked only on breast; Rufous fades whitish-buff by spring.
- In flight holds wings uptilted in shallow V. Generally flies low, flight is buoyant and weak for a raptor, often tilting from side-to-side. Soars mainly during migration.

Vocalizations: A sample of vocalizations can be heard at: Link.

- Combination of white rump and facial disk unique. With practice, long wings and tail, up tilted wings and manner of flight can be used to identify this raptor even at long distances.

Distribution

Northern Harriers occur widely in northern Europe, Asia, and North America. In North America, they breed from the treeline south to the central United States and winter in the northern part of South America. In British Columbia, they breed widely but sparsely throughout interior and northern regions. They can occur anywhere in the province during migration and winter mainly in the Fraser Lowlands. Small numbers winter throughout the southern interior, particularly in the Okanagan.

Population Status

The Northern Harrier is not a species at risk. The North American population is estimated at more than 110,000 birds and the Canadian population at 20,000-50,000 pairs (MacWhirter and Bildstein 1996).

Movements

Spring migrant Northern Harriers start to move through southern British Columbia in late March and by mid-April migrants have reached the Peace River area (Cannings et al. 1987; Phinney 1998). By October, most have left interior regions.

Habitat

In British Columbia, Northern Harriers use a wide range of habitats at all times of the year. In general, Northern Harrier habitat is characterized by open areas. Breeding habitat in British Columbia is fairly low elevation uncultivated open areas. Nests occur in a variety of wetlands and occasionally in dry sites.

During migration Northern Harriers can occur in nearly any habitat from alpine meadow, to sagebrush, to coastal mudflat. They often hunt over

agricultural fields during migration and the winter. On Vancouver Island, where they are very scarce during migration and the winter, they are usually seen in areas of mixed farmlands and pastures, at estuaries, and at freshwater wetlands. The Fraser Lowlands is the major wintering grounds for raptors in British Columbia. Northern Harriers are the second-most numerous raptor (behind Red-tailed Hawk) in the Fraser Lowlands, where they use agricultural fields, freshwater wetlands and coastal marshes (Campbell et al. 1990). They prefer foraging in wet marshy fields and fields with abundant vegetation over sparsely vegetated places such as over-grazed rangeland (MacWhirter and Bildstein 1996).

Breeding

Northern Harriers build nest platforms of marsh vegetation such as sedges, grasses and bulrushes on or very near the ground—usually in wetlands. The usual clutch of 5 or 6 eggs is laid in a nest cup on top of the nest platform. Eggs are incubated for about 30-32 days. About 2 weeks after hatching the young can leave the nest and move about in the nearby vegetation, at about 5-6 weeks they can fly fairly well. The adults feed the chicks for a few weeks longer until they leave the nesting area during the summer (MacWhirter and Bildstein 1996).

Food Habits

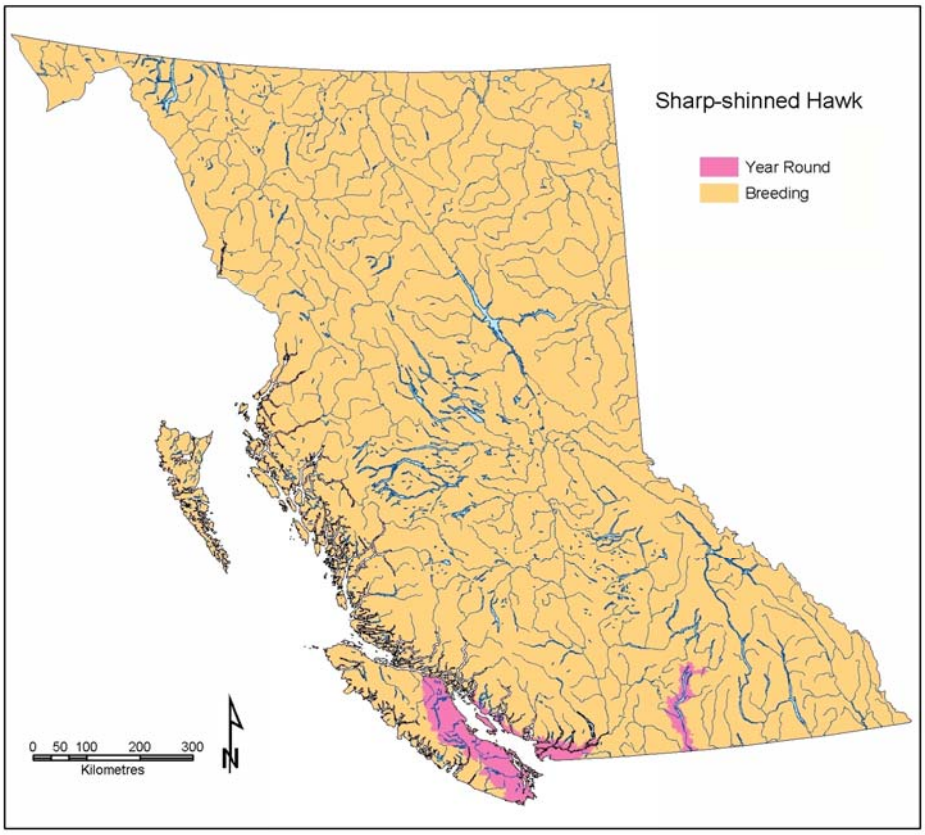
Northern Harriers hunt exclusively on the wing. Generally, they fly about 3-5 m above the ground while looking for prey and can hover momentarily when a prey item is spotted (hence the name harrier). They steal prey from other Northern Harriers on occasion.

Small mammals make up most of the Northern Harrier's diet. Rodents of many species are taken; *Microtus* voles are the most important type in most regions. Birds, reptiles, frogs and a few insects are also taken.

Compatibility with Human Landscapes

In-filling of wetlands, over-grazing of pastures, diminished hedgerows, intensively cultivated fields, and pest control have reduced prey availability and hunting habitats for Northern Harriers. Development of agricultural areas and shoreline habitats for housing developments decreases the availability of prey. Northern Harriers may also be at risk of pesticide contamination.

10.5 Sharp-shinned Hawk *(Accipiter striatus)*



COSEWIC: Not at Risk B.C. status: Yellow-listed

Identification (Length 24-36 cm; Wingspan 51-71 cm)

- Small, short-winged hawk with long narrow tail.
- Adults: Much like Cooper's Hawk but smaller and colour of crown is the same as the back. Blue-grey upperparts, rufous and white barred underparts. Square-tipped tail has four dark bands and a narrow white tip. Eyes are orange to red.
- Immatures: Brown backs and upperwings, creamy underparts heavily streaked with brown on belly and breast. Eyes are yellow.
- Females are larger than males.
- Usually flies with a series of flaps interspersed with short glides. Soars at times.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Has square-tipped tail often appearing notched, unlike round tipped tail of Cooper's Hawk. In flight, head even with or slightly behind leading edge of wing; Cooper's Hawk has a relatively larger head which projects forward of the wings. Tail relatively shorter than in Cooper's Hawk. Colour of crown not darker than back, not appearing capped.

Distribution
The Sharp-shinned Hawk breeds south of tundra regions from central Alaska, east to Newfoundland, and south to the northern and western United States. During winter it is found along the Pacific coast from south coastal Alaska, coastal and southern British Columbia, southern Ontario and Quebec, south to Costa Rica (Bildstein and Meyer 2000).

Population Status
The Sharp-shinned Hawk is not a species at risk. It has a wide breeding range and at present is common in most of that range. This is another raptor species whose numbers declined during the mid-1900s then rebounded after bans on some toxic pesticides were imposed in the United States and Canada (Bildstein and Meyer 2000).

Movements
Many Sharp-shinned Hawks in eastern North America make long migrations along traditional routes. Thousands are counted at hawk watches each fall as they move south. The spring movement is not as concentrated. Such large numbers of Sharp-shinned Hawks are not seen in British Columbia at a single site, perhaps because virtually the whole province is a series of north-south mountain ranges and ridges (prime migration routes). Nevertheless, large numbers migrate through the province. Sharp-shinned Hawks start to migrate north through the southern interior of British Columbia in early April and through the northern regions during May. Southbound migrants are widely seen during September and October.

Habitat
Sharp-shinned Hawks breed in forests of many types from sea level to high elevations. Migrating Sharp-shinned Hawks can be seen almost anywhere in the province from downtown Vancouver to high alpine ridges. They migrate during the day and tend to follow linear features like ridges, rivers, lake, river and coastal shorelines, frequently soaring on the updrafts that many of these landforms create. Flap-and-glide flight is also used during migration.
During the winter Sharp-shinned Hawks utilize nearly every low elevation habitat on Vancouver Island, and in the Fraser Lowlands and the Okanagan Valley. Prime winter habitat includes agricultural fields, hedgerows, mixed woodland and open fields, and residential areas; anywhere likely to have a large population of small birds, their primary prey.

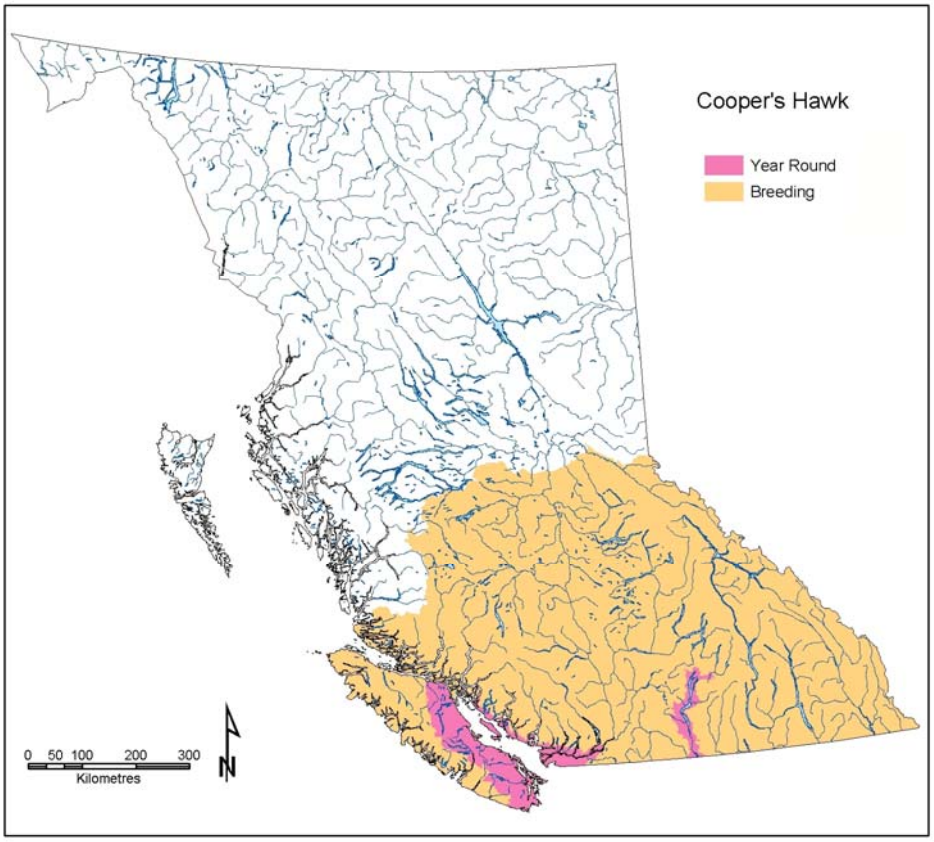
Breeding
Sharp-shinned Hawks are very secretive during nesting until the young leave the nest. Very few nests have been found in British Columbia. An active nest in Campbell Valley Park in the Fraser Valley was in a medium-size conifer less than 100 m from a parking lot and close to several walking trails (M. Bentley, pers. obs.). They build fairly large nests of sticks close to the trunk of a medium-sized conifer. The clutch of 4 or 5 eggs is incubated for about 30-32 days. The parents feed the young hawks in the nest for 3-4 weeks and out of the nest near the nesting territory for another 3-4 weeks (Bildstein and Meyer 2000).

Food Habits
Sharp-shinned Hawks often hunt by flying stealthily toward potential prey and making a quick surprise attack. They will use vegetation, rises in landscape, or other obstacles to shield themselves from the prey's view. They also hunt by sitting quietly in a concealed spot until prey is sighted then making a quick attack.

Small birds up to the size of American Robin (*Turdus migratorius*) are the principal food of the Sharp-shinned Hawk. Small mammals are a much less important part of the diet.

Compatibility with Human Landscapes
Sharp-shinned Hawks do not usually nest in urban or rural areas in British Columbia. However, during migration and winter they frequently use urban and rural areas in southern British Columbia—particularly near woodlands and shrubby habitats that support populations of small birds.

10.6 Cooper's Hawk (*Accipiter cooperii*)



COSEWIC: Not at Risk **B.C. status: Yellow-listed**

Identification (Length 36-51 cm; Wingspan 74-94 cm)

- Small- to medium-sized hawk with relatively long tail and short rounded wings.
- Adults: Dark blue-grey upperparts and rufous and white barred underparts. Crown darker than nape and back, the rest of head is greyish. Throat white with narrow dark streaks. Grey tail is crossed by 4 broad straight dark bars has a narrow white tip. Iris is orange to red.
- Immatures: Upperparts brown with white mottling and rufous edges. Underparts have dark streaks on creamy breast and belly. Iris is pale yellow.
- In level flight alternates several quick flaps with a short glide. Soars often.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Can be difficult to distinguish from the Sharp-shinned Hawk. Structure and tail shape are the best identification features - Cooper's Hawk has comparatively longer tail with a rounded tip. Compared to the Sharp-shinned Hawk, adult Cooper's Hawks have a darker cap that contrasts more with the nape and back. In flight, the head projects forward of the leading edge of the wing, whereas the Sharp-shinned Hawk's head is even with, or behind the wrists. Can also be confused with the Northern Goshawk which is larger, has different proportions, and 5-6 irregular bars across the tail or the (rare in British Columbia) Broad-winged Hawk which has a much shorter tail.

Distribution

Cooper's Hawks breed throughout the southern half of North America, withdrawing from the coldest interior areas during winter. They breed throughout British Columbia south of Prince George, and winter on the south coast and in the Okanagan area.

Population Status

The Cooper's Hawk is not a species at risk. In western North America the population is thought to be stable (Rosenfield and Bielefeldt 1993).

Movements

Migrating Cooper's Hawks use a broad range of habitats ranging from alpine to sea level in southern British Columbia. They migrate singly during the day. The peak of spring migration is in late April. Autumn migration is more extended; from late August to November (Campbell et al. 1990). In the Victoria area, many Cooper's hawks are year round residents, though some may be migratory, likely using the Pacific Flyway (A. Stewart, pers. comm.).

Habitat

Though a bird of the forest over most of their range, Cooper's Hawks also breed in urban and rural habitats as long as there are suitable nesting trees. In spite of habitat fragmentation and human disturbance, Cooper's Hawks will nest in large trees in small patches of forest surrounded by residential and commercial developments. They are strongly territorial and usually nest in

the same territory year after year (Rosenfield and Bielefeldt 1993). Andy Stewart of the B.C. Ministry of Environment has conducted a long-term study of Cooper's Hawks using urban habitats in the Victoria area over the past decade.

Breeding

Cooper's Hawks build their nest of sticks or they may use a stick-nest built by another bird species in a previous year. The nests are often lined with bark chips. Usually 3 to 5 eggs are laid with 2 to 3 days between each egg. Eggs are incubated for 30-36 days. Eggs hatch in the same order in which they were laid and at about the same interval, resulting in uneven aged chicks. The female does most of the incubation while the male supplies most of the food. The young leave the nest when about five weeks old and the family group remains together in the vicinity of the nest for another week or so (Rosenfield and Bielefeldt 1993).

Food Habits

Several strategies are used by Cooper's Hawks when hunting. Probably the most-used technique is perching in a concealed spot in a tree and watching for potential prey. When prey is spotted the hawk makes a short fast ambush attack on the prey. They may also fly low and fast, using objects like bushes, dykes, or ridges to conceal their approach then surprising prey with a sudden, quick attack. The diet varies geographically and seasonally and is mostly composed of birds and small mammals. In urban areas around Victoria, "nuisance" species such as Rock Pigeons, European Starlings, House Sparrows and Grey Squirrels constitute a significant portion of their diet, making them a very useful urban predator (A. Stewart, pers. comm.).

Compatibility with Human Landscapes

The Cooper's Hawk is one of the most common raptors in the urban/rural areas of southern British Columbia—particularly Greater Victoria. Because they readily nest in developed areas, a popular misconception is that they are very tolerant of human disturbance and habitat alteration (Rosenfeld et al. 1986). This is probably not the case except on a very limited basis. What has likely happened is that Cooper's Hawks have moved into the urban environment in response to the presence of a good food supply and adequate nest sites. Most nests have been found in mature neighbourhoods with large trees, or in parks and undeveloped areas adjacent to residential land. It is has been suspected that disturbance to nest sites and major habitat alteration from new developments would adversely affect local populations, but Rosenfeld et al. (1986) found Cooper's Hawks thriving in highly urbanized areas in Wisconsin.

10.7 Northern Goshawk (*Accipiter gentilis*)

A. g. atricapilus
COSEWIC: Not at Risk **B.C. status: Yellow-listed**
A. g. laingi
COSEWIC: Threatened **B.C. status: Red-listed**

Identification (Length 46-66 cm; Wingspan 98-117 cm)

- Large, long-tailed hawk with relatively short wings.
- Two subspecies in British Columbia differing most in colour tone and extent of dark areas, size and distribution.
- Adults: Dark crown is separated from dark back and greyish face by a conspicuous white eyeline. Eyes are red. Upperparts are dark blue-grey. Underparts are white with fine grey barring. Tail is broad, somewhat wedge-shaped and crossed by 4-5 irregular bars.
- Immatures: Upperparts are brown Underparts are whitish heavily streaked with brown. Eyes are yellow.
- Females are larger than males.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Adults when well seen are unmistakable. Immatures can be difficult to distinguish from immature Cooper's Hawks. Northern Goshawks are larger, have a subtly different shape, shorter tail, and usually a

much more distinct eyeline. In flight head extends farther forward than on Cooper's Hawk and tail is broader and more rounded at tip.

Distribution
The Northern Goshawk is widespread in north temperate regions of Europe, Asia, and North America. In North America breeds south of tundra regions, from western Alaska to Newfoundland south to the northern United States in the east and to central Mexico in the west.

Population Status
Globally, the Northern Goshawk is not at risk, but the *laingi* subspecies is red-listed in B.C. and designated as Threatened by COSEWIC. Its large range in North America still has many vast areas of relatively remote forest and mountain areas where good Northern Goshawk habitat exists. However, there are concerns that logging is reducing the amount of good habitat in parts of its range and causing population declines. Two subspecies occur in British Columbia, *A. g. atricapillus* occurs throughout the mainland with its centre of abundance in the northern interior. In British Columbia, the Queen Charlotte Goshawk (*A. g. laingi*) occurs west of the Coast Mountains along the coastal mainland plain and offshore islands including Vancouver Island and the Queen Charlotte Islands. The Queen Charlotte Goshawk is believed to be rare throughout its range. Recent genetic works suggests that the *laingi* subspecies on the Queen Charlotte Islands are mostly resident and may have been separated long enough to warrant distinct subspecific status. Therefore, protection of this population is critical given that there are believed to be no more than 20 breeding territories in existence (M. Chutter, pers. comm.).

Movements
The Northern Goshawk is largely non-migratory in British Columbia, although individual birds may move into lower elevation or more open habitats like agricultural areas during the winter. Goshawks may occasionally use urban and rural environments at this time. Large numbers of Northern Goshawks, like several other species of raptors, have been documented to migrate south during years of the 10-year snowshoe hare cycle when prey abundance is low.

Habitat
Mature and old-growth coniferous forests at a wide range of elevations (mostly below 900 m for the *laingi* subspecies) are used for breeding. A variety of deciduous and mixed forest habitats are also used. Prime habitat consists of forest stands with large trees and a high percent of canopy cover, situated on a gentle slope (McClaren 1999).

Foraging habitat is varied and includes primarily mature and old-growth forests. It is occasionally seen in city parks like Stanley Park in Vancouver where there is an abundance of suitable forest habitat and large populations of squirrels, rats, skunks, songbirds, and waterfowl—all potential prey. Very rarely, they are observed in winter using the open flat areas of Delta with its large population of potential prey.

Breeding
Northern Goshawks are very secretive during the nesting cycle. They build their fairly large nests of sticks and twigs in a variety of coniferous and deciduous trees. Two to 4 eggs are laid during April and May. The incubation period is 28-32 days. The young stay in the nest for about 5 weeks (Squires and Reynolds 1997).

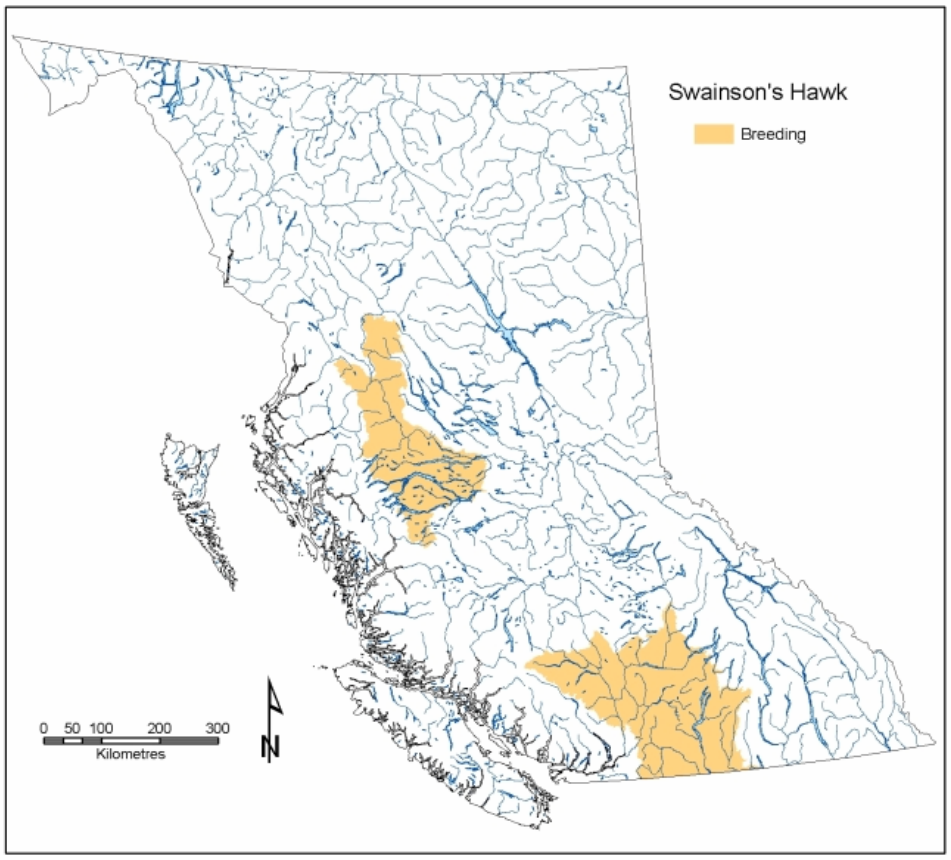
Food Habits
Northern Goshawks hunt mainly by perching for several minutes at a time, scanning the surroundings, then moving to another perch and doing the same. A variety of other strategies have been observed including chasing and harassing an animal in vegetation until it flushes into the open, rapid flights along edge habitat hoping to take something by surprise, or even chasing prey on the ground (Squires and Reynolds 1997).

The diet is mainly small mammals and birds. Their diet varies, as it does for most raptors, depending on location, season, and prey availability. Mammals make up about 90% of the biomass in the diets of Northern Goshawks in Alaska and Yukon and birds 10%. In British Columbia, the proportion of birds is higher—especially in coastal areas where Blue Grouse and/or Ruffed Grouse are common (Ethier 1999).

Compatibility with Human Landscapes

The Northern Goshawk generally prefers large tracts of mature forest, but they occasionally nest and winter on the periphery of rural and urban areas.

10.8 Swainson's Hawk (*Buteo swainsoni*)



COSEWIC: Not Listed **B.C. status: Red-listed**

Identification (Length 43-55 cm; Wingspan 120-137 cm)
The Swainson's Hawk is about the same size and shape as the Red-tailed Hawk, though its wings are narrower and more pointed at the tip. The plumage is extremely variable with light and dark morphs and a full range of intergrades. The head, neck and chest of light birds (most common) are a dark sepia brown contrasting with the rest of the ventral surface, and the flight feathers of underwings are dark contrasting with light ones on the body of the underwing. The tail is banded with black and white. Often looks all dark from above in flight with a pale rump similar to the Northern Harrier. Often flies with wings held slightly uptilted. Often seen soaring. A sample of vocalizations can be heard at: Link.
.

Distribution and Status
Swainson's Hawk occurs widely but locally in mainland British Columbia. The main breeding areas in British Columbia are in the region of the Thompson and Okanagan valleys. A few also breed in the Bulkley Valley near Hazelton. It is occasionally seen during migration (Fraser et al. 1999).

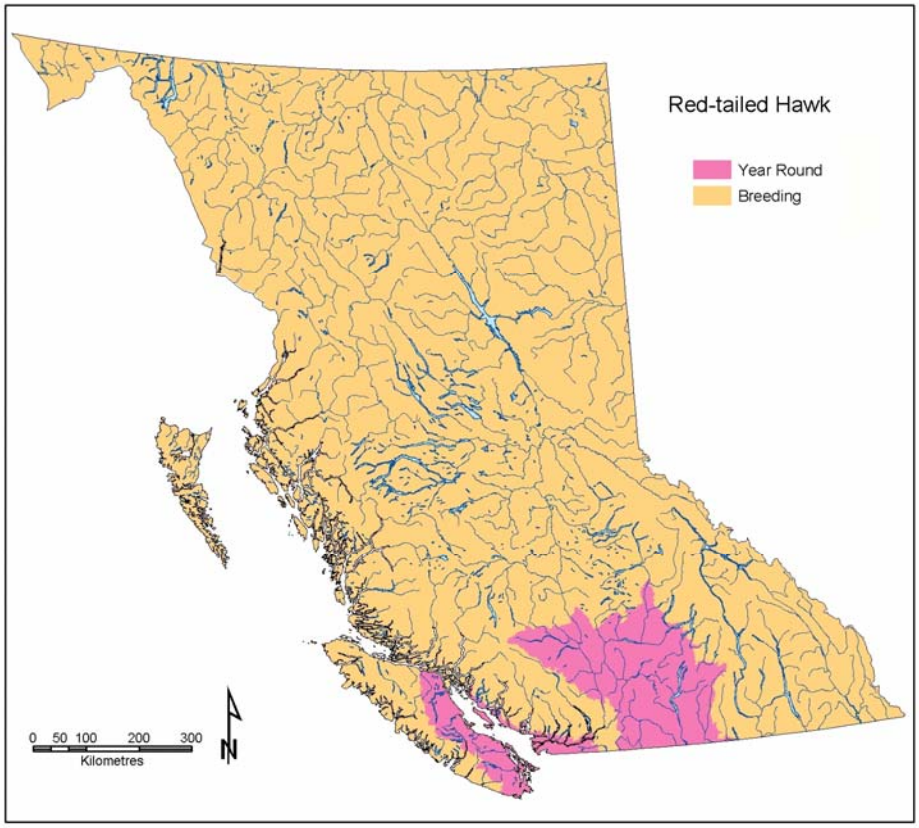
Habitat
Typical habitat of Swainson's Hawk is open grassland and woodlands. Agricultural land with available nest trees is also used. In British Columbia, most nests have been found in open agricultural, grassland and wetland habitats with nearby woodlands. They build their large stick nests in trees (England et al. 1997).

Food Habits
Hunts mainly by soaring over open areas with short vegetation while searching for potential prey. During the breeding season, this species preys mainly on small mammals, birds and reptiles.

Compatibility with Human Landscapes
The Swainson's Hawk frequently uses rural and agricultural areas of the southern interior of B.C. They sometimes nest and forage close to roads, buildings and other human developments (M. Chutter, pers. comm.).

10.9 Red-tailed Hawk

(Buteo jamaicensis)



COSEWIC: Not at Risk **B.C. status: Yellow-listed**

Identification (Length 45-56 cm; Wingspan 101-145 cm)

- Medium-sized, stocky, broad-winged hawk with short broad tail.
- Highly variable plumage; several subspecies and intergrading morphs in British Columbia.
- Adults: Light birds are generally brown above and light below with variable amounts of spotting and streaking. Red tail above and below is distinctive. Dark birds may appear nearly all black except for red tail. Harlan's Hawk (*B. j. harlani*) a very dark subspecies that occurs rarely in British Columbia is the exception; its variable tail is usually greyish with streaks with a dark tip.
- Immatures: Similar to adults but tail finely barred brownish or greyish, not red. Gradually acquires red tail during second year. Wings and tail longer than adult.
- Powerful and versatile in flight. Commonly soars. A flap and glide flight pattern when several quick flaps are followed by a short glide is very frequent.
- Vocalizations: A sample of vocalizations can be heard at: Link.

- Because of the widely variable plumage, it can be difficult to identify unless the red tail is seen. In British Columbia, Red-tailed Hawks are most likely to be confused with Rough-legged Hawks, which have longer, narrower wings and black wrist patches, compared to the Red-tailed Hawk's black patagium (the area of the forewing between the shoulder and wrist).

Distribution
Red-tailed Hawks occur throughout North America from the Arctic treeline to Panama (Preston and Beane 1993). They are common throughout most of British Columbia.

Population Status
Common nearly everywhere in its large range, the Red-tailed Hawk is not a species at risk. Numbers have increased in eastern portions of range due to the change of large tracts of forest to a mosaic of fields and woodlots. The population has also increased in plains areas of North America, in response to increased availability of nesting trees in formerly treeless areas (Preston and Beane 1993).

Movements
Most Red-tailed Hawks in northern regions leave their breeding territory and move south to more favourable climates. In warmer areas, Red-tailed Hawks are usually resident in their breeding territory (Preston and Beane 1993). In British Columbia, Red-tailed Hawks move north between February and May. The autumn migration starts in August and ends in October.

Habitat
Red-tailed Hawks use many types of habitat. They prefer habitat containing open areas with hunting perches (Preston and Beane 1993). They occur from sea level to alpine areas in British Columbia. Occurring throughout the province in nearly every habitat makes it difficult to describe habitat preferences for this species. Nevertheless, Red-tailed Hawks are seen more often in some types of habitat than others. Breeding density is greatest where there is a good supply of small mammals for food. Coastal areas including the Queen Charlotte Islands, Vancouver Island and the Coast Ranges don't have as many hawks as interior areas probably for this reason. On Vancouver Island they are seen most often seen in areas of mixed woodland and open habitat. This includes areas of clearcut close to forested land, subalpine forest near alpine meadows, estuaries with nearby woods, and agricultural areas with forest in and near them. In south-western British Columbia they frequently occur in urban areas that have parks nearby to provide nesting trees. Many Red-tailed Hawks nest and winter in the Fraser Lowlands. The mix of woodlot, hedgerow, agricultural field, and old-fields with abundant rodent prey provide prime habitat at all times of the year. In winter, those that breed in the Fraser Lowlands are joined by birds from other areas. They are often seen along the highways and other roads perched on streetlight poles, telephone poles, communication towers, fence posts and trees. In the

interior, they inhabit all areas and habitats with available prey and nesting trees.

Breeding

Red-tailed Hawks usually build their large stick nests in trees or more rarely on cliffs or other sites. Trees selected are generally taller than other nearby trees, often high on a slope with a wide view from the nest. The clutch is usually of 2 or 3 eggs, which are incubated for 28-35 days. Eggs are laid at about 2 day intervals; incubation begins after the first egg is laid, resulting in uneven aged chicks. Chicks leave the nests when about 6-7 weeks after hatching but stay in the vicinity, remaining dependent on the parents for food for another 6-8 weeks or more (Preston and Beane 1993).

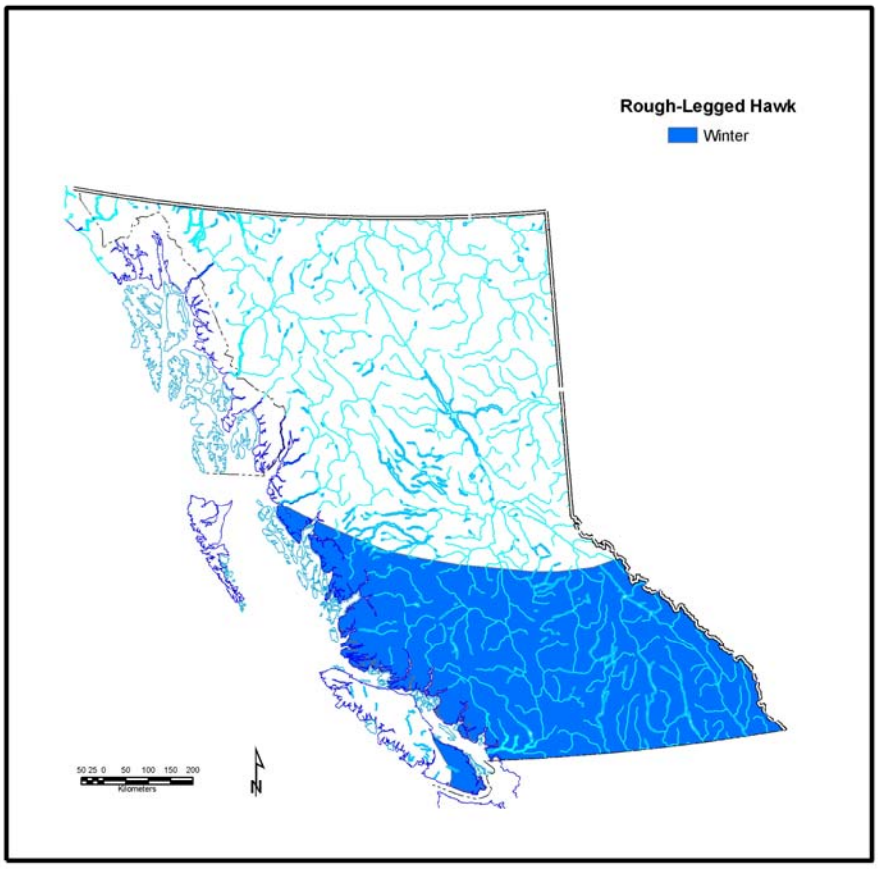
Food Habits

Red-tailed Hawks do most of their hunting from perches with good views of prey habitat. Less often-used hunting methods are soaring or flapping-and-gliding flight while searching for prey (Preston and Beane 1993).
Red-tailed Hawks capture a wide variety of prey including insects, birds, reptiles and mammals up to the size of waterfowl or large rabbits and hares. Small mammals often form the bulk of their diet, although their diet can vary greatly depending on the availability of prey. Carrion is also eaten (Preston and Beane 1993).

Compatibility with Human Landscapes

Red-tailed Hawks are compatible with several different urban environments that support populations of rodents such as voles. Red-tailed Hawks can coexist with humans in the rural environment if they have open grassy or shrubby areas to hunt in, large trees to nest in, and are not subject to disturbance at the nest. Red-tailed Hawks are beneficial to landowners as they reduce small mammal populations. Nesting Red-tailed Hawks are very wary during nest construction, and will often abandon the nest during this period if disturbed. At the local level, Red-tailed Hawk populations are limited by both nest sites and food supply. The relative importance of each factor may be variable throughout the year. For example, competition with Great Horned Owls for nest sites and food may depress Red-tailed Hawk populations. Leading causes of death of this species include collisions with automobiles and starvation. Mortality from shooting and trapping also occurs.

10.10 Rough-legged Hawk (*Buteo lagopus*)



COSEWIC: Not at Risk **B.C. status: Yellow-listed**

Identification (Length 46-59 cm; Wingspan 122-143 cm)
The Rough-legged Hawk is similar in size and shape to a Red-tailed Hawk but with different proportions and colour patterns. Like several other hawks, there are light and dark birds with various intergrades. Light birds are most common in British Columbia. Like the Swainson's Hawk, the Rough-legged Hawk has longer, narrower wings than the Red-tailed Hawk and usually flies with wings slightly uptilted. The main plumage feature in all Rough-legged Hawks is the white tail with one broad dark band at the tip. Light birds have a dark mark on the underwing near the wrist.

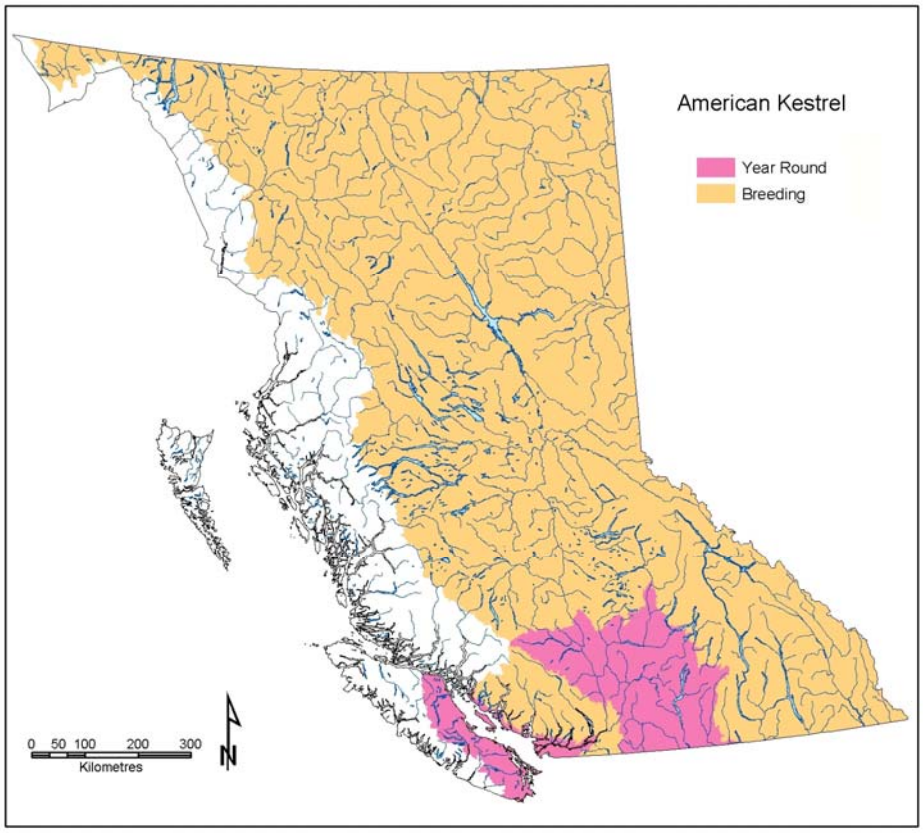
Distribution and Status
This hawk breeds around the globe in arctic tundra regions. It occurs in British Columbia only during the nonbreeding season from October to May. It winters in southern British Columbia mainly in the Fraser Lowlands, the Thompson and Okanagan Valleys and near Creston.

Habitat
During the breeding season it occurs over tundra. During the nonbreeding season in frequents grasslands, wetlands and agricultural fields.

Food Habits: Searches for prey by soaring over open areas. Its primary food at all times of the year is small mammals. During the winter, voles, mice and shrews make up much of the diet (Bechard and Swem 2002).

Compatibility with Human Landscapes
A considerable number of Rough-legged Hawks winter in the Lower Fraser Valley and occasionally in Southern Interior valleys in agricultural areas close to human developments and roads.

10.11 American Kestrel (*Falco sparverius)*



COSEWIC: Not Listed **B.C. status: Yellow-listed**

Identification (Length 22-27 cm; Wingspan 52-61 cm)

- small falcon with long pointed wings; frequently bobs tail when perched.
- Adults: Males have blue-gray and rufous on crown and a white face marked by two narrow black vertical bars. The back is rufous with dark bars on lower half. Folded wing looks blue-grey. Underparts are

pale rufous with sparse small black spots. Tail rufous with black band at tip.

- Females: Similar to males but browner upperparts with barring on entire back. Blue-grey on upperwings is replaced by brown with dark brown barring. Underparts streaked. Tail brown with narrow dark brown bands. Females are slightly larger than males.
- Immatures: Males are like adult males but heavily streaked on the breast and completely barred above. Immature females are much like adult females.
- Level flight is usually somewhat fluttery though strong and direct in higher winds. Often hovers when hunting and during courtship displays. Soars with wings flat.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Similar in size to, but flight is not as powerful as the Merlin. Merlin has no rufous feathers.

Distribution

The American Kestrel is widely distributed in North and South America. In North America they are absent as a breeder only from tundra and northwest coastal regions. Most birds winter well south of Canada: they are rare during winter in extreme southern Canada. The American Kestrel breeds throughout British Columbia, except the Queen Charlotte Islands and the Coast Mountains. Small numbers breed in the Fraser Lowlands and on Vancouver Island. They are common breeders in many parts of the interior. Migrating birds may be seen anywhere in the province. During the winter small numbers remain on southern Vancouver Island, the Fraser Lowlands, and in the some interior valleys including the Okanagan and Thompson (Campbell et al. 1990).

Population Status

The American Kestrel is not a species at risk. The total population, estimated in 1982, was about 2.5 million pairs, split about equally between North and South America (Smallwood and Bird 2002). The population of this species fluctuates rapidly in response to habitat changes. The population increases when forest is converted to more patchy or open habitats. Subsequent conversion of these agricultural and rural areas to residential and industrial developments causes a decrease in the local kestrel population.

Movements

Early spring migrants move into British Columbia during early March, the peak passage is in April. The vast majority have left the province by mid-October.

Habitat

American Kestrels use a variety of open habitats at all times of the year. In general, prime foraging habitat is open areas with low open vegetation and suitable hunting perches. When they are in more heavily forested areas, foraging is done in openings (Smallwood and Bird 2002). In some areas of

North America, good foraging habitat exists but there is a lack of nesting cavities. Provision of nest boxes has allowed kestrels to use these areas.

During the breeding season, preferred habitat in British Columbia includes many types of open and partially open areas. Breeding birds are often seen perched on power-lines and fence posts along roads.

In migration, American Kestrels often fly over unsuitable foraging habitat stopping to hunt when good habitat is encountered. At this time they may be seen nearly anywhere in the province including urban areas.

During the winter in British Columbia, American Kestrels are often associated with human developments including airports, residential areas, orchards and agricultural fields (Cannings et al. 1987).

Breeding

Cavities formed by woodpeckers or some other means in living or dead trees are the most important nesting sites for American Kestrels. A variety of other sites have been reported in British Columbia including holes in cliffs, old nests of other birds, holes in the walls of abandoned buildings, and nest boxes (Cannings et al. 1987; Smallwood and Bird 2002). In Vernon, a pair nested successfully in a hole in a tree on a busy downtown street (Cannings et al. 1987). The usual clutch is 4 or 5 eggs, laid at 2-day intervals. Eggs may be laid during early April in the south; into late June in the north. The incubation period is about 30 days. The young leave the nest when they are about 1 month old and depend on the parents for food for about another 2 weeks (Smallwood and Bird 2002; Campbell et al. 1990).

Food Habits

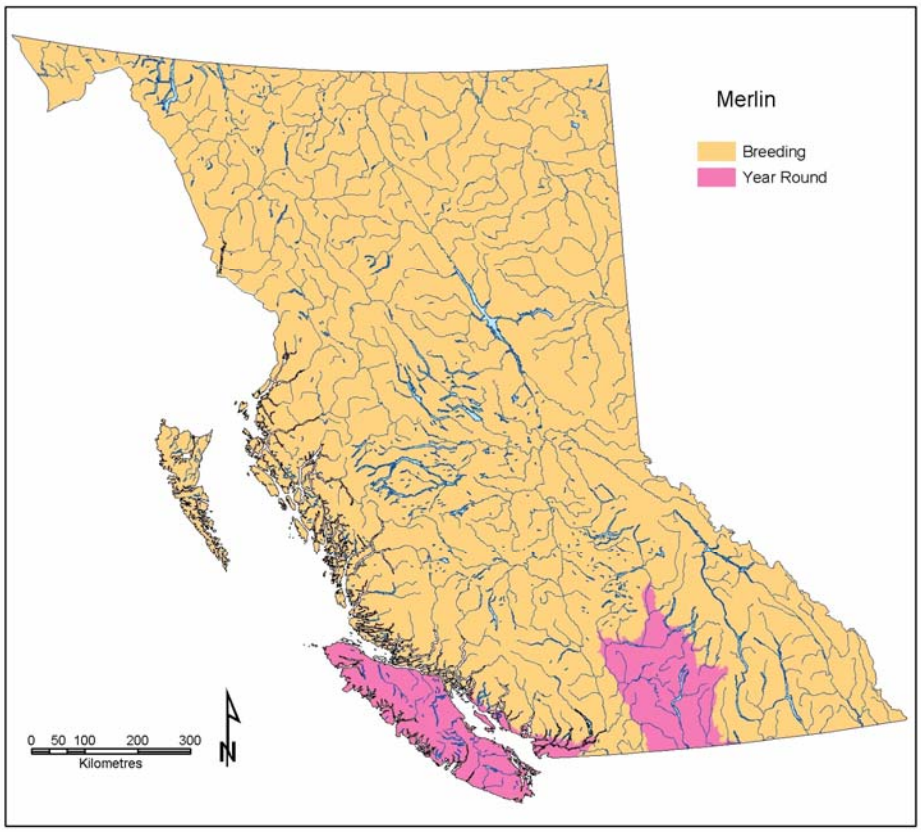
Much of the time American Kestrels search for prey by perching on elevated sites such as telephone poles and wires, trees, buildings, and communication towers. Where there is no suitable perch, kestrels will hover. Kestrels hover about 10-20 m above the ground, by facing into the wind and, with alternating bouts of flapping and gliding, stay stationary over the ground while scanning for prey. Large insects and small rodents are the main prey, but amphibians, reptiles, and birds are also taken.

Compatibility with Human Landscapes

American Kestrels eat many small prey animals that occur in urban and rural areas. Large insects such as dragonflies and grasshoppers, and small rodents such as voles and mice, make up much of their diet. Like most raptors, kestrels will take advantage of any food source. Other prey species in their diet include but are not limited to many types of small birds, reptiles, and amphibians. Human-related mortality is the most commonly reported cause of death for this species. Collisions with wires, vehicles and windows, electrocution, drowning in tanks and pools, and attacks by domestic pets are commonly reported. Removal of young and eggs by snakes, crows and mammals occur; other raptors are known to kill adults. While known to have

been affected by pesticide contamination, American Kestrels may be affected more by reduced numbers of insect prey following pesticide applications.

10.12 Merlin (*Falco columbarius*)



COSEWIC: Not At Risk B.C. status: Yellow-listed

Identification (Length 24-31cm; Wingspan 53-68cm)

- Small, typical falcon-shape (cylindrical body, thick-chested and tapered behind, tapered pointed wings).
- Three subspecies in British Columbia, differing physically mainly in colour tone and extent of darker areas of plumage. Intermediate forms also occur. Breeding range and migratory patterns also different.
- Adults: In males the side of head is pale grey to blackish; pale birds have a light line over the eye. Throat whitish. Crown, back and upper wings and tail range from blue-gray to nearly black. Underside of wings checkered with dark and light. Underparts on pale birds are moderately streaked rufous or brown; dark birds more heavily streaked grey-black. Dark tail usually shows 3 narrow greyish bands and a grey tip.
- In females the black and blue-grey tones of the male are brown.
- Juveniles: Similar to adult female.

- Powerful flight is fast and steady with continuous wingbeats. Also soars while holding wings flat. Does not hover.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Merlins are about the same size as American Kestrel but are more heavily built with much more powerful flight. Merlins have no rusty tones on upperparts or tail. Peregrine Falcon and Prairie Falcon are much larger with longer wings. Sharp-shinned Hawk is similar in size but very different in shape with a long tail, broad rounded wings.

Distribution
Merlins breed around the world in north temperate regions. In North America they breed throughout Canada and Alaska, south of the treeline and in some northwest states. North American Merlins winter in coastal areas of British Columbia and Alaska, as well as many western states and throughout Mexico and Central America to northern South America (Sodhi et al. 1993).

Population Status
Globally, the Merlin is not a species at risk. Its populations have been expanding in parts of North America as Merlins have started using urban centres (Sodhi et al. 1993). However, there is some concern about the "Black" Merlin subspecies occurring along the coast of B.C. and Washington State (F. c. suckleyi, see Link).

Movements
Merlins that breed in coastal British Columbia are a subspecies known as Black Merlins (*F. c. suckleyi*). Most Black Merlins are non-migratory although some move south as far as southern California for winter. The Taiga Merlin (*F. c. columbarius*) is a lighter colour race that breeds in north-eastern British Columbia and winters from the western United States to South America. Palest of the three North American races, the Prairie Merlin (*F. c. richardsonii*) is not known to breed in British Columbia. Prairie Merlins rarely occur in British Columbia and mostly during migration. Some Prairie Merlins spend the winter in northern parts of their range; others move south as far as Central America (Campbell et al. 1990; Sodhi et al. 1993). Spring migration is during April and May; fall migration is between August and November.

Habitat
Merlins breed in coniferous or deciduous forest habitats with nearby open areas. Nest sites are often near water. Merlins are frequently seen in urban and rural areas. In British Columbia, they hunt in clearcuts, agricultural fields, grasslands, subalpine meadows, and wetlands (Campbell et al. 1990). Wintering birds along the coast are frequently seen at estuaries, shorelines, wetlands, agricultural fields and urban and rural areas.

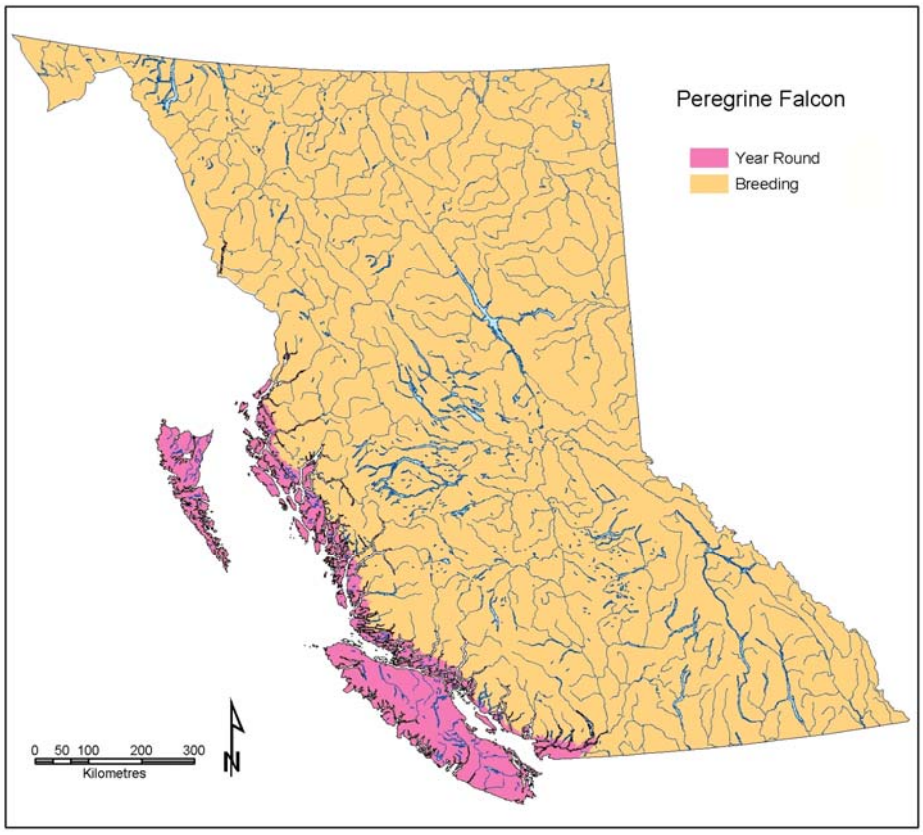
Breeding
Merlins do not build their own nest—they use old nests in trees of other birds such as crows or magpies. Rarely, other sites are used including cliff ledges. They usually lay 3 to 5 eggs between April and July. Eggs are laid at 2

day intervals and are incubated for about 30 days. The young stay in the nest for about 30 days after hatching. Parents and young stay together in the vicinity of the nest for up to another month before the young disperse (Sodhi et al. 1993).

Food Habits
Merlins do much of their hunting by perching in a tree or other vertical structure with a wide view of open ground. When prey is spotted the Merlin flies rapidly to it usually grabbing it in the air. Their diet is mainly of small birds. Insects (e.g., dragonflies), reptiles and small mammals can also be important, depending on local availability (Sodhi et al. 1993).

Compatibility with Human Landscapes
In other parts of its range, including the British Columbia interior, Merlins have become well adapted to urban environments (Warkentin and James 1988). The availability of nesting sites and the abundance of songbird prey probably draws this species into urban areas. Merlins are able to adapt well to breeding in wooded areas of urban/rural environments.

10.13 Peregrine Falcon (*Falco peregrinus*)



F. p. anatum
COSEWIC: Threatened **B.C. status: Red-listed**
F. p. pealei

COSEWIC: Special Concern **B.C. status: Blue-listed**
F.p. tundrius
COSEWIC: Special Concern **B.C. status: Blue-listed**

Identification (Length 37-46 cm; Wingspan 94-116 cm)

- Medium to large-sized, long-winged falcon
- Three subspecies in British Columbia, differing mainly in colour tone and extent of dark feathers.
- Adults: Head mostly dark with pale throat and cheeks creating a distinctive wide dark moustache mark on side of face. Upperparts dark blue-gray to blackish. Underside of body light, lightly to heavily spotted and barred. Tail dark with narrow greyish bands.
- Immatures: Like adult except brownish above and streaked below
- Females are larger than males.
- Powerful level flight. Frequently soars with wings flat. Often stoops from great height.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Very similar in size and shape to Prairie Falcon. Peregrine is darker overall with grey, black, and blue-gray tones, Prairie is much paler with buff-brown tones. Distinctive in Prairie Falcon is the dark areas at the base of the underside of the wings. Underside of wings in Peregrine is uniformly coloured. Dark morph Gyrfalcons can be difficult to separate from immature Peregrine Falcons. Gyrfalcons have relatively broader, wings, a heavier build and less extensive moustache. Merlin similar in build and flight but much smaller and lacks wide moustache mark.

Distribution

The Peregrine Falcon is distributed nearly worldwide. In North America, it nests from the low Arctic to Central America. Distribution is very patchy especially in eastern North America (White et al. 2002). Populations of breeding birds are known from several parts of British Columbia, notably the entire coast, the Fraser Canyon, and the Southern Interior of British Columbia (Campbell et al. 1990).

Population Status

The *anatum* subspecies of the Peregrine Falcon is listed as Threatened nationally and red-listed in B.C.; the *pealii* and *tundrius* subspecies are listed as "special concern". Several of the world's 19 subspecies, including two of North America's three subspecies (*F.p. anatum* and *F.p. tundrius*), have had recent population declines. Major declines in North America during the mid-1900s were traced to high levels of pesticides in the food chain, resulting in greatly diminished breeding success. The ban of many of the worst chemicals, coupled with intense conservation measures has resulted in a recovering population over much of its range. An estimated 12,000-15,000 pairs of Peregrine Falcons breed in North America (White et al. 2002). Nonetheless, all three subspecies in British Columbia are considered to be provincially and nationally at risk. *F.p. anatum* is the most at risk with fewer

than 25 active nest sites known in the province, mostly around the extreme southwest coast. *F.p. pealii* has been stable for several decades in B.C. with around 100 known breeding pairs occurring mostly on the Queen Charlotte Islands, north and western Vancouver Island and other offshore islands. *F.p. tundrius* does not breed in B.C. and is only recorded here as an occasional migrant.

Movements

Three subspecies of Peregrine Falcon occur in British Columbia. Physically they vary in colour tone and extent of dark areas. They also have different migration strategies and breed in different geographic areas. The Peale's Peregrine Falcon, (*F. p. pealei*) the darkest race, lives in coastal areas and is mostly sedentary with short- and medium-distance migrations southward along the Pacific coast. The next palest subspecies, the American Peregrine Falcon (*F. p. anatum*), ranges throughout the interior of the continent south of the tundra. It is a medium- to long-distance migrant with some individuals moving to South America. The palest of North America's races is the Tundra Peregrine, (*F. p. tundrius*) also a long-distance migrant, with some birds moving as far as southernmost South America (White et al. 2002). There is much variation in the distance travelled by individual birds of the various populations.

Habitat

In general, prime habitat at all times of the year for Peregrine Falcon includes open areas with an abundance of prey usually close to the sea coast or interior lakes and rivers. Preferred breeding habitat nearly always contains a prominent cliff that serves as a nesting location and perch sites with a wide view of the surrounding area.

Foraging occurs in open areas, including all coastal shoreline habitats, especially estuaries, tidal marshes, mudflats, and open nearshore waters. An abundance of suitable prey and landscape features that enable successful prey capture are the most important factors for good hunting habitat. During the winter, Peregrine Falcons take up residence in a suitable area but may range widely in search of food. An abundance of shorebirds, waterfowl, or Rock Doves (*Columba livia*) is enough for habitat to be suitable for wintering Peregrine Falcons. Night roost sites during winter are important and Peregrine Falcons will fly up to 24 km between foraging areas and a night roost. A variety of roost sites have been reported in Washington, including coniferous trees, cliffs and bluffs and human-made structures like buildings, towers and bridges (Hayes and Buchanan 2002).

Breeding

Most Peregrine Falcons that breed in British Columbia nest on cliffs or other steep locations such as rocky bluffs, and steep banks. Larger cliffs are probably favoured over smaller ones because of the better view of the landscape and of potential hunting opportunities (Hayes and Buchanan 2002). Nesting cliffs may have a vertical height of less than 7 m to more than 100 m. Some pairs use nests constructed by other species (usually on cliffs).

Peregrines nest in some human-made sites such as high-rise buildings and bridges in urban landscapes and highway cut banks and quarries in rural areas. These sites are in an area of much human disturbance (Ritchie et al. 1998). A few Peregrine Falcons nest in trees in British Columbia. Six nests were located in trees on offshore islands near seabird colonies: 4 of the 6 were in old Bald Eagle nests (Campbell et al. 1978; Campbell et al. 1990). Many coastal nest sites are close to seabird colonies. Peregrine Falcons, like all other falcons, do not build nests. A shallow depression on a cliff ledge or the old nest bowl in another species old nest is sufficient to hold the eggs and developing chicks. The nest site may be enhanced by a shallow scraped out spot made by the adults prior to egg-laying. Usually 3 or 4 eggs are laid with 2-3 days between eggs. The eggs are incubated for about 33 to 37 days. The young leave the nest about 6 weeks after hatching though the family stays together; adults feed the young for several more weeks, until the young are independent.

Food Habits

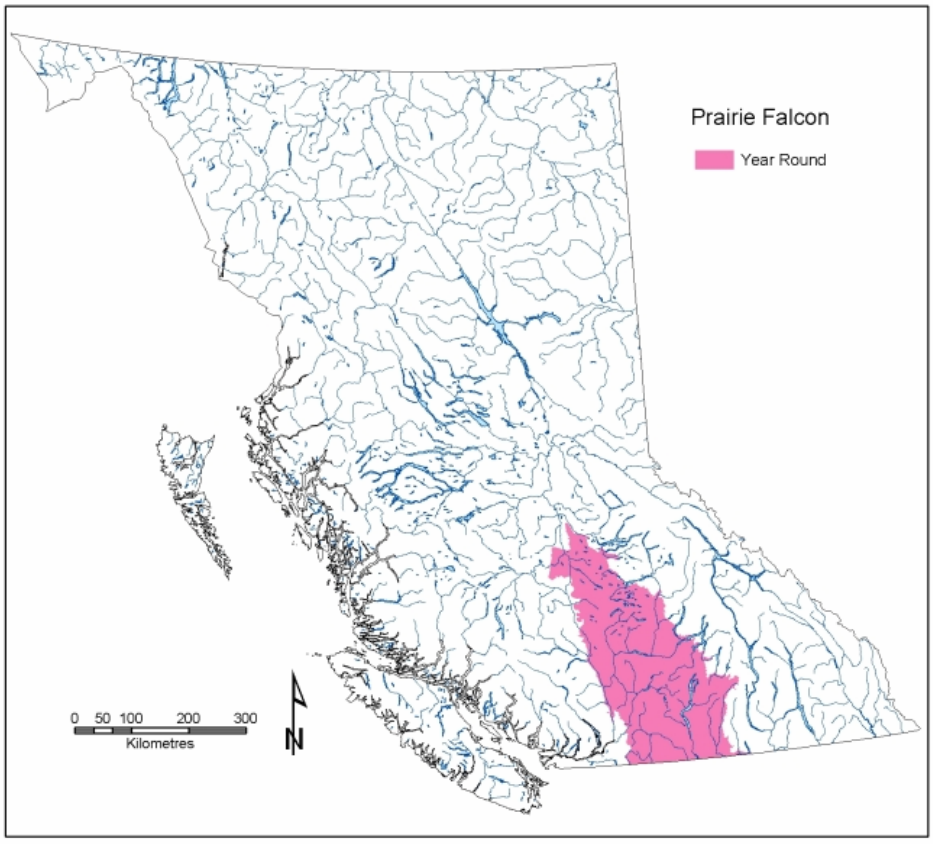
Peregrine Falcons locate potential prey from the air or an elevated perch. They capture their prey (birds) in the air. One of the fastest flying birds on the planet, the Peregrine Falcon is capable of chasing most other birds and grabbing them in the air. Peregrine Falcons also stoop from great heights by folding their wings at their sides and plummeting straight down, reaching extremely high speeds. In spite of the speed that Peregrines are able to reach, many other smaller species are more manoeuvrable and Peregrines often fail in their capture attempts. Often Peregrines attempt to surprise their prey by flying low over the ground or water keeping some higher landscape feature between them and their prey until, at the last possible moment, they move over or around the feature and attack the prey. They also steal prey from other raptors including fish from Ospreys and mice from Red-tailed Hawks (White et al. 2002).

Peregrine Falcons feed almost exclusively on birds. Many species of birds have been recorded in the Peregrine Falcons diet from small shorebirds and songbirds, to waterfowl up the size of geese. Occasionally small mammals are taken and rarely, fish, amphibians and insects (White et al. 2002).

Compatibility with Human Landscapes

Threats to Peregrines in interior British Columbia have been attributed to the loss of wetland foraging habitats to urban and agricultural development as well as continued exposure to organochloride pesticides and other toxic chemicals (Wilson et al. 1996). This is an ongoing and significant threat. Although cliff-nesting habitat is secure in British Columbia, development of hillsides below nesting cliffs or recreational use of cliffs may be a problem for Peregrine Falcons that are sensitive to repeated human disturbance at nest sites. Outside of British Columbia, Peregrine Falcons have adapted to urban areas where high-rise buildings provide nesting and perching habitat and there is an abundance of prey such as Rock Pigeons (Cade et al. 1996).

10.14 Prairie Falcon (*Falco mexicanus*)



COSEWIC: Not at Risk **B.C. status: Red-listed**

Identification (Length 37-47 cm; Wingspan 93-113 cm)
The Prairie Falcon is a medium-large falcon similar in size and shape to the Peregrine Falcon. Upperparts are pale brown. The underparts are whitish with dark spots. A distinctive feature, visible in flight from below is the dark patch on the inner wing (in the "armpit"). The overall colour is much paler than in Peregrine Falcon. A sample of vocalizations can be heard at: Link.

Distribution and Status
The species is scarce during the breeding season in the southern interior of the province, north to about Williams Lake. It is relatively more numerous, though still rare, in the Okanagan, Nicola, and Thompson valleys. A few pairs probably nest at suitable locations throughout the southern interior (Fraser et al. 1999). It is rare in its winter range. Occasionally, an individual is observed wintering in the Lower Mainland. The origin of the wintering birds on the coast is uncertain and some may be escaped falconry birds.

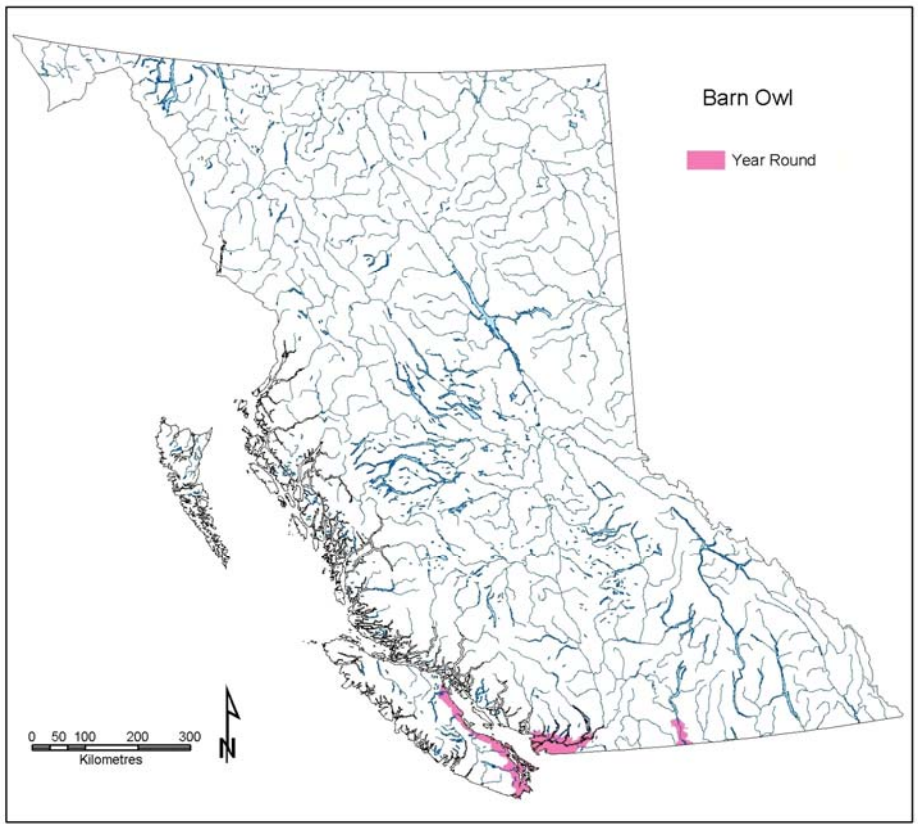
Habitat
This species occurs mainly in open areas of grassland and sagebrush, and during the breeding season, near suitable nesting cliffs. During the winter,

they occur in rural and urban areas attracted by the abundant source of birds as prey at bird feeders and livestock operations (Fraser et al. 1999). They nest on cliffs or other very steep sites.

Food Habits
Throughout much of its range the Prairie Falcon feeds mainly on ground-squirrels (Steenhof 1998). In British Columbia, many species of small mammals and birds are taken. Small mammals include chipmunks, mice, red squirrels, ground-squirrels, marmots and a wide variety of small birds up to the size of Mallard (*Anas platyrhynchos*) (Hooper 1997).

Compatibility with Human Landscapes
Prairie Falcons nest on fairly remote cliffs in open habitats away from urban environments, but regularly use urban and rural areas during the winter.

10.15 Barn Owl (*Tyto alba*)



COSEWIC: Special Concern **B.C. status: Blue-listed**

Identification (Length 41 cm; Wingspan 107 cm)

- Medium-sized pale-coloured owl with broad but fairly pointed wings.
- Adults: Whitish heart-shaped face with dark eyes, no ear tufts. Golden-brown upperparts are variably spotted with grey. Underparts

range from white to buff and are speckled with black spots. Underside of the wings looks white to cinnamon.
- Immatures: Like adults after first couple of months.
- Females are larger and typically darker than males.
- When hunting flies with much banking and turning.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Looks ghostly white in headlights or streetlights. Heart-shaped face unique among British Columbia owls. Combination of pale colour and rusty-brown colours unique. Snowy Owl is much larger, has yellow eyes and lacks rusty tones. Short-eared Owl has yellow eyes, is streaked on breast, and has relatively longer wings. Downy juveniles of other owls (e.g., Great Horned Owl, Barred Owl) are sometimes mistaken for Barn Owls as they are whitish in colour, lack ear tufts and give harsh calls. The shape of the facial discs should differentiate the young of these other species from Barn Owls.

Distribution
Barn Owls are distributed nearly worldwide. In Canada, Barn Owls breed only in southwestern Ontario (very low numbers) and southern British Columbia. In British Columbia, Barn Owls occur throughout the Fraser Lowlands, and very locally in southeast British Columbia, the Okanagan, and on Vancouver Island (Campbell et al. 1990; Marti 1992).

Population Status
The Barn Owl is a fairly recent arrival in British Columbia. The clearing of the forest and development of large agricultural areas probably made it possible for Barn Owls to live in the region (Andrusiak and Cheng 1997). Barn Owl populations have declined in several parts of their range and the species is on Species at Risk lists in several western states. In British Columbia, Barn Owls are only common in the Lower Mainland. On Vancouver Island and southern interior areas the Barn Owl is rare. It nests in very low numbers and at very low densities. The population of Barn Owls in British Columbia is about 1,000 individuals (Andrusiak and Cheng 1997).

Movements
Barn Owls are non-migratory and largely resident in British Columbia. Young birds disperse from their parents nesting territory during the fall and may show up as vagrants far from their normal range.

Habitat
Barn Owls hunt in open areas including but not limited to agricultural fields, marshes, and urban areas. In British Columbia, they are associated with low elevation agricultural areas of the Fraser Lowlands. During the nonbreeding season, Barn Owls often roost in the same location that is used for nesting (Andrusiak and Cheng 1997). Only 9 of the 236 sites used for nesting or roosting that were found during a study in the Lower Mainland were not in human-made sites (Andrusiak and Cheng 1997).

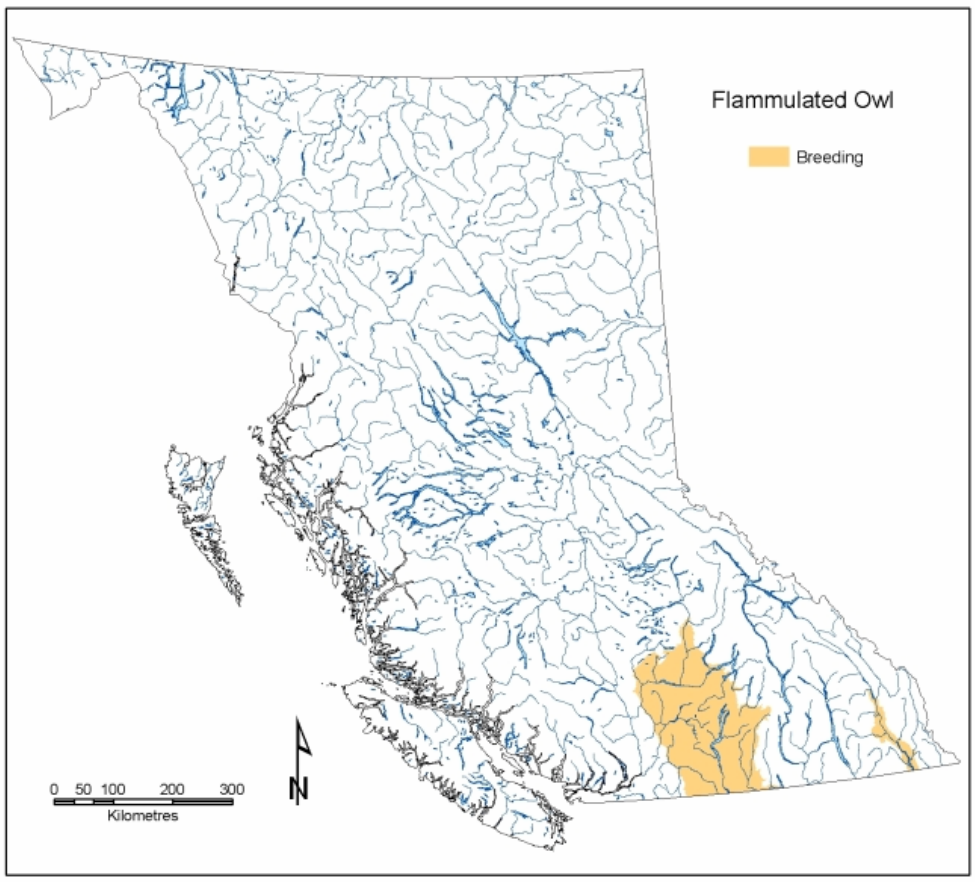
Breeding
Barn Owls use many types of nesting sites. Natural sites include cavities in trees, cracks in cliffs, and old nests of other birds. Barn Owls also use man-made structures, particularly barns (hence their name), attics, grain silos, church steeples, and nest boxes (Marti 1992). Human-made nesting sites provide shelter from the weather and protection from predators (Andrusiak and Chang 1997). They do not build a nest, although the eggs are usually laid on a layer of regurgitated pellets. The usual breeding period for Barn Owls in British Columbia is early March to May. They may breed at other times in response to an abundance of prey. The clutch size is highly variable but 3 to 6 eggs is the norm in British Columbia, laid at 2-3 day intervals. Incubation of about 29 to 34 days is performed by the female while the male provides her with food. It takes the young up to 2 months to become independent and they may roost near the nest for up to 2 months more.

Food Habits
Nearly all hunting Barn Owls fly low over open habitats making sharp banks and sudden changes in direction as they try to locate prey. Occasionally they search for prey from a perch. Barn Owls are capable of capturing prey in total darkness, using only their incredibly sensitive, directional hearing to locate the animal.

Barn Owls hunt for small mammals that are active at night such as voles, mice, and shrews. The most important prey species in southwestern British Columbia is the Townsend's Vole (*Microtus townsendii*). The rest of the diet is largely other small mammals. Birds are also eaten in lesser amounts.

Compatibility with Human Landscapes
The presence of the Barn Owl in British Columbia is primarily a result of human activities that have produced suitable nesting and roosting habitats (barns and other buildings) and suitable foraging areas (e.g., agricultural areas). Fragmentation and development of habitats may result in population declines. Loss of nest and roosting sites, particularly the removal of derelict farm buildings, and the decline of agricultural lands that support high densities of small mammals may also limit populations. Areas of old-fields and hedgerows preferred by this species in agricultural areas are gradually disappearing in urban and rural areas of B.C. Voles (important prey for Barn Owls) are also susceptible to large population fluctuations in fragmented landscapes. The institution of nest box programs may help to alleviate the problems of the potential decline of suitable nesting and roosting habitat. Causes of mortality in British Columbia include starvation, shooting, nestling mortality, predation by Great Horned Owls and collisions with vehicles.

10.16 Flammulated Owl (*Otus flammeolus*)



COSEWIC: Special Concern **B.C. status: Blue-listed**

Identification (Length 15-17 cm; Wingspan 40 cm)
The Flammulated Owl is a very small brownish owl with dark eyes and small ear tufts. It is similar to the somewhat larger Western Screech-owl except it has dark eyes and shorter ear tufts. A sample of vocalizations can be heard at: Link.

Distribution and Status
In British Columbia, Flammulated Owls occur from the US border in the Southern Interior north to Williams Lake, west to Lillooet and east to Kamloops; it is also found in the Kootenay Trench (van Woudenburg 1999). It is highly migratory and normally occurs in British Columbia only between May and October.

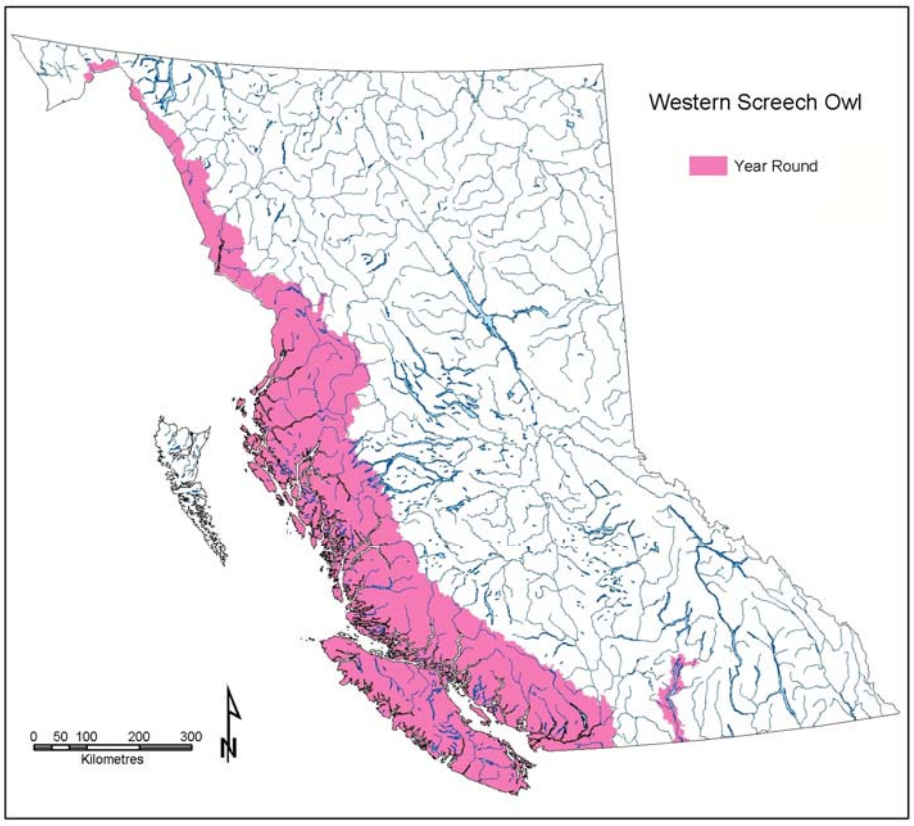
Habitat
Breeding habitat in British Columbia is in the Interior Douglas-fir Biogeoclimatic Zone. Open forests of mature or old-growth Douglas-fir mixed with Ponderosa pine and shrubby thickets are preferred in British Columbia. It nests in a cavity in a tree. It has used nest boxes in British

Columbia and other areas. They most often use nest cavities made by Northern Flickers and Pileated Woodpeckers (Cannings and van Woudenberg 2004).

Food Habits
Flammulated Owls locate prey at night while perched and fly to capture it. They capture prey in the air, on the ground or on branches by hovering. The diet is almost entirely insects especially moths and beetles (McCallum 1994).

Compatibility with Human Landscapes
In the southern interior valleys of B.C. they may occur close to urban and rural areas, provided mature woodlands and riparian habitats with large trees are nearby.

10.17 Western Screech-Owl *(Megascops kennicottii)*



M. k. kennicottii
COSEWIC: Special Concern **B.C. status: Blue-listed**
M. k. macfarlanei
COSEWIC: Endangered **B.C. status: Red-listed**

Identification (Length 22 cm; Wingspan 50 cm)
- Small owl with short tail and rounded wings.

- Two subspecies in British Columbia differing mainly in colour and distribution.
- Most coastal birds are browner and about 10% are much redder than the greyish interior birds.
- Adults: Generally grey or brown overall with streaks on the underparts and much barring and other marking on the upperparts and wings. Facial disc well-defined. Ear tufts are present, but are often not visible. The eyes are yellow and the bill is black.
- Immatures: Like adults after first couple of months.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Flammulated Owl is smaller and has dark eyes and different call.

Distribution
The Western Screech-Owl occurs from south-coastal Alaska to central Mexico. In British Columbia, two subspecies occur with no range overlap. The race *M. k. kennicottii* occurs the length of British Columbia in coastal regions except the Queen Charlotte Islands. The race *M. k. macfarlanei* occurs in some parts of the south interior. It is sometimes considered to be part of a more widespread race known as *M. k. bendirei*. This race has a very small population in British Columbia with only a few confirmed breeding locations, all in the Okanagan Valley (Cannings and Angell 2001).

Population Status
There are conservation concerns regarding the Western Screech-Owl in British Columbia. The Interior subspecies, *M. k. macfarlanei,* is designated as Endangered nationally and red-listed in B.C., while the coastal race, *M.k. kennicottii*, is of Special Concern. A severe loss and degradation of riparian habitats is the main reason for the decline of Western Screech-Owls in the Okanagan and Similkameen Valleys (Cannings 2004). Local declines have occurred in some areas including Vancouver, Victoria and Salt Spring Island. The Western Screech-owl appears to be undergoing a range withdrawal on southern Vancouver Island (Levesque, *pers. obs.*). The reason for these declines is undetermined. The abundance of Barred Owl greatly increased in these areas during the same period as the Western Screech-Owl populations declined. Predation by Barred Owl on Western Screech-Owl is one theory used to explain this decline. The Great Horned Owl population also increased near Victoria during the same period (Campbell et al. 1990).

Movements
Western Screech-Owls do not migrate; pairs are resident on their territory all year. During late summer, young owls leave their parents' nesting territory and look for their own territory. Juvenile dispersal is generally a very short distance of less than 20 km (Cannings and Angell 2001).

Habitat
Western Screech-Owls occupy many types of habitat throughout their large range though are often associated with riparian habitats and deciduous trees. In British Columbia, coastal birds (*M. k. kennicottii*) use lower elevation

habitats including a variety of woodlands, city parks and rural areas. In general, their preferred habitat is lowland forests with a mix of deciduous and coniferous trees near water. At Point Grey in Vancouver, Western Screech-Owls territories were in mixed woodlands with ravines containing large big-leaf maples. On Vancouver Island, mature mixed forest with openings and nearby water is the preferred general habitat. Old-growth habitats are also prime habitats for Western Screech-Owls on Vancouver Island.

Interior birds are strongly associated with deciduous riparian woods often in pine-fir forests (Cannings and Angell 2001). Foraging habitat preferences in the Okanagan Valley are unknown. It is assumed that interior screech-owls hunt in the open coniferous forests beyond the narrow riparian zones where the owls breed (Cannings and Angell 2001).

Breeding

Western Screech-Owls nest in tree cavities excavated by woodpeckers or formed by some other means. In the Southern Interior, large Black Cottonwood trees are used most frequently for nesting (Bezener 2004). Nest boxes are also used in many areas including British Columbia. No nest is built; the eggs are laid on the bottom of the cavity. Usually 3-5 eggs are laid between mid-March and late May. The incubation period is about 33-34 days. Chicks leave the nest when they are just over a month old and are fed out of the nest by the adults for another 5 weeks or so before the young disperse. (Cannings and Angell 2001).

Food Habits

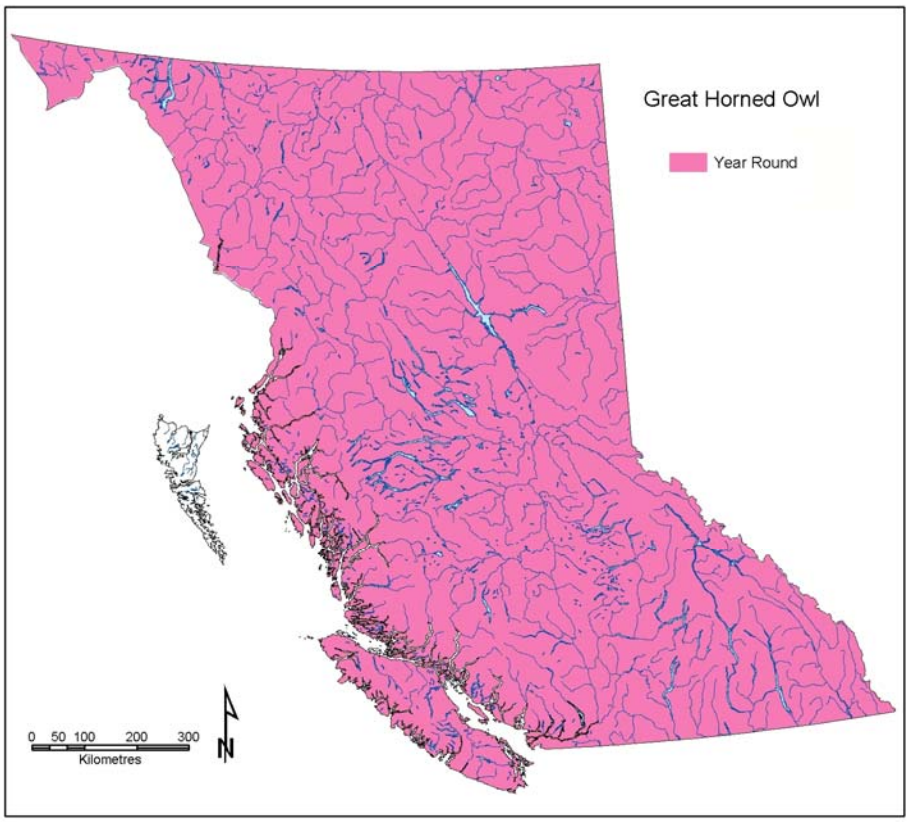
The main hunting method is perching low on an inconspicuous perch and waiting for prey to appear. Small mammals and birds are taken by short dives or stoops. Insects may be caught in the air or may be gleaned from foliage (Cannings and Angell 2001).

Small animals of many types make up the diet of the Western Screech-Owl. Small mammals and birds are commonly taken. Insects are important mainly during warmer months. The exact diet varies annually, seasonally and locally; many unexpected prey species are captured at times including bats, fish, earthworms, and crayfish (Cannings and Angell 2001).

Compatibility with Human Landscapes

Western Screech-Owls need patches of forest with suitable cavities for nesting and roosting, and sufficient prey. This type of habitat can be provided in woodlots, riparian areas and undeveloped green spaces. The availability of suitable nest cavities likely affects the ability of the Western Screech-Owl to successfully breed, although if nest boxes are provided they will readily use them. Urban developments and forestry operations may negatively affect screech-owl habitat by removing forest stands and dead trees which serve as potential nest cavity trees. Western Screech-Owls occasionally collide with vehicles and windows.

10.18 Great Horned Owl (*Bubo virginianus*)



COSEWIC: Not Listed **B.C. status: Yellow-listed**

Identification (Length 56 cm; Wingspan 112 cm)

- Large, stocky, big-headed owl with broad rounded wings.
- Three subspecies in British Columbia, varying mainly in colour tone of dark feathers and facial disk. Coastal birds are darker than interior and northern ones.
- Adults: Head very large with grey or brown facial disks. Prominent ear tufts on head. Throat white. Eyes yellow. Body and wings mostly brown variably spotted and barred. Underparts barred.
- Immatures: Similar to adults after first couple of months.
- Females are larger than males.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Much larger and bulkier than Long-eared Owl.

Distribution

Great Horned Owls inhabit most of the New World from the treeline, south to southern South America. The species is widespread and common throughout North America including all of British Columbia except the Queen Charlotte Islands (Campbell et al. 1990; Houston et al. 1998).

Movements
Great Horned Owls are resident throughout their range even the northernmost regions (Houston et al. 1998).

Habitat
The Great Horned Owl occurs in nearly all terrestrial habitats in British Columbia except alpine areas. Ecologically it is the night time equivalent to the Red-tailed Hawk and utilizes the same habitats and prey.

Population Status
The Great Horned Owl is not globally at risk. This species is common throughout its large range and is an adaptable species that utilizes many diverse habitats and prey species.

Breeding
Great Horned Owls do not build their own nest but may add a lining of various materials to old nests of other species. Natural nesting sites include large stick nests in trees built by other birds, cliff ledges, and cavities in snags and rotting trees. Also used, though much less frequently, are various man-made structures, including buildings, and nest platforms erected for them or other species (Houston et al. 1998).

The nesting period of Great Horned Owls in British Columbia varies depending on local conditions as it does for nearly all bird species. In general, the more northern and eastern the location is, the later the nesting period.

Great Horned Owls lay their eggs between the middle of February and late May with the early third of the period being most frequent (Campbell et al. 1990). One to four eggs are laid usually with 2 to 3 days between each. After 30 –32 days of incubation the eggs hatch. The young are fed in the nest for about 35 days, after which they leave the nest, but remain dependent on their parents for food for another month or more.

Food Habits
Great Horned Owls hunt mainly by perching on elevated structures such as trees, bushes, telephone poles, lamp posts, or communications towers in open areas. Occasionally hunts while flying low over open areas. When prey is detected, the owl flies straight toward the animal, grabs it with its powerful feet and sharp talons, and carries it off.

A great variety of prey animals have been reported in the diet of this owl over its broad range. Small mammals up to the size of rabbits and hares make up about 90% of the diet in many regions. Waterfowl and other birds can also be important foods.

Compatibility with Human Landscapes
If suitable foraging habitat exists nearby, Great Horned Owls are resilient to degradation of nesting habitat and are somewhat tolerant to disturbance of nests and roosts. They do not occur in heavily urbanized areas, unless well-

wooded parkland is available. Rural areas with patches of open fields and woodlands are very good habitat for Great Horned Owls. Collisions with vehicles and electrocution account for large numbers of mortalities. Starvation of young during periods of food shortages is by far the largest contributor to Great Horned Owl mortalities.

Formerly very scarce in the Victoria region, Great Horned Owls have increased their population since the 1970s. This is possibly in response to the greater abundance of small mammal prey with the increased population of grey squirrels, eastern cottontail rabbits and European rabbits (all introduced species). Great Horned Owls are known to prey on other raptors and they may reduce recovery potential of less adaptable raptor species (Bosakowski and Smith 2002).

10.19 Northern Pygmy-Owl *(Glaucidium gnoma)*

G. g. grinnelli
COSEWIC: Not listed **B.C. status: Yellow-listed**
G. g. californicum

COSEWIC: Not listed **B.C. status: Yellow-listed**
G. g. swarthi
COSEWIC: Not listed **B.C. status: Blue-listed**

Identification (Length 17 cm; Wingspan 31 cm)

- Very small short-winged owl with narrow relatively long tail.
- Three subspecies in British Columbia differing mainly in plumage colouration and geographic distribution.
- Adults: Head is red-brown with small pale spots on crown, and white eyebrows. Small facial disc. A false eye pattern on the back of the head formed by two oval black spots with white borders is distinct. Red-brown upperparts with small pale spots. The whitish underparts have dark streaks. The tail, relatively long for an owl, is dark with several narrow white bands. The eyes are yellow. The bill is yellow.
- Immatures: Similar to adult except fewer spots on head, bill dark and tail shorter.
- Flight: Undulating with quick bursts of flaps alternating with short glides.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Smaller than other British Columbia owls and similar in size to the Flammulated Owl. Western Screech-Owl (larger) and Flammulated Owl (dark eyes) are much more streaked overall, with shorter tails and ear tufts (not always visible) Northern Saw-whet Owl is similar in colour but larger with a much shorter tail and different plumage pattern. No other British Columbia owl has such a relatively long tail except the much larger Northern Hawk-owl.

Distribution

The Northern Pygmy-Owl has a patchy distribution from southeast Alaska to Central America. In British Columbia, it occurs throughout coastal areas except the Queen Charlotte Islands, and occurs widely in the southern two-thirds of the Interior.

Population Status

The Northern Pygmy-Owl is not globally at risk, but the subspecies, *G. g. swarthi*, is blue-listed in B.C. It is uncommon throughout its wide range in North America. The Canadian population was roughly estimated at 2,000-10,000 pairs (Kirk and Hyslop 1998). On Vancouver Island, habitat change due to the forest industry may threaten the long-term existence of the endemic subspecies, *G. g. swarthi* (Darling 2003).

The taxonomic status of some populations is uncertain. Birds from the southwest states and southward may be one or more distinct species. Three recognized subspecies inhabit British Columbia, differing mainly in colour and geographic distribution. One subspecies, *G. g. swarthi* occurs only on Vancouver Island. It is darker, browner and less rufous than *G. g. grinnelli* of the coastal mainland. *G. g. californicum*, the third subspecies, is greyer than the other two subspecies and is less Rufous-coloured than *grinnelli*. It occurs in the north-central Interior. (Campbell et al. 1990).

Movements
The Northern Pygmy-Owl is non-migratory, though short distance elevational movements are common during the nonbreeding season. During winter in interior British Columbia, it is often seen along roads near valley-bottoms where it is absent from during the rest of the year. Whether these birds are elevational migrants from the local area or longer distance migrants from farther north is unknown (Campbell et al. 1990).

Habitat
Forested habitats are preferred by the Northern Pygmy-Owl. On Vancouver Island, it uses old-growth and mature forests with openings in the forest and nesting cavities (Darling 2003). In the Okanagan Valley it does not use valley bottoms during most of the year. However, during December and January of many years it is often seen at low elevations along roads, perched on fruit trees, telephone wires, or other objects.

Breeding habitat may be in a variety of forest types, but suitable nest cavities are most available in stands of old trees. Foraging may be done in quite open locations, including clearcuts and road corridors.

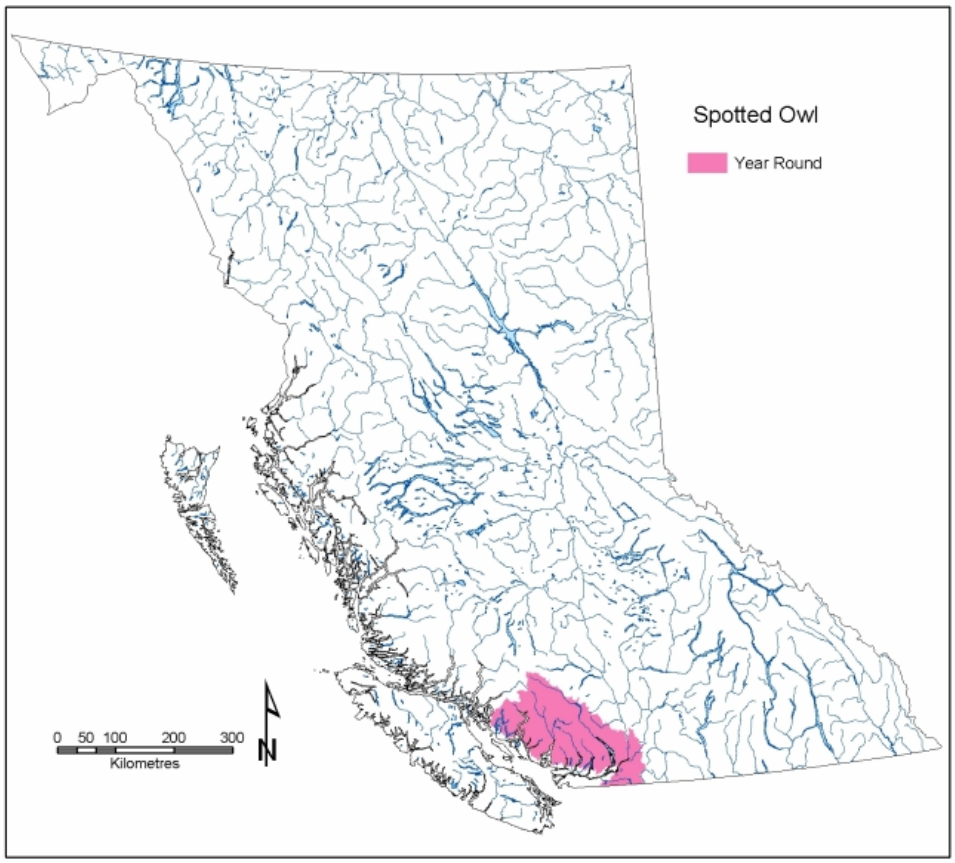
Breeding
Little information is available about the reproductive biology of this species compared to most other raptors. Very few Northern Pygmy-Owl nests have been found in British Columbia. All 5 recorded in British Columbia prior to 1990 were in old woodpecker holes in coniferous trees (Campbell et al. 1990). As many as 7 eggs are laid and incubated for about 4 weeks. The young leave the nest when they are about 3-4 weeks old. They are weak fliers at first and are fed by the adults for some time after leaving the nest (Holt and Peterson 2000).

Food Habits
Northern Pygmy-Owls hunt during daylight and twilight hours, rather than at night as is the case for most other owls. They often search for prey from an elevated perch during the winter.

Small birds and mammals probably make up much of its diet in British Columbia. Insects are likely important in some regions during the warmer months. Amphibians and reptiles are known to be taken in areas outside of British Columbia.

Compatibility with Human Landscapes
The Northern Pygmy-Owl has been recorded in urban and rural areas, but little is known of their nesting requirements as only 5 nests have been found (Campbell et al 1990).

10.20 Spotted Owl (*Strix occidentalis*)



COSEWIC: Endangered **B.C. status: Red-listed**

Identification (Length 45-48 cm; Wingspan 100 cm)
The Spotted Owl is a medium-sized, round-headed, short-tailed, broad-winged owl with dark eyes and no ear tufts. Differs from the similar Barred Owl by having a consistent pattern of white spotting on underparts rather than barring of the upper chest contrasting with vertical streaking on the rest of the ventral surface. It also is usually darker in overall plumage and has different vocalizations. A sample of vocalizations can be heard at: Link.

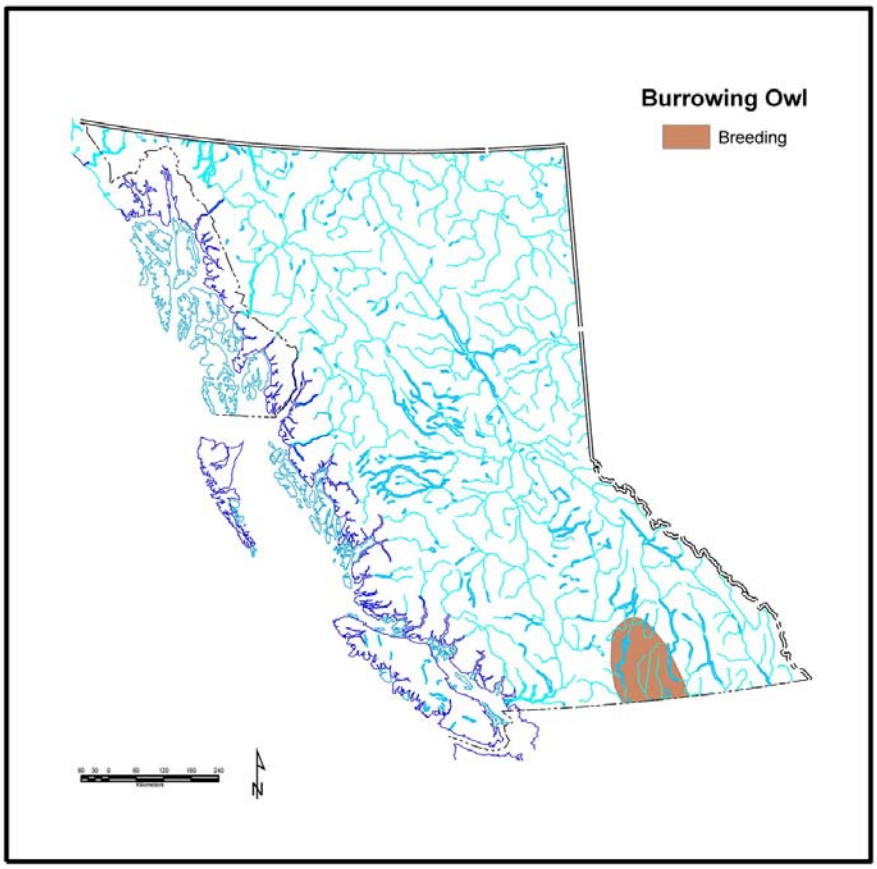
Distribution and Status
The current number of breeding pairs of Spotted Owls in British Columbia is estimated at less than 33 breeding pairs (Blackburn and Harestad 2002; M. Chutter, pers. comm.). This is considerably fewer than the estimated 100 pairs in 1991 (Dunbar et al. 1991) and the estimated 500 pairs prior to European colonization (Blackburn and Harestad 2002). This decline in population is attributed largely to the loss and fragmentation of mature and old-growth forested habitat in its range, and to the relatively recent and increasing competition with Barred Owls. Spotted Owls are patchily distributed between Vancouver and Manning Park north to about Lillooet.

Habitat
In British Columbia, the Spotted Owl uses two broad old-growth forest types. Owls living closer to the coast inhabit wetter forests, while those farther inland inhabit drier forests. Spotted Owls will also use some younger forests for foraging and dispersal. Prime Spotted Owl habitat is mature conifer stands older than 140 years (Kirk 1999).

Food Habits
Spotted Owls perch and search for their prey within the forest. They hunt at night mainly for small mammals which make up about 90% of their diet in northern parts of their range. Their primary prey species are the Northern Flying Squirrel (*Glaucomys sabrinus*) and the Bushy-tailed Woodrat (*Neotoma cinerea*; Gutiérrez et al. 1995).

Compatibility with Human Landscapes
Spotted Owls require large tracts of old-growth forest, but could potentially occur on the periphery of rural environments if unlogged forest is nearby.

10.21 Burrowing Owl (*Athene cunicularia*)



COSEWIC: Endangered B.C. status: Red

Identification (Length 19-25 cm; Wingspan 50-55 cm)
The Burrowing Owl is a small slender owl with long legs and a small round head lacking ear tufts. The eyes are yellow. Underparts are pale heavily barred with brown. Upperparts are brown with whitish spots. A sample of vocalizations can be heard at: Link.

Distribution and Status
Formerly found in open grassland and sage habitats in the southern interior of British Columbia. Very close to extirpation as a naturally occurring breeding species in the province. Attempts to reintroduce the species (the only raptor to be classified as Endangered under the Wildlife Act) near Kamloops are ongoing. Released captive bred birds have successfully bred in the wild, sometimes attracting unbanded wild or captive bred birds released in previous years' birds. Some birds have returned following their winter migration; return rates are similar to those in other areas. Appropriate habitat for this species is very limited in British Columbia and continued

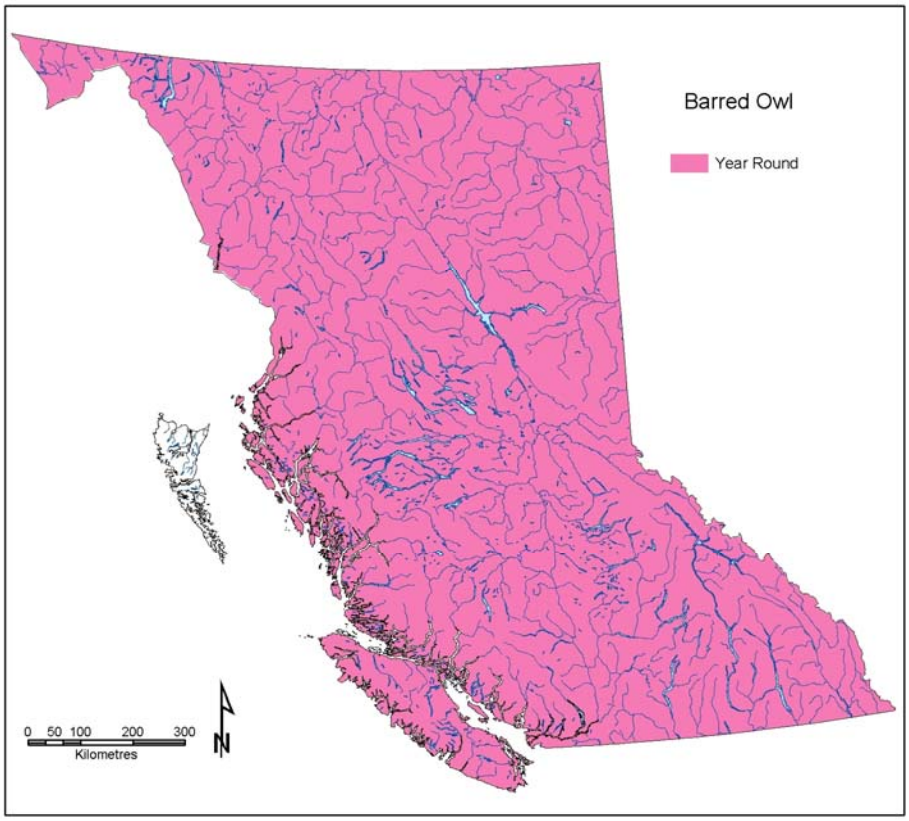
management and conservation efforts are focused increasingly on habitat stewardship and management.

Habitat
This species is native to the shrub-steppe areas of the southern interior of British Columbia. Burrowing Owls nest in burrows underground. Successful stewardship partnerships with ranchers promote maintaining healthy grassland habitat and practising grazing rotations that benefit the owls and livestock.

Food Habits
Burrowing Owls hunt at all times of the day with peaks around dawn and dusk. They are opportunistic hunters and will take insects, birds, small mammals, reptiles and other small animals (Haug et al. 1993).

Compatibility with Human Landscapes
Burrowing Owls can breed in close proximity to human developments provided they are not harassed and the habitat around the nesting burrow is in good condition.

10.22 Barred Owl (*Strix varia*)



COSEWIC: Not Listed **B.C. status: Yellow-listed**

Identification (Length 44-60 cm; Wingspan 105 cm)

- Medium-sized, round-headed, short-tailed, broad-winged owl.
- Adults: Head mostly brown with well-developed facial discs, no ear tufts. Upper breast heavily brown barred horizontally, lower breast and belly are whitish with long vertical, heavy brown streaks. Tail is dark brown, heavily barred buff or whitish. Bill is orange-yellow. Eyes dark.
- Young birds retain some downy feathers after leaving nest until late summer. Reach adult plumage at about 4 months old.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Most similar to Spotted Owl (rare and local in British Columbia) but Barred Owl has streaked belly, a paler face, is paler overall and has different vocalizations. Great Grey Owl is much larger with yellow eyes. The dark eyes distinguish Barred Owl from all other British Columbia owls except the Spotted Owl, Barn Owl (much paler body and face) and Flammulated Owl (much smaller).

Distribution

Barred Owls are resident in the eastern United States, eastern Canada, the central Prairie Provinces, the northern Rocky Mountains, and most of British Columbia.

Population Status

The Barred Owl is not globally at risk. The Canadian population is estimated at 10,000 to 50,000 pairs (Kirk and Hyslop 1998). Almost unknown in British Columbia prior to the 1950s, Barred Owls are now common throughout most of British Columbia. Barred Owls were first recorded in coastal British Columbia at Surrey in 1966 and in Victoria in 1969. The population near the coast has increased since then and it is likely the most abundant owl on southern Vancouver Island now (Campbell et al. 1990).

Movements

Barred Owls have managed to dramatically expand their range in western North America, during the last 35 years, without being a truly migratory species. Southern birds are resident in their breeding territories. Barred Owls in northern British Columbia may move south routinely during the winter (Campbell et al. 1990). During winters of low prey populations, Barred Owls, like several other northern owl species, range widely in search of more abundant prey (Mazur and James 2000).

Habitat

In most parts of North America, Barred Owls are strongly associated with large tracts of old-growth or mature forest near water. Although found in British Columbia in remote areas with large old trees, they have also dispersed into urban and rural habitats. In areas such as farmlands, and rural and urban habitats, the Barred Owl often lives in parks, riparian corridors, and ravines. Breeding habitat must contain trees of sufficient size to provide cavities large enough for the female to nest in (Mazur et al. 1997).

Breeding
Cavities in large trees are the most common nest site. A variety of other sites including old nests of other species, nest boxes and the ground have been reported. Barred Owls do not build a nest (Mazur and James 2000). One to 5 eggs are laid at 1-3 day intervals during the spring. Incubation takes 28 to 33 days per egg and is begun after the first or second egg is laid. The eggs hatch at about the same intervals resulting in chicks of uneven age and size. Four to 5 weeks after hatching, although still unable to fly, the young leave the nest but stay in the area. The whole family stays together, the parents catching most of the food, until fall when the young disperse (Mazur and James 2000).

Food Habits
Barred Owls hunt primarily during the night. Perching on a structure with an open flight path to habitat with potential prey, Barred Owls wait, watch and listen. When prey is located they drop down grabbing the prey with their talons.

Barred Owls are versatile and adaptable feeders over their wide range. Many species of prey are recorded including various small mammals, birds, amphibians, reptiles, fish, and invertebrates (Mazur and James 2000).

Compatibility with Human Landscapes
Capable of breeding and hunting in urban areas that support stands of mature trees. Great Horned Owl, Northern Goshawk, mustelids and raccoons have been noted as predators of eggs, nestlings and adult Barred Owls. Barred Owls have greatly expanded their range in B.C., including urban and rural environments, and are implicated in the decline of smaller owl species such as the Western Screech-Owl.

10.23 Long-eared Owl (*Asio otus*)

COSEWIC: Not Listed **B.C. status: Yellow-listed**

Identification (Length 35-40 cm; Wingspan 90-100 cm)
The Long-eared Owl is a slim, medium-sized owl with long wings. The plumage is generally brown and buff with darker mottling and barring throughout. Its long ear tufts are close to the middle of the head and usually held erect. The facial disc is reddish. The eyes are yellow. Short-eared Owl has very short inconspicuous ear tufts. Appears very similar to Short-eared Owl in flight but the buff and black wrist marks are less prominent. Great Horned Owl is much larger. A sample of vocalizations can be heard at: Link.

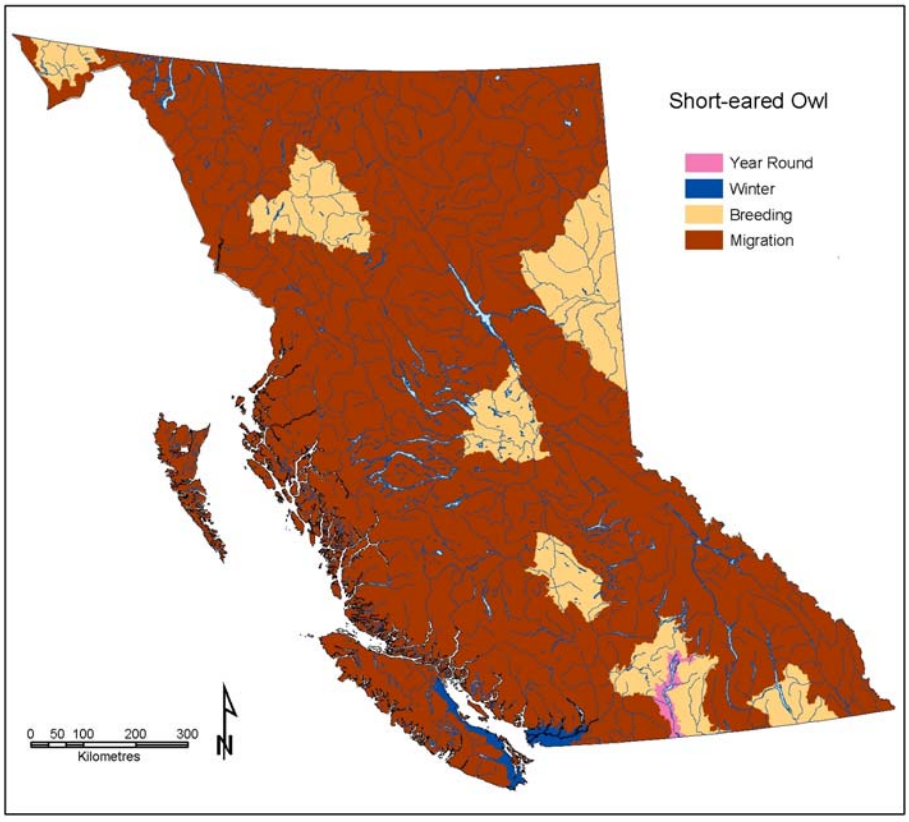
Distribution and Status
Uncommon to rare breeder on the Mainland south of Prince George. Rare on the south coast where most of the records are of wintering birds. The largest breeding population known in the province is in the Okanagan Valley. A small number winter in the Interior and the Fraser Lowlands. It is very rare on Vancouver Island.

Food Habits
Hunts at night by flying low over open ground while searching for prey. Mainly feeds on small mammals, although birds can also be important. (Marks et al. 1994). A study in the southern Okanagan Valley found that small mammals were more than 98% of the diet, and voles were about 50% of the diet (Campbell et al. 1990).

Habitat
In the Okanagan most nesting is in thick riparian forest of trees and shrubs. In the winter, it roosts in dense conifers especially western redcedar. It forages over open areas including wetlands, old fields and pasture. They sometimes roost communally in the Okanagan Valley (up to 6 birds).

Compatibility with Human Landscapes
Long-eared Owls can breed in urban and rural environments provided thickets of deciduous or coniferous trees are available.

10.24 Short-eared Owl (*Asio flammeus)*



COSEWIC: Special Concern **B.C. status: Blue-listed**

Identification (Length 38 cm; Wingspan 97 cm)

- Medium-sized owl with long narrow wings.
- Adults: Tawny brown overall. Prominent facial disc. The small ear tufts are only visible at close range. Eyes are yellow. The bill is black. The brownish breast is strongly streaked by dark brown. The belly is paler with less streaking. Wings are generally brown with two distinctive marks visible in flight; a buffy patch on the upperside and a black mark on the underside of the wings near the wrist.
- Females: Slightly larger, darker and buffier.
- Flight: easy, bouncing, and erratic flight is similar only to Northern Harrier. Often hovers briefly 1-3 m above the ground when potential prey is spotted.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- The only medium- to large-sized owl that normally flies and hunts during the day. Appears similar to Long-eared Owl in flight and is difficult to separate. Long-eared Owl very rarely flies during the day unless disturbed, has less distinct black and buff wing markings and has a rufous facial disc. While perched, Long-eared Owls show long ear tufts; Short-eared Owls have very short ear tufts that are usually not noticeable. May look like Barn Owl, especially during darkness when seen in headlights or other artificial lighting may look like Barn Owl. Barn is much paler below and on the face, is unstreaked and has a unique rusty-brown colour to upperparts. Short-eared Owl perches in a less upright position than most other owls.

Distribution
The Short-eared Owl has a very wide distribution that includes much of Europe, Asia, North America, and South America as well as several remote oceanic islands. Many continental populations withdraw from northern parts of their range for the winter and occur south of the normal breeding areas.

Population Status
Globally, the Short-eared Owl is not considered at risk and has a very large range. In B.C., the species is blue-listed. Major population declines in eastern, central and parts of western North America are of concern and the species is listed by several states as a Species of Risk. Presently, numbers appear to be declining in B.C., but their status is uncertain because of a lack of survey data (Cooper and Beauchesne 2004).

Movements
Northern populations of Short-eared Owls are highly migratory. In British Columbia, early spring migrants start to move through the province during late March. The main northward movement is in April. Fall migration peaks in late October and continues through November.

Habitat
Short-eared Owls prefer open habitats of many types. Marshes, grasslands, agricultural fields, coastal foreshores and beaches, airports, and sagebrush are all commonly used areas in British Columbia. They are frequently found in very open areas sitting on the ground.

Most nests in British Columbia have been found in shrubby fields near agricultural areas. This may be because nests in such locations are much more likely to be found than ones in large wetlands or remote areas.

During migration, Short-eared Owls may occur in nearly any area that includes open habitat though they occur most frequently at estuaries, marshes and beaches along the entire coast and freshwater wetlands throughout the interior.

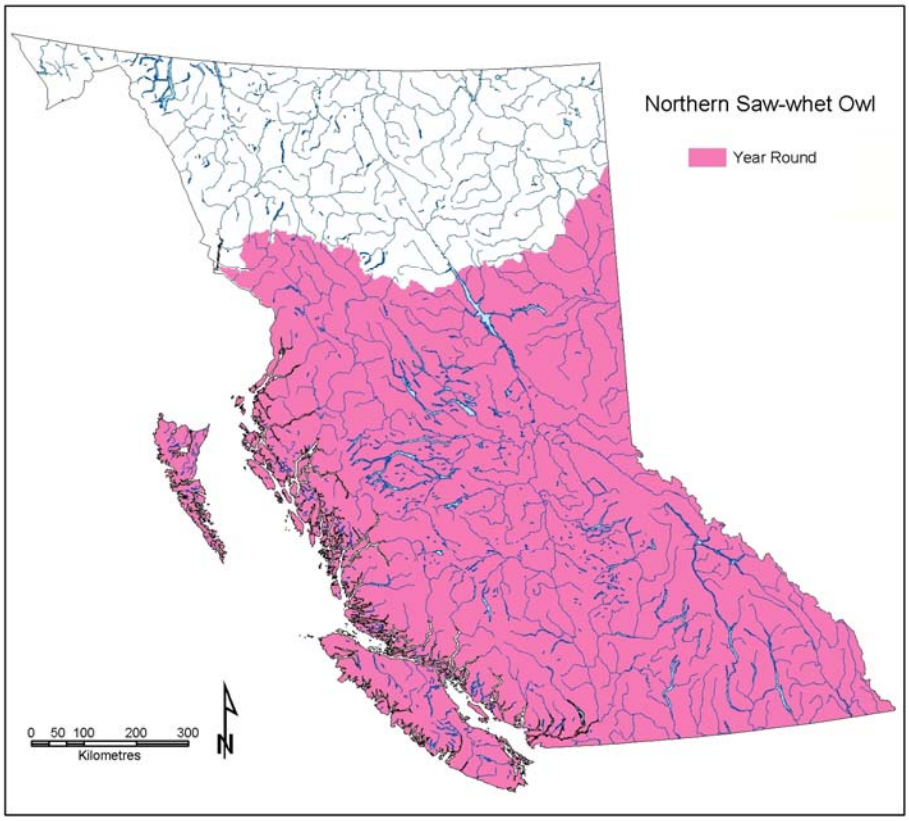
The few Short-eared Owls that winter on Vancouver Island are usually seen at agricultural fields or larger estuaries. The Lower Mainland including Richmond and Delta and surrounding cities was formerly an important wintering area with more than 100 owls in years of high vole abundance during the 1970s. On rare occasions, they may winter in almost any part of British Columbia, including the Queen Charlotte Islands, the Okanagan, the Cariboo, and the Peace regions (Campbell et al. 1990).

Breeding
Short-eared Owls nest on the ground. Usually a shallow scraped out nest is made and lined with grasses and other vegetation. It is often on a slightly elevated spot such as a hummock or small ridge. Although up to 13 eggs may be laid, the usual clutch is 5 or 6. Eggs hatch after about 26-37 days. The young leave the nest when they are about 2 weeks old and move around on foot for about 3 weeks until they are able to fly (Holt and Leasure 1993).

Food Habits
Short-eared Owls search for prey by flying above suitable habitat and listening and looking for prey. They hover briefly before dropping down quickly and grabbing the prey in their talons. Small mammals are the principal prey over most of North America, *Microtus* voles being most important in most places. Other small rodents, shrews, and rabbits are also common in the diet. Birds are also common but of secondary importance. In some places, however, Short-eared Owls specialize in hunting birds (Holt and Leasure 1993).

Compatibility with Human Landscapes
The Short-eared Owl is threatened by rapid urbanization, industrialization, intensive agriculture and human disturbance. Similarly, fragmentation of habitats may accentuate the magnitude of population fluctuations of their rodent prey base.

10.25 Northern Saw-whet Owl *(Aegolius acadicus)*



A. a. acadicus
COSEWIC: Not Listed **B.C. status: Yellow-listed**
A. a. brooksi
COSEWIC: Not Listed **B.C. status: Blue-listed**

Identification (Length 20 cm; Wingspan 43 cm)

- Small owl with broad rounded wings and short tail.
- Two subspecies in British Columbia; differ mainly in colouration and breeding distribution.
- Adults: Large round head with whitish facial discs edged in red-brown, no ear tufts. Eyes are yellow. Upperparts reddish brown. Small white streaks on crown and neck; upper wings, back and tail spotted with white. Underparts white, with wide rufous streaks.
- Immatures: Fledglings plumage very different for first few months out of nest with underparts entirely dark red-brown. Facial discs and upperparts are also darker than adult.
- Females are larger than males.
- Flight low with quick wing beats rising up to perch.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Boreal Owl is similar but larger with black-bordered facial disks, and is more chocolate-brown. Western Screech-owl is similar in size, but

is brownish-grey overall and has ear tufts. The Northern Hawk Owl is larger with long tail.

Distribution
The main breeding range is the southern half of all provinces in Canada from British Columbia to the Maritimes. It extends farther north on the Pacific Coast into Alaska, and at higher elevations in most western states and some mountain areas of northern and central Mexico. During winter many move into the eastern and central United States. It breeds throughout British Columbia except possibly some north-central and north-eastern parts.

Population Status
The Northern Saw-whet Owl is not considered to be at risk. Cannings (1993) estimated at least 100,000 to 300,000 individuals in North America and indicated the population was likely declining slowly due to loss of habitat. Northern Saw-whet Owls that breed on the Queen Charlotte Islands are of the subspecies *A. a. brooksi* and are Blue-listed provincially. Saw-whets breeding in the rest of the province are *A. a. acadicus*. It is not known whether *acadicus* occurs on the Queen Charlotte Islands during the nonbreeding season.

Movements
In eastern North America, Saw-whets owls are known to make long-distance migrations. Northern Saw-whet Owls are migratory but not much is known about their migratory strategies in western North America. In the west some movements may be short-distance elevational ones while others may be much longer latitudinal migrations. Fairly large numbers of Saw-whet Owls pass through south-coastal British Columbia in October and November (Campbell et al. 1990).

Habitat
Northern Saw-whet Owls breed in a variety of forested habitats. Across mainland British Columbia, they frequently nest in younger forests, including second-growth. Nests are often near lakeshores or in riparian forest (Campbell et al. 1990).

In the Okanagan Valley, Northern Saw-whet Owls breed in two different habitats. In the valley bottom, they nest in the remnant deciduous riparian forests present in some areas. At higher elevations, they nest in coniferous forests of ponderosa pine and Douglas-fir (Cannings 1987).

On the Queen Charlotte Islands, the endemic subspecies has been little-studied. Most singing males were located in forested patches within clearcuts (Cannings 1993). Trees used by singing males were larger and had a sparser understorey than randomly selected trees. In the same areas owls were associated with areas of old forest adjacent to second-growth possibly because old forest provides nesting sites while second-growth provides good thickly vegetated roosting sites (Gill and Cannings 1997).

During winter, individuals may roost (during the day) in the same location for weeks; often in a sheltered spot in a cedar or other conifer (Campbell et al. 1990; Cannings 1993).

Breeding
Cavities in trees made by woodpeckers are the most important nest site for Northern Saw-whet Owls. Cavities in trees formed by branches breaking off or some other means are also used. Nest boxes have been used in British Columbia and many other areas. Most commonly, 5 or 6 eggs are laid at 2-day intervals. After being incubated for 27-29 days the eggs hatch. Month-old young are able to fly fairly well when they fledge (young of many species of owls leave the nest before they can fly well or at all). At least one adult stays and provides food for the young for another month or so (Campbell et al. 1990; Cannings 1993).

Food Habits
The Northern Saw-whet Owl hunts at night by perching on a fairly low (1-3 m) object and locating prey using hearing and vision. It captures prey on the ground by grasping it in its talons.

The main food is small mammals, the species depending on local availability. The list of small mammals recorded in their diet over North America, includes nearly every species that occurs in the Saw-whets range. Overall, deer mice (*Peromyscus* sp.) are the predominant prey. A study in the Okanagan Valley found that deer mice and other rodents made up most of the diet; less important prey included shrews and songbirds (Cannings 1987). On the Queen Charlotte Islands, Saw-whets forage in intertidal habitats for a variety of invertebrates (Hobson and Sealy 1991).

Compatibility with Human Landscapes
This species is known to adapt well to urban and rural environments outside of the breeding season. Logging of older forests throughout its range has undoubtedly reduced the amount of suitable breeding habitat for this species, particularly through the loss of snags used for nesting. In recent decades, the Barred Owl has expanded its range into coastal areas and is thought to be having an impact on small owl species by preying on them and excluding them from some habitats.

10.26 Other Species

The following species do not occur in urban and rural areas in British Columbia often enough to warrant specific management practices. However, if Best Management Practices are followed for other raptors, then most of these species will likely benefit if and when they occur in such environments.

Golden Eagle *(Aquila chrysaetos)*

COSEWIC: Not at Risk **B.C. status: Yellow-listed**

Identification (Length 70-102 cm; Wingspan 185-224 cm)

- Very large dark eagle.
- Adults: overall dark brown except tawny nape and back of head and faint paler tail bands. The eyes and bill are dark.
- Immatures: similar to adults but with white patches at base of primaries and white tail with broad dark band across the end.
- Females appear similar to males but are larger.
- Soars frequently, often with slightly uplifted wings, sometimes to great heights. Level flight is strong and steady.
- Vocalizations: A sample of vocalizations can be heard at: Link.
- Can be confused with Bald Eagles, which have relatively larger heads and shorter tails. This is especially true for first year Bald Eagles and adult Golden Eagles both of which are mostly dark all over. The white areas on 2-year old immature Bald Eagles are usually irregularly placed throughout all body surfaces, gradually concentrating in the head and tail area as they mature. Immature Golden eagles also show definitive white patches, but these are concentrated at the base of primaries and tail. The Turkey Vulture is nearly as large as the Golden Eagle; see Turkey Vulture account for field marks.

Distribution

Very wide world range includes much of Europe, Asia, North Africa, and western North America. Golden Eagles breed in mountainous areas throughout most of British Columbia, except on the Queen Charlotte Islands and the coastal Mainland. During migration they can occur anywhere in the province. Wintering birds are common—mainly south of Prince George, in the Fraser Lowlands, and eastern Vancouver Island (Campbell et al. 1990; Kochert et al. 2002).

Population Status

The Golden Eagle is not a species at risk, although populations in some areas are declining. Kirk and Hyslop (1998) estimated between 2,000 and 10,000 breeding pairs in Canada.

Movements

Although it occurs throughout British Columbia during migration, not much is known about the migratory routes and behaviour of Golden Eagles in the province. Large numbers of southbound migrants have been counted in recent years on the eastern slopes of the Rocky Mountains in Alberta, not far from British Columbia. Possibly most of the birds from northwestern North America migrate along that route. In British Columbia, birds are not known to concentrate in the same way and are recorded, usually as individuals or pairs. Fall migration in British Columbia consists of low numbers of birds during September and October. Spring migration occurs across British Columbia during March and April, also involving low numbers.

Habitat
In British Columbia, the Golden Eagle is a bird of the mountains. Unlike the Bald Eagle, Golden Eagles are not normally seen on coastal beaches, or at estuaries and rivers feeding on dead salmon. Some Golden Eagles in British Columbia breed close to human populations, although the nests are usually in inaccessible locations such as cliff ledges. In the Okanagan Valley a few nests are close to the valley bottom in sight of the highway. On Vancouver Island, Golden Eagles usually nest in trees in remote areas. Foraging habitat is open areas of many types including alpine meadows, rangelands, and agricultural fields. Although occasionally seen soaring over urban areas during migration, the Golden Eagle is not known to use urban areas in the province regularly. In some areas of mixed agriculture and residential land use such as the Fraser Lowlands and southeast Vancouver Island this eagle may be seen during winter perched on powerline towers, telephone poles or a similar elevated structure.

Breeding
A variety of nest sites have been used in North America including cliffs, riverbanks, the ground, trees, human-made structures and nest platforms (Kochert et al. 2002). In British Columbia, the most frequent type of nest site is on cliffs, or other steep rocky ground. Nests are also built in large trees and this appears to be the predominant choice on Vancouver Island. Mainly during March, massive nests of branches and sticks are built with a nest cup lined with moss, grasses, and green conifer boughs. One to 3 eggs are laid at 3-5 day intervals and incubated for about 45 days. Young eagles leave the nest as young as 45 days old, but the average is about 65 days. The young stay with the parents for several weeks to several months with fledglings starting to attempt prey capture 1- 3 months after fledging (Campbell et al. 1990; Kochert et al. 2002).

Food Habits
Golden Eagles look for prey while soaring high above the ground, flying fast and low to the ground, or perching on a structure. Many strategies are used; the one chosen at a given time depends on the weather, the landscape, and the type of prey available. Soaring flight is used most often during sunny and windy days, presumably using air currents as an aid to flight.

Small- and medium-sized mammals are the primary food of Golden Eagles. Numerous species of mammal have been recorded in their diet. Rabbits, hares and ground squirrels are the most important type of mammalian prey for this eagle. Golden Eagles also forage for carrion including roadkill, especially during the winter. Both Golden Eagles and Bald Eagles feed on stillborn offspring and placentas of cows and sheep in ranching country, and they can be subject to control by landowners who mistakenly presume they are killing their livestock. Prey is spotted while the eagle is soaring high above the ground; carrion is located by watching the behaviour of Common Ravens and other scavengers.

Broad-winged Hawk (*Buteo platypterus*)

COSEWIC: Not Listed **B.C. status: Blue-listed**

Identification (Length 34-42 cm; Wingspan 82-92 cm)
The Broad-winged Hawk is a black and white hawk, similar in shape to Red-tailed Hawk but smaller. Light and dark morphs occur; the dark is very rare. Light birds have whitish underwings with a narrow black border except the inner leading edge of the wing. The tail has white and black bands.

Distribution and Status
A rare breeder in British Columbia, northwest of Prince George, mainly known from the Peace River and Fort Nelson area. In recent years, it has been found annually in very small numbers during fall migration in southern British Columbia, especially extreme southern Vancouver Island.

Habitat
Inconspicuous and secretive during the breeding season, Broad-winged Hawks are rarely seen at that time in British Columbia. Little is known of its breeding habitat in the province. The few breeding records for British Columbia indicate that like elsewhere in its range, nesting habitat is extensive mixed or deciduous forests with clearings, often near water.

In recent years, during fall migration (mainly late September to late October), a handful of Broad-winged Hawks have been seen near Rocky Point on southern Vancouver Island. The habitat there is very hilly with forested parks, hobby farms, houses and military bases. They are occasionally seen flying over Victoria. It is not the type of habitat that attracts them to this area. Rather, like many other raptors, Broad-winged Hawks prefer not to fly across large bodies of water. Any Broad-winged Hawk on Vancouver Island during fall migration likely ends up at the southern tip of the Island where it waits for the right weather conditions to cross Juan de Fuca Strait on its way south.

Food Habits
Broad-winged Hawks hunt by perching unobtrusively in the forest, often at the edge of a clearing, and watching for potential prey. The wide range of prey in their diet includes small mammals, amphibians, insects, and young birds (Goodrich et al. 1996).

Ferruginous Hawk (*Buteo regalis*)

COSEWIC: Special Concern **B.C. status: Red**

Identification (Length 56-69 cm; Wingspan 135-145 cm)
The Ferruginous Hawk is similar to the Red-tailed Hawk, but slightly larger with relatively longer more pointed wings. Light- and dark-type birds occur but light ones are much more frequent. Light adults are nearly all white below with rusty coloured legs and mostly dark above. The tail is variable: all

white or sometimes with some pale rusty or grey near the tip. Some Red-tailed Hawks are very pale with whitish tails and are best separated by the different shape and proportions. A sample of vocalizations can be heard at: Link.

Distribution and Status
British Columbia is at the very edge of its range and it is a very rare bird in the province. Two breeding records are known from the southern Interior. Most sightings are during migration. Ferruginous Hawks from central Washington move north to Alberta after breeding (Watson and Pierce 2001) and possibly contribute to summer and fall sightings in British Columbia. Spring sightings may be birds breeding in the province or spring migrants that have over shot their normal range.

Habitat
In other parts of its range, the Ferruginous Hawk uses grasslands, deserts and shrub-steppe habitats. Because there have been so few sightings in British Columbia the preferred habitat in the province is little known. Most sightings have been in open dry locations in the southern interior especially the Okanagan and Nicola valley areas. Both nests that have been reported in British Columbia were in trees (Campbell et al. 1990). The species may be extirpated in B.C. since breeding has not been documented in recent years (M. Chutter, pers. comm.).

Food Habits
Searches for prey while perched or flying in open habitats. In the western part of its range the principal prey are hares and rabbits (Bechard and Schmutz 1995). Nothing is known about its diet in British Columbia.

Gyrfalcon (*Falco rusticolus)*

COSEWIC: Not at Risk B.C. status: Blue-listed

Identification (Length 50-61 cm; Wingspan 110-130 cm)
The Gyrfalcon is the largest falcon in the world. It has the typical falcon shape (pointed wings and narrow tail) although the wings are relatively broader than in other large falcons. Their variable plumage can be white to dark grey, or dark brown. Gyrfalcons lack the broad dark vertical mark on the face of the Peregrine Falcon. The tail extends far beyond the wing on perched birds, unlike other falcons. A sample of vocalizations can be heard at: Link.

Distribution and Status
Mainly an arctic species; in B.C., the Gyrfalcon is only known to breed in the extreme northwest part of the province, though it may breed in other parts of the north (sightings have occurred in Spatsizi Park as well as in the extreme northeast corner of the province). It can occur throughout the rest of the province during the nonbreeding season. Most sightings are along the coast. A very small number winter each year in the Lower Mainland.

Habitat
Prefers open country year-round. During the winter it is seen most often in farm fields near Boundary Bay and Roberts Bank where one or two birds occur most winters. In coastal areas it is often seen along rocky shorelines and estuaries.

Food Habits
The Gyrfalcon is a versatile hunter able to locate prey while perched, soaring or actively flying. It will chase prey for long periods of time unlike most other raptors, sometimes forcing the prey high into the air. The Gyrfalcon's diet is mostly of birds up to the size of grouse and geese (Clum and Cade 1994). During the winter in coastal British Columbia, it likely preys mainly on waterfowl and seabirds.

Northern Hawk Owl (*Surnia ulula)*

COSEWIC: Not at Risk B.C. status: Yellow

Identification (Length 41 cm; Wingspan 71 cm)
The Northern Hawk Owl is a medium sized owl with relatively long wings and tail. Facial disc has a dark border. The eyes are yellow. It is dark brown above with pale spots. Pale below barred with dark brown. It is darker brown than the smaller and shorter tailed Northern Saw-whet Owl. It has a longer tail than the Boreal Owl. When seen perched, it appears more like a falcon than like other owls due to its long tail and less upright posture. A sample of vocalizations can be heard at: Link.

Distribution and Status
Widespread in British Columbia except the coastal ranges, Vancouver Island and the Queen Charlotte Islands. Although common in the north of the province, it is thinly distributed in appropriate habitat in the south.

Habitat
In British Columbia, it breeds in areas of spruce forest. In the southern half of British Columbia, spruce forests are found at higher elevations. In northern British Columbia, spruce forests are more widespread and so is the Northern Hawk Owl. Like many northern raptors, it may move in search of prey and at that time can occur in urban and rural habitats mainly agricultural areas.

Food Habits
Hunts during daylight or darkness. Mainly hunts by perching high up in a tree with a view of open ground. It specializes in capturing small mammals—primarily voles and mice (Duncan and Duncan 1998).

Great Gray Owl (*Strix nebulosa)*

COSEWIC: Not at Risk B.C. status: Yellow-listed

Identification (Length 61-84 cm; Wingspan 132 cm)
The Great Gray Owl is a very large, greyish owl with large facial discs, yellow eyes and no ear tufts. Only the Great Horned Owl (has ear tufts) and Snowy Owl (much paler) are similar in size to the Great Gray Owl. The Barred Owl is smaller with dark eyes. A sample of vocalizations can be heard at: Link.

Distribution and Status: An uncommon resident in the interior of the province and rare winter visitor to southwestern B.C.

Habitat
Although a bird of the forest, it is usually seen along the edge of the forest adjacent to an open area. In areas where this species is common it can be seen sitting on fence posts or telephone poles along roads in areas of forest and open habitats. It usually nests in abandoned nests of other large raptors, but also will nest in the top of snags and on artificial platforms.

Food Habits
Hunts mainly at night, but also will hunt during twilight. It usually perches in an elevated position overlooking potential prey habitat. The diet is almost entirely of small mammals, mainly rodents. Like several other northern raptors, Great Gray Owls will move widely if there is a lack of prey in their nesting region (Bull and Duncan 1993).

Snowy Owl (*Bubo scandiacus)*

COSEWIC: Not at Risk B.C. status: Yellow-listed

Identification (Length 58 cm; Wingspan 132 cm)
The Snowy Owl is a large, mostly white owl. The white plumage has a variable amount of black barring depending on age and sex. The eyes are yellow. About the same size as the Great Horned Owl (some individuals are very pale) but lacks ear tufts. A sample of vocalizations can be heard at: Link.

Distribution and Status
Circumpolar, breeding north of the treeline. During winter may move south. In some years they travel long distances to the central United States. Occurs in British Columbia only during the winter. In some years, dozens may be seen on the Lower Mainland and southern Vancouver Island.

Habitat
The Snowy Owl inhabits open Arctic tundra during the breeding season, and open habitats of many types during winter when it moves south of the treeline. In British Columbia, it is most often seen in agricultural fields, beaches, wetlands, and airport fields. It commonly perches in trees and on the ground, fence posts, towers and buildings.

Food Habits
Hunts mainly by sitting and scanning for potential prey. Pounces on prey on the ground; will chase birds through the air or take them off the water. Primarily takes small mammals to the size of large hares. Birds up to the size of geese are also taken (Parmelee 1992).

Boreal Owl *(Aegolius funereus)*

COSEWIC: Not at Risk **B.C. status: Yellow-listed**

Identification (Length 21-28 cm; Wingspan 55-62 cm)
The Boreal Owl is a small owl with a large head and long wings. Facial disc is greyish-white with a dark brown border. The eyes are yellow. Underparts are whitish streaked by dark brown. The upperparts are brown with white small white spots. As with the related Northern Saw-whet Owl, the immature's plumage is quite distinct from the adults, being a uniform dark sooty brown with obvious white eyebrows. A sample of vocalizations can be heard at: Link.

Distribution and Status
Common and widespread throughout most of interior British Columbia. Generally resident in its breeding territory. However, like several other northern raptors, it will move to new areas during winter in search of food.

Habitat
Breeding habitat is boreal spruce forests with deciduous stands in northern parts of the province, and subalpine forests of spruce and subalpine fir in the southern parts. It nests in cavities in trees, but also uses nest boxes in many parts of its range including British Columbia. During winter, the Boreal Owl may be found in unusual habitats and locations. Very few sightings of this species have been made during the winter away from known breeding locations.

Food Habits
Boreal Owls hunt at night by sitting and waiting for prey then pouncing. Small mammals mainly mice and voles make up most of the diet. Birds and insects are also taken (Hayward and Hayward 1993).

11 Glossary

Biodiversity: (biological diversity): the diversity of plants, animals, and other living organisms in all their forms and levels of organization, including genes, species, ecosystems, and the evolutionary and functional processes that link them. (MOF Web Glossary - Link).

Buffer: An area of land that surrounds and protects a sensitive feature from the adverse effects of activities on, or encroachments from, adjacent land.

Compliance monitoring: Measures performance against some environmental standard to establish a compliance record. May include audits, assessments, and reviews. Legal Definition: measurement of performance against practices required by law (e.g. regulations under the *Fish Protection Act*, *Wildlife Act*, etc.). Practices Definition (not required by law): Measurement of performance against environmental standards, policies, best management practices or plans that are recommended but not required by law. CAUTION: In some British Columbia ministries, the term "compliance" refers exclusively to performance against legal standards.

Effectiveness monitoring: Measures environmental condition in the context of a program, policy, plan or activity to gauge progress towards its desired outcomes or effects. Different from compliance monitoring in that rather than addressing whether people are complying with environmental standards, effectiveness monitoring attempts to uncover whether those standards are having an effect in the environment.

Environmental Impact Assessment: A study of the potential future effects of resource development on other resources and on social, economic and/or environmental conditions. (MOF Web Glossary).

Goal: goals provide general purpose and direction. They are the end result of ultimate accomplishment toward which an effort is directed. They generally should reflect perceived present and future need. They must be capable of being effectively pursued. (MOF Web Glossary). An ideal; a desired endpoint; frequently defined in abstract terms. Goals are qualitative and are achieved by means of objectives. (Dunster and Dunster 1996).

Guidelines: a set of recommended or suggested methods or actions that should be followed in most circumstances to assist administrative and planning decisions, and their implementation in the field. Guidelines may consist of policy statements, procedures, or checklists. They are provided as a broad framework of recommended actions to be taken and, therefore, provide some flexibility for decision making. Note that guidelines cannot, by definition, be mandatory; such actions are prescribed by regulations or rules. (Dunster and Dunster 1996).

Inventory: a single enumeration of an ecological system; generally carried either as a basis for estimating potential yield or to establish a benchmark. An inventory may act as one point in time in a monitoring program. Ecological inventories may be more comprehensive and spatially/temporally discrete than monitoring activities.

Mitigation: measures implemented to control, reduce or eliminate a potential adverse impact of a project, including restorative measures. (Environmental Assessment Office 2003).

Monitoring: repeated, systematic measurements done with a specific purpose in mind. Monitoring is focused on measurements over time in order

to detect the change toward, or away from, a stated standard or objective. Monitoring is part of the cycle of assessment and evaluation that is linked to management activities.

Objective: a quantifiable, measurable and defined target, capable of attainment within a defined period of time. Objectives are the means by which goals are achieved and should include four main components: 1. they must state the desired outcome (i.e., what is to be accomplished.); 2. They must indicate the time period within which the expected outcome is to be achieved; 3. They must include measurement factors, such as quantity, quality, or cost, so that the fulfilment of the objective can be verified; 4. They must indicate who is responsible for achieving the indicated result. Desirable (but not absolutely essential) elements of objectives are a description of how they will be achieved and an indication of who will determine whether the results have been achieved. Objectives are typically narrower and shorter in range than goals, and serve as milestones toward goal achievement. (Dunster and Dunster 1996).

Precautionary Principle: The UN Convention on Biodiversity 1992 defined this principle as follows: "Where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat."

Professional biologist: is registered in B.C. under the *College of Applied Biology Act*, and acting under the college's code of ethics and subject to disciplinary action by the college, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide sound advice within their area of expertise.

Rehabilitate: to restore ecosystem functions and processes in a degraded system or habitat. (Dunster and Dunster 1996).

Reporting: the process of effectively communicating the results of monitoring and their potential implications to a target audience.

Restore: to return ecosystems or habitats to their original structure and species composition. Restoration requires a detailed knowledge of the (original) species, ecosystem functions, and interacting processes involved. (Dunster and Dunster 1996).

Results-based performance standards: Typically define a maximum permissible disposal or impact threshold. For example, the concentration of a particular chemical in waste water discharge or a receiving environment; minimum in-stream flow levels; forest age class distribution within a defined zone. Requiring users of the environment to stay within the established threshold is presumed will achieve the environmental goal that the standard relates to. Results-based performance standards must be scientifically supported, as locally-relevant as possible, accepted by the public and

stakeholders, enforceable by being capable of being measured, and affordable and feasible to implement (Brown, 2002).

Risk: the probability that an undesirable event will or will not occur. It is the product of the probability of the event taking place, the probability of being exposed to the event, and the probability of certain outcomes occurring if exposure did take place. Risk can be statistically quantified in a risk assessment. (Dunster and Dunster 1996).

Standard: quantifiable and measurable thresholds that are typically defined in law or regulation, and are mandatory. A statement that outlines how well something should be done, rather than how it should be done. A standard does not necessarily imply fairness or equity, or an absolute knowledge of cause-and-effect linkages. Standards are typically established using a combination of best available scientific knowledge, tempered by cautious use of an established safety (caution) factor. (Dunster and Dunster 1996).

Stewardship: caring for the land and associated resources so that healthy ecosystems can be passed on to future generations. (Dunster and Dunster 1996).

12 References

Allen, E.D. and G.W. Morrison. 1996. Common Tree Diseases of British Columbia. Natural Resources Canada, Canadian Forest Service, Victoria, BC. 178pp.

Andrusiak, L.A. and K.M. Cheng. 1997. Breeding biology of the Barn Owl (*Tyto alba*) in the Lower Mainland of British Columbia. Pp. 38-46 *in* J.R. Duncan, D.H. Johnson, T.H. Nicholls, eds. Biology and Conservation of Owls of the Northern Hemisphere. Second International Symposium. USDA Forest Service General Technical Report NC-190.

Bechard, M.J. and J.K. Schmutz. 1995. Ferruginous Hawk (*Buteo regalis*). *In* The Birds of North America, No. 172. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Bechard, M.J. and T.R. Swem. 2002. Rough-legged Hawk (*Buteo lagopus*). *In* The Birds of North America, No. 641. A. Poole, F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Bezener, A.M. 2004. Western Screech Owl: Fact Sheet. One Wild Earth Ecological Services. 2pp.

Bildstein K.L. and K Meyer. 2000. Sharp-shinned Hawk (*Accipiter striatus*). *In* The Birds of North America, No. 482. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Blackburn, I.R. and A.S. Harestad. 2002. Supplement to the Population Assessment of the Northern Spotted Owl in British Columbia 1992-2001. B.C. Ministry of Water, Land and Air Protection and Simon Fraser University, Victoria and Burnaby, BC. 47pp.

Blood, D.A. and G.G. Anweiler. 1994. Status of the Bald Eagle in British Columbia. Wildlife Working Report No. WR-62. Wildlife Branch, B.C. Ministry of Environment, Lands and Parks, Victoria, BC.

Bosakowski, T. and D.G. Smith. 2002. Raptors of the Pacific Northwest. Frank Amato Publications, Inc. Portland, OR. 151pp.

Brown, D. 2002. Performance-based Environmental Management in British Columbia. Daryl Brown Associates Inc. and Victoria Consulting Network Ltd. Written for B.C. Ministry of Sustainable Resource Management, Ministry of Water, Land and Air Protection, and Environmental Assessment Office, Victoria, BC. September 2002.

Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). *In* The Birds of North America, No. 506. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Bull, E.L. and J.R. Duncan. 1993. Great Gray Owl (*Strix nebulosa*). *In* The Birds of North America, No. 41. A. Poole and F. Gill, eds. Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

Butler, R.W. and R.W. Campbell. 1987. The Birds of the Fraser River Delta: Populations, Ecology and International Significance. Occasional Paper No. 65. Canadian Wildlife Service, Ottawa, ON. 73pp.

Cade, T.J., M. Martell, P. Redig, G. Septon and H. Tordoff. 1996. Peregrine Falcons in Urban North America. *In*: D. Bird, D. Varland and J. Negro, eds. Raptors in Human Landscapes: Adaptation to Built and Cultivated Environments. Raptor Research Foundation/Academic Press, London, England. 396pp.

Campbell, R.W., M.A. Paul, M.S. Rodway and H.R. Carter. 1978. Tree-nesting Peregrine Falcons in British Columbia. Condor 79:500-501.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser and M.C.E. McNall. 1990. The Birds of British Columbia. Vol. 2: Diurnal Birds of Prey through Woodpeckers and Vol. 4. Passerines through Old World Sparrows. Royal British Columbia Museum, Victoria, BC.

Cannings, R.A., R.J. Cannings and S.G. Cannings. 1987. Birds of the Okanagan Valley, British Columbia. Royal British Columbia Museum, Victoria, BC. 420pp.

Cannings, R.J. and T. Angell. 2001. Western Screech-owl (*Otus kennicottii*). *In* The Birds of North America, No. 597. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Cannings, R.J. and A.M. van Woudenberg. 2004. Flammulated Owl. *In* Accounts and Measures for Managing Identified Wildlife. - Accounts V. 2004. B.C. Ministry of Water, Land and Air Protection, Victoria, BC. 8pp.

Cannings, R.J. 1987. The Breeding Biology of Northern Saw-whet Owls in Southern British Columbia. p. 193-198 *in* R.W. Nero, R.J. Clark, R.J. Knapton and R.H. Hamre, eds. Biology and Conservation of Northern Forest Owls: Symposium Proceedings. USDA Forest Service General Technical Report RM-142.

Cannings, R.J. 1993. Northern Saw-whet Owl (*Aegolius acadicus*). *In* The Birds of North America, No. 42. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Cannings, R.J. 2004. "Interior' Western Screech Owl. *In* Accounts and Measures for Managing Identified Wildlife - Accounts V. 2004. B.C. Ministry of Water, Land and Air Protection, Victoria, BC. 8pp.

Chaundy-Smart, R. 2001. Draft COSEWIC Status Report on Western Screech-owl (*Otus kennicottii*). Committee On the Status of Endangered Wildlife In Canada. 29pp.

Clum, N.J and T.J. Cade. 1994. Gyrfalcon (*Falco rusticolus*). *In* The Birds of North America, No. 114. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Cooper, J.M. and S.M. Beauchesne. 2004. Short-eared Owl. *In* Accounts and Measures for Managing Identified Wildlife. - Accounts V. 2004. B.C. Ministry of Water, Land and Air Protection, Victoria, BC. 8pp.

Darling, L.M. 2003. Status of the Vancouver Island Northern Pygmy-owl (*Glacidium gnoma swarthi*) in British Columbia. Wildlife Bulletin B-113. B.C. Ministry of Sustainable Resource Management. Conservation Data Centre, and B.C. Ministry of Water, Land and Air Protection, Biodiversity Branch, Victoria, BC. 14pp.

Dunbar, D.L., B.P. Booth, E.D. Forsman, A.E. Hetherington and D.J. Wilson. 1991. Status of the Spotted Owl (*Strix occidentalis*) and Barred Owl (*Strix varia*) in Southwestern British Columbia. Canadian Field-Naturalist 105:464-468.

Duncan, J.R. and P.A. Duncan. 1998. Northern Hawk Owl (*Surnia ususa*). *In* The Birds of North America, No. 356. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Dunster, J. and K. Dunster. 1999. Natural Resource Management Dictionary. University of B.C. Vancouver, BC. 380pp.

England, A.S., M.J. Bechard and C.S. Houston. 1997. Swainson's Hawk (*Buteo swainsoni*). *In* The Birds of North America, No. 265. A. Poole

and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Environmental Assessment Office. 2003. Guide to the British Columbia Environmental Assessment Process. Victoria, BC. March 2003.

Ethier, T.J. 1999. Breeding Ecology and Habitat of Northern Goshawks (*Accipiter gentilis laingi*) on Vancouver Island: A Hierarchical Approach. MSc Thesis, University of Victoria, Victoria, BC.

Ewins, P.J. 1994. Artificial Nest Structures for Ospreys— A Construction Manual. Environment Canada. Toronto, ON. 41pp.

Farr, A.C.M. and D. Dunbar. 1988. British Columbia's 1988 Midwinter Bald Eagle Survey, B. C. Ministry of Environment. Surrey, BC. 34pp.

Fraser, D.F., W.L. Harper, S.G. Cannings and J.M. Cooper. 1999. Rare Birds of British Columbia. Wildlife Branch and Resource Inventory Branch, B.C. Ministry of Environment, Lands and Parks. Victoria, BC. 244pp.

Gill, M. and R.J. Cannings. 1997. Habitat Selection of Northern Saw-whet Owls (*Aegolius acadicus brooksi*) on the Queen Charlotte Islands, British Columbia. p. 197-204 *In*: J.R. Duncan, D.H. Johnson and T.H. Nicholls, eds. Biology and Conservation of Owls of the Northern Hemisphere. Second International Symposium. USDA Forest Service General Technical Report NC-190.

Goodrich, L.J., S.C. Crocoll and S.E. Senner. 1996. Broad-winged Hawk (*Buteo platypterus*). *In* The Birds of North America, No. 218. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Gutiérrez, R.J., A.B. Franklin and W.S. Lahaye. 1995. Spotted Owl (*Strix occidentalis*). *In* The Birds of North America, No. 179. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Haug, E.A., B.A. Millsap and M.S. Martell. 1993. Burrowing Owl (*Speotyto cunicularia*). *In* The Birds of North America, No. 61. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Hayes, G.E. and J.B. Buchanan. 2002. Washington State Status Report for the Peregrine Falcon. Washington Department of Fish and Wildlife, Olympia, WA. 77 p.

Hayward, G.D. and P.H. Hayward. 1993. Boreal Owl (*Aegolius funereus*). *In* The Birds of North America, No. 63. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Henigman, M.E. 2004. Securing Present and Future Bald Eagle Nest Trees on the Nanoose Peninsula, Vancouver Island, British Columbia. MA Thesis, Royal Roads University, Victoria, BC.

Hobson, K.A. and S.G. Sealy. 1991. Marine Protein Contributions to the Diet of Northern Saw-whet owls on the Queen Charlotte Islands: A Stable Isotope Approach. Auk 108:437-440.

Holt, D.W. and J.L. Peterson. 2000. Northern Pygmy-owl (*Glaucidium gnoma*). *In* The Birds of North America, No. 494. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Holt, D.W. and S.M. Leasure. 1993. Short-eared Owl (*Asio flammeus*). *In* The Birds of North America, No. 62. A. Poole and F. Gill, eds. The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

Hooper, T.D. 1997. Status of the Prairie Falcon in the Chilcotin-Cariboo Region, British Columbia. B.C. Ministry of Environment, Victoria, BC. Wildlife Working Report WR-85. 11pp.

Houston, C.S., D.G. Smith and C. Rohner. 1998. Great Horned Owl (*Bubo virginianus*). *In* The Birds of North America, No. 372. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Kirk, D.A. 1999. Updated COSEWIC Status Report on the Northern Spotted Owl, *Strix occidentalis caurina*. Committee on the Status of Endangered Wildlife in Canada. 16pp.

Kirk, D.A. and C. Hyslop. 1998. Population Status and Recent Trends in Canadian Raptors: A Review. Biological Conservation 83:91-118.

Kirk, D.A. and M.J. Mossman. 1998. Turkey Vulture (*Cathartes aura*). *In* The Birds of North America, No. 339. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Kochert, M.N., K. Steenhof, C.L. McIntyre and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). *In* The Birds of North America, No. 684. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Lane, A. (EDITOR). 1996. Best Management Practices: Fish and Wildlife Habitat Management. Ontario Ministry of Agriculture, Food and Rural Affairs. 91pp.

MacWhirter, R.B. and K.L. Bildstein. 1996. Northern Harrier (*Circus cyaneus*). *In* The Birds of North America, No. 210. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Manning, Cooper and Associates. 2003. Best Management Practices for the Maintenance of Raptors during Land Development in Urban/Rural Environments of Vancouver Island Region (Region 1): MWLAP Discussion Document. Report prepared for B.C. Ministry of Water. Land and Air Protection. Nanaimo, BC.

Marks, J.S., D.L.Evans and D.W. Holt. 1994. Long-eared Owl (*Aegolius funereus*). *In* The Birds of North America, No. 133. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Marti, C.D. 1992. Barn Owl (*Tyto alba*). *In* The Birds of North America, No. 1. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Mazur, K.M., P.C. James and S.D. Frith. 1997. Barred Owl (*Strix varia*) Nest Site Characteristics in the Boreal Forest of Saskatchewan. Pp. 267-271 *in* J. R. Duncan, D. H. Johnson and T. H. Nicholls, eds. Biology and Conservation of Owls of the Northern Hemisphere. Second International Symposium. USDA Forest Service General Technical Report NC-190.

Mazur, K.M. and P.C. James. 2000. Barred Owl (*Strix varia*). *In* The Birds of North America, No. 508. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

McCallum, D.A. 1994. Flammulated Owl (*Otus flammeolus*). *In* The Birds of North America, No. 93. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

McClaren, E. 1999. Northern Goshawk Population Inventory for Vancouver Island, British Columbia, 1994–1998. p. 251-262 *In* Proc. Biology and Management of Species and Habitats at Risk, Kamloops, B.C., 15–19 Feb. 1999.

MELP. 1999. Landscape Unit Planning Guide (Forest Practices Code of British Columbia). Co-published by Ministry of Environment, Lands and Parks, Resource Stewardship Branch, Environment Regional and District Offices. 1999.

Nowlan, L., C. Rolfe and K. Grant. 2001. The Smart Growth Guide to Local Government Law and Advocacy. Co-published by Smart Growth BC.

Parmelee, D. 1992. Snowy Owl. *In* The Birds of North America, No. 10. A. Poole, P. Stettenheim and F. Gill,, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Phinney, M. 1998. Spring and Summer Birds of Dawson Creek 1991-1995. WTB Wildbird Trust of British Columbia Wildlife Report 4:1-60.

Poole, A.F., R.O. Bierregaard and M.S. Martell. 2002. Osprey (*Pandion haliaetus*). *In* The Birds of North America, No. 683. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Preston, C.R. and R.D. Beane. 1993. Red-tailed Hawk (*Buteo jamaicensis*). *In* The Birds of North America, No. 52. A. Poole and F. Gill, eds. The

Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Richardson, C.T. and C.K. Miller. 1997. Recommendations for Protecting Raptors from Human Disturbance: A Review. Wildlife Society Bulletin 25(3):634-638.

Ritchie, R.J., T.J. Doyle and J.M. Wright. 1998. Peregrine Falcons (*Falco peregrinus*) Nest in a Quarry and on Highway Cutbanks in Alaska. Journal of Raptor Research 32:261-264.

Rosenfield, R.N. and J. Bielefeldt. 1993. Cooper's Hawk (*Accipiter cooperii*). *In* The Birds of North America, No. 75. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Rosenfield, R.N., J. Bielefeldt, J.L. Affeldt and D.J. Beckmann. 1986. Urban Nesting Biology of Cooper's Hawks in Wisconsin. Pp. 41-44 *in* D. Bird, D. Varland and J. Negro,, eds. Raptors in Human Landscapes: Adaptation to Built and Cultivated Environments. Raptor Research Foundation/Academic Pres, London, England. 396pp.

Smallwood, J.A. and D.M. Bird. 2002. American Kestrel (*Falco sparverius*). *In* The Birds of North America, No. 602. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Sodhi, N.S., L.W. Oliphant, P.C. James and I.G. Warkentin. 1993. Merlin (*Falco columbarius*). *In* The Birds of North America, No. 44. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Squires, J.R. and R.T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). *In* The Birds of North America, No. 298. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, The American Ornithologists' Union, Washington, DC.

Statistics Canada. 2005. The Loss of Dependable Agricultural Land in Canada. Rural and Small Town Canada Analysis Bulletin 6(1). January 2005. 16pp.

Steeger, C., H. Esselink and R.C. Ydenberg. 1992. Comparative Feeding Ecology and Reproductive Performance of Ospreys in Different Habitats of Southeastern British Columbia. Canadian Journal of Zoology 70:470-475.

Steeger, C. 2003. Life of the Osprey in Southern British Columbia. (Internet Link).

Steenhof, K. 1998. Prairie Falcon (*Falco mexicanus*). *In* The Birds of North America, No. 346. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

USDA. 1997. Tongass National Forest Land and Resource Management Plan. United States Department of Agriculture, Forest Service. (Internet Link).

USFWS. 1986. Recovery Plan for the Pacific Bald Eagle. U.S. Fish and Wildlife Service, Portland, OR. 160pp.

van Woudenberg, A.M. 1999. Status of the Flammulated Owl in British Columbia. B.C. Ministry of Environment, Victoria, BC. Wildlife Working Report WR-95. 29pp.

Ward, P., G. Radcliffe, J. Kirkby, J. Illingworth and C. Cadrin. 1998. Sensitive Ecosystems Inventory: East Vancouver Island and Gulf Islands 1993-1997. Vol. 1: Methodology, Ecological Descriptions and Results. Technical Report Series No. 320. Canadian Wildlife Service, Pacific and Yukon region, Delta, BC.

Warkentin, I.G., P.C.James. 1988. Nest-site Selection by Urban Merlins. The Condor 90: 734-738.

White, C.M., N.J. Clum, T.J. Cade and W.G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). *In* The Birds of North America, No. 660. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

Wildlife Tree Committee. 2001 Wildlife/Danger Tree Assessor's Course Workbook - Forest Harvesting and Silviculture Module. WCB, B.C. Ministry of Forests and Ministry of Water, Land and Air Protection, Victoria, BC. June 2001.

Wilson, L.K., J.E. Elliott and P.E. Whitehead. 1996. Chlorinated compounds in wildlife from the Fraser River Basin. Technical Report Series Number 251. Pacific and Yukon Region, Canadian Wildlife Service, Environmental Conservation Branch, Delta. BC. 73pp.

Yackel Adams, A.A., S.K. Skagen and R.L. Knight. 2000. Functions of Perch Relocations in a Communal Night Roost of Wintering Bald Eagles. Canadian Journal of Zoology 78:809-816.

Personal Communications

M. Chutter, B.C. Ministry of Environment, Victoria, BC

A. Stewart, B.C. Ministry of Environment, Victoria, BC

M. Bentley, Biologist, LGL Limited, Sidney, BC

P. Levesque, Vice President, Rocky Point Bird Observatory, Victoria, BC

13 Additional Information Sources

Management, conservation, and educational resources (with an emphasis on those available via the Internet) are listed below.

Bald Eagle: Management Guidelines and Recommendations in Ontario
http://www.mnr.gov.on.ca/mnr/forests/forestdoc/guidelines/pdfs/bald_eagle.pdf

Bald Eagle Information (US Fish & Wildlife Service)
https://ecos.fws.gov/species_profile/SpeciesProfile?spcode=B008

Barn Owl (Status in Canada)
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=44

Best Available Science for Northwestern Washington
http://www.metrokc.gov/ddes/cao/#best

Best Management Practices for Wildlife and Others in Ontario
http://www.gov.on.ca/OMAFRA/english/environment/bmp/series.htm#top

Best Management Practices for Forestry and Riparian Zone Management in Canada
http://www.wnmf.com/main/partners/working/buffer/reports/BZWG%20Final%20Report.pdf

Bibliography of Raptors and Humans
http://users.cybercity.dk/~ccc12787/bibacci/raptorandman.html

Flammulated Owl (Status in Canada)
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=48

Glossary of Terms; B.C. Ministry of Forests
http://www.for.gov.bc.ca/hfd/library/documents/glossary/

Guidelines and Best Management Practices in British Columbia

http://www.env.gov.bc.ca/wld/BMP/bmpintro.html

Greenhouse Agriculture and Wildlife in the Fraser Delta:
http://www.ec.gc.ca/science/sandenov/article6_e.html

Habitat Management Guidelines for Nesting Accipiters, Buteos and Eagles in Ontario
http://www.mnr.gov.on.ca/mnr/forests/forestdoc/guidelines/pdfs/buteos.pdf

Habitat Management: Enhancing Wildlife Habitat on Farmlands
http://ohioline.osu.edu/w-fact/0014.html

Habitat Management: Practices for Enhancing Wildlife Habitat (Pennsylvania)
http://pubs.cas.psu.edu/FreePubs/pdfs/uh107.pdf

Hawk Information: Links to many different sites
http://www.hawkwatch.org/links.php

Hawk Information: Northern Prairie Wildlife Research Centre
http://www.npwrc.usgs.gov/resource/taxa_n.htm

Hawkwatch International: Comprehensive Information on Hawks
http://www.hawkwatch.org/

Identified Wildlife under the Forest and Range Practices Act
http://www.env.gov.bc.ca/wld/identified/iwms2004.html

Inventory: Terms of Reference for an Urban Bio-inventory
http://wlapwww.gov.bc.ca/vir/pa/bmp-appendTOR.pdf

Inventory: Avian Inventory and Monitoring Protocols
http://www.parks.ca.gov/pages/734/files/imap%20bird%20protocol%20table%20.pdf

Inventory: B.C. Inventory Methods for Raptors
http://ilmbwww.gov.bc.ca/risc/pubs/tebiodiv/raptors/version2/rapt_ml_v2.pdf

Land Use in the Vicinity of Airports (Transport Canada)
http://www.tc.gc.ca/civilaviation/AerodromeAirNav/Regulatory/menu.htm

Management Recommendations for Washington's Priority Species, Volume IV: Birds
http://wdfw.wa.gov/hab/phs/vol4/birdrecs.htm

Natural Heritage Systems in Urban Settings
http://www.toronto.ca/moraine/pdf/natural_heritage_systems_urbanizing_settings.pdf

Northern Goshawk (*laingi* subspecies) Status Distribution and trends
http://www.sis.ec.gc.ca/ec_species/ec_species_e.phtml

Ospreys and Contaminants
http://www.ecoinfo.org/env_ind/region/osprey/osprey_e.cfm

Osprey: Management Guidelines and Recommendations in Ontario
http://www.mnr.gov.on.ca/mnr/forests/forestdoc/guidelines/pdfs/osprey.pdf

Osprey Nesting Platforms
http://www.mnr.gov.on.ca/mnr/forests/extension%5Fnotes/pdf/ospry.pdf

Owl Information: Northern Prairie Wildlife Research Centre
http://www.npwrc.usgs.gov/resource/taxa_n.htm

Owls: Biology and Conservation in the Northern Hemisphere
http://www.ncrs.fs.fed.us/pubs/gtr/other/gtr-nc190/toc.html

Owls: General Information
http://www.owlpages.com/

http://www.rci.rutgers.edu/~au/owl.htm

Peregrine Falcon Information and Monitoring Plan
http://endangered.fws.gov/recovery/peregrine/index.html

Peregrine Falcon (*anatum* and *pealei* Subspecies Status in Canada)
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=29
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=54

Pesticides and Birds
http://www.abcbirds.org/pesticides/ResourcesandLink.htm
http://www.ecoinfo.org/env_ind/region/bepesticide/bepesticide_e.cfm
http://www.vancouverisland.com/Wildlife/wildlife/information/Pesticides%20and%20Wild%20Birds.htm
http://www.mda.state.mn.us/appd/bmps/bmps.htm

Raptor Identification (Patuxent Center)
http://www.mbr-pwrc.usgs.gov/id/framlst/infocenter.html

Raptor Bibliography
http://www.calacademy.org/research/library/biodiv/biblio/raptor.htm

Raptors and Powerlines
http://www.eei.org/products_and_services/descriptions_and_access/suggested_pract.htm
http://www.eei.org/products_and_services/descriptions_and_access/mitigating_birds.htm

Raptors and the West Nile Virus:
http://www.dvrconline.org/WestNileVirus.html

Raptors and Wind Power Facilities
http://www.nationalwind.org/
http://www.nationalwind.org/workgroups/wildlife/

Raptors (and Other Wildlife; Alberta Government site)
http://www.srd.gov.ab.ca/fw/watch/index.html

Raptors (and Other Wildlife; Manitoba Government site)
http://www.gov.mb.ca/conservation/wildlife/managing/index.html

Raptors (and Other Wildlife; Ontario Government site)
http://ontariosforests.mnr.gov.on.ca/publications.cfm#guides

Short-eared Owl (Status in Canada)
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=60

Smart Growth British Columbia
http://www.smartgrowth.bc.ca
http://www.wcel.org/wcelpub/2001/13300.pdf

Species at Risk Act:
http://www.ec.gc.ca/press/2003/030605-2_b_e.htm

Spotted Owl Information (US Fish & Wildlife Service)
https://ecos.fws.gov/species_profile/SpeciesProfile?spcode=B08B

Spotted Owl (Status in Canada)
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=33#reference

Urban Birds and Wildlife trees
http://www.urbanecology.washington.edu/products/Rohila_urban_bird_snag_thesis2002.pdf

Urban Habitats Journal
http://www.urbanhabitats.org/

West Coast Environmental Law
http://www.wcel.org

Western Screech-owl (*macfarlanei* and *kennicottii* subspecies status in Canada)
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=720
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=719

Wildlife in Parks (Vancouver Parks Board)
http://www.city.vancouver.bc.ca/parks/info/wildlife/

Wildlife Species and Ecosystem Explorer (B.C.)
http://www.env.gov.bc.ca/atrisk/toolintro.html

Wildlife Status Reports: Alberta Wildlife
http://www.srd.gov.ab.ca/fw/status/reports/birds/index.html

14 Appendices

14.1Legislation

This information is based on a cursory review of relevant legislation concerning raptors and their habitat and does not represent a legal interpretation or opinion. For legal purposes, the reader must seek legal council and/or the official legislation.

Provincial Legislation

British Columbia Wildlife Act
The *British Columbia Wildlife Act* was designed to help protect and manage wildlife in British Columbia. Although most species of wildlife are included in this Act, marine mammals are not. All native birds described in the American Ornithologists Union Checklist of North American Birds, 7th Edition or its supplements, and all birds covered by the federal *Migratory Birds Convention Act* are included in this Act. In addition, some non-native species are included. This includes non-native upland game birds imported for hunting, all raptor species imported for falconry purposes, and some nuisance alien species designated as wildlife to enable their management and control.

The *Wildlife Act* has the power to designate Wildlife Management Areas. The minister may by regulation designate land as a Critical Wildlife Management Area for threatened or endangered species. If the Lieutenant Governor in Council considers that a species of wildlife is threatened with imminent extinction throughout all or a significant portion of its range in British Columbia because of the actions of humans, the Lieutenant Governor in Council may, by regulation designate the species as an endangered species. Note that there are presently four species classified as endangered under the Act, including one raptor—the Burrowing Owl. By the same method, if the Lieutenant Governor in Council considers that a species of wildlife is likely to become endangered in British Columbia, the Lieutenant Governor in Council may designate the species a threatened species.

A person that alters, destroys, or damages wildlife habitat, or deposits on land or water a substance or manufactured product or by product in a manner that is harmful to wildlife or wildlife habitat that person commits an offence under the *Wildlife Act*. Under the *Wildlife Act* (section 7(4), a regional manager may make orders prohibiting a person from:

"entering, cutting, picking, removing, altering, destroying or damaging vegetation in, disturbing or harassing wildlife in, releasing or abandoning an animal in, and allowing an animal to enter a wildlife management area, a critical wildlife area or a wildlife sanctuary."

A person who contravenes an order made under this subsection commits an offence.

Section 34 of the *Wildlife Act* is specific to birds and states that:
"A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys:

a) a bird or its egg,
b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or
c) the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg."

Subsection 34 (b) provides year-round protection to the nests of the species listed (Bald Eagle, Golden Eagle, Peregrine Falcon, Gyrfalcon, Osprey and Burrowing Owl) regardless of whether the nests are active or not. While all birds, their eggs and nests (when occupied by a bird or egg) are protected by the Wildlife Act, the habitat surrounding the nest site, or habitat needed for foraging, roosting, or wintering, is not unless specific habitat protection legislation is provided. Though this is a widely accepted view, it is not entirely true and similar legislation in the *Migratory Bird Convention Act* is currently under legal review. Firstly, section 34 extends protection to the tree a nest is in. Secondly, there is always some debate over what "injures, molests or destroy" means. Some argue that this only pertains to the bird, its nest and eggs, while others counter that by definition and under the auspices of due diligence, in order to protect an active nest, it must apply to some level of buffer. This has forced consultation and site-by-site compromises. The current legal challenge to the MBCA may change this. Other than for an actual nest tree or other nest site, habitat protection under the *Wildlife Act* occurs only for areas set aside as Wildlife Management Areas, Critical Wildlife Areas or Wildlife Sanctuaries. Except as permitted, statutes under Section 7 of the Act make it an offence to alter, destroy or damage wildlife habitat. Furthermore, it is an offence to deposit on land or water a substance or manufactured product or by-product in a manner that is harmful to wildlife or wildlife habitat in a wildlife management area. Additionally, it is an offence to enter, cut, pick, remove, alter, destroy or damage vegetation, or to disturb or harass wildlife, release or abandon an animal in, or allow an animal to enter a wildlife management area, a critical wildlife area or a wildlife sanctuary.

Another section of the *Wildlife Act* that has the potential to protect wildlife is Section 75; Accidental Killing of Wildlife. Section 75 states that:
"*A person commits an offence if the person:*
kills or wounds wildlife, other than prescribed wildlife, by accident or for the protection of life or property, and
does not report promptly to an officer the killing or wounding and the location of the wildlife."

Note that Section 34 of the Act states that, unless a permit is obtained in advance, it is illegal to kill or trap a raptor on your property. Depending on

the offence, various penalties and fines may be imposed for offences under the *Wildlife Act* or a regulation under the Act.

Forest and Range Practices Act

For non-protected (i.e., non park) areas where industrial forestry is prevalent, The *Forest and Range Practices Act* provides for varying degrees of raptor habitat conservation. These include the Identified Wildlife Management Strategy and General Wildlife Measures. The Identified Wildlife Management Strategy allows for the creation of Wildlife Habitat Areas (WHAs). WHAs are usually small (i.e., typically <50 ha) areas of limiting habitat that have been mapped and approved by the chief forester and deputy minister of the Ministry of Environment. However, they can be large (hundreds of hectares) for some species such as the Northern Goshawk or Marbled Murrelet. WHAs are designed to minimize disturbance or habitat alteration to a species' limiting habitat or to a rare plant community. In most cases, the WHA consists of a core area that is protected from habitat alteration and a buffer to minimize disturbance. The Act provides for Identified Wildlife and General Wildlife Measures under Operational Planning Regulations. The net result is the establishment of a management practice that applies within a specified ecosystem unit as a general wildlife measure where necessary to maintain a specified habitat.

Ecological Reserve Act, Protected Areas of British Columbia Act, Park Act

These acts as well as associated pieces of legislation (e.g., Ecological Reserve Regulations, Application of Park Legislation to Ecological Reserves Regulation) serve to create and protect significantly important ecological sites that are located on Crown land (terrestrial or submarine). This Act provides very strong legal protection because the Act and regulations and orders made under it prevail over all other provincial legislation. For matters requiring cooperation between federal and provincial agencies, BC Parks will coordinate provincial participation.

Ecological Reserves are established through publication of a notice in the B.C. Gazette by the Minister responsible. The purpose of the *Ecological Reserve Act* is to reserve Crown land for ecological purposes including the following areas:

"*areas suitable for scientific research and educational purposes associated with studies in productivity and other aspects of the natural environment;*
areas that are representative examples of natural ecosystems in British Columbia;
areas that serve as examples of ecosystems that have been modified by human beings and offer an opportunity to study the recovery of the natural ecosystem from modification;
areas where rare or endangered native plants and animals in their natural habitat may be preserved; and
areas that contain unique and rare examples of botanical, zoological or geological phenomena."

The Ecological Reserve Regulations strictly regulate human activities in Ecological Reserves. Section 1 of the regulations state that

"*no person shall enter upon an ecological reserve for a purpose inconsistent with the Ecological Reserve Act, and without limiting the generality of the foregoing, no person shall prospect for minerals, cut timber, allow domesticated animals to graze, camp, light fires, trap or molest animals, build roads or trails, use motorized vehicles within an ecological reserve, or remove plants, animals or material from an ecological reserve.*"

Permits may be authorized for research or educational purposes. Permits may be cancelled or modified by the administrator when he considers such action advisable. Persons that commit an offence under the regulations are punishable by fine. The *Ecological Reserve Act* and related legislation has powers to protect wildlife as it is expressly stated that no person may molest animals in an Ecological Reserve. "Molestation of animals" is not defined in the Act.

Environmental and Land Use Act
The *Environmental and Land Use Act* is legislation that allows the provincial government to customize land use regimes to meet particular objectives. It is used when the government wants to formally designate areas where the desired management objectives do not neatly fit into any of the other designations available. This is strong legislation that makes it relatively easy for the province to be flexible and adaptive to local situations that are not easy to manage under other legislation.

Federal Legislation

Migratory Bird Convention Act
This legislation governs the 1916 Migratory Birds Convention, which was designed to protect and manage migratory bird species that used habitats in both Canada and the United States. The following species are covered by the Act: Waterfowl; cranes; rails and coots; shorebirds, including gulls and terns; pigeons and doves; insectivorous songbirds (excluding blackbirds); seabirds; loons; grebes; herons, egrets and bitterns. While this act supersedes the *Wildlife Act* for species that appear on both, it does not cover raptors, which only receive federal protection if they become covered by the *Species at Risk Act* (see below).

Species at Risk Act
The *Species at Risk Act* was given Royal Assent in the Canadian Parliament on 12 December 2002. The purpose of the Act is:

"to prevent Canadian indigenous species, subspecies and distinct populations of wildlife from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species and to encourage the management of other species to prevent them from becoming at risk."

This enactment established the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as an independent body of experts responsible for assessing and identifying species at risk. It provides that

COSEWIC's assessments are to be reported to the Minister of the Environment and to the Canadian Endangered Species Conservation Council and it authorizes the Governor in Council to establish by regulation the official list of species at risk based on that process. It requires that the best available knowledge be used to define long- and short-term objectives in a recovery strategy for endangered and threatened species and it provides for action plans to identify specific actions. It creates prohibitions to protect listed, threatened, and endangered species and their critical habitat. It recognizes that compensation may be needed to ensure fairness following the imposition of the critical habitat prohibitions. It creates a public registry to assist in making documents under the Act more accessible to the public. It is consistent with Aboriginal and treaty rights and respects the authority of other federal ministers and provincial governments.

The *Species at Risk Act* aims to protect threatened species and their habitats by using species assessments from COSEWIC to determine which species are threatened. The Act sets out the process whereby COSEWIC will classify species in Canada and the other duties of COSEWIC. Recovery strategies and action plans will be developed for species that are considered to be endangered, threatened, or extirpated. Management plans will be developed for species of special concern. Critical habitats for these species will be identified.

General prohibitions (Section 32) of the Act specify that:
"(1) No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species.
(2) No person shall possess, collect, buy, sell or trade an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species, or any part or derivative of such an individual.
(3) For the purposes of subsection (2), any animal, plant or thing that is represented to be an individual, or a part or derivative of an individual, of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species is deemed, in the absence of evidence to the contrary, to be such an individual or a part or derivative of such an individual."

Section 33 states that:
"No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada."

Species of concern are listed in three schedules within the Act depending on the time frame that COSEWIC has to finalize its evaluation of the conservation status of the species. The Act will be enforced by officers designated by the Minister. Contravention of the Act by persons or corporations is punishable by fines and imprisonment.