STANLEY PARK ECOLOGY SOCIETY

Best Management Practices for Species of Significance in Stanley Park

Submitted to: Alan Duncan, Vancouver Park Board

Submitted by: Robyn Worcester and Brian Titaro, Stanley Park Ecology Society

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Acknowledgments

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1.0 Introduction

Background

On May 6, 2010, Vancouver Park Board (VPB) directed their staff to form a working group in conjunction with the Stanley Park Ecology Society (SPES) to prioritize identified options for action on short-term restoration and enhancement activities to benefit the ecological health and biodiversity of Stanley Park's ecosystems. On January 17, 2011, VPB subsequently approved a series of recommended actions to be conducted in collaboration with SPES in the following five priority areas of concern: Beaver Lake's rapid infilling; Lost Lagoon's water quality; invasive plant species; fragmentation of habitat; and Species of Significance to Stanley Park. This is the Stanley Park Ecological Action Plan.
SPES is the only Park Partner working in Vancouver which is actively involved in wildlife management with Park Board staff. Examples of this unique partnership with the Park Board include the Co-Existing with Coyotes program, eagle nest monitoring, heron colony management and monitoring, and Canada goose management. SPES has also significantly contributed content to the Stanley Park Heron Colony Management Plan and the Stanley Park Forest Management Plan. During the 2006/07 windstorm restoration, SPES conducted biological surveys and environmental monitoring, participated on a task force and created reports on Species at Risk for the Park Board. Although not yet recognized in our Joint Operating Agreement, SPES currently leads all wildlife monitoring and related research programs in Stanley Park and additionally acts as a central point for communication about wildlife in the City of Vancouver for the public and the media.

Project Summary

The Stanley Park Ecological Action Plan includes an action which is to create Best Management Practices (hereafter referred to as BMP's) for Species of Significance in Stanley Park (refer to list below):

"Produce Best Management Practices for each group of Species of Significance to be written in collaboration by Park Board and SPES staff" (VPBR, 2011). Best management practices are techniques, methods, processes, activities, incentives or rewards that are more effective at delivering a particular outcome than any other technique, method, process, etc. With proper processes, checks, and testing, a desired outcome can be delivered with fewer problems and unforeseen complications. BMP's can also be defined as the most efficient (least amount of effort) and effective (best results) way of accomplishing a task, based on repeatable procedures that have proven themselves over time for large numbers of people.

Goal

'Species of Significance' are integral to biodiversity in Stanley Park and in Vancouver but are currently in rapid decline and/or vulnerable to disturbance, often through unintentional human activities. The goal of this project is to increase awareness concerning Species of Significance best management, regulations, and conservation. The deliverables from this project will be used in a future educational program for Park Board staff, similar to the staff awareness program after the adoption of the Stanley Park Heron Colony Management Plan (VBPR, 2006), e.g. crew talks, workshops, installation of fence and signage, etc.

Objectives

1) Create BMP's for each species or group of Species of Significance in Stanley Park, listed below, based on the most up-to-date information compiled or generated over time by SPES:

   - Species at Risk: Species listed by the federal government through the Committee on the Status of Endangered Wildlife in Canada (COSEWIC and red and blue listed by the BC provincial government through the Conservation Data Center CDC)
   - Keystone species
   - Nesting bald eagles
   - Rare species - endemic or otherwise rarely observed
   - Locally declining species – those which were once but no longer common in Stanley Park
   - Migratory birds - those protected under the Migratory Birds Convention Act, 1994.

2) Make these BMP's available in a readily accessible and understandable format, including photographs and maps, for Park Board staff and as a resource to groups elsewhere.

3) Clarify all existing laws and regulations pertaining to wildlife in general and Species of Significance in particular to ensure Park Board operations are in compliance.

Project Work Plan

Deliverable	Completion Deadline
Research and compile existing species information and resources from SPES, Park Board and other sources and report back with a finalized list of BMP's, to the satisfaction of the General Manager of the Park Board.	August 15, 2011
A minimum of twenty-five (25) Best Management Practices written for species as determined above.	November 30, 2011
Creation of a final Best Management Practices report, including photos and peer review, to be presented to Park Administration with all photos, maps, and documents to be provided in digital media to be used by Park Board staff, and proposing a process for the on-going internal review and updating the Best Management Practices as laws, environmental conditions, etc… change, to be recommended for adoption by the Park Board.	March 31, 2011

Key Staff and Project Partners

- **Robyn Worcester,** SPES Conservation Programs Manager, has a diploma in BCIT's Resource Management: Fish, Wildlife, and Recreation program, a BSc in Biology from SFU, and is a Registered Professional Biologist (RPBio).

- **Brian Titaro,** SPES Conservation Technician, has a BES in Environment and Resource Management and a Diploma of Excellence in Ecological Restoration and Rehabilitation from the University of Waterloo, and is a registered Environmental Professional in training (EPt).

- **Project Supervisor:** Alan Duncan, Environmental Planner for Vancouver Park Board. Author of Stanley Park Ecological Action Plan.

Methodology

The following BMP's were written by staff at the Stanley Park Ecology Society and were peer reviewed by experts related fields. The BMP's are either based on existing BMP's whenever possible (such as those written by the BC government) or are based on online research into management techniques used in other areas.

Photo: Paul Colangelo

Each BMP begins with a description of the species or group of species including threats to their survival and the special significance of the species (why were they chosen to be featured in a BMP format). For each BMP, a list of Wildlife Management Emphasis Areas (designated in the Stanley Park Forest Management Plan (VBPR, 2009)) is identified for areas in Stanley Park in which the species or group of species occurs, and a list of documented occurrences in Stanley Park based on SPES data or other reliable sources is provided. The relevant wildlife laws are given for each BMP followed by recommended:

- Best Management Practices for operations in Stanley Park
- Habitat Enhancement Opportunities, and
- Operations Timing.

The BMP and habitat enhancement sections are intended to act as a guide and as a reference, and are not considered 'policy', nor are they intended to be followed under every situation. They are based on sound information and advice gathered during SPES's research and reviewed by biologists and experts for those species. The 'operations timing' sections are based on relevant wildlife laws where these apply (i.e. for wildlife protected under the Species at Risk Act (2002), BC Provincial Wildlife Act (1996) or Migratory Birds Convention Act (1994)).

2.0 Species at Risk

Species at Risk (SAR) in Canada are native species that have been listed by the Ministry of the Environment based on recommendations from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Species listed under Schedule 1 of the Species at Risk Act (SARA) are extirpated, endangered or threatened in Canada and are afforded protection under federal law. The Government of BC lists species that are imperilled in the province through the Conservation Data Centre (CDC). In BC, Species at Risk are designated as either red listed (extirpated, endangered, or threatened), blue listed (special concern) or yellow listed (secure). The number of species at risk in an environment can be used as a measure of biodiversity and help to indicate where stresses are occurring on the natural system.

There are eight species which have been documented in Stanley Park that are listed on Schedule 1 of the SARA and there are 32 species that have been seen in Stanley Park which are listed by the CDC (either on the red or blue list). Of these, 21 are known to inhabit and/or breed in the Park and several rely heavily on the Park for breeding or wintering (including the Pacific great blue heron, surf scoter, barn swallow and double-crested cormorant). SARA-listed marbled murrelets and western screech-owls once commonly bred in the Park but are now rarely seen. There are several other SARA-listed species that are on record for the Park but we currently know little about their population status (e.g., Johnson‘s hairstreak butterfly, red-legged frog) and at least another four species that are not on record in the Park yet, but are found in similar areas (e.g., Pacific water shrew and Oregon forest snail).

The first field surveys aimed at locating SAR in Stanley Park were undertaken as a part of the windstorm Restoration Plan (2007). During the restoration, potential shrew habitat and other features such as wetlands and wildlife trees were protected in the interest of SAR and a task force was created to mitigate damage to their habitat. A comprehensive list and preliminary survey maps have been created by SPES for all species occurrences and habitat preferences in the Park.

Band-tailed Pigeon

Patagioenas fasciata

CDC: Blue
COSEWIC: Special Concern
BREEDING STATUS IN STANLEY PARK: Possible

Band-tailed pigeon.
Photo: Gary Kramer
Source: http://digitalmedia.fws.gov

Identification:
Band-tailed pigeons are relatively large pigeons at 33-40 cm in length. They're dark overall with a purple-grey head and breast, and a white collar on the nape with an iridescent greenish-bronze patch just below the collar. Their rumps and wing coverts are grey but paler than the rest of their grey upperparts. Tail is dark grey at the base with light grey across the tip; undertail is paler. Feet are yellow; bill is yellow with a black tip. Sexes look similar, but females are duller, with a narrower white crescent and less extensive iridescence. Males are slightly larger and juveniles lack the white crescent and iridescent patch on their nape (Cornell Lab, 2011a).

Behaviour:
Band-tailed pigeons are gregarious and often seen in flocks. During courtship, males perform a series of rapid flights alternating with short glides to attract a mate. Once in a tree, males bow to the female they're courting. Band-tailed pigeons are a nomadic species, traveling large distances in search of food and are likely breeding opportunistically in response to abundant food supplies. Both male and female band-tailed pigeons work together to build their nest, incubate the eggs and tend to their young (Ehrlich et al., 1988).

Habitat Requirements:
North American coastal populations are usually found below 1,000 m in a variety of forest types, especially pine-oak, spruce, fir, Douglas-fir, cedar, hemlock and alder. Site use probably depends on mineral content in food source, vegetation structure, traditional use by the species, and level of development and human activity (BC CDC, 2012a).

Breeding:
This species breeds in temperate and mountain coniferous and mixed forests and woodlands, especially pine-oak woodlands, and locally in southern lowland areas. They also forage in cultivated areas and suburban gardens (BC CDC, 2012a). Nests are built primarily in coniferous trees at a fork in a horizontal branch between 2 and 10 m above the ground. The nest is crudely built and shallow, consisting of crossed twigs and occasionally lined with pine needles. Pairs are monogamous, typically laying only one, although sometimes two, unmarked eggs. Eggs take 18 to 20 days to hatch and the young are born helpless, blind and naked. After 27 days the young are able to fly (Ehrlich et al., 1988).

Strong fidelity to nesting area is demonstrated with nest trees being used repeatedly and new nests being constructed each year in those trees (BC CDC, 2012a).

Food:
Foraging for food often takes place in diverse habitats not used for nesting (BC CDC, 2012a). Diet consists primarily of nuts but also includes various grains and berries. Food is typically collected directly off the tree foliage but ground collection of fallen nuts and berries also occurs (Ehrlich et al., 1988). Mineral sites are important and it was historically believed that calcium was sought for egg and crop milk development by eating elderberry and cascara, which are high in calcium. It is now believed that mineral sites are visited in search of sodium. Much of band-tailed pigeons' mid-summer diet is high in potassium, which causes an electrolyte imbalance. The sodium is essential for cellular functions as it counters and neutralizes this imbalance (COSEWIC, 2008).

Threats:
- Loss and degradation of breeding habitat and mineral sites through residential and industrial development; chemical contamination; disturbance at foraging and mineral sites; and predation on nests by invasive species (COSEWIC, 2008).
- Have long been hunted and continues to be susceptible to overhunting in California, Oregon, Arizona, Colorado, New Mexico, Utah, Mexico, Central and South America (NAS, 2011).
- Population was once nearly exterminated and populations continue to decline in most areas (Cornell Lab, 2011a).

Special Significance of the Species:
- Band-tailed pigeons have a long history in the old market hunting days (prior to 1916) as a bird harvested for food (COSEWIC, 2008).
- During the last 100 years it was an important bird for sport hunters. Currently, few hunters pursue this pigeon in Canada but it is observed with delight by bird watchers (COSEWIC, 2008).

Wildlife Management Emphasis Areas (WMEAs):
- Deciduous patches - small patches of deciduous trees, thickets of shrub communities and pioneering species that provide habitat for birds and other wildlife.
- Ecotones - located throughout the Park anywhere that two structurally distinct habitat types meet.

Applicable Wildlife Laws:
- BC Provincial Wildlife Act, 1996 – it is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Species at Risk Act, 2002.
- Migratory Birds Convention Act, 1994 - no person shall disturb, destroy or take a nest, egg or nest shelter… of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any area frequented by migratory birds.

Documented Occurrences in Stanley Park:

- Fairly common in spring, fall, and winter; rare in summer; species known or strongly suspected to breed in Stanley Park (Weber et al. 1988).
- Found in flocks off Lees Trail and Rawlings Trail (Monica Schroeder, pers. comm. 2007).
- Small flocks observed along Cathedral Trail in the spring of 2010 (Dalyce Epp, pers. comm. 2012).
- SPES data (2006-2011): Regular sightings along forest trails, in intertidal areas, near Prospect Point and around the heron colony.

Best Management Practices for Operations in Stanley Park:

- Create and maintain patches of deciduous trees, thickets and shrubs where they're present in Stanley Park: behind the Park Board works yard, south of Kinglet Trail, and in the old wildflower meadow near Prospect Point.
- Brushing tree plantations and trail sides: Use hand tools wherever possible. Retain non-competing vegetation. Avoid brushing in April, May, June, and in wildlife MEAs in July. Conduct breeding bird surveys and mark nests if brushing is to occur in May/June (hand tools only in these months) (VBPR, 2009).
- Special events and filming: Avoid disturbances in wildlife MEAs (especially during the breeding season) (VBPR, 2009).
- Invasive species removal: No large-scale removal during the breeding season (unless nesting surveys are completed); removed biomass and habitat should be replaced by adding mulch and/or planting species equivalent in wildlife value (i.e., salmonberry replaces blackberry, salal replaces ivy) especially where soil erosion or recolonization by invasives is a concern (VBPR, 2009).
- Small blowdowns in Wildlife Emphasis Areas generally should be left as they are. Those in other management areas also may be left as they are, or they may be bucked to ground level and replanted, depending on the surrounding fire fuel type.
- Control and reduce the spread of invasive plants and animals that compete with and prey on native wildlife, and destroy valuable habitat. Avoid the importation of soil material into or near the forest unless it is verified as being weed-free.

Habitat Enhancement Opportunities:

- Maintain existing deciduous patches in Stanley Park as unique ecosystems.
- Allow natural succession to take place in blowdown areas so that deciduous pioneering species can exist and provide habitat.

Operation Timing:

- Band-tailed pigeons arrive from their winter breeding grounds to southern BC in late February and continue to arrive through March and April. They then spend the summer breeding in deciduous patches before migrating south in late August and September (COSEWIC, 2008).
- During the summer breeding months between March and September, restrict noisy activities (such as filming, parades and special events) as well as Park maintenance operations to 100 m from deciduous patches in Stanley Park so as not to disturb breeding band-tailed pigeons.

Barn Swallow

Hirundo rustica

CDC: Red
COSEWIC: Threatened
BREEDING STATUS IN STANLEY PARK: Confirmed

Barn swallows.
Photo: Robyn Worcester

Identification:
Small (size: 15-19 cm) slender songbird; tail long and forked; upper parts steely iridescent blue; under parts rufous; forehead and throat chestnut; wings long; bill small and black; legs and feet tiny; acrobatic flier; sexes look similar, but males have deeper chestnut colour on under parts and longer tail streamers; juvenile looks similar to adult, but tail shorter and less forked, under parts paler (Cornell Lab, 2011b).

Behaviour:
Males pursue females in long, graceful courtship flights; on landing, the pair rubs heads and necks, interlock bills or mutually preen. Often nest in small colonies. Helpers are often seen at nest occasionally feeding nestlings. Helpers are usually yearlings or immature birds from the first clutch aiding their parents (Ehrlich et al., 1988).

Habitat Requirements:
Open situations, frequently near water such as wetlands, meadows, seashore. Wintering concentrations often associated with sugar cane fields in the tropics (BC CDC, 2011b).

Breeding:
Nest is a half-cup built out of mud and hidden under eaves of buildings (Sibley, 2000). Breeders tend to return to the same colony, same cluster of nests within the colony and occasionally the same nest and same mate (Ehrlich et al., 1988). Yearlings often return to within 30 km or closer to natal site (BC CDC, 2011b). Typically nest in barns or other buildings, under bridges, in caves or cliff crevices, usually on vertical surface close to ceiling. Both male and female birds help in building the nest that takes between 7 and 14 days to construct. Males may mate with only one or with several females, with each female producing between 4 and 7 eggs (Ehrlich et al., 1988).

Food:
Feed primarily on insects although will also occasionally eat berries and seeds. Barn swallows use a series of aerial foraging techniques to catch prey insects in mid-flight (Ehrlich et al., 1988).

Threats:

Typical barn swallow nest.
Photo: Robyn Worcester

- Loss of natural nesting sites, especially old trees with cavities (Pearson and Healy, 2011).
- Loss of nesting habitat due to the replacement of wooden-style farm structures to modern buildings that lack easy access to suitable nesting sites (Campbell et al., 1997).
- Loss of wintering habitat in Central and South America.
- House sparrows occasionally usurp barn swallow nests (Ehrlich et al., 1988).
- Majority of nestling mortalities in British Columbia are from nest infestation by the larvae of the parasitic blowfly (*Protocalliphora*) (Campbell et al., 1997).
- Reduced availability or contamination of food caused by wide spread insecticide use (Pearson and Healy, 2011).
- Predation by domestic pets, primarily house cats (Pearson and Healy, 2011).

Special Significance of the Species:

- The most abundant and widely distributed swallow species in the world (Cornell Lab, 2011b).
- Once nested in caves throughout North America, but now build their nests almost exclusively on human-made structures (Cornell Lab, 2011b).
- The killing of barn swallows for the hat-making prompted naturalist George Bird Grinnell's 1886 editorial in *Forest and Stream* decrying the waste of bird life. His essay led to the founding of the first Audubon Society (Cornell Lab, 2011b).

Wildlife Management Emphasis Areas:

- Ecotones: Located throughout the Park anywhere that two structurally distinct habitat types meet.
- Wetlands, streams and riparian: Zones of vegetation directly adjacent to freshwater watercourses and permanent or seasonally wet areas with distinct wildlife and plant communities and important features.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 – it is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 - no person shall disturb, destroy or take a nest, egg or nest shelter… of a migratory bird, or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.
- Species at Risk Act , 2002

Documented Occurrences in Stanley Park:

- Breeding colonies in Stanley Park located in the barns off Pipeline Road, under the bridge crossing Beaver Creek and under the stone bridge at Devonian Park (Robyn Worcester, pers. comm.).
- Common in spring, summer, fall. (Weber et al., 1988).
- SPES data: 1971-2006 - 50 sightings recorded, 1 to over 50 birds per sighting, Beaver Lake, Lost Lagoon, Coal Harbour
- SPES data: 2006-2012 – regularly observed in spring-summer bird counts.

Best Management Practices for Operations in Stanley Park:

- Control domestic pets (Pearson and Healy, 2011).
    - Use an animal control bylaw to prevent domestic pets from accessing the preferred habitat of barn swallows and other listed songbirds.
    - Produce and distribute information on the dangers that pets pose to songbirds in the City of Vancouver and Stanley Park.
- Reduce pesticide use (Pearson and Healy, 2011).
    - Ban insecticide and herbicide use for cosmetic purposes on lands within jurisdiction.
    - Eliminate insecticide and herbicide use on local government lands.
- Install and maintain nesting boxes (Pearson and Healy, 2011).
- Small blowdowns in Wildlife Emphasis Areas generally should be left as they are. Those in other management areas also may be left as they are, or they may be bucked to ground level and replanted, depending on the surrounding fire fuel type (VBPR, 2009).
- Survey and map important habitat areas for this species, to better understand their distribution and requirements in the Park.
- Monitor populations of this species to better understand trends in their abundance and use of the Park's habitat.

Habitat Enhancement Opportunities:

- Maintain and install new nest boxes at Beaver Lake and Lost Lagoon to increase nesting and breeding opportunities.
- Install new nesting boxes at the Park works yard.
- Maintain riparian areas and ecotones that currently exist in the Park as valuable habitat.
- Restore open lawn areas to meadow and field habitats where permissible, especially near water (example: southwest Lost Lagoon, Ceperly Creek area).
- Provide education for users about barn swallow nesting habitat (i.e. barns, buildings) and about the blue-listed status and need for conservation of this species.

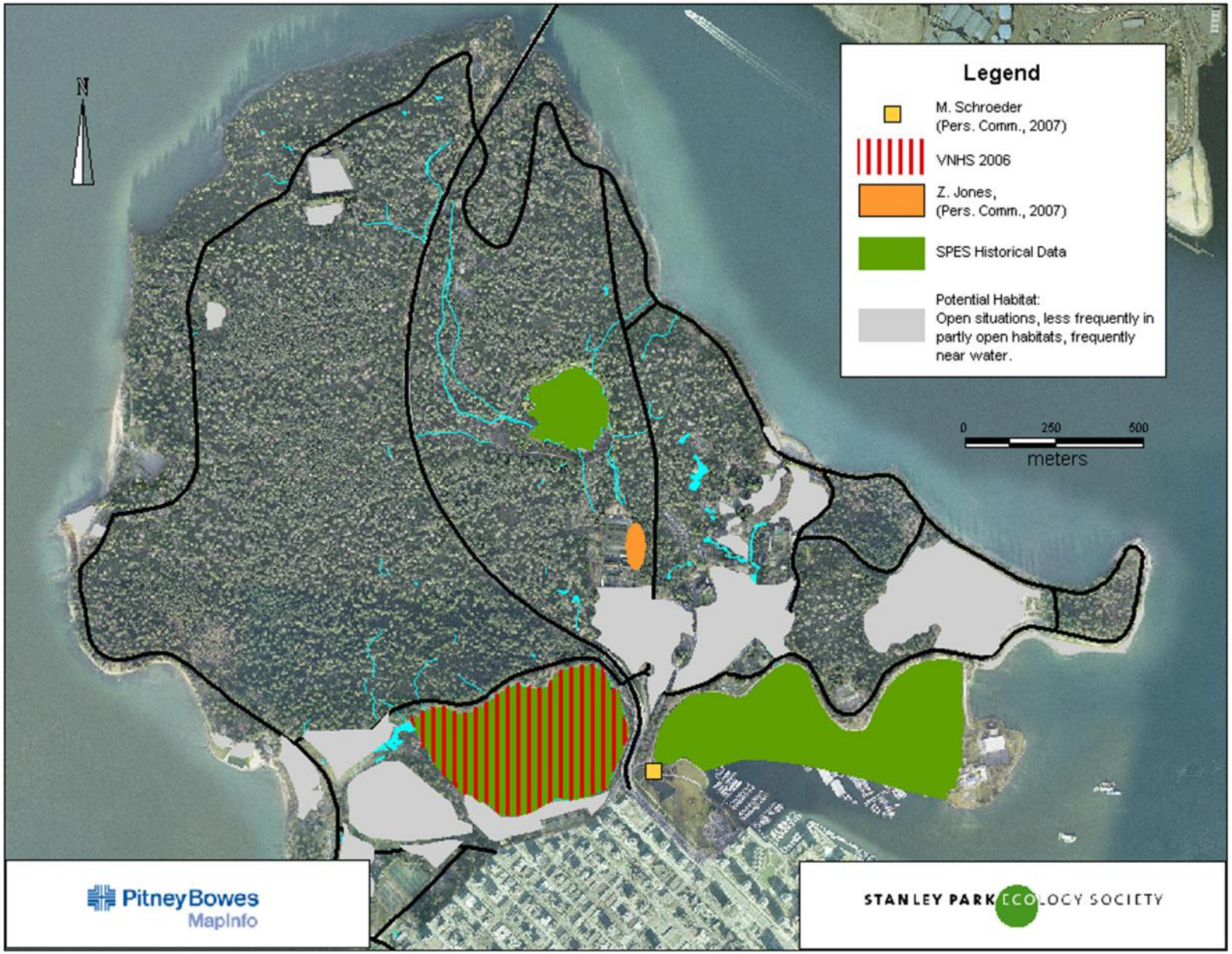
Operation Timing:

- Barn swallow nesting period in British Columbia extends from early May to late September and operations around active nests should be minimized to reduce disturbance to parents raising and feeding young (Campbell et al., 1997).
- Avoid disturbances within 30m of active nests during the breeding season (March-July).

Species at Risk Habitat in Stanley Park

Barn Swallow

Hirundo rustica



January 2009

Stanley Park Ecology Society

Blue Dasher

Pachydiplax longipennis

CDC: Blue
COSEWIC: Not listed
BREEDING STATUS IN STANLEY PARK: Confirmed

Adult male blue dasher.
Photo: Robert A. Cannings

Identification:
Mature males have a white face and green eyes; the abdomen is thickly coated with pale blue frosted cuticle, but the thorax is usually just thinly frosted. Thorax has yellow and brown stripes; base of the hind wing has an orange patch with two dark-brown streaks. Females and young males have brown eyes and a dark brown abdomen with two interrupted yellow stripes on the top (Cannings 2002a; Cannings 2002b).

Immature dragonflies (called nymphs) are aquatic, dark greenish brown and handsomely patterned, including cross banding on the upper legs (i.e. femora) (Milne and Milne, 2005). The dark ridge running inward from the hind margin of eye is a good field mark (Cannings and Stuart, 1977). Developing wing buds are present on top of thorax; have internal rectal gills. They have large heads and well-developed chewing mouthparts like those of adults but the floor of the mouth (i.e. labium) is greatly expanded into a hinged, grasping organ for capturing prey. Their eyes are typically smaller and their antennae are usually more prominent than those of adults (Haggard and Haggard, 2006).

Behaviour:
Adult hunting usually occurs from a perch from which the dragonfly darts out and grabs the prey. Adult males are highly territorial and frequently clash with other males. Both sexes actively defend their feeding perches (Zevit and Lilley, 2011). When perched, adult blue dashers often rest with their wings cocked downward (Cannings, 2002a).

Habitat Requirements
Blue dashers are most commonly associated with still, freshwater ecosystems that have an abundance of emergent vegetation (Zevit and Lilley, 2011). Typical habitat includes ponds, lakes, marshes, ditches, slow streams and other quiet bodies of water at low elevations (Odonata Central, 2007; Digital Atlas of Idaho, 2007). Where suitable habitat does occur, blue dashers are typically found in high concentrations. Preferred perching habitats for hunting include stems or twigs of shrubs and trees from ground to canopy level (Zevit and Lilley, 2011). Larvae live among submerged aquatic vegetation (Odonata Central, 2007; Digital Atlas of Idaho, 2007).

In Stanley Park, blue dashers are sometimes seen in cultivated areas, which occur mostly in the eastern half of the Park and at its very southern edges (Robertson and Bekhuys, 1995), but also in a

variety of locations such as the picnic area near Prospect Point, the Hollow Tree, and Second Beach. Grassy areas that have not been mowed provide a special habitat for select species. Blue dasher dragonflies have been observed in grassy areas that have not been mowed (Peter Woods, pers. comm.).

Breeding:
Mating is brief and typically occurs during flight, although some is done while perched on the stems of plants or similar objects (Haggard and Haggard, 2006). Blue dasher eggs are laid directly in the water in ponds, marshy lakeshores and sluggish streams (Cannings 2002a; Cannings 2002b). Females lay eggs either while alone or in the company of guarding males by dipping the tip of their abdomen into the water when releasing the eggs although some will tap or splash the eggs into wet mud or moss (Cannings 2002a; Cannings 2002b).

Food:
All members of the Order Odonata (dragonflies and damselflies), including the blue dasher, are carnivores (Zevit and Lilley, 2011). Prey of adults includes a variety of soft-bodied flying insects from mosquitoes to moths. Dragonfly larvae usually prey on aquatic invertebrates, including mosquito larvae, aquatic fly larvae, mayfly larvae, freshwater shrimp and larvae of their own species or those of other dragonflies or damselflies. Larger species may eat small fish or larval amphibians (Zevit and Lilley, 2011; Odonata Central, 2007; Digital Atlas of Idaho, 2007).

Threats:
- The preferred habitat of the blue dasher, especially small ponds and marshy lakeshores, is often subject to destruction by and reduction in structural complexity from various land uses (dredging, infilling) (Zevit and Lilley, 2011). This is the case for Beaver Lake in Stanley Park where infilling is taking place. Future dredging is possible. The water in the ecosystem itself is controlled by the City of Vancouver.
- Erosion and loss or alteration of stream bank, and lake and pond shoreline riparian vegetation can result in direct adult habitat loss.
- The degradation of water quality (for example, contaminated storm water runoff and broadcast spraying of pesticides and insecticides) and its impacts on associated habitat may impact the blue dasher at all of its life stages. Prey abundance and quality may also be affected (Zevit and Lilley, 2011).
- The spread and colonization of invasive plant species can impact the structural diversity and hydrology of the blue dasher's breeding habitat as well as the availability of its prey (Zevit and Lilley, 2011).
- The introduction or enhancement of fish species may increase predation pressure on the blue dasher and all Odonata populations, especially in the larval stages. Increased fish populations are also likely to alter aquatic habitat characteristics, such as the amount of emergent vegetation - which nymphs use for cover - and available prey species for nymphs and adults (Zevit and Lilley, 2011).

Special Significance of the Species:
- The presence of dragonflies is a visible indicator of the diversity and health of the surrounding aquatic ecosystems (Haggard and Haggard, 2006).

- Since both the adults and larvae are carnivorous, they play an important role as regulators of insect populations (Haggard and Haggard, 2006).
- As a result of their abundance at appropriate habitat sites, both larval and adult dragonflies, are an important food source for many species of wildlife (Haggard and Haggard, 2006)
- Although this species is locally common and abundant across its range in the southern half of North America, it is rare in the province and is restricted to south western BC (Rob Cannings, pers. comm.; Cannings 2002).
- The species depends on aquatic habitats (small marshy areas) in southern lowlands. These areas are highly populated by people and are often destroyed by development (Rob Cannings, pers. comm).

Wildlife Management Emphasis Areas:

- Riparian areas, wetlands and streams - Zones of vegetation directly adjacent to freshwater watercourses. Distinct wildlife and plant communities are supported by high soil moisture and nutrients. Important features may include snags, downed logs, deciduous plants, and uneven age canopy.

Applicable Wildlife Laws:

- Species at Risk Act , 2002 – 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. 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.

Documented Occurrences in Stanley Park:

- Observed/photographed at Beaver Lake and in adjacent riparian areas, and at Lost Lagoon near the platform and in riparian east of the stone bridge (Peter Woods, pers. comm. 2007).
- Between 2007 and 2008, scientists Rex Kenner and Karen Needham collected aquatic invertebrates at Beaver Lake for the Spencer Entomological Collection, Beaty Biodiversity Museum, including *Pachydiplax longipennis* (Needham and Kenner, unpublished data).
- Observed/photographed at the Lost Lagoon platform at the northwest corner of the lake (Stanley Park Bioblitz, 2011).

Best Management Practices for Operations in Stanley Park:

- Ensure that recreational activities taking place around known congregating areas (Beaver Lake, Lost Lagoon, riparian areas, picnic areas near Prospect Point, the Hollow Trees and Second Beach) do not impact local blue dasher populations (Zevit and Lilley, 2011).
- Continue the ban of broadcast and cosmetic pesticide use in Stanley Park so as not to indirectly target blue dashers or their prey species (Zevit and Lilley, 2011).
- Implement integrated storm water planning and management approaches that work to reduce and eliminate contaminated non-point source runoff entering Beaver Lake, Lost Lagoon, Beaver Creek and North Creek (Zevit and Lilley, 2011).
- Consider restoring historic maintenance regimes (i.e. seasonal flooding of lowland wetlands) where possible (Zevit and Lilley, 2011).
- Reduce operational disturbances and brushing in potential habitat (riparian and wetland) especially in May through August by:

- Reducing the frequency of disturbance (i.e. how often brushing/mowing occurs),
- Reducing the spatial application (i.e. exclude disturbance from a standard buffer),
- Excluding disturbance from a proportion of the areas of interest (i.e. identify disturbance exclusion zones along the length of lakeshore or stream).

Habitat Enhancement Opportunities:

- Remove invasive and aggressively spreading vascular plants (both aquatic and terrestrial) that are impacting the water and surrounding wetland habitat quality to protect blue dasher populations (Zevit and Lilley, 2011).
- Ecosystem restoration activities: Identify riparian edges that have been adversely affected by public activity or other maintenance activity; select portions for plantings of native shrubs and seeding of emergent vegetation; seed native grasses and wildflowers around the edges of grassy openings and picnic areas.
- Conduct public outreach to raise awareness of this species and how it can be identified. This will help improve knowledge of its distribution (Zevit and Lilley, 2011).
- Restrict mowing of grassy areas around Lost Lagoon, the picnic areas around Prospect Point, the Hollow Tree, and Second Beach where blue dashers are present or likely to occur by:
    - Creating a buffer around the edge of the clearing where mowing/brushing is not done to encourage native grass, herb and shrub development and structurally diverse edges for hunting and perching dragonflies.
    - Reduce the frequency of mowing/brushing in these grassy areas (i.e. allow for prolonged undisturbed periods between operations).
- Riparian edges (lake, pond, stream):
    - Include signage to encourage people to stay on the trails and viewing platforms; signs can have a photo of a blue dasher on it (and other SAR associated with the aquatic habitat) .
    - Place barriers on approaches to viewing platforms to minimize excessive wear to shorelines.
    - Ensure walking trails are appropriately cross-drained and/or ditched so that rainwater is directed away from the pond, lake, wetland or stream to avoid sediment transport into the aquatic habitat.

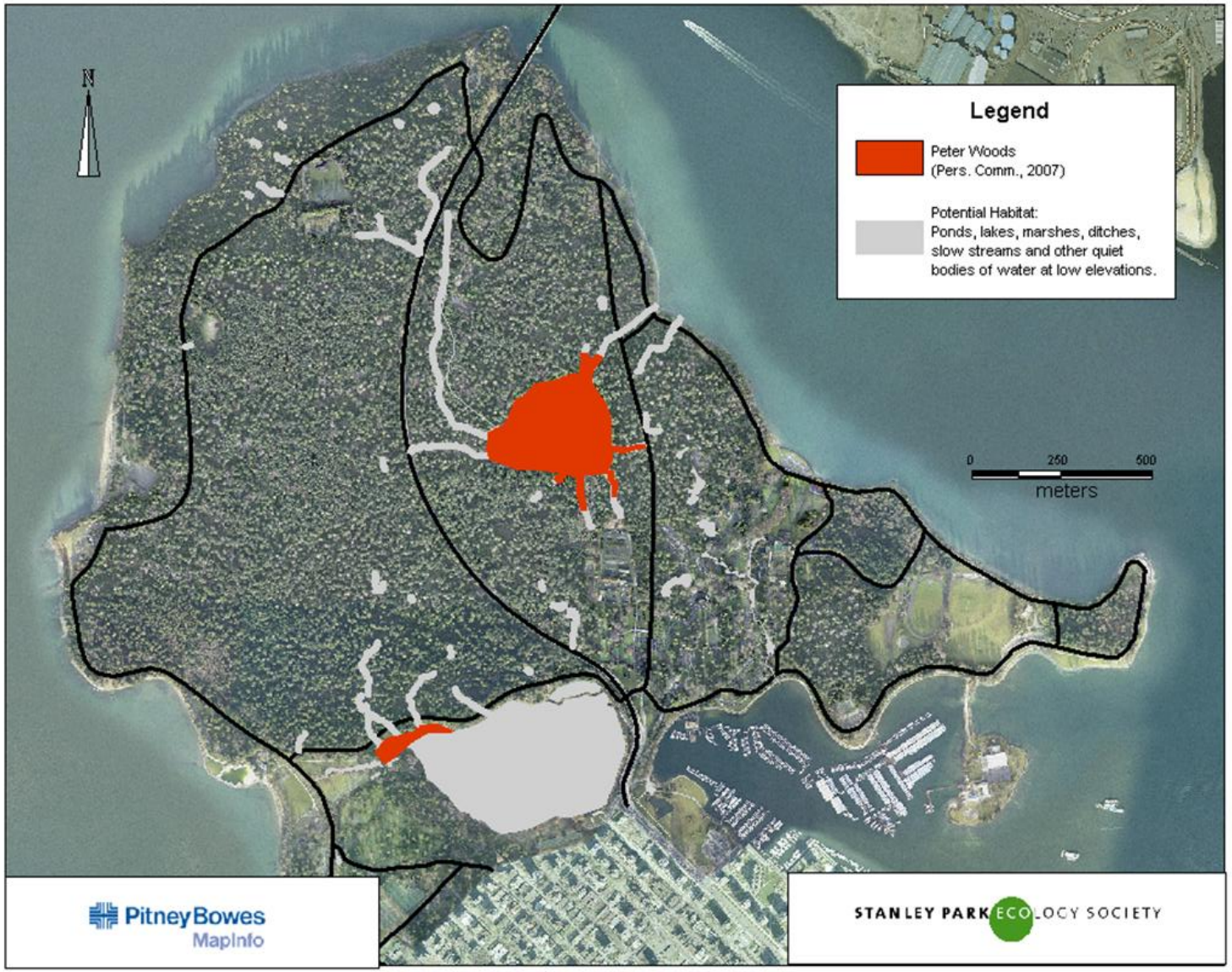
Operation Timing:

- Adult emergence, breeding and egg deposition typically takes place in BC between May and August. In parts of Washington State, the dragonfly has been observed as late as October (Zevit and Lilley, 2011).
- During this time, management activities in and around known active locations (i.e. viewing platforms and the NW corner of Lost Lagoon and Beaver Lake) should be minimized to avoid disturbance of perching and breeding habitat (i.e. no trailside brushing, mowing, plant removal, etc.).

Species at Risk Habitat
in Stanley Park

Blue Dasher (a.k.a. Swift Long-Winged Skimmer)

Pachydiplax longipennis



January 2009

Stanley Park Ecology Society

Johnson's Hairstreak

Callophrys johnsoni

CDC: Red
COSEWIC: Not listed
BREEDING STATUS IN STANLEY PARK: Possible

Johnson's hairstreak butterfly.
Photo: Peter Woods

Identification:
Slightly larger-than-average butterfly; wingspan: 25-30 mm. Upper side chocolate brown in male and reddish brown in female; underside brown with thin white post median band (Univ. Michigan 2008). Larvae are flattened, short, oval and slug-like (Haggard and Haggard, 2006)

Behaviour:
Hairstreak butterflies are rapid flyers and, when resting, hold their wings together over their backs unlike other closely related butterfly species (Haggard and Haggard, 2006). Larvae secret a sugary solution through a "honey gland". Ants in turn feed on this solution and protect the caterpillar from predators (Guppy and Shepard, 2001; Layberry et al., 1998).

Habitat Requirements:
Hairstreak butterflies occur mostly in mature or old-growth coniferous forests with western hemlock trees (BC CDC 2012c; Univ. Michigan 2008). Adults often frequent forest openings, riparian areas and forest edges with abundant wildflowers that are nearby to their preferred forest habitat. Juveniles require hemlock dwarf mistletoe, a perennial parasite, which inhabits hemlock forests and spreads its sticky seeds through explosive ejection whereby they take root on the branches and foliage on which they land (Guppy and Shepard, 2001; Layberry et al., 1998).

Breeding:
Adult emergence, breeding and egg deposition take place between late May and early July (Guppy and Shepard, 2001; Layberry et al., 1998). Only one brood is produced per year and eggs are laid directly onto mistletoe. The larvae mature and pupate quickly after the eggs hatch. They overwinter as a pupa before emerging the following late May and repeat the cycle (Layberry et al., 1998; Opler et al. 1995; Guppy and Shepard 2001). In BC, the larvae of this species require hemlock dwarf mistletoe to complete their lifecycle (Guppy and Shepard, 2001; Layberry et al., 1998).

Food:
Larvae feed on all of the exposed parts of dwarf mistletoe plants which in BC is typically hemlock dwarf mistletoe and is associated with western hemlock and Douglas fir forests. Adults feed on the nectar of wildflowers such as dull Oregon grape, goatsbeard, salmonberry and thimbleberry growing in forest and riparian openings (Guppy and Shepard, 2001; Layberry et al., 1998).

Threats:

- Johnson's hairstreaks are a naturally rare species; their preferred habitat has also been severely reduced over the last century (Zevit and Guppy, 2011; Xerces Society 2012).
- Populations are vulnerable to extirpation (especially undetected populations) when trees or stands infected with the preferred larval host plant are cleared or eliminated due to silviculture or hazard management practices (Zevit and Guppy, 2011).
- The larval host plant occurs in the forest canopy and is difficult to inventory. Additionally, adult butterflies are typically found in very small numbers and may be difficult to detect within forest communities (Zevit and Guppy, 2011).
- Invasive plants species can displace native plants that are the preferred nectar providers for adults (Zevit and Guppy, 2011).
- Land management practices such as pesticide applications may impact this species at all life stages as well as the host plant communities upon which they rely (Larsen *et al.* 1995; Zevit and Guppy, 2011).

Special Significance of the Species:

- Butterfly species are important pollinators for many flowering plants (BCE, 2008).
- Butterflies are a good indicator of the ecological quality of the habitat in which they live. They are an important component of the food chain, especially while in their larval stage (BCE, 2008).

Wildlife Management Emphasis Areas:

- Ecotones - This includes the edges between two distinct forest habitats and is seen near major blowdown areas, hard forest edges or between highly structurally distinct forest types. These are very productive areas for wildlife and offer multiple habitats in close proximity.
- Old growth patch - One stand of old growth trees is located in the area between Tunnel Trail and Pipeline Road and provides a picture of what the forest looked like prior to logging in the 1860's. This area is able to provide unique habitat for old growth dependent species.

Applicable Wildlife Laws:

- Species at Risk Act , 2002

Documented Occurrences in Stanley Park:

- Recorded in Pacific Spirit Park in 1995 by G. Scudder (Strix and Ryder 2002).
- Reported at Lost Lagoon in April 2004 (Mathias 2004, pers. comm.).
- Reports observe that this species may exist in Stanley Park in conjunction with dwarf mistletoe (VPB 1989).
- The Stanley Park population of the rare Johnson's Hairstreak butterfly was 'suspected to have been eliminated by spraying for gypsy moths' (Scudder 1996).
- Observed (1) wet grassy area northeast of the stone bridge on Lost Lagoon, (2) in wet grassy area east of the train yard just south of Park Drive, (3) in the grassy area adjacent to the Hollow Tree (Peter Woods, pers. comm. 2007).
- Recently photographed in the Park in June (Peter Woods 2011, pers. comm.).

Best Management Practices for Operations in Stanley Park:

- Maintain all remaining mature western hemlock trees and old-growth forest stands in Stanley Park as potential habitat for adult Johnson's hairstreak butterflies and other species that rely upon old growth forest characteristics.
- Whenever possible, retain hemlock trees infected with dwarf mistletoe as it is vital to the lifecycle of this species and provides change in the forest ecosystem by creating wildlife trees and structural diversity in the forest (Zevit and Guppy, 2011).
- Continue to ban broadcast and cosmetic pesticide use in Stanley Park so as not to indirectly target this species (Zevit and Guppy, 2011).
- Document and map observations of fruiting hemlock dwarf mistletoe on the branches or trunks of any tree as this may be a potential site for larval feeding.
- Following windstorms where trees are blown over, visit the windthrow site as soon as possible and note any hemlock that has fallen and whether there is indication of hemlock dwarf mistletoe. The fruiting bodies dry up quickly, but if larvae are present they may also be within the fruiting bodies on the tree.

Habitat Enhancement Opportunities in Stanley Park:

- Remove invasive plant species in potential habitat (i.e. old growth forests, areas with mature trees) so that they do not outcompete native flowering plants that this species is dependent upon for food sources (Zevit and Guppy, 2011; Larsen *et al.* 1995).
- Restrict mowing of grassy areas around Lost Lagoon, the picnic areas around Prospect Point, the Hollow Tree, and Second Beach where this species is present or likely to occur.

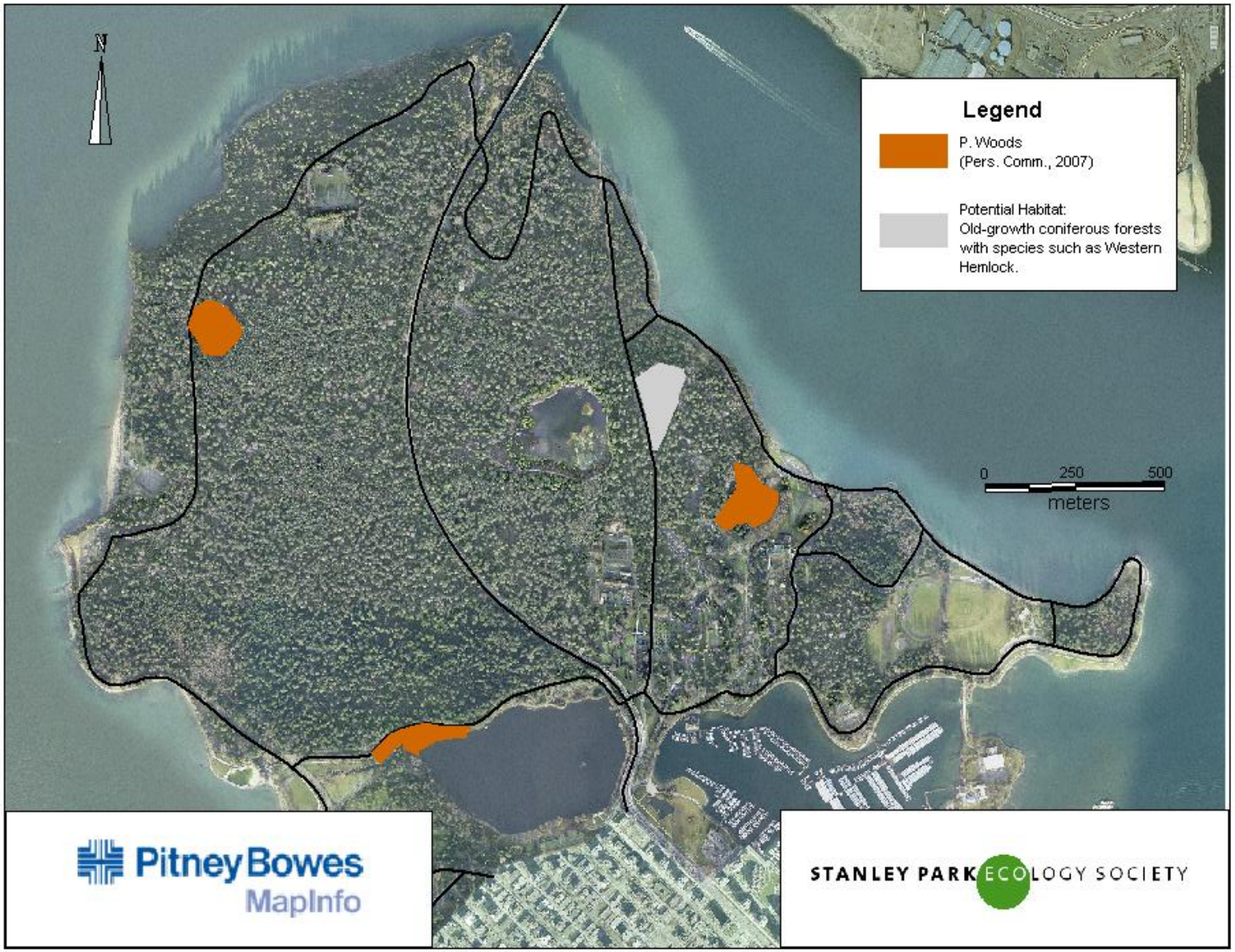
Operation Timing:

- This species is only active as adults between late May and early July.
- During this time management activities in and around known active or potentially active locations should be minimized to avoid disturbance to breeding and feeding sites (i.e. no trailside brushing, mowing, plant removal, coarse woody debris removal, hazard tree treatment/removal, spiral pruning etc.).

Species at Risk Habitat in Stanley Park

Johnson's Hairstreak

Callophrys johnsoni



January 2009

Stanley Park Ecology Society

Pacific Water Shrew

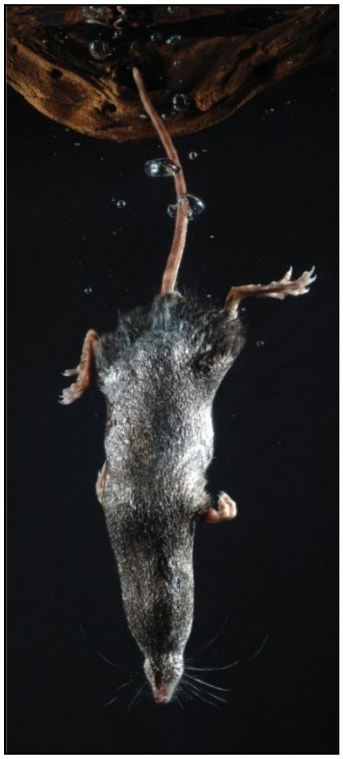
Sorex bendirii

CDC: Red
COSEWIC: Endangered
BREEDING STATUS IN STANLEY PARK: Possible

Pacific water shrew.
Photo: Denis Knopp
Source: http://www.shim.bc.ca

Identification:
Total length: 14-17 cm; tail length: 6-8 cm. Fur is velvety black or brownish-brown with slightly lighter undersides in winter. In summer the fur is slightly browner in appearance. The tail is dark both above and below, the nose is pointed, and the hind feet are fringed with stiff hairs that help in swimming. The common water shrew is similar in appearance; however it has lighter undersides and a bicoloured tail (Eder and Pattie, 2001).

Behaviour:
When hunting underwater, it will seize prey in its jaws and carry it to land before eating. Likely relies on touch to detect prey underwater using the sensitive vibrissae (whiskers) on its long snout. It will cache excess food to be consumed later. It can run short distances along the water's surface before diving under, where it can swim for several minutes by propelling itself with alternating movements of its hind legs. Its waterproof fur traps in air, making it appear silvery in colour and provides buoyancy (Eder and Pattie, 2001; Nagorsen, 2012).



A common water shrew (close relative to the Pacific water shrew) displaying typical water shrew diving behaviour.
Photo: Kenneth C. Catania
Source: www.nature.com

Habitat Requirements:
This species is strongly associated with moist environments, and it inhabits riparian areas adjacent to slow-moving streams and wetlands. It is typically found in streamside forests of red alder, big leaf maple, western hemlock or western red cedar, and in skunk cabbage patches. These habitats typically have extensive canopy cover as well as abundant shrubs and coarse woody debris. The Pacific water shrew is less dependent on standing water than a close relative, the common water shrew, and during periods of heavy rain may move up to 1km away from the nearest water body (Eder and Pattie, 2001; Nagorsen, 2012).

Breeding:
Young are born in a bulky nest of dry grass often located beneath the loose bark of a fallen tree or within a rotted log or stump. Virtually nothing is known about the gestation period or the time to independence of young. Relative to other small mammals, shrews are slow to reach sexual maturity. They only live for about 1.5 years and don't breed until after their first winter, whereas most rodents begin

breeding within a few weeks of birth. This is an important factor for conservation initiatives as shrews' limited time for reproduction makes their population more sensitive to disturbance (Gliwicz and Taylor, 2002).There is no breeding data for populations in BC, however in other parts of its range the breeding season extends from late January to late August, with most young born in March. Males do not breed in their first summer (Nagorsen, 2012).

Food:
Specialized diet consisting of aquatic insects (water beetles and the nymphal stages of stoneflies, mayflies and alderflies), craneflies, ground beetles, spiders, harvestmen, centipedes, earthworms, slugs and small terrestrial snails. Aquatic invertebrates typically make up 25% of the diet. Much of what is known about the feeding behaviour comes from observations of captive individuals (Nagorsen, 2012).

Threats:

- The greatest threats to survival and recovery of this species is from habitat loss and fragmentation from urban sprawl, road development, golf course construction, and agricultural activities. This is compounded by this species' naturally low occurrence, unique habitat requirements, and that fact that its range in BC coincides with the most heavily populated urban centre in the province (Nagorsen, 2012).
- Aquatic invertebrates are negatively affected by even minor levels of pollution and are an important prey source for Pacific water shrews. The loss of this food source can result in localized populations starving. In addition, contaminants such as oil might reduce the insular properties of the fur (COSEWIC, 2006). Main sources of pollution in Stanley Park would be runoff from roads (salt, sand and oil).
- Mortality from domestic cats is a potentially important threat in urban areas. The rate of mortality from domestic cats on shrew populations is unknown but could be an important source of localized mortality (Galindo-Leal and Runciman, 1994).
- No formal predation studies have taken place, but owls, Pacific giant salamander, and fish are the most likely natural predators of this shrew (Nagorsen, 2012).
- Trapping mortality – accidental deaths resulting from traps designed to target other species (e.g., minnow and rodent traps) may sometimes result in a locally high mortality rate (COSEWIC, 2006).

Special Significance of the Species:

- Pacific water shrew is a predator of terrestrial and aquatic invertebrates, and it helps in the control of these species (PWSRT, 2009).
- The Pacific water shrew is a part of the Pacific Coastal faunal element, a group of unique coastal mammals that share the same distributional range from northern California to BC and southeast Alaska (COSEWIC, 2006).
- The Pacific water shrew is at its most northern range in southwestern BC. Such peripheral populations are particularly important for the conservation of rare species (Lesica and Allendorf, 1995). Accordingly, because this is the only area in Canada where this species is known to occur, it is red-listed in BC and federally listed as endangered.

Wildlife Management Emphasis Areas:

- Wetlands, streams and riparian - zones of vegetation directly adjacent to freshwater watercourses and permanent or seasonally wet areas with distinct wildlife and plant communities and important features.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996
- Species at Risk Act , 2002

Documented Occurrences in Stanley Park:

- To date, no Pacific water shrews have been collected or observed in the Park, but a local resident and naturalist believes that she observed a water shrew near Lost Lagoon. However, this sighting may have been that of the Pacific water shrew's close relative, the common water shrew, which is not as rare (Monica Schroeder, pers. comm.).
- During the 2007-2008 Restoration in Stanley Park, Ecologic Consulting and B. A. Blackwell and Associates assessed Species at Risk and identified high quality habitat for Pacific water shrews in the Park.

Best Management Practices for Operations in Stanley Park:

- All naturally occurring riparian forest habitat, including both younger successional forests and mature or old-growth forests, should be permanently maintained and needs to be wide enough to support shrew populations. Some researchers have suggested buffer strips of 60 to 100m may be required. Currently 30 to 50m wide riparian management areas are recommended by the Forest Practices Code (Blood, 1995) and 75m buffer are recommended by the Identified Wildlife Management Strategy for establishing Wildlife Habitat Areas for this species (Lindgren, 2004).
- Prevent habitat fragmentation and encourage habitat connectivity by identifying, maintaining, and restoring a connected network of dispersal habitats within the potential range of Pacific water shrews in Stanley Park (PWSRT, 2009).
- Prevent the inadvertent loss of not-yet discovered populations by conducting a survey of potentially suitable habitat.
- Maintain access to current habitat models, maps occurrence data, essential habitat data, and management tools (PWSRT, 2009).
- Address immediate threats such as mortality from introduced predators and incidental captures by educating visitors on the importance of keeping pets on leash and not releasing wildlife into Stanley Park. Ensure fish, amphibian and small mammal trapping programs are complying with trapping BMPs to protect incidental species captures (PWSRT, 2009).
- Reduce or limit the creation of any additional trails directly adjacent to riparian areas.
- Reduce brushing and trail maintenance within 50 meters of North Creek and Beaver Creek.
- Leave coarse woody debris in riparian areas to provide nesting habitat.

Habitat Enhancement Opportunities:

- Restore historical and important potential habitats to rehabilitate/retain recovery sites for Pacific water shrews by planting appropriate native vegetation and scattering coarse woody debris in riparian areas (PWSRT, 2009).

Operation Timing:

- Pacific water shrews inhabit riparian areas which are highly sensitive to disturbance. Work in and around riparian areas should be limited to only that which is deemed as highly necessary. It should not include activities such as trailside brushing (which will negatively impact riparian areas and their associated species), but may include activities such as danger tree removal for public safety reasons.
- Necessary streamside work should be limited to winter months, when Pacific water shrews are more likely to be dispersed away from riparian areas. Work should not take place during the breeding season, which can extend from late January to late August.

Western Screech-Owl

Megascops kennicottii kennicottii

CDC: Blue
COSEWIC: Schedule 1, Special Concern (May 2002)
BREEDING STATUS IN STANLEY PARK: Possible

Western screech-owl.
Photo: Jerry Oldenettel
http://www.flickr.com/photos/jroldenettel

Identification:
This is a small owl with feathered 'ear tufts', pale face with dark lateral border, streaked underparts and barred; yellow eyes and dark bills. Sexes are alike in plumage characteristics; plumage brown or grey-brown in the northwest. Some populations in coastal regions of the Pacific Northwest have more variable in colour, often displaying reddish-brown morphs. Feet and toes are feathered in northern populations (BC CDC, 2012d).

Behaviour:
It is a nocturnal species, calling and feeding almost exclusively at night. Pairs are monogamous and territorial throughout the year, and can be heard calling in all seasons to varying degrees.

Habitat Requirements:
Woodland, especially broadleaf and riparian woodland, and scrub. Also mixed forests of northwest coastal regions consisting of big leaf maple, red alder, Douglas-fir, western hemlock, and western red cedar. It is also known to use urban and suburban parks, and residential areas. Usually found at lower elevations, closely linked to riparian habitats, these areas often the first habitat in any given area to suffer effects of urban development.

Breeding:
It nests in natural tree cavities or abandoned woodpecker holes. Breeding populations continually threatened by rapid urbanization and degradation of habitat, and face possible competition from exotic species such as European starlings. Currently no official data on trends of population densities, however, populations probably declining slowly with habitat loss. This species lays a single clutch of two to seven eggs between mid-March and the end of May (SARA, 2010).

Food:
Feeds mainly on small mammals (mice and shrews), insects, birds, and sometimes also on other small vertebrates such as fish and reptiles (BC CDC, 2012d; Cornell Lab, 2011c; Univ. Michigan, 2008).

Threats:

- The relationship between these owls and forestry practices has not been studied, but it has been suggested that forestry operations negatively affect screech-owl habitat, both through timber harvesting and the removal of dead trees that serve as potential nest-cavity sites. A severe loss

and degradation of riparian habitats is the main reason for the decline of western screech-owls in the Interior. Local declines have occurred in Vancouver, but the reason for these declines is undetermined.

- The abundance of barred owls greatly increased in the Park during the same period as the western screech-owl populations declined and predation by barred owl on western screech-owl is one theory used to explain this decline. However, the great horned owl population also increased near Victoria during the same period. They also occasionally collide with vehicles and windows.

Special Significance of the Species:

- It is considered an indicator species for healthy riparian ecosystems throughout most of its range. Its dependence on older trees for roosting and nesting cavities and its position near the top of the food chain, make it an ideal choice for an umbrella species in multispecies conservation plans (SARA, 2010).

Wildlife Management Emphasis Areas:

- Wetlands, streams and riparian – the areas of vegetation around Beaver Lake and Lost Lagoon as well as along all streams.
- Old-growth Patches - between Pipeline Road and Tunnel Trail east of Beaver Lake.
- Ecotones - located throughout the park and are areas where two structurally distinct habitat types meet.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 – it is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Species at Risk Act , 2002

Documented Occurrences in Stanley Park:

- On list for study area (Robertson and Bekhuys, 1995).
- Frequently heard in wooded parts of the Greater Vancouver area, and can be expected in Stanley Park (Robertson and Bekhuys, 1995).
- Natural Areas Map – habitat for Western Screech Owl (Parks Canada, 2002).
- Listed as uncommon in spring, summer, fall and winter (Weber et al., 1988).
- In the mid-1990s, western screech owl nest boxes were erected in the Park. The boxes were monitored for the next three years but no owl nesting activity was observed (Mike Mackintosh, pers. comm.).
- Sightings of western screech owls and other species have been reported to the SPES Nature House staff over the years (Koren Johnston, pers. comm.).
- During the restoration efforts in 2007, owl-call playback surveys were conducted by biologists and SPES staff in the Park. SPES carried on conducting these surveys as a long-term monitoring program, and in March 2008 and 2011 western screech-owls responded to call playbacks near Blowdown area S2 (off South creek trail) and near Beaver Lake (Worcester, 2010).

Best Management Practices for Operations in Stanley Park:

- Retain edge habitats – especially small-medium openings in the forest canopy.
- Maximize retention of hedgerow and brushy thickets.

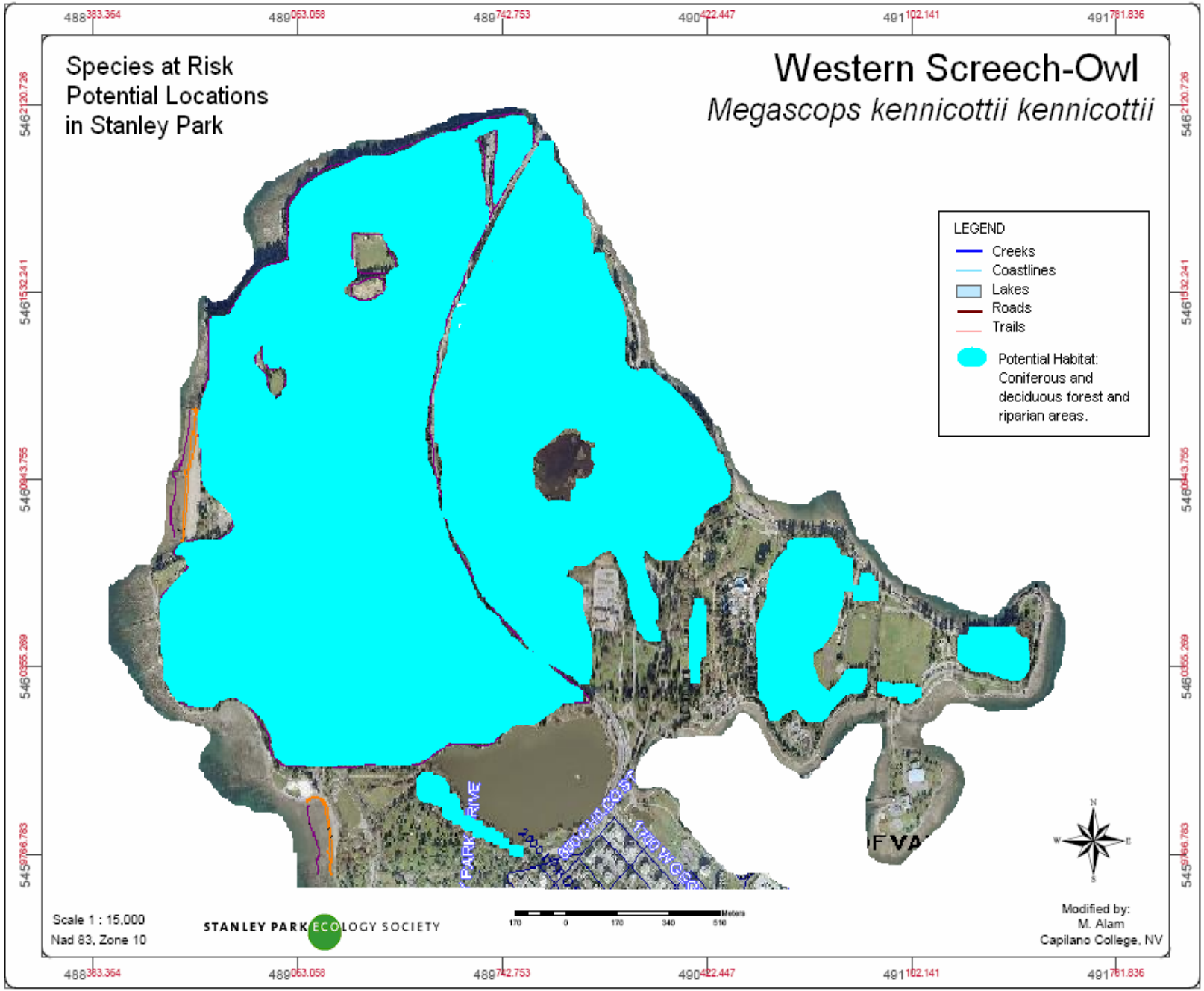
- Protect riparian areas and snags within.
- Preserve all trees and snags used or suspected of being used by owls as nesting sites.
- Protect existing and potential nest sites, including veteran recruit trees and trees with natural cavities.
- Reduce brushing in potential habitat.
- Maintain a minimum buffer of 1.5 tree lengths, consisting of undisturbed natural vegetation, around nest sites in trees (BC MOE, 2005).

Habitat Enhancement Opportunities:

- Let grass grow longer to improve rodent habitat.
- Install nest boxes where natural cavities are scarce, especially in riparian areas.
- Restore habitats where natural vegetation has been removed or altered, by removing invasive species and/or planting native plants.
- Protect owls from crashing into windows by installing shapes in the relevant windows or closing blinds (BC MOE, 2005).

Operation Timing:

- Breeding from March-August, concentrated in April-June. Avoid brushing, thinning, or hazard tree treatment in known or potential nesting locations.
- Restrict noisy activities (such as filming, parades and special events) as well as Park maintenance operations to 200m or greater away from nest sites from March-August.


Species at Risk
Potential Locations
in Stanley Park
Western Screech-Owl
Megascops kennicottii kennicottii
LEGEND
Creeks
Coastlines
Lakes
Roads
Trails
Potential Habitat:
Coniferous and
deciduous forest and
riparian areas.
Scale 1 : 15,000
Nad 83, Zone 10
STANLEY PARK ECOLOGY SOCIETY
Modified by:
M. Alam
Capilano College, NV

Olive-sided Flycatcher

Contopus cooperi

CDC: Blue
COSEWIC: Threatened
BREEDING STATUS IN STANLEY PARK: Possible

Olive-sided flycatcher.
Photo: Brian E. Small
(Cornell Lab, 2011g).

Identification:
Large, stocky flycatcher (18 – 20 cm) with a large head and relatively short tail. Plumage is brownish-olive in colour above with a dull white to yellowish breast and belly, giving a vested appearance. Both male and females are similar in appearance (Cornell Lab, 2011g; BC CDC, 2012h). Easily identified by their loud, three note whistle that sounds like "quick, three beers" (OMNR, 2009).

Immature birds are similar to adults, but upper parts are more dark brown and their wing feather edges are brownish-buffy to brownish-white (Cornell Lab, 2011g; BC CDC, 2012h).

Behaviour:
Rushes from the tops of tall trees or snags to catch flying insects, a form of hunting known as "hawking". Will frequently return to the same perch to hunt and is known to beat large prey on its perch (Cornell Lab, 2011g).

Pairs will aggressively defend their nests. They have been observed knocking red squirrels off limbs near the nest and chasing them away (Cornell Lab, 2011g). Courtship includes territorial fights between male birds, and males actively pursuing females across the canopies of coniferous forests. These displays continue for at least two weeks until a nest site is chosen and the pairing is complete (BC CDC, 2012h). Territorial behaviour is observed in non-breeding sites and often display strong year-to-year fidelity to breeding and wintering locations (BC CDC, 2012h).

Habitat Requirements:
Open woodlands - winters at the edge of forests and near clearings where tall trees or snags are present (Cornell Lab, 2011g). Primary habitat is mature, evergreen montane forests (BC CDC, 2012h).

Breeding:
Open woodlands - Breeds in the montane northern coniferous forests at forest edges and openings such as those near ponds and meadows (Cornell Lab, 2011g).

In BC eggs are typically laid between late May and mid-July. Incubation is performed by the female and lasts between 14 and 19 days. The young will leave the nest between 15 and 23 days after hatching. Re-nesting following the loss of the first clutch is common although second clutches may be smaller with 2 – 3 eggs as opposed to 3 – 4 eggs (BC CDC, 2012h).

Food:
Diet consists almost entirely of flying insects with a special fondness for wild honeybees and other members of the Hymenoptera order. During the breeding season, prey also includes dragonfly species (BC CDC, 2012h).

Threats:
- Olive-sided flycatchers have shown widespread and consistent population declines over the last 30 years. The Canadian population is estimated to have declined by 79% from 1968 – 2006 (COSEWIC, 2009). The reason for this decline is unclear, but it may be attributed to the following:
    - Habitat loss and alteration at both breeding and winter grounds.
    - Forest management practices – evidence suggests lower nest success in managed forests then natural forest stands.
    - Prey declines likely due to pesticide and insecticide use and unsustainable land practices (OMNR, 2009).

Special Significance of the Species:
- Olive-sided flycatchers make the longest migrations of any flycatcher nesting in North America (BC CDC, 2012h).
- Considered an indicator species of the coniferous forest biome throughout North America, although they're occasionally found in mixed deciduous/coniferous forests as well (BC CDC, 2012h).

Wildlife Management Emphasis Areas:
- Ecotones - this includes the edges between two distinct forest habitats and is seen near major blowdown areas, hard forest edges or between highly structurally distinct forest types. These are very productive areas for wildlife and offer multiple habitats in close proximity.
- Old-growth patch - one stand of old-growth trees is located in the area between Tunnel trail and Pipeline road, and it provides a picture of what the forest looked like prior to logging in the 1860's. This area is able to provide unique habitat for old-growth dependent species.
- Riparian areas, wetlands and streams - zones of vegetation directly adjacent to freshwater watercourses. Distinct wildlife and plant communities are supported by high soil moisture and nutrients. Important features may include snags, downed logs, deciduous plants, and uneven age canopy.

Applicable Wildlife Laws:
- BC Provincial Wildlife Act, 1996 – it is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 - no person shall disturb, destroy or take a nest, egg or nest shelter… of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.
- Species at Risk Act , 2002

Documented Occurrences in Stanley Park:

- Recorded as Uncommon (0-5 per day) in Stanley Park (Weber et al., 1988).
- Has been recorded on SPES monthly bird counts between 2006 and 2012, but it is uncommon (Robyn Worcester, pers. comm.).
- Recorded during May-June Breeding Bird surveys in Stanley Park between 2007-2009, where it was listed as a "possible breeder" (Worcester, 2010).
- Has been observed in the Van Dusen Botanical Gardens in spring (Robyn Worcester, pers. comm.).
- Heard in May/June 2012 north of Second Beach between Lees Trail and Rawlings Trail as well as between Beaver Lake and Pipeline Road north of Tisdall Walk (Brian Titaro, pers. comm.).

Best Management Practices for Operations in Stanley Park:

- Leave all dead standing snags that do not pose a public safety threat. This is especially important near ponds, meadows, open areas and Wildlife Management Emphasis Areas, where olive-sided flycatchers are likely to inhabit and use the trees as hunting perches.
- Maintain open meadow habitat where it currently exists as prime feeding sites.
- Continue with the ban of broadcast and cosmetic pesticide use in Stanley Park to avoid not to indirectly target the prey species of olive-sided flycatchers.

Habitat Enhancement Opportunities:

- Restrict mowing of grassy areas around Lost Lagoon, and other areas, to mimic open-meadow habitat adjacent to forests which serves as hunting areas.
- Construct and put up more mason bee condos near open meadow, lake and wetland habitats to provide a native food source in areas, where olive-sided flycatchers are likely to be hunting.

Operation Timing:

- Breeding bird nesting season in BC extends from March through late July, with olive-sided flycatchers typically nesting from late May through mid-July (RISC, 1999; BC CDC, 2012h).
- Park operations around active nests should be minimized to reduce disturbance to parents raising and feeding young.

Surf Scoter

Melanitta perspicillata

CDC: Blue
COSEWIC: Not listed
BREEDING STATUS IN STANLEY PARK: Unlikely

Surf scoters off the Stanley Park seawall.
Photo: Robyn Worcester

Identification:
This is a large, stocky diving duck (48-60 cm). Males and females vary in appearance but there are no seasonal plumage changes; male is entirely velvety black, except for white patch on forehead and larger white triangle on nape. Bill is large and swollen at upper base and patterned with white, red, yellow, and a black patch near base, appearing mainly orange at a distance. Eyes are pale blue-gray or yellowish white; feet are reddish orange with dusky webs. Females are less distinctly marked with smudgy face patches and a dark bill, eyes pale brown, may be pale gray or yellow, feet yellow to brownish red, with dull black webs. Juveniles are similar to adult females but with white belly and more distinct face patches, eyes dark brown (BC CDC, 2012g; Cornell Lab, 2011h).

Behaviour:
It performs a surface dive to find and catch food on or near the ocean bottom (Cornell Lab, 2011h). They form monogamous pairs, with males defending a moving area around the female (Ehrlich et al. 1988; Cornell 2007). Courtship displays tend to take place in large groups (Ehrlich et al. 1988). Surf scoters often occur in large flocks with other species, especially during spring staging periods.

Habitat Requirements:
The surf scoter winters in shallow marine coastal waters, usually over pebble and sand bottom and less frequently in bays or on freshwater lakes and rivers (Cornell Lab, 2011h). Typically arrives to the southern coast of BC in October and November and leaves for their spring breeding grounds in March and April (SAS, 2011).

Breeding:
Breeds on shallow freshwater lakes, bogs and sluggish streams in the boreal forest and tundra environments (Ehrlich et al. 1988). Pairs form on wintering areas and may reunite in successive years (SDJV, 2011). They build their nest on the ground in small clumps of spruce or dwarf willow. The nest is lined with feathers and down, and typically holds between 5 – 8 unmarked eggs. Their breeding biology is the least known of all North American ducks (Ehrlich et al. 1988).

Food:
It eats various aquatic invertebrates, although primarily mollusks, crustaceans and aquatic insects. Very little of their diet is made up of aquatic vegetation (Ehrlich et al. 1988). Surf scoters often

congregate at herring spawning sites on the west coast to feast on herring eggs (SDJV, 2011). Fish eggs will occasionally constitute 90% of their diet in these cases (Ehrlich et al. 1988).

Threats:

- Populations appeared to decline extensively in the early 1900's, and while the population seems to have stabilized, it might be continuing to decline, especially in the west (Ehrlich et al. 1988, Cornell Lab, 2011h). The cause of this decline is unknown, however pesticides or other contaminants are the suspected cause (SAS, 2011).
- Vulnerable to oil spills especially on their wintering grounds, and increased oil transportation along the coast of southern BC will likely increase risk to the population (SAS, 2011).

Surf scoter (male).
Photo: Peter Woods

- Increased boating (commercial and recreational) traffic around Stanley Park disturbs surf scoters at their feeding grounds, and it forces them to expend energy by flying and diving to avoid boats.

Special Significance of the Species:

- Surf scoter wintering habitat around Stanley Park is designated an Important Bird Area of Canada: English Bay-Burrard Inlet.
- This species relies on the waters of English Bay - Burrard Inlet for food and shelter during the winter months.

Wildlife Management Emphasis Areas:

- Intertidal – all of the littoral areas off the seawall around Stanley Park including Coal Harbour and around Deadman's Island.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 – it is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 - no person shall disturb, destroy or take a nest, egg or nest shelter… of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.

Documented Occurrences in Stanley Park:

- Abundant in spring, fall and winter, but uncommon in summer (Weber et al. 1988).
- Listed in VNHS guide as marine, winter-only (VNHS, 2006).
- Peak number (on one day) was 3167 during winter 2001-2002 (Boisclair-Joly and Worcester, 2002).
- Peak number (on one day) was 450 in the winter of 2010-2011 (La Fond and Thomas, 2011).

- SPES Historical Data**:** 1971-2006: 28 sightings recorded 1-500 birds per sighting, Lost Lagoon. Stanley Park foreshore, Second Beach pool (Peter Woods, Pers. Comm.)

Best Management Practices for Operations in Stanley Park:

- Minimize all watercraft traffic around large groups of surf scoters off shore of Stanley Park from October through April.
- Enforce a 250 meter buffer for all local boat traffic around surf scoter flocks.
- Survey and map important habitat areas for this species to better understand their distribution and requirements in the park.
- Monitor populations of this species/group to better understand trends in their abundance and use of the Park's habitat.
- Create intertidal gabions to create foraging habitat for mussel and barnacle feeding ducks. This has been tested in the Port of Vancouver.

Surf scoters off the seawall in Stanley Park.
Photo: Robyn Worcester

Habitat Enhancement Opportunities:

- Install seasonal buoys around key feeding areas off Stanley Park to restrict boat traffic in these areas during the winter feeding season.
- Enhance and protect mussel beds and rocky shoreline habitat on which these birds depend.
- Install educational signs at key points along the seawall to inform members of the public about giving seabirds their personal space.

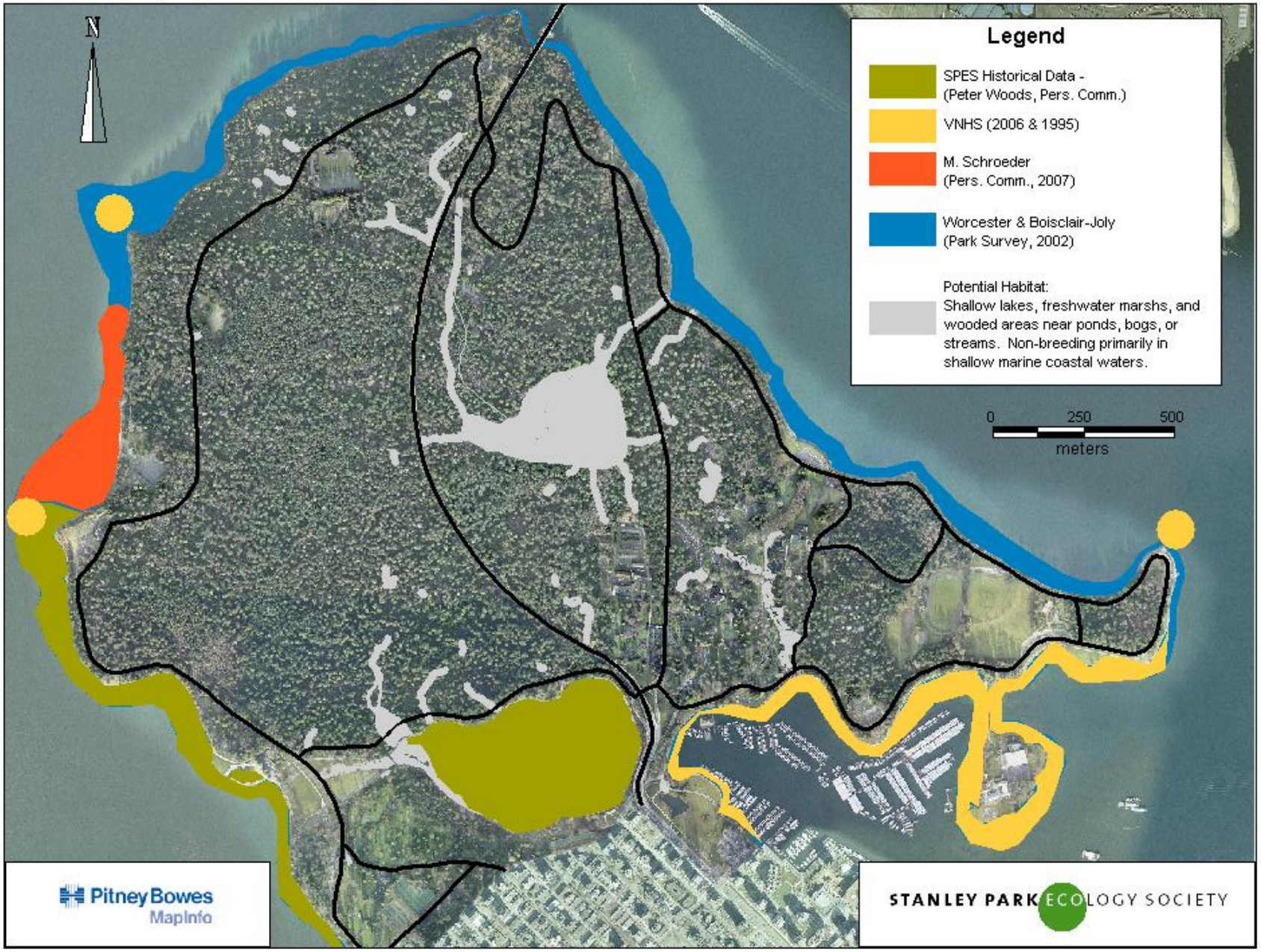
Operation Timing:

- Surf scoters are only present in our coastal waters from October through April, and measures should be made to minimize all disturbances to them during this time.

Species at Risk Habitat in Stanley Park

Surf Scoter

Melanitta perspicillata



January 2009

Stanley Park Ecology Society

Purple Martin

Progne subis

Female purple martin (Rocky Point Park, Port Moody). Photo: Tom Middleton

CDC: Blue
COSEWIC: Not listed
BREEDING STATUS IN STANLEY PARK: Potential

Identification:
The purple martin is a medium sized songbird (19 – 20 cm) but large for a swallow; with a large head and thick chest; broad, pointed wings. Males are entirely glossy bluish-black above and below with dull black wings. Females are purplish-black on back with dark wings, a gray chest; paler gray belly and a light gray collar around back of neck (Sibley, 2003).

Juveniles are similar to the female but drabber with no purplish on back and under parts are grey-white. Wing and tail feathers are brownish-black. During first winter birds of both sexes resemble adult female but have a whiter belly; yearling males often have a few dark blue-black feathers scattered on the head, back, chest and belly (Cornell Lab, 2011h).

Behaviour:
Purple martin obtain almost all of their food and water in flight by using an aerial foraging technique to gather food and to scoop up water with their lower bill by skimming the surface of ponds (Cornell Lab, 2011h). When extended periods of cold or wet weather cause a lack of flying insects, they may forage for larvae and small insects in vegetation.

Males choose potential nesting cavities and then begin courting potential females. They perform a 'claiming-reclaiming' display, in which they fly out from the chosen cavity, sail in a wide arc and return to and enter the cavity, where they sing with their head poking out. Mating occurs once a female has accepted the male and the chosen cavity.

Aerial foraging takes place much higher up than for other swallow species, often above 50 m and even well above 500 m from the ground. Although they nest in marine habitats, most foraging takes place over freshwater or upland habitats away from nesting sites. Most foraging is done singly or in pairs, with larger aggregations occurring only during migration or when there is a significant mass-emergence of flying insects (Fenneman, 2010a).

Habitat Requirements:
It overwinters in South America, where it feeds in rainforest clearings and agricultural areas. It is also known to form large roosts in village plazas (Cornell Lab, 2011h). In BC, purple martins nest along coastal habitats in the Lower Mainland, the Gulf Islands and southeastern Vancouver Island, at artificial nesting sites created in ~50 locations, such as Maplewood Flats, Rocky Point Park, Iona Regional Park, Crescent Beach, and many locations on Vancouver Island from Victoria to Sooke and Campbell River.

Breeding:
Nesting occurs almost entirely in nest boxes erected on pilings in sheltered marine areas such as harbours, lagoons, bays, estuaries and marinas; occasionally also in cavities in old decayed pilings. Pairs originally nested near freshwater habitats such as lakes and ponds, but the current BC population breeds only in marine habitats (Fenneman, 2010a).

While on their breeding grounds, they will forage in open areas such as over coastal mudflats, lakes, marshes, ponds, open fields and forested habitat in search of flying insects (Fenneman, 2010a).

Food:
Feeds almost exclusively on flying insects such as beetles, moths, butterflies, ants, flies, dragonflies, and wasps (Fenneman, 2010a); rarely also gleans insects on vegetation when starved during periods of unfavourable cold or wet weather.

Threats:

- Habitat loss: The greatest long-term threat to continued presence of purple martins in BC is lack of original nesting habitat in the wild. This deficit has been partly offset, in the short term at least, by provision of artificial housing on pilings on the marine foreshore within the Georgia Basin, on which they are now entirely dependent. These nest boxes and the pilings they are mounted on are in continuous gradual decay, requiring maintenance, repair and periodic replacement. Fifty percent of the pilings in use are abandoned and will not be replaced, and many others face potential removal. (Cousens and Lee, 2012).
- Predation: Owls, hawks, jays, crows, squirrels, raccoons and domestic cats all predate on purple martins as well as their nests (Brown, 1997).
- Nest Site Competition: The primary threat to breeding purple martins in urban and coastal areas near human habitation is competition from non-native European starlings and house sparrows for nesting cavities (Garrett and Dunn, 1981; Unitt, 1984; Airola and Grantham, 2003; Airola and Williams, 2008). These invasive bird species have been known to destroy eggs and kill or wound nestlings in eastern North America (USFS 2008). On the west coast, these resident species typically take over nest cavities before our western martins return to their nest sites in spring, which can result in displacement of martins from colonies when few or no vacant cavities remain. The erection of clusters of starling-resistant nest boxes will effectively limit competition from starlings, but in urban areas regular intervention is required to prevent the smaller house sparrows from taking over all the nest boxes in a colony and excluding martins (Stephenson and Calcarone, 1999; Airola et al., 2008; Cousens and Lee, 2012). Some native bird species, mainly earlier-migrating tree and violet-green swallows, may also occupy martin housing and exclude martins from nest sites in spring, potentially preventing them from re-establishing their colonies if no vacant nest sites remain. Clustering of nest boxes in tight groups usually avoids this problem, providing some vacant cavities for the martins, which may displace the swallows later in the season (Cousens and Lee, 2012).
- Adverse weather: As aerial insectivores, martins are highly dependent on availability of flying insects for food. During periods of cool wet weather, when food supplies may be extremely limited, martins may suffer moderate to severe nestling and occasional adult mortality due to starvation (Brown, 1997; Fraser et al., 1997). When such losses substantially reduce nesting success and fledgling production, recruitment of yearlings to sustain the population the following season is poor and the population declines. Thus weather conditions during the

breeding season are a major determinant of breeding success and population growth or decline, and climate change with ongoing global warming may present a significant long-term threat (Cousens and Lee, 2012).

- Human Disturbance and Habitat Change: Purple martins require open habitat around their nesting sites for protection from predators. Land use changes that restrict open air space around nesting sites has resulted in site abandonment in some cases (Airola and Grantham, 2003). However, like their eastern cousins, western martins can adapt to and become quite tolerant of moderate levels of human activity near their nest colonies. Direct nest disturbance, especially after dark, may cause nest site abandonment.
- Reliance on Nest Boxes: Purple martins now nest exclusively in human built nest boxes (Fenneman, 2010a). This puts a great deal of pressure on those responsible for putting up and maintaining these boxes. If nest box programs were to be discontinued, then new breeding habitat would not be created and existing habitat would decline and could eventually disappear entirely. Also, if nest box stewards do not monitor, clean and maintain their nest boxes, they can be taken over by other competing species or become unusable by purple martins due to parasite infestations or decay.

Special Significance of the Species:

- The recovery of the purple martin in the Pacific Northwest is one of the most successful conservation efforts in the region in recent history. As a peripheral species (i.e. it is at its northern breeding range limit) in BC, purple martin populations have historically been low and subject to fluctuations. Their population declined in the early 1900's, and by the 1960's the species had plummeted in BC and all along the Pacific coast of North America. The decline was likely due to a combination of original nesting habitat loss (snag stands and Garry oak parkland), replacement of decayed old untreated pilings with creosote-treated pilings, and arrival of aggressive cavity nesting house sparrows and European starlings, which claimed most of the remaining available nesting sites (Fraser et al., 1997; Cousens and Lee 2012).
- By the early 1980's, the population of purple martins in BC had declined from a roughly estimated 150 – 600 pairs to only 5 known pairs spread among several colonies on Vancouver Island (Fraser et al., 1997). This is a local population decrease of 96-99% over a period of about 50 years. The few remaining birds were found nesting in natural cavities in offshore pilings that presumably were not targeted by European starlings due to their location offshore over marine habitat (Fraser et al., 1997; Cousens and Lee, 2012).
- An aggressive nest box program was initiated in BC in 1985 (a decade earlier in Puget Sound), soon using nest box designs that proved unattractive to starlings, as well as placing them over water on wooden pilings in sheltered marine habitats, where the last few pairs were nesting. Populations began increasing almost immediately, and while fluctuations still occur, there are now approximately 750 pairs of breeding purple martins (as of 2011) at 49 sites on Vancouver Island, the Gulf Islands, the Sunshine Coast and the Lower Mainland. Therefore, in 25 years the BC population increased from 5 to 750 pairs and from 2-3 to 49 nesting sites (Cousens and Lee, 2012; B. Cousens, pers. comm.

Wildlife Management Emphasis Areas:

- Ecotones - located throughout the park anywhere that two structurally distinct habitat types meet.

- Wetlands, Streams and Riparian areas - zones of vegetation directly adjacent to freshwater watercourses and permanent or seasonally wet areas with distinct wildlife and plant communities and important features

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 – it is an offence to take, harm, or destroy the birds, their active nests, or their eggs.
- Migratory Birds Convention Act, 1994 - no person shall disturb, destroy or take a nest, egg or nest shelter… of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.

Documented Occurrences in Stanley Park:

- Purple martins have been seen passing by the park, likely while foraging or seeking nest sites in the area. These birds were presumably nesting at established colonies in other areas farther down the inlet such as Rocky Point Park or Maplewood Flats (Robyn Worcester, pers. comm.).

Best Management Practices for Operations in Stanley Park:

- Control domestic pets (Pearson and Healy, 2011).
    - Use an animal control bylaw to prevent domestic pets from accessing the preferred habitat of purple martins and other listed songbirds.
    - Produce and distribute information on the dangers that pets pose to songbirds in the City of Vancouver and Stanley Park.
- Reduce pesticide use (Pearson and Healy, 2011).
    - Ban insecticide and herbicide use for cosmetic purposes on lands within jurisdiction.
    - Eliminate insecticide and herbicide use on local government lands.
- Survey and map important habitat areas for this species, to better understand their distribution and requirements in the park.
- Monitor populations of this species to better understand trends in their abundance and use of the park's habitat

Habitat Enhancement Opportunities:

- Install new nest boxes at Coal Harbour around the Vancouver Rowing Club, Royal Vancouver Yacht Club and Deadman's Island (sheltered marine areas) to increase nesting and breeding opportunities.
- Maintain riparian areas and ecotones that currently exist in the park as valuable habitat.
- Replace open lawn areas to meadow and field habitats where permissible, especially near water (example: southwest Lost Lagoon, Ceperly Creek area).
- Provide education for users of their nesting habitat about the species' Blue-listed status and needed conservation of this species.

Operation Timing:

- Purple martins begin to arrive to BC in mid-April (occasionally in early April). They continue to arrive well into June and most depart primarily during August. By mid-September most

individuals have left the province (Cousens and Lee, 2012; Fenneman, 2010a). During this breeding window (mid-April to late August), operations around active nests should be minimized to reduce disturbance to parents raising and feeding young.

Ecosystems at Risk

The CWHxm Sword fern site association is only found along the Prospect Point cliffs in Stanley Park. Photo: Robyn Worcester

The BC Conservation Data Centre (CDC) has listed a number of ecological communities that are classified as 'At Risk'. Several of Stanley Park's site associations, identified by scientists and experts throughout the province, have been assigned a global and provincial ranking by the CDC. The site associations are given designation on the red or blue lists to ensure that special attention is paid and they are maintained as part of BC's natural heritage.

Although the reason for the rarity of these site associations is not well documented in all of the status report, the main cause is likely that these forest communities have declined as a result of extensive timber harvesting in the past and human development (BC CDC, 2007). The following list of site associations "at risk" in Stanley Park was constructed with the BC Species and Ecosystems Explorer, using the search criteria of Lower Mainland region, Chilliwack Forest District and Greater Vancouver Regional District. The results are listed in Table 1.

Table 1: Ecological Communities (site associations) at risk in Stanley Park; red list indicates extirpated, endangered, or threatened communities and blue list indicates communities of special concern).

Biogeoclimatic Unit	Name	Status		
		Provincial	BC List	Global
CWHxm1/04 CWHdm/04	Douglas-fir / sword fern	S2 (2004)	Red	G2G4
CWHdm/06	Western hemlock - western red cedar / deer fern	S2 (2004)	Red	G2G3
CWHdm/07	Western red cedar / three-leaved foamflower dry Maritime	S2S3 (2004)	Red	G3
CWHdm/03	Douglas-fir - western hemlock / salal dry maritime	S2S3 (2004)	Blue	G3G4
CWHdm/05	Western red cedar / sword fern dry Maritime	S2S3 (2006)	Blue	G2G3
CWHdm/12	Western red cedar - sitka spruce / skunk cabbage	S3 (2004)	Blue	G3
CWHdm	Dune wildrye - beach pea	S1S2 (2008)	Red	GNR
CWHxm1/Wb50	Labrador tea / western bog-laurel / peat-mosses	S3 (2004)	Blue	G4

CWHdm/Wm05	Common cattail marsh	S3 (2004)	Blue	G5

Identification:

Name: Douglas-fir - Sword Fern
Zone ID: CWHxm/04
Status: Red listed
The areas in Stanley Park classified as CWHxm – Very Dry Maritime – are restricted to the slopes between Siwash Rock and Prospect Point. This zone is rare in the Lower Mainland, but exists on the south side of the Fraser River to Chilliwack, and along the Sunshine Coast to Desolation Sound (Green and Klinka, 1994). It occurs usually only up to 150m in elevation in wet areas such as Stanley Park, and features water deficits on zonal sites (Green and Klinka, 1994). The sword fern (04) site series, mapped as such in the Stanley Park Forest Management Plan (VBPR, 2009), is dominated by Douglas-fir with an understory of sword fern. Other common trees in this series are western hemlock, western red cedar, and small amounts of red alder. Common shrubs include salal, ocean spray, and baldhip rose, and sword fern is dominant in the herb layer. Step moss and Oregon beaked moss are the most common bryophytes. The sword fern site series is similar too but slightly drier than zonal CWHxm, but is characterized as having a rich to very rich soil nutrient regime (Green and Klinka, 1994).

Skunk cabbage site association 12.0.
Photo: Robyn Worcester

Name: Douglas-fir - Sword Fern
Zone ID: CWHdm/04
Status: Red listed
Description: Same as CWHxm above

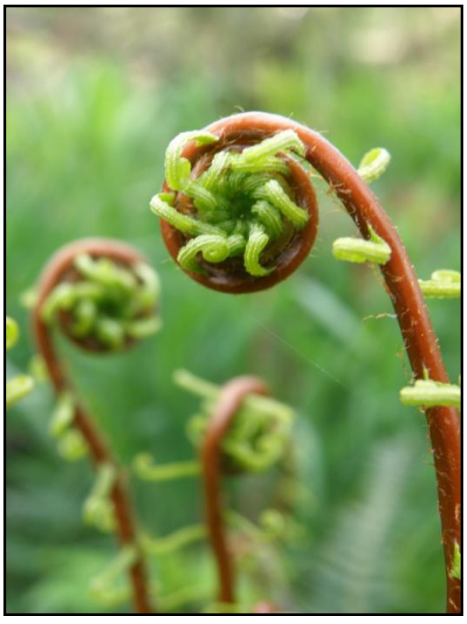
Name: Douglas-fir - western hemlock / salal Dry Maritime
Zone ID: CWHdm/03
Status: Blue listed
Description: Presence of salal and sword fern indicate this is the driest site with sandy, well-drained soils. There are four main areas in the Park with this site association: north of Lost Lagoon, west of the junction of Tatlow and Lovers Walk, above the seawall between Siwash Rock and Third Beach, and along Pipeline Road (Beese and Paris, 1989). Red huckleberry and salal are the two most common

shrubs, and dull Oregon-grape (Mahonia nervosa) is found in the Park only within this site association, making it a good indicator species (Beese and Paris, 1989).

Name: Western redcedar - Sitka spruce / skunk cabbage
Zone ID: CWHdm/12
Status: Blue listed
Description: This site association is found in regions that have sloped topography or depressions, including low elevation areas west of Cathedral Trail and west of Beaver Lake (Beese and Paris, 1989). Skunk cabbage is the dominant plant species in this site association. Abundant shrubs are stink currant (*Ribes bracteosum),* red elderberry, salmonberry, false azalea and oval-leaved blueberry (Beese and Paris, 1989). Other abundant plants are lady fern, deer fern (Blechnum spicant), bunchberry (Cornus canadensis), horsetail and sedges (Beese and Paris, 1989).

Name: Western redcedar / sword fern Dry Maritime
Zone ID: CWHdm/05
Status: Blue listed
Description: This area is well-drained as it is situated on middle to upper slopes. This region can be found on the ridge between the Prospect Point picnic area and Lovers Walk, and on the slopes between Prospect Point and Siwash Rock. This site association can also be identified on a ridge situated southwest of Beaver Lake and in certain scattered areas on raised ground. It is confirmed to occur only in BC and it has experienced a substantial decline in distribution in the last 50 to 150 years due to harvesting of what was extensive old and mature forest stands (BC CDC, 2012). Currently, most of the remaining mature stands originated from catastrophic fire events in the early part of the 20th century and these stands are now being harvested. Less than 5% of confirmed sites exist as old forest stands (BC CDC, 2012).

Name: Western hemlock - western red cedar / deer fern
Zone ID: CWHdm/06
Status: Red listed
Description: This is the least common site association in Stanley Park, and it is found in only two areas: a narrow area between Beaver Lake and Pipeline Road, and west of the Causeway between Lake Trail and Tatlow Walk (Beese and Paris, 1989). Soils lack an abundance of nutrients and drain poorly, and as a result don't support skunk cabbage (*Lysichitum americanum).* The region of this site association on the east side of Beaver Lake has a 90% total cover of tall salal (*Gaultheria shallon*), due to the abundance of sunlight that can penetrate the area (Beese and Paris, 1989). Other common plant species that occur in this region include false azalea (*Menziesia ferruginea*), red salmonberry, red huckleberry (*Vaccinium parvifolium*), oval-leaved blueberry (*Vaccinium ovalifolium*) and Alaskan blueberry (*Vaccinium alaskaense*) (Beese and Paris, 1989).



Deer fern.
Photo: Robyn Worcester

Name: Western redcedar / three-leaved foamflower Dry Maritime
Zone ID: CWHdm/07
Status: Red listed
Description: Moderately well-drained soils found on lower to middle slopes occur in this site association. It is found between where the Hollow Tree once stood and Lovers Walk on west-facing slopes, on the flat ridge-top around the Prospect Point picnic area, and in many locations east of the Causeway (Beese and Paris, 1989). There is an abundance of foamflower and spiny wood fern; however, lady fern is rare (Beese and Paris, 1989). There can be great variations in the amount of sword fern coverage. False lily-of-the-valley (*Maianthemum dilatatum*) can grow occasionally on this site (Beese and Paris, 1989).

Name: Labrador tea / western bog-laurel / peat-mosses
Zone ID: CWHxm1/Wb50
Status: Blue listed
Description: Bogs are wetlands covered or filled with poorly to moderately decomposed Sphagnum-derived peats (Meidinger and Pojar, 1991). Peat materials in bogs derive primarily from Sphagnum moss and forest materials (decaying wood and litter). The vegetation is low in stature and dominated by Labrador tea (*Ledum groenlandicum*) with an abundance of bog laurel (*Kalmia microphylla*) and bog cranberry (*Oxycoccus oxycoccos)* (MacKenzie and Moran, 2004). Herb cover is variable, and raised sites can have cloudberry (*Rubus chamaemorus*) in abundance. Group I Sphagnum spp. are most common (S. *fuscum, S. capillifolium*) but coastal species also occur (*S. papillosum*), mostly in wetter hollows (MacKenzie and Moran, 2004).

Name: Dune wildrye - beach pea
Zone ID: CWHdm
Status: Red listed
Description: This community has a limited range, occurring primarily within 10 m of the high tide mark and only where sand beaches accumulate through the process of deposition and accretion (BC CDC, 2012). An assessment of foreshore vegetation in Stanley Park found that salt-tolerant plant species associated with typical coastal areas living above the high tide mark, but influenced by sea spray and storm events, are uncommon in Stanley Park. It was thought that the seawall surrounding the Park resulted in an abrupt, artificial transition between the terrestrial and marine environments (Coast River, 1995). The areas of foreshore above the high tide line that are dominated by dune grass are found below both of the Deadman's Island and Vancouver Yacht Club wharves, and near Second Beach.

There are only a few intact dune grass sites in Stanley Park due to the construction of the seawall.
Photo: Robyn Worcester

Name: Common cattail marsh
Zone ID: CWHdm/Wm05
Status: Blue listed
Description: Cattail *(Typha latifolia)* marshes are permanently or seasonally inundated wetlands with nutrient rich water that support extensive cover

of emergent herbaceous vegetation rooting in mineral-rich substrate (Meidinger and Pojar, 1991). Cattail marshes are common throughout the Coast and Interior at low elevations in subzones with warm summers (MacKenzie and Moran, 2004). Cattail dominates, often with few other rooted plants present, especially where nutrient levels are high and *T. latifolia* growth is profuse (MacKenzie and Moran, 2004). Occasionally there is significant cover of sedges (*Carex spp*.), hardstem bulrush (*Schoenoplectus acutus*), or duckweed (*Lemna spp*.). These sites often have organic veneers of well-decomposed, odiferous muck, and water depths may be up to 1 m in the spring but recede in late summer (MacKenzie and Moran, 2004).

Threats:

Forest Ecosystems at Risk:

- Habitat loss: Conversion from forested/wetland habitat into roads, trails, or facilities. Removal of old growth forests and trees.
- Invasive species: The introduction and spread of invasive plant species seriously impacts these sensitive native habitats. Shade tolerant species such as English ivy and English holly are of particular concern in Stanley Park.
- Fragmentation: Habitat fragmentation by the creation of roads and trails reduces habitat quality and ecosystem functioning in these areas.
- Suppression of natural processes: Windthrow, insect infestations and fires are important components of a healthy forest ecosystem.

Dune Ecosystems at Risk:

- Recreational activity seriously damages the 'dune wildrye - beach pea' site association as can be seen in sites that have easy public access compared to immediately adjacent areas that are out of bounds to the public (BC CDC, 2012).
- Breakwaters and other external structures affect the deposition and accretion of sands, and result in loss of sandy beach areas where this ecosystem occurs or previously occurred (BC CDC, 2012). Development and artificial barriers to control beach erosion are a problem in urbanized and residential areas as well as some recreational areas and public beaches.
- Coastal sand dune systems are highly vulnerable to disturbance by trampling. Pedestrians and dogs can compact the sand and crush vegetation. leaving the shoreline prone to erosion (CRD, 2012).
- Invasion of the alien species *Ammophila arenaria* is a threat to this community because it out-competes *Leymus mollis* and replaces the community type (BC CDC, 2012).

Wetland Ecosystems at Risk:

- The Beaver Lake cattail marsh is rapidly undergoing succession and transforming into meadow habitat. This natural process has been accelerated by the introduction of invasive water lilies that are filling the lake with unnaturally high levels of organic plant matter.
- Invasive species: the introduction and spread of invasive plant species seriously impacts these sensitive wetland habitats. Species such as fragrant water lily, yellow flag iris and purple loosestrife are of particular concern in Stanley Park's wetlands.
- Sections of the Stanley Park bog are still intact, but at risk of disappearing due to the influx of small trees and other terrestrial plants such as salal.

Special Significance of these Wetland Ecosystems:

- These sensitive ecosystems are high in biological diversity, as they serve as critical habitat for species at risk and provide a foundation to support other life forms (BC CDC, 2012).
- They provide ecosystem services for a healthy economy and for social wellbeing (BC MOE, 2011a).
- They regulate climate, clean water, reduce carbon dioxide levels, generate and clean soils, and recycle nutrients (BC MOE, 2011a).
- They provide recreational opportunities for the public and enhance quality of life for park visitors and local residents.
- They provide an important learning environment for thousands of school children and adults, who participate in educational programs in the Park's forests and wetlands each year.
- Cattail wetlands in Stanley Park are essential wildlife habitat to many species, including waterfowl, migratory songbirds, small mammals, amphibians, fish and aquatic invertebrates.
- Due to the introduction of invasive water lilies and anthropological changes to its hydrology, Beaver Lake is rapidly disappearing and becoming degraded. The only other significant cattail wetland in Stanley Park is the Lost Lagoon bio-filtration marsh.
- The small bog adjacent to Beaver Lake on its southern edge is representative of a rare and sensitive habitat. It supports plant species found nowhere else in Stanley Park such as round-leaved sundew.
- There are only a few small areas of beach-dune habitat left in Stanley Park, mainly due to the construction of the seawall in areas where this already rare habitat existed.

Applicable Laws:

- Species at Risk Act , 2002

Documented Occurrences in Stanley Park:

- Stanley Park's forest is part of the Coastal Western Hemlock (CWH) biogeoclimatic zone as well as the Georgia Depression Ecoregion (Demarchi, 1996). Most of Stanley Park is considered Dry Maritime (CWHdm) while the cliffs between Siwash Rock and Prospect Point have been designated Very Dry Maritime (CWHxm), which is slightly drier and cooler (VBPR, 2009).
- Six CWHdm site associations were first described in Stanley Park by Beese and Paris (1989) during the first forest inventory. Site associations are a basic unit of site classification within the biogeoclimatic zones. These sites are differentiated by indicator plant species which provide evidence of the underlying soil moisture and nutrient regime.
- Forest inventory surveys in 2008 were carried out as a part of restoration efforts following the 2006 storm. These newer surveys confirmed the presence of the six site associations in the park, but the CWHxm site series was added (VBPR, 2009). The survey results were used towards the creation of the revised Stanley Park Forest Management Plan and methodologies were similar to those done by Beese and Paris in 1989. See Figure 1 for a map of all site associations in Stanley Park.

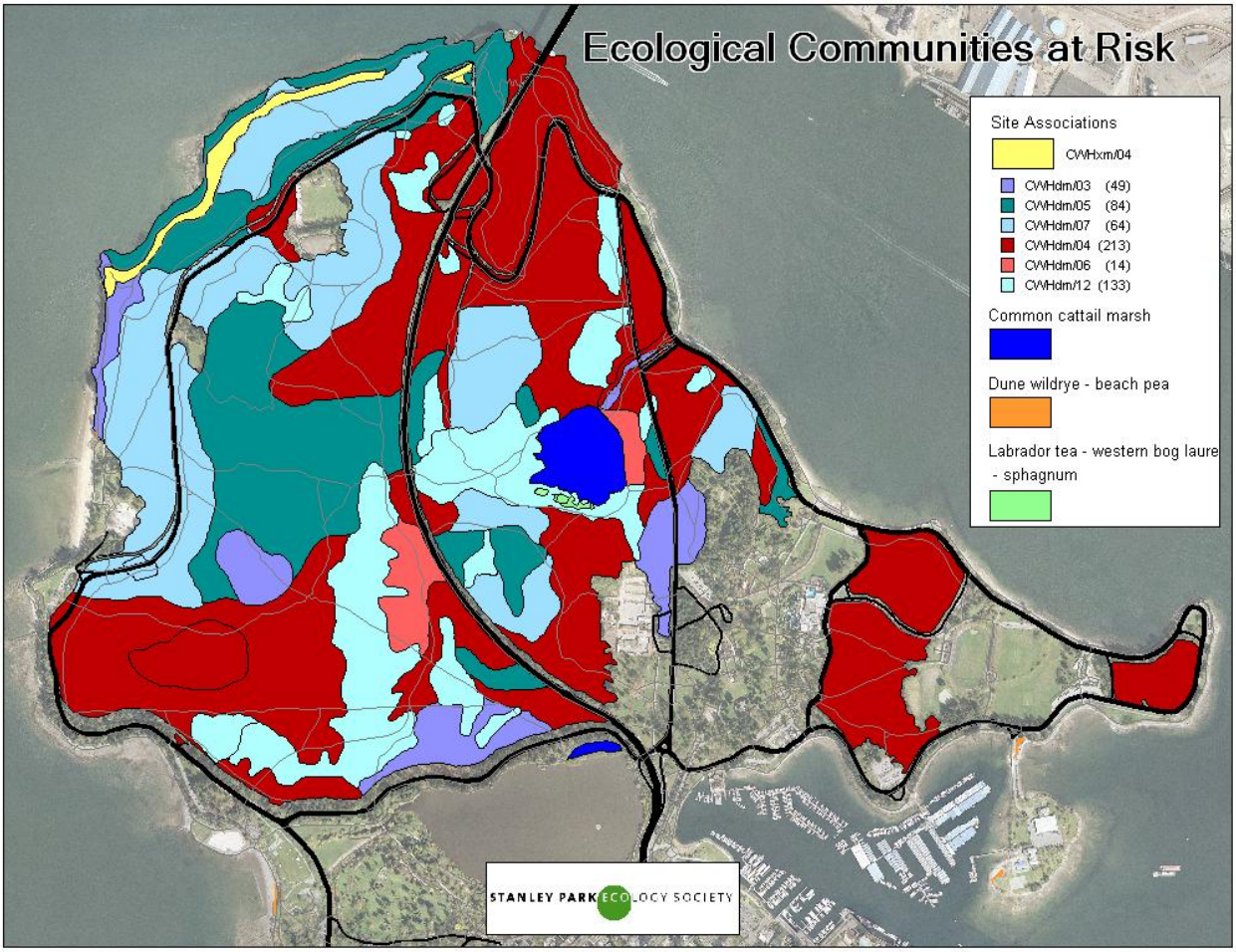


Figure 1: Map of ecological communities at risk.

Best Management Practices for Operations in Stanley Park:

- Inventory and mapping of the sensitive ecosystems to aid in planning and decision making and to protect critical elements of biodiversity (BC MOE, 2005a).
- Where ever possible and appropriate, control recreational access to fragile ecosystems (BC MOE, 2011a).

Forests:

- Reduce and improve fragmentation of habitat by providing continuity that allows for movements of animals (BC MOE, 2004).
- Prioritize these areas for the control of invasive species (see Invasive Species BMPs in Stanley Park Forest Management Plan - VBPR, 2009).
- Avoid the importation of soil material into or near the forest, unless it is verified as being weed free, and avoid exposing bare soil during trail and road maintenance operations (VBPR, 2009).
- When brushing tree plantations and trail sides, use hand tools and retain non-competing vegetation whenever possible.

- Felled danger trees in areas of elevated fire risk should be retained as CWD - branches bucked and the logs laid to ground level. Felled danger trees away from areas of fire risk may be left intact, especially in wet areas (VBPR, 2009).
- Small blowdowns in Wildlife Emphasis Areas generally should be left as they are. Those in other management areas may also be left as they are, or they may be bucked to ground level and replanted, depending on the surrounding fire fuel type.

Cattail Wetlands:

- Stop the establishment and spread of competing alien species such as yellow flag iris and purple loosestrife.
- Stop or mitigate the rapid infilling of Beaver Lake due to the introduction of invasive water lilies and anthropological changes to its hydrology.
- Try to locate new roads, trails or facilities away from wetlands, streams, and riparian areas (BC MOE, 2004).

Dune grass:

- Survey and inventory areas where this ecological community exists to verify plant species composition.
- Prevent the further loss of these rare habitats and restore habitat quality in existing areas
- Monitor for and prevent the introduction of Ammophila arenaria (European Beachgrass) and slow the spread of established gorse (Ulex europaeus) and Scotch broom (Cytisus scoparius) (CRD, 2012).

Habitat Enhancement Opportunities:

- Reduce fragmentation of forested habitat by reducing or eliminating trails and roads wherever possible.
- Remove invasive species and restore habitat by adding mulch and/or planting plant species equivalent in wildlife value, especially where soil erosion or recolonization by invasives is a concern.
- Increase the size of forested areas by reducing the amount of lawn and adding native grasses, flowers, shrubs and trees to cultivated areas.
- Cover any incidental scalping's of forest soil with mulch (> 5 cm) (VBPR, 2009).
- Ensure that connectivity of habitat is maintained by setting aside undisturbed habitat for travel routes to these areas (BC MOE, 2004). Close all unauthorized trails (VBPR, 2009).
- Plant a diversity of tree and shrub species to meet stand objectives and retain characteristic plants of site associations (VBPR, 2009).
- Maintain linkages between wetlands and other habitats through the use of vegetation corridors, raised boardwalks, large culverts and intact riparian areas and discourage human access (BC MOE, 2004).
- Maintain or restore the natural hydrology of wetlands and streams, so that these habitats continue to provide suitable conditions for semi-aquatic species over the long term (BC MOE, 2004).
- Restore wetland and riparian habitat where natural vegetation has been removed or altered, by removing invasive plants and/or planting using native plants.

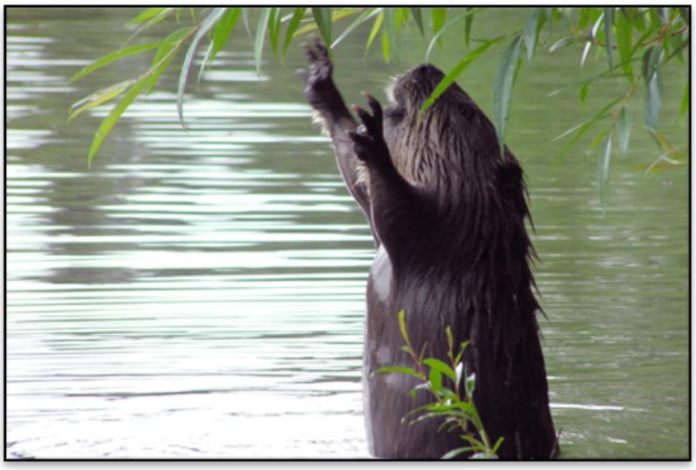
- Remove invasive gorse and Scotch broom and restore native dunegrass (*Elymus mollis*) in beach areas. Other native beach plants to restore could include: dune bluegrass (*Poa macrantha*), coastal strawberry (*Fragaria chileonsis*), seashore lupine (*Lupinus littoralis*), sand verbena (*Abronia spp*.), sea rocket (*Cakile* edentual), seabeach sandwort (does this need to be capitalized?) (Honkenya pepliodes), beach morning glory (Convolvus soldanella), Kinnikinnick (Arctostaphylos uva-ursi) and beach pea (Lathyrus japonica) (CRD, 2012).
- Create marked trails or boardwalks to reduce the incidence of trampling of dune vegetation (CRD, 2012).
- Leave driftwood in place, rather than "cleaning up" the beach. Logs help to stabilize sand dune sand provide hiding places for wildlife (CRD, 2012).

3.0 Keystone Species

A keystone species is one whose very presence contributes to a diversity of life and whose extinction would consequently lead to the extinction of a number of other forms of life. These species play a critical role in maintaining and supporting the Stanley Park ecosystem, often because they modify habitat on which many other species depend. Two animal types that are considered keystone species in Stanley Park are woodpeckers and beavers, but others may exist as well and have yet to be identified. In this section, we will focus on beavers; woodpeckers are covered in more detail in section 6.0 Locally Declining Populations under 'cavity nesting birds'.

American Beaver

Castor Canadensis



Adult beaver feeding on willow at Lost Lagoon, Stanley Park.
Photo: Mark T. White

CDC: Not listed
COSEWIC: Not listed
BREEDING STATUS IN STANLEY PARK: confirmed

Identification:
Beavers are the largest rodent in North America. They have a short neck, broad head, small beady eyes and short ears. An adult can weigh between 16-32 kg and measure on average 1.3 m long including its 30 cm tail. This broad, flat, scaly tail is one of their most easily identifiable features (Kavanagh, 2005; Fisher et al., 2000). They have dark brown fur on their backs and paler under parts that lack the reddish-brown hue (Fisher et al., 2000). Their forepaws are small and un-webbed, with long sharp claws suited to digging. The hind feet are very large, with five long, blunt-clawed, webbed toes suited for swimming (Kavanagh, 2005). Their long, strong, sharp incisors grow continuously and are hardened with dark orange coloured enamel on the forward face (Kavanagh, 2005).

Behaviour:
Beavers are generally nocturnal and are most active from dusk to dawn. Shortly before beaver kits are born, the female will drive the male away from the lodge to live temporarily in an old lodge or a burrow along a river bank. The family unit is the basis for the beaver society. If kits are threatened, the female will carry them in her mouth under water to another retreat (Kavanagh, 2005). Offspring do not work their first summer but start to help with colony chores during their second season. Kits eventually disperse when they are 2 or 3 years old and will migrate along streams, lakes or across ocean stretches to find mates or suitable building sites. These migrations can range from a few kilometers to 250km (Kavanagh, 2005).

In Vancouver, beavers regularly show up in local ponds in search of new territories after being expelled from their natal ponds upon reaching maturity. These juveniles often float down the Fraser River into the Strait of Georgia where their low tolerance for salt water forces them into the nearest available lakes and ponds, namely Jericho pond, Charleston Park pond, and Lost Lagoon.

Habitat Requirements:
Beavers will inhabit freshwater environments wherever there is suitable woody vegetation for food and den construction (Fisher et al., 2000). They are most common in forested areas, but will also expand into un-forested habitats if there are watercourses bordered by deciduous trees or shrubs (Kavanagh, 2005).

Breeding:
Beavers are monogamous and mate for life. The female usually establishes the home site which consists of the same habitat requirements as listed above. If her mate is lost, she will remain with her family until a new male joins her in the next mating season. If the female dies and leaves no female offspring, the male will abandon the site in search of a new mate. Mating occurs between January and February. The gestation period is 100 days and one litter of 3–4 kits is born each year in May or June (Kavanagh, 2005).

Food:
The preferred food choice is bark and cambium of deciduous trees, particularly aspen, willow, alder and birch trees (Fisher et al., 2000). During the summer months, aquatic pond vegetation (such as water lilies) is also eaten and sometimes they will come ashore to eat grains or grasses (Fisher et al., 2000).

Resident beaver in Stanley Park.
Photo: Peter Woods

Threats:

- In Stanley Park beaver predators include coyotes and river otters (Kavanagh, 2005).
- Sudden fluctuations in water levels can force beavers to leave their den and face danger on shore (Kavanagh, 2005). This may become a very real situation for the beavers in Stanley Park as the water level in both of their known habitats (Lost Lagoon and Beaver Lake) is controlled by the City of Vancouver.
- Beaver/human conflicts have become a recently problem as beavers can cause damage to farmlands, roads, trails, parks and tree plantations through their tree cutting and flooding practices (Kavanagh, 2005).
- Overall, populations of this species are on the rise in BC.

Special Significance of the Species:

- The beaver has influenced the history of Canada more than any other animal due to the long-running and lucrative trade in beaver pelts during the European colonization of North America (Kavanagh, 2005).
- Beavers are considered a keystone species because of the influence they have on their environment and the species that are dependent on the conditions they create. Through building their dams they do the following:
    - Maintain water levels
    - Improve habitat for many forms of wildlife
    - Stabilize stream flow
    - Prevent stream bed erosion (Kavanagh, 2005)
- Since arriving in Beaver Lake, this “ecosystem engineer” has been dredging the lake bottom and removing invasive lilies to the benefit of native fish, amphibians, birds and invertebrates which rely on deeper, colder water pools that persist into the summer.

- Beavers also benefit people by providing opportunities for wildlife observation, nature photography, environmental education and bird watching.

Wildlife Management Emphasis Areas:

- Riparian areas, wetlands and streams — Zones of vegetation directly adjacent to freshwater watercourses in particular those around Lost Lagoon, Beaver Lake, Beaver Creek, North Creek and all unnamed creeks.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act
    - Damaging beaver dams — An offence is committed if a person disturbs, molests or destroys a beaver house or den or beaver dam unless they're a licensed trapper, the action is taken to provide irrigation or drainage under lawful authority for the protection of property, or if the action is authorized by regulation.
    - It is unlawful to attempt to capture wildlife except with an authorized permit.
    - It is unlawful to possess wildlife (alive or dead) or any part of wildlife without an authorized permit.

Documented Occurrences in Stanley Park:

- The beaver(s) currently living at Lost Lagoon were first recorded in the Park in the summer of 2005 (Robyn Worcester, pers. comm.). This was first evidenced by the appearance of gnawed trees until finally photographs were captured by local naturalists. This beaver population continues to reside in Lost Lagoon (Mike Mackintosh, pers. comm.).
- There were several kits documented in the fall of 2010 at the Lagoon (see photo), but only 1–2 kits have been seen within the last year (Mark White, pers. comm.).

Beaver kits with parents near the Stone Bridge at Lost Lagoon, 2010.
Photo: Mark T. White

- The first beaver to live in Beaver Lake in many decades was first observed in 2008. It is thought that this young beaver may have come from the Capilano watershed and made its way across First Narrows where it found Beaver Creek. There are at least 2 beavers confirmed living in Beaver Lake as of the summer of 2011 (Robyn Worcester, pers. comm.).

Best Management Practices and Habitat Enhancement Opportunities in Stanley Park:

- Management activities should be operated in a way so as to live in cooperation with the beavers found in Stanley Park in order to benefit from the economic and ecological attributes they provide. This can be done through:
    - Beaver baffler — Installing a better beaver baffler at Beaver Lake will allow water to escape from Beaver Lake into Beaver Creek to maintain natural water levels while not destroying the dam built at Beaver Lake. Destroying the dam would result in overworking the beaver as it builds a new dam and would in turn cause it to remove extra trees around the lake to do so (see Figure 2).
    - Tree wrapping — To help protect certain trees from beavers, the trunks can be wrapped with cylindrical cages, have low fences installed around them or have their bases painted with sand.
- All deciduous trees cut in riparian areas should be bucked and left on the ground to be foraged by beavers for food and construction materials.

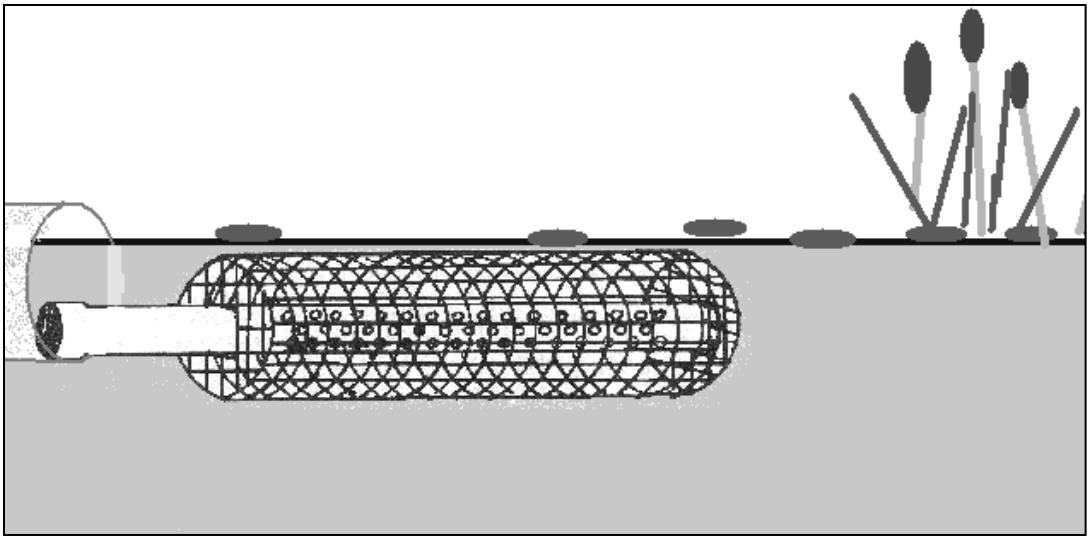


Figure 2: Diagram of pond-levelling device currently installed in Beaver Lake.

Operation Timing:

- Park Board work should be done at times when it is not detrimental to beaver foraging and den/dam construction activities. Beavers are most active from dusk to dawn and as a result, Park Board activities should be limited around Beaver Lake and Lost Lagoon during this time of the day.

4.0 Nesting Bald Eagles

There are four known breeding pairs of bald eagles in Stanley Park. SPES has been monitoring bald eagles nesting in the Park and also in various areas in Vancouver since 2004. SPES works in partnership with the Wildlife Tree Stewardship program (WiTS) to use standardized protocols and mapping techniques to track the bald eagles throughout the breeding season. The information gathered during the season is shared with Vancouver Park Board, BC government wildlife staff, the public and the media through the SPES website and regular printed updates.

There are four active bald eagle nests in Stanley Park: on Merilees Trail, near Brockton Oval, on Pipeline Road, and on Cathedral Trail. The Cathedral Trail and Pipeline Road nests are two of the largest and oldest in the Park and have been used since at least 1989. The newest nest near Brockton Oval was constructed in 2009–2010 and is likely occupied by the pair formerly nesting near the Dining Pavilion.

Section 34(b) of the BC Wildlife Act is the law that provides year-round protection to a select group of birds' nests, including those of bald eagles and great blue herons. These nests may not be disturbed during the breeding season. The Vancouver Park Board follows Best Management Practices (BMP) for Raptor Conservation during Urban and Rural Land Development in British Columbia as a tool for deciding how to protect bald eagle nests and habitat. The raptor BMP is not law, but is a set of guidelines for development and activities taking place near raptor nests, and is used as a tool by city planners and developers. The BMPs must be considered for each nest on a case-by-case basis as many urban eagles have chosen to build nests in non-traditional locations (e.g., in parking lots or industrial areas).

Nesting Bald Eagles

Adult preparing the nest for its young.
Photo: Martin Passchier

Urban bald eagles (*Haliaeetus leucocephalus*), particularly those living in the Vancouver area, have adapted very well amidst human development. They are frequently seen nesting in large trees in parks, backyards, parking lots, and even industrial sites. Vancouver eagles prey primarily on birds such as ducks, gulls and crows (Goulet, 2009). The breeding season for Vancouver eagles (when nests are built or repaired and eggs are laid) occurs earlier and for a longer period than in more northern or eastern areas of the province.

The Pacific Northwest region has the highest relative breeding abundance and British Columbia has the highest relative winter abundance of bald eagles in North America (Environment Canada, 2000). In 1994, there were an estimated 9,000 eagles breeding, and up to 30,000 eagles wintering on the coast (Blood and Anweiler, 1994).

SPES works in partnership with the Lower Mainland Wildlife Tree Stewardship (WiTS) program using standardized protocols and mapping techniques to track bald eagles throughout the breeding season. WiTS operates with all levels of government as well as with community groups like the Federation of BC Naturalists.

The Vancouver bald eagle nest monitoring program was initiated in 2004 by SPES in response to the growing number of nests in the City and a great interest from the public and park staff. In the first year of the program, SPES staff monitored six eagle nests, and by 2012, this number has grown to 19. The program relies on the help of dedicated volunteers, and the information gathered is shared with government wildlife staff, the public and the media through the SPES website and regular printed updates.

Identification:
Bald eagles are the only species of eagle regularly seen on the coast. Young eagles are often misidentified as golden eagles (*Aquila chrysaetos*) because they lack a white head. Adults have distinct white heads, white tail feathers and yellow beaks, and females are larger than males. Juveniles have primarily brown head feathers and black beaks. They gradually attain the distinct, adult white head and tail plumage, and yellow beak over 4–6 years, coinciding with reaching breeding age (BC MOE, 2004).

Adult **Sub Adult** **Yearling**

Breeding Habitat

Eagles in the Lower Mainland tend to select nest sites in large black cottonwood (62%) and Douglas-fir trees (30.4%) within 1.3km of permanent water sources (Goulet, 2009). Bald eagles are faithful to their mates and their nest locations, resulting in large, deep nests that are used nearly year-round as feeding and resting platforms. They can have several nests in their territory. An eagle's nest can measure 1.5–2.5 meters across (5–8 feet) and weigh 0.25–1 metric tonne or more (500 to 2,000 pounds). There are four active eagles' nests in Stanley Park (see map below).

Breeding Behaviour

Generally, between March and July, both parents attend to nesting activities. This includes a month long incubation period followed by a two-month rearing period until the young are able to leave the nest (see a generalized nesting calendar below). Bald eagles have been known to start nesting as early as January. Adult eagles do not appear to feed the young outside the nest and so the fledged young likely rely on their baby fat until they reach salmon rivers in the north (Hancock, 2006). A study of 140 nests in Greater Vancouver (including Stanley Park's four nests) showed that eagles have highest nest success (68.3%) and productivity figures (1.1 young/active territory) in North America, indicating that the local population is currently stable and possibly increasing (Goulet, 2009).

Generalized Bald Eagle Nesting Timeline

- October 2 - Return from northward migration (to take advantage of salmon runs).
- October 20 - Nest building and repairs begin (bringing sticks to nest).
- November 15 - Winter survival (mostly hunting and resting).
- February - Mating and a second flurry of nest preparation (add more branches and moss).
- March 25 - Egg laying; second and third eggs laid 2–3 days apart.
- April - Brooding month (both males and females take turns sitting on the eggs for approximately 35 days).
- May 1 - Chicks hatch.
- June - Chick development (small “peeps” heard at first; seen sitting on nest edge by late June).
- July - Chick development (flapping wings and jumping by July 10th).
- July 25 - First flight (85 days after hatching) .
- August - Fledged the nest (family hangs around the nest for a time, and then they all leave).
- September - Migration north to feed on early salmon runs (adults, new eaglets and non-breeding).
- October 2 - Adult eagles (only) return to nest territory.

Bald Eagle Nests in Stanley Park

Active Nest	UTM		Description
Merilees 3	488957	5461912	Near the corner of Merilees and Siwash Trails
Pipeline Road	490153	5461332	On Tunnel Trail, west of the miniature train fence
Cathedral Trail	489507	5460638	At the Junction of Bridal / Tatlow / Cathedral Trails
Brockton Oval	490687	5460575	Just north of the Vancouver Yacht Club


Cathedral


Dining Pavilion


Merilees


Pipeline

Food:

The diet of eagles in Greater Vancouver is made up of about 85% birds (35 species), 7% mammals (eight species), 7% fish (six species), and 1% invertebrates (three species) (Goulet, 2009). Vancouver eagles primarily eat northwesterncrows (*Corvus caurinus*), gulls (*Larus* sp.) and rock pigeons (*Columba livia*), and consume more sole (*Pleuronichthys coenosus*), Pacific sanddab (*Citharichthys sordidus*) and ring-billed gulls (*Larus delawarensis*) than suburban and rural eagles (Goulet, 2009). Local eagles also prey on crab, mussel and clams (Goulet, 2009).


An adult bald eagle catching a gull on Lost Lagoon in Stanley Park.
Photo: Mark T. White

Threats:

- 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 (BC MOE, 2004).
- Loss of old growth and large conifer trees near the seashore — New developments along the shore often result in the loss of mature trees which cannot be replaced for many hundreds of years. Many of the suitable nesting trees in Vancouver are already occupied and the loss of

any additional large trees would be a detriment to this species. Faster-growing species, such as black cottonwood, can replace these lost conifers temporarily but cottonwood trees have a short life span and SPES has observed that there are more problems associated with cottonwood nests — such as the nests falling apart and the chicks falling from those nests prematurely (Robyn Worcester, pers. comm.) — than with nests in conifers.

- Ecosystem degradation — Eagles need a healthy and diverse ecosystem to provide them with a wide range of food choices and year-round feeding opportunities.
- Declining salmon stocks — On the west coast of BC, eagle survival is closely tied to the historic migration patterns of the salmon (Hancock, 2009).
- Pollution — Eagles are sensitive to toxic contaminants including chlorinated hydrocarbons, lead and pesticides and others (Environment Canada, 2000).
- Electrocution is a common cause of death and BC Hydro is trying to reduce this by experimenting with various types of structural changes to utility poles and lines (Environment Canada, 2000).

Special Significance of the Species:

- There are four nesting territories in Stanley Park and at least 18 in the City of Vancouver. These eagles and their nests provide an incredible teaching and learning opportunity for the public, are a draw to international tourists and provide enjoyment to local residents.
- Spiritual values — Bald eagles play a significant spiritual role in many First Nations cultures (BC MOE, 2004).
- Educational and scientific values — 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, including bald eagles. By discontinuing the use of that pesticide to conserve raptors (and other species), environmental conditions for humans and other animals have improved (BC MOE, 2004) and this has been partly responsible for the recovery of bald eagles across North America.
- Ecological values — Eagles consume a wide variety of prey and so they play a role in regulating prey populations, nutrient cycling and cleaning up the environment through scavenging. 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 the region (BC MOE, 2004).
- Economic values — By helping to control prey populations, raptors can directly benefit humans by reducing pest species and by reducing 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. The presence of raptor habitat (wooded areas, wetlands, old fields) can add to the economic value (marketability) of a property (BC MOE, 2004).

Wildlife Management Emphasis Areas:

- Old Growth Patch — One stand of old growth trees, located in the area between Tunnel Trail and Pipeline Road, provides a picture of what the forest looked like prior to logging in the 1860's.
- Ecotones — The edges, or interfaces between two distinct forest habitats: Edges of major blowdown areas, hard forest edges, and between highly structurally distinct forest types.

Applicable Wildlife Laws:

- Section 34 of the BC *Wildlife Act* provides protections to native birds and their active nests in British Columbia. Paragraph (b) of the section provides year-round protection to the nests of a select group of birds including those of bald eagles and great blue herons (*Ardea herodias*). These nests are protected year-round, though in some special circumstances, permits can be granted by the BC Ministry of Forests, Lands and Natural Resource Operations (MoFLNRO) to provide exemption from this protection.

Documented Occurrences in Stanley Park:

- There are four known breeding pairs of bald eagles in Stanley Park and several nests.
- The Cathedral Trail and Pipeline Road nests are two of the largest and oldest in the Park, and have been used at least since 1989 (Robertson et al., 1989).
- Since SPES began the monitoring program in 2004, each nest has been intensely monitored throughout the breeding season. The results are shown in Table 2. below:

Table 2: Stanley Park bald eagle pair nesting productivity records.

	2004	2005	2006	2007	2008	2009	2010	2011
Pipeline Road Nests (eagle pair 1)	1 Chick	1 Chick	1 Chick	1 Chick	0 Chicks	0 Chicks	0 Chicks	0 Chicks
Dining Pavilion Nest (eagle pair 2)	2 Chicks	1 Chick	2 Chicks	0 Chicks	0 Chicks	0 Chicks	Secondary nest (not used)	
Brockton Nest (eagle pair 2)							Nest Built 1 chick	0 Chicks
Cathedral trail (eagle pair 3)	1 Chick	0 Chicks	0 Chicks	0 Chicks	0 Chicks	0 Chicks	0 Chicks	1 Chick
Merilees Trail 1 (Fd 1) (eagle pair 4)	no records	1 Chick	0 Chicks	Nest Gone				
Merilees Trail 2 (snag) (eagle pair 4)				Nest Built	Secondary nest (not used)			
Merilees Trail 3 (Fd 2) (eagle pair 4)					Nest Built 1 chick	2 Chicks	2 Chicks	1 Chick

Best Management Practices for Operations in Stanley Park:

SPES follows Best Management Practices (BMP) for "Raptor Conservation During Urban and Rural Land Development in British Columbia", as a tool for decision-making on how to protect bald eagle nests and their habitat. The following are select excerpts from that document (BC MOE, 2004):

Adult eagle feeding nestling.
Photo: Martin Passchier

- Where possible, retain existing, natural habitats suitable for raptors: It is much better to leave natural structures in place than it is to restore or recreate them later.
- 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 law (Wildlife Act, section 34) provides legal protection for all active nests and for some species whether they are active or not (including bald eagle, golden eagle, osprey (*Pandion haliaetus*), peregine falcon (*Falco peregrinus*), gyrfalcon (*Falco rusticolus*). Generally, unoccupied nests of other raptors are not protected when not in use or outside the nesting season; though protection may be extended to them if they are listed as Identified Wildlife under the *Forest and Range Practices Act* and occur in a Wildlife Habitat Area designated under that Act. Perches and roosts are not afforded legal protection but should also be retained. Raptors and their nests are not protected under the federal *Migratory Birds Convention Act*; however, they would receive protection under the federal *Species At Risk Act* if the species became legally designated as threatened or endangered under that Act.
- 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 caution must be used to prevent attracting raptors to otherwise unsuitable areas where survival and productivity may be reduced.
- 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. A buffer distance of 100m is recommended to prevent disturbance during the breeding season and a 1.5 tree lengths buffer of undisturbed vegetation is recommended. Larger buffers may be required depending on the conditions at each site.
- Be able to demonstrate that activities comply with provincial laws: In BC the active nests of all raptors as well as the inactive nests of the bald eagles are protected year-round. The destruction of any aforementioned nest (or nest tree) is unlawful unless authorization by permit from MoFLNRO is acquired prior to such activity.

Habitat Enhancement Opportunities:

- Retain old growth trees, snags and candelabras. Eagles prefer to nest in live trees but use large, dead trees as feeding and roosting platforms.
- Install floating perches such as logs or docks. The floating logs installed in Lost Lagoon in 2006 are used daily by one pair of nesting bald eagles in Stanley Park.

Operation Timing:

- If work that risks disturbing the eagles must proceed around an active nest, the local FLNRO office should be advised and a qualified professional environmental monitor should be assigned the responsibility of observing and recording the response of the eagles to the disturbance. The monitor should advise the proponents if it appears the disturbance is likely to cause nest abandonment, as this could result in charges being laid under section 34 of the Wildlife Act.
- Egg laying and chick rearing generally occur from February–August, but eagle pairs are most sensitive to disturbance during the courtship phase from November–February. Abandonment of a nest site in response to disturbance is therefore more likely to occur during the courtship phase, somewhat less likely when eggs are in the nest and less likely again when the young have hatched. The older the fledglings, the more the adults have invested that year and the less likely they are to abandon the site; though disturbance at a late stage could impact the adults' choice of nest site the following year. Activity should be minimized around the nest site at all times of the year, and, if practicable, restricted to August–September, particularly for major works. If this is not possible, a qualified professional should be hired to assess the situation.

5.0 Rare species

Rare species are endemic to the area but are rarely observed in the Park because of their small population size or very narrow geographical range. These species of special significance have been identified by SPES, with the help of local naturalists and by Parks Canada in its Commemorative Integrity Statement for Stanley Park. Such rare species include:

- a healthy population of a unique, endemic species of feather duster worm (*Eudistylia vancouveri*),
- a small number of marbled murrelets, which were once common and bred in the Park
- and a small population of round-leaved sundew, now only found in a few square meters of bog habitat on the southwest corner of Beaver Lake.

Vancouver Feather-duster

Eudistylia vancouveri

Identification:
The worm secretes a tough, leathery parchment-like tube to enclose and protect its body. Tube can be up to 68 cm long, 2 cm diameter. The body of the worm is segmented into three distinct regions: tentacular crown (head), thorax and abdomen. The worm body is held in place inside its tube by hooked structures called uncini: thoracic uncini and abdominal uncini. The worm itself is only visible by its green and reddish-purple tentacular crown or plume when the worm extends from the tube on the incoming tide and fully expands the tentacular crown. The tentacular crown can expand to a diameter of 6.0 cm (Lamb and Hanby, 2005; Duane Sept, 1999; Huemoeller, 2007).

Vancouver feather-duster at Steep Island, Discovery Passage, southern BC.
Photo: Bernard P. Hanby (Lamb and Hanby, 2005).

Behaviour:
The Vancouver feather-duster is, more often than not, aggregated into large groves or colonies where individual tubes are permanently occupied by the worms. The Vancouver feather-duster worm was first described from Vancouver Island, and records from the early 1920s estimated that large groves contained as many as 375,000 to 500,000 individuals (Lamb and Hanby, 2005). The tentacular crown filters suspended food and particles from the surrounding water and is responsible for 80% of the worm's respiratory requirements (oxygen demand) (Beesley et al., 2000).Light-sensitive eyespots on the tentacular crown that can detect even the slightest shadow, in combination with the action of giant nerve fibres within the ventral nerve cord that respond to the slightest disturbance, enable the worm to retract rapidly inside its tube. If the tube breaks, the worm is capable of repairing it rather than building a new one (Duane Sept, 1999). When the tide is out, water is retained within the tube to protect the worm from drying out (Huemoeller, 2007).

Habitat Requirements:
Usually found in large colonies anchored in sandy silt and in crevices amongst rocks at the low intertidal zone of rocky shores, to a depth of 30 m. Floats or pilings are often favoured habitats by individual worms. Although the feather-duster colonies are less commonly found in areas of heavy surf, their tough and securely anchored parchment-like tubes are able to withstand relatively strong wave-action and currents. This is a beneficial attribute since there must be sufficient current or wave

action wherever they establish themselves to provide a constant supply of food (Duane Sept, 1999; Huemoeller, 2007; SODC, 2009).

Breeding:
Reproduction takes place by external fertilization through broadcast spawning of male and female gametes (sperm and eggs, respectively) (Beesley et al., 2000). The resulting young, free swimming larvae drift along ocean currents as part of the zooplankton, feeding on their own yolk supply. Within 3 - 4 weeks the larvae swim out of the plankton towards the ocean bottom to find a hard surface on which to attach, often near their own adults. The young worm then begins to metamorphose into a permanently attached adult (Huemoeller, 2007).

Colonies of Vancouver feather-duster in the middle to low subzones of the intertidal area at Brockton Point.
Photo: Ken Seward-Naumann, Langara College, 2011.

Food:
The Vancouver feather-duster uses its tentacular crown to trap and eat food such as unicellular algae and planktonic larvae (Beesley et al., 2000; Lamb and Hanby, 2005). The radioles (branches) of the tentacular crown trap the food and transport it to the mouth via ciliated grooves that run the length of each of the radioles, much like a funnelling effect. The mouth only accepts the smallest particles for ingestion. The larger particles are sorted and either rejected or reserved for use in building and repairing their tube (SODC, 2009; Huemoeller, 2007).

Threats:

- The Vancouver feather-duster worms have a habit of settling on floats, wharf and dock pilings. Maintenance on these structures often involves removing the worms from these sites (Huemoeller, 2007).
- They are predated upon by increasing populations of sea stars (SODC, 2009).

Special Significance of the Species:

- The Vancouver feather-duster worm is an endemic species to the Vancouver area (Coast River, 1995).
- The beauty of these worms with their colourfully-patterned tentacular crown is a sight actively sought after by SCUBA divers and tide pool explorers (Huemoeller, 2007).
- The Vancouver feather-duster is a prey item for several species of gill-nipping fishes (high cockscomb, gunnels, pricklebacks), red rock crabs, purple sea star, shorebirds and likely wading birds that inhabit the intertidal areas around Stanley Park (Sheila Byers, 2011) .

Wildlife Management Emphasis Areas:

- Intertidal - All of the littoral areas off of the seawall around Stanley Park including Coal Harbour and around Deadman's Island.

Applicable Wildlife Laws:

- None

Documented Occurrences in Stanley Park:

- Coast River Environmental Services performed a marine invertebrate study in 1995 and identified the Vancouver feather-duster worm (as the synonym northern feather duster worm) at Brockton Point (Coast River, 1995).
- Sheila Byers conducted an intertidal survey of flora and fauna off the rocky point jutting into Burrard Inlet directly north of the SS EMPRESS of JAPAN figurehead (sometimes referred to as Figurehead Point) between 2007 and 2011. Small colonies of the Vancouver feather-duster were observed in the vicinity of the Girl In Wetsuit statue (Sheila Byers, 2009; 2011).

Best Management Practices for Operations in Stanley Park:

- Vancouver feather-duster worm colonies found on the seawall, pilings, docks, etc. around Stanley Park, including on the seawall and Coal Harbour marina facilities, should not be removed during routine maintenance work on these facilities.
- A survey of known colonies of Vancouver feather-duster, as well as a reconnaissance of other potential colonies at rocky habitat areas around Stanley Park, should be conducted to determine colony numbers, size estimates, and numbers of individuals/colonies to obtain a more accurate baseline and mapping of existing Park populations. Mapped colonies of Vancouver feather-duster should be monitored on an annual basis to record any short and long-term changes.

Habitat Enhancement Opportunities:

- The Vancouver feather-duster worms have been documented near Brockton Point and Figurehead Point, both historically with rich intertidal areas. Before performing any habitat enhancement projects it is suggested that a more thorough investigation be conducted to determine if all the colonies in Stanley Park have been located and obtain accurate details of these colonies to confirm and update existing data. If through these investigations a lack of habitat is determined, or a decline in colony numbers is observed, then pilings could be placed near existing colonies to act as anchoring sites for new colonies to establish. Pilings could also be placed in suitable locations where Vancouver feather-duster worms are not present but where ideal habitat conditions exist.

Round-leaved Sundew

Drosera rotundifolia

Round-leaved sundew in the Stanley Park bog.
Photo: Peter Woods

CDC: Not Listed
COSEWIC: Not Listed
BREEDING STATUS IN STANLEY PARK: Confirmed

Identification:
Most easily identified by its sticky, glandular, spreading leaves that form a basal rosette 3–7 cm long and 5 cm tall. Leaf blades are round and fringed with long, reddish, glandular hairs that exude drops of sticky fluid. Flowers are white and small (petals 6–10 mm long) clustered (3–10) all on one side of a single stem that rises to a maximum of 25 cm above the leaves (Pojar and MacKinnon, 2004).

Habitat Requirements:
Found primarily in wet habitats with acidic soils and high levels of sunlight (Worcester, 2010). Habitats include sphagnum bogs, fens and wet meadows at low to middle elevations. Usually grow on sites low in available nitrogen (Pojar and MacKinnon, 2004).

Reproduction:
Round-leaf sundew can only flower in strong sunlight and are typically pollinated by the same insects that they capture in their sticky hairs and digest (Pojar and MacKinnon, 2004). Seed capsules are 1–1.5 mm long and contain large numbers of tiny seeds (Douglas *et al*, 1999). The plant can spread rapidly due to the large number of tiny seeds, particularly in wet bare sites (Laurence Brown, pers. comm.).

Food:
Round-leaf sundews are carnivorous and eat mosquitoes, midges and gnats among other insects to help supplement the low nitrogen levels found in their growing conditions (Pojar and MacKinnon, 2004).

Threats:

- Alterations to the Beaver Lake bog water levels due to the construction of the Stanley Park Causeway and Beaver Lake perimeter trail and weir.
- Accumulation of organic debris on top of peat that creates growing conditions favouring terrestrial plants.
- Round-leaved sundews are very sensitive to the effects of trampling and are easily destroyed when people go off the trails (MacGowan, 2002).
- The Stanley Park bog (on the southwestern shore of Beaver Lake) — their only habitat in the Park — is rapidly disappearing due to encroachment by other plants such as western hemlock and salal. Without intervention (clearing of salal, hemlock and shrub layer), round-leaved sundew may become extirpated from Stanley Park (Worcester, 2010).

Special Significance of the Species:

- Various northwest coast First Nations used the leaves for removing corns, warts and bunions (Pojar and MacKinnon, 2004).
- In Haida, the plant is known as "many hearts" and was used as a good luck charm for successful fishing (Pojar and MacKinnon, 2004).
- The sap contains an antibiotic that is effective against several bacteria and was used to treat tuberculosis, asthma, bronchitis and coughs (Pojar and MacKinnon, 2004).
- It is the only carnivorous plant in Stanley Park which is one of only two small sites in the City of Vancouver where it is found (Laurence Brown, pers. comm.).

Round-leaved sundew feeding on insects.
Photo: Peter Woods

Wildlife Management Emphasis Areas:

- Wetland and riparian areas — The areas of vegetation around Beaver Lake and the current bog site that were historically bog or have bog indicator species such as Labrador tea and sphagnum moss.

Documented Occurrences in Stanley Park:

- Round-leaved sundew has only been documented in a few small patches in the small Beaver Lake bog on the south-western shore of Beaver Lake, in association with sphagnum moss (Worcester, 2010).
- In 1997, a report by the Beaver Lake Bog Committee of BLEEP noted round-leaved sundew in the Beaver Lake bog (BLEEP, 1997).
- In 1998, a Capilano College Environmental Science study confirmed round-leaved sundew to be present only along unsanctioned trail edges in the Beaver Lake bog (Worcester, et al., 1998).
- In 2009, three small test patches were created by SPES staff in the bog to see if sundew growth would increase with the removal of competing salal and Labrador tea (Worcester, 2010).
- In 2011, a baseline inventory report of the Beaver Lake bog by SPES staff confirmed that round-leaved sundew were still present in the Beaver Lake bog among the test patches created in 2009 and old remnants of sphagnum hummocks.

Best Management Practices and Habitat Enhancement Opportunities:

To ensure the survival of round-leaved sundew in Stanley Park, it is imperative that ecological restoration of the Beaver Lake bog take place. In 2011, restoration work was initiated by SPES, in partnership with the Vancouver Park Board and under the advisement of the Camosun Bog Restoration Group (www.camosunbog.org).

Current restoration work includes:

- Removal of hemlock trees
- Removal of encroaching terrestrial plants such as Labrador tea and salal
- Removal of accumulated organic material above the peat
- Levelling of peat to encourage sphagnum moss growth
- Planting of sphagnum moss
- Planting of round-leaved sundew and spreading of seeds on established sphagnum hummocks

Future restoration work should include:

- Alterations to water drainage (culverts, trail re-construction, etc.) around the Beaver Lake bog to restore traditional drainage patterns favouring a wet bog environment, as opposed to the drier terrestrial environment that was historically created.
- Installation of boardwalks and signage to act as an interpretive opportunity and a way to stop unsanctioned trails while maintaining sundew habitat (Worcester, et al., 1998).

Operation Timing:

- All work - other than bog restoration - should be limited in the Beaver Lake bog at all times of the year due to the sensitive growing conditions and locally rare plants.

Marbled Murrelet

Brachyramphus marmoratus

CDC: Blue
COSEWIC: Threatened
BREEDING STATUS IN STANLEY PARK: unlikely

Marbled murrelet off Stanley Park seawall in winter (non-breeding) plumage.
Photo: Allan Jensen

Identification:
The marbled murrelet is a small, plump water bird 25 cm in length, with a short, pointed bill, a short, pointed tail and small, webbed feet. Males and females have similar colouring, although plumage changes during the breeding season. Breeding adult has sooty brown on upper parts and mottled brown on under parts. Nonbreeding adult has blackish upper parts and white under parts extending up the sides of head almost all the way around the nape. Immature birds are similar to non-breeding adults but under parts are lightly speckled, not clean white (Cornell Lab, 2011d; Blood, 1998). When swimming, the slender bill and stubby tail are usually pointed upwards. When airborne they beat their sturdy wings very rapidly, zigzagging over the water, and making flying birds look like oversized "bumblebees" (Blood, 1998).

Behaviour:
During spring courtship, a "bill-up" display is performed in which both partners swim side-by-side, point their bills into the air, lift their breasts out of the water and then swim rapidly forward together for as long as 30 seconds. Preceding the "bill-up" display, one member engages in a "V" wing display in which the bird half-opens its wings, forming a "V", and swims alongside its mate while making unique buzzing calls (Fenneman, 2010). While underwater, marbled murrelets "fly" using their muscular wings as flippers and their feet for steering. They are known as "fast fliers" and demonstrate a great deal of speed and agility during bouts of underwater fishing (Blood, 1998).

Habitat Requirements:
Wintering in the open sea, they occur along the entire BC coast, sparsely in the north and relatively abundant in sheltered waters to the south such as the Georgia Straight and surrounding fjords (Cornell Lab, 2011d;, Blood, 1998). They prefer coastal waters within 2km of land, and are often found in channels and fjords along the inner coast. They also frequent exposed coastlines, such as Vancouver Island, but remain near the shore. Important foraging sites include tidal rips through narrow passages, shelves at the mouths of inlets and shallow banks (Blood, 1998).

Breeding:
These birds nest along the entire BC coast — usually within 20km of saltwater, but possibly much farther inland — in mature and old growth coniferous forests, from sea level to montane elevations (Blood, 1998, Fenneman, 2010). Their preferred forests have an abundance of large trees (usually greater than 200 years old), with large limbs or platforms created by mistletoe infections ('witches

brooms'), damage, diseases, or other factors. Preferred sites also have thick cushions of moss or accumulations of debris suitable for nesting substrates. Marbled murrelets have occasionally been found nesting in younger forests, although there are still usually at least a few mature or old growth trees present (Fenneman, 2010; Cornell Lab, 2011d). Most coastal watersheds are used for nesting, except areas that have been heavily logged or developed, such as the southeast coast of Vancouver Island, the Gulf Islands and the Lower Mainland (Blood, 1998, Fenneman, 2010). Occasionally, marbled murrelets can be seen on freshwater lakes during the breeding season, typically within 20km of the coast — although they have been seen up to 75km inland on Cultus and Harrison Lakes (Blood, 1998).

Food:
Marbled murrelets feed primarily on small fish (around 8.5 cm in length) or on shrimp-like crustaceans such as euphausids and mysids. Schools of juvenile Pacific sandlance and herring are an important source of food, especially in the spring and summer months, when sandlance appear to be the fish most often carried to nestlings (Blood, 1998).

Threats:

- Breeding habitat is dependent on the conservation of old growth forests. This puts them at conflict with the forestry industry in its entire range. Breeding populations around the Strait of Georgia have been almost completely eliminated due to habitat loss for development (Fenneman, 2010).
- Forest fragmentation can open the forest to new predators that are more adept at detecting murrelets and their eggs, for which they have no natural defense (Blood, 1998).
- Susceptible to entanglement in gill nets while wintering at sea (Fenneman, 2010).
- Oil spills pose a serious threat to marbled murrelets and other marine wildlife along the entire BC coast (Blood, 1998).

Special Significance of the Species:

- Despite being adapted perfectly for life at sea, marbled murrelets nest far inland in ancient forests (Blood, 1998).
- Nesting sites are so difficult to find that while the species was first described in 1780, the first nest wasn't formally documented until 1974, 185 years later (Cornell Lab, 2011d).
- All members of the auk family, except for the marbled murrelet, nest in burrows in dense colonies on small offshore islands and are adapted perfectly for this environment. The marbled murrelet, however, has breeding season plumage and greenish-tinted eggs better adapted to nest in the forest (Blood, 1998).
- Marbled murrelets differ from other forest nesting birds in that they do not nest in cavities or build nests among branches. They nest directly on mossy platforms, on thick limbs or on some sort of deformity. Only old trees provide these types of site, greatly limiting their choice of nesting sites (Blood, 1998).

Wildlife Management Emphasis Areas:

- Old Growth Patch — Only one stand of old growth trees that provides a picture of what the Stanley Park forest looked like prior to logging in the 1860's remains and is located in the area between Tunnel Trail and Pipeline Road.

- Intertidal — All of the littoral areas off of the seawall around Stanley Park including Coal Harbour and around Deadman's Island.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 — It is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 — No person shall disturb, destroy or take a nest, egg or nest shelter… of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.
- Species at Risk Act, 2002

Documented Occurrences in Stanley Park:

- Prior to 1988, it was considered a known, or strongly suspected, breeding species in Stanley Park (Weber et al. 1988).
- Seen in deep water from Stanley Park (VNHS 2006)
- Natural Areas Map — Habitat for Marbled Murrelet (Parks Canada 2002)
- SPES Historical Data: three sightings recorded in Coal Harbour in 2005; two birds seen off seawall in 2009; one bird seen along seawall near Second Beach in January 2012.

Best Management Practices for Operations in Stanley Park:

- Protect all remaining old-growth forest patches and old-growth trees in Stanley Park as they're the only suitable nesting sites for this species (Blood, 1998).
- Minimize all watercraft traffic around groups of waterbirds wintering off the shore of Stanley Park from October through April (i.e., enforce a 250 meter buffer zone).
- Monitor populations of this species to better understand trends in their abundance and use of the Park's habitat.
- Do not remove or destroy trees infected with hemlock dwarf mistletoe.

Habitat Enhancement Opportunities:

- Install seasonal buoys around key feeding and congregating areas off of Stanley Park to restrict boat traffic in these areas during the winter feeding season.
- Install educational signs at key points along the seawall to inform members of the public about giving seabirds plenty of space.
- Create intertidal gabions to create foraging habitat for mussel and barnacle feeding ducks. This has been tested in the Port of Vancouver.

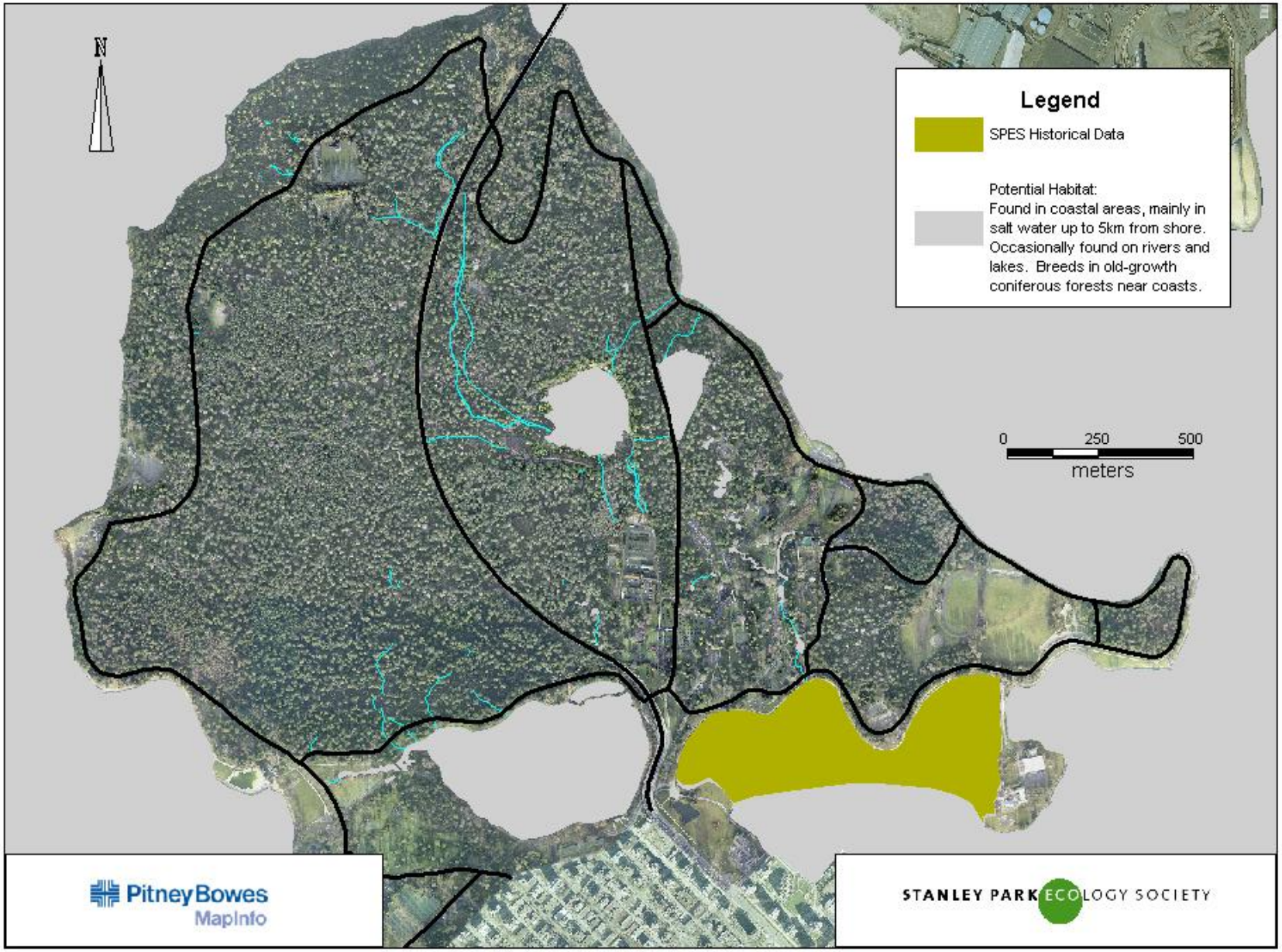
Operation Timing:

- Nesting typically begins in early May and may not finish until September (Blood, 1998). During this time, if marbled murrelet nesting sites are located in Stanley Park, all Park Board maintenance work must be limited to at least 30 meters or 1.5 tree lengths (whichever is greater) from the nesting site to protect this species at risk. It is possible that park operations may have to cease completely (depending on the activity) around breeding nests due to the high concern over this species.

Species at Risk Habitat in Stanley Park

Marbled Murrelet

Brachyramphus marmoratus



6.0 Locally Declining Populations

Some populations of species that are not considered rare in other places are declining in Stanley Park. Most of these are not well documented, but local naturalists and Park staff have witnessed these declines over the past decades. Perhaps the most extensively documented is the decline in seabirds using the Park foreshore and Lost Lagoon (mainly in winter). Seabird counts have recorded a change in status for many species from common and abundant, to uncommon and rare. These declines may be attributed to factors such as the decline of their food resources, the alteration of their breeding habitat, pollution, or climate change. Some species may be avoiding areas they once used due to increased human presence, disturbance from boats, and off leash dogs. However, none of the potential causes for decline have been officially studied.

Small Owls

Northern pygmy-owl
Source: http://en.wikipedia.org/wiki/File:Northern_pygmy-owl.jpg

Small owls in Stanley Park include the northern pygmy-owl (*Glaucidium gnoma*) and northern saw-whet owl (*Aegolius acadicus*) (hereafter referred to as NPOW and NSWO respectively). In the past these animals were much more common in Stanley Park than they are today. These smaller owls rely on shrub undergrowth to hide from predators. The most common theory for their decline is that the recent encroachment of barred owls (*Strix varia*) into southern BC since the 1960's has corresponded with a decline in other, smaller owl species.

Identification:
NSWO (Length 18–21 cm), NPOW (Length 15–17 cm) (Cornell Lab, 2011e, f). NSWO: Round, light grey face with brown streaks, outlined in brown and white; eyes yellow; bill black; under parts pale with dark streaks; upper parts brown with white spots. NPOW: Gray, brownish-gray or rufous in colour; round white spotted head; quite a long tail compared to other owls; eyes yellow; bill yellowish-green; two black nape spots outlined in white on the back of head, which look like eyes (Univ. Michigan, 2008).

Northern saw-whet owl in Stanley Park.
Photo: Peter Woods

Behaviour:
Hunts at night (NSWO) or in day/evening, (NPOW) from low perches. Can be found roosting in winter in small, dense conifer trees, sometimes even in parks and gardens. Defence upon discovery is to sit still and not fly, leading people to perceive them as "tame". Highly territorial and solitary (Cornell Lab, 2011e, f).

Habitat Requirements:
Dense coniferous or mixed forest, cedar groves, riparian areas, alder thickets, and swamps; also hunts in open fields, wetlands, blowdown areas and the edges of meadows (BC CDC, 2012e, f). NSWO: often roosts in dense evergreens in winter, at various heights and usually close to the trunk (Cornell Lab, 2011e). NPOW: roosts in quiet, shady alder thickets. Winters in a variety of habitats with dense vegetation for roosting (Univ. Michigan, 2008).

Breeding:
Nests in tree cavities in snags or larger living trees, typically in old woodpecker holes; also uses nest boxes. Nesting March-July (mainly April-May) (Cornell Lab, 2011e, f).

Food:
NSWO: woodland mice, especially deer mice, and occasionally some small birds and large insects. (Cornell Lab, 2011e). NPOW: Small birds, small mammals, insects, and reptiles (Univ. Michigan, 2008).

Threats:

- Habitat Loss - Though population trends have not been well studied, populations of these owls are probably declining slowly due to habitat loss (BC CDC, 2011e, f).
- Predation - 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.

Special Significance of this Group:

- These owls impact the populations of small mammals that they eat (Univ. Michigan, 2008).

Wildlife Management Emphasis Areas:

- Riparian Areas – the areas of vegetation around Beaver Lake and Lost Lagoon as well as along all streams.
- Deciduous Patch – stands dominated by alder or maple, including behind the Park Board works yard, south of Kinglet Trail, and in the old wildflower meadow.
- Old Growth Patches - between Pipeline Road and Tunnel Trail east of Beaver Lake.
- Ecotones - located throughout the park, any areas where two structurally distinct habitat types meet.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 – It is an offence to take, harm, or destroy the birds, their nests, or their eggs.

Documented Occurrences in Stanley Park:

- On list for study area (Robertson and Bekhuys, 1995).
- Listed as uncommon in spring, summer, fall and winter (Weber et al., 1988).
- Sightings of these owls and other species have been reported to the SPES Nature House staff over the years (Koren Johnston, pers. comm.).
- Northern saw-whet owls have been photographed in the Park and some have been released here from raptor rehabilitation facilities in cooperation with SPES (Worcester, 2010).
- One northern saw-whet owl was recorded during SPES owl call playback surveys in March 2011.
- Dead northern saw-whet owls have been recovered from Park Drive in 2009-2011 (Ziggy Jones, pers. comm.).

Best Management Practices for Operations in Stanley Park:

- Retain edge habitats – especially small-medium openings in the forest canopy.
- Maximize retention of hedgerow and brushy thickets.
- Protect riparian areas and snags within.
- Preserve all trees and snags used or suspected of being used by owls as nesting sites.

- Protect existing and potential nest sites, including veteran recruit trees and trees with natural cavities.
- Reduce brushing in potential habitat.
- Maintain a minimum buffer of 1.5 tree lengths, consisting of undisturbed natural vegetation, around nest sites in trees (BC MOE, 2005).

Habitat Enhancement Opportunities:

- Let grass grow longer to improve rodent habitat.
- Install nest boxes where natural cavities are scarce.
- Restore habitats where natural vegetation has been removed or altered, by removing invasive plants and/or planting native plants.
- Protect owls from crashing into windows by installing shapes in the window or closing blinds (BC MOE, 2005).

Operation Timing:

- Breeding from March – August (concentrated in April-June) – avoid brushing, thinning, or hazard tree treatment in known or potential nesting locations.
- Restrict noisy activities (such as filming, parades and special events) as well as Park maintenance operations to 200m or more away from nest sites from March – August.

Amphibians

Amphibians are vertebrates that lay eggs lacking a shell or membrane; they have thin, moist and generally smooth skin that is vulnerable to drying. Many of the native species that are on record in Stanley Park have been locally extirpated from the Park in the last 20-30 years. The decrease in native amphibian diversity and abundance is likely due to changes in habitat in the Park (in particular the loss and degradation of habitat), genetic isolation of species living in the Park, and the spread and competition of the invasive American bullfrog and green frog.

Adult northwestern salamander near Beaver Lake, Stanley Park.
Photo: Brian Titaro

Amphibians on record for Stanley Park include both the following native and invasive species:

Native Species:

- Northwestern salamander (*Ambystoma gracile*)
- Western redback salamander (*Plethodon vehiculum*)
- Common Ensatina (*Ensatina eschscholtzi*)

Invasive Species:

- American bullfrog (*Lithobates catesbeiana)*
- Green frog (*Lithobates clamitans)*

Extirpated Species:

- Roughskin newt (*Taricha granulosa*)
- Long-toed salamander (*Ambystoma macrodactylum*)
- Western toad (*Anaxyrus boreas)* * Blue listed Species at Risk in BC
- Northern red-legged frog (*Rana aurora*) * Blue listed Species at Risk in BC
- Pacific Chorus Frog *(Pseudacris regilla)*

Identification:
Roughskin newt: Adult snout to vent length (SVL) 12-80mm; grainy skin surface absence of costal grooves; pale yellow eyes with distinct dark bar; greyish/ brown back contrasts against bright orange underside (Corkran and Thoms, 1996).

Northwestern salamander: Adults are large (total length 240mm); body uniformly dark brown (sometimes grey or black); large, dark, protruding eyes; broad head with large parotoid glands behind the eyes; 10-12 prominent costal grooves between the front and rear legs (BC MOE, 2012).

Long-toed salamander: Adult is slender (total length 85mm); dark grey-black skin; yellow-green stripe (sometimes patchy and uneven on edges) runs down the back almost to the tip of tail; long fourth toe on each hind foot; 12 costal grooves (BC MOE, 2012).

Western redback salamander: Adult SVL of 13-64mm; long body with 16 costal grooves; dorsal stripe (if present) usually red or gold but sometimes greenish or gray; edges of the stripe distinct and uniform; stripe broad, solid band from hind legs to the tip of tail (Corkan and Thoms, 1996).

Common ensatina : Adult SVL of 17-65mm; very short body with large head and eyes; tail constricted at base and may show several vague rings; colour varies but typically translucent red-brown, grading into pale tan or cream on the underside with a pink tone overall (Corkran and Thoms, 1996).

Northern red-legged frog: Adult is medium sized (70-100mm in length); brown or reddish; smooth skin marked by small black freckles; prominent dorsolateral folds running from behind eyes down the sides of the back; distinctive red colouring of the underside of hind legs; gold eyes oriented to the sides (BC MOE, 2012).

American bullfrog: Adult is large and robust (up to 200mm in length); green or brown in colour with large golden eyes; large distinct tympanum just behind and below the eye partly surrounded by a fold of skin running from the eye down to the shoulder (BC MOE, 2012).

Green frog: Adult is medium sized (up to 100mm in length); green or bronze in colour; resemble adult bullfrogs but smaller with more distinct dorsolateral folds; large tympanum behind each eye (BC MOE, 2012).

American bullfrog.
Photo: Martin Passchier

Behaviour:
Native pond-breeding amphibians perform yearly migrations from the terrestrial habitats that they occupy most of the year to permanent and ephemeral ponds to breed and lay their eggs. Amphibians are most active at night and after rains when the weather is cool and damp and the risk of predation is low. Non-native bullfrogs and green frogs occupy permanent ponds year round, as do the larva and neotenic adults of the native northwestern salamander.

Habitat Requirements:
Amphibians in Stanley Park rely primarily on two main habitat types: wet coniferous and deciduous forest and shallow lakes and wetland environments. Most of our amphibian species live in forested areas, and adults are typically found either underground, in rotten logs, at the bottom of snags or under piles of coarse woody debris. Species found in these habitats include: roughskin newts, northwestern salamanders, long-toed salamanders, western redback salamanders and ensatina salamanders. The young of the first three salamander species spend the start of their lives in shallow

lakes or ponds and under logs submerged in water. The young of the western redback salamander and ensatina salamander are born in the forest and spend their entire lives in the same habitat as the adults (Corkran and Thoms, 1996).

Ensatina salamander.
Photo: Robyn Worcester

Adult and juvenile northern red-legged frogs live primarily in moist coniferous and deciduous forest, while their eggs and larva are found in forested wetlands. The American bullfrog and green frog live in the warm water of permanent ponds, lakes and marshes with dense aquatic vegetation. Their young live in the dense vegetation found in these environments (Corkran and Thoms, 1996).

Breeding:
Amphibians in Stanley Park can be broken down into either terrestrial-breeding or aquatic-breeding amphibians. The western redback and ensatina salamanders are fully terrestrial and lay their eggs in a cluster on land typically in or under decaying logs and course woody debris. The ensatina female usually stays with the eggs until they hatch (Corkran and Thoms, 1996).

Aquatic-breeding amphibians lay their eggs in ponds, lakes and marshes with some aquatic vegetation. American bullfrogs and green frogs lay their eggs along the surface of the water, while other species like the northwestern salamander lay their eggs in large masses attached to small diameter sticks and aquatic vegetation. These species prefer aquatic habitats of depths between 0.5 and 2 meters to lay their eggs. In contrast, the long-toed salamander prefers to lay its eggs in small ephemeral ponds with water shallower then 0.5 meter (Corkran and Thoms, 1996).

Food:
All adult amphibians and larval aquatic salamanders feed primarily on invertebrates. Certain species, such as the roughskin newt, are also known to eat the eggs of other amphibians (BC MOE, 2012).

The tadpoles of frogs found in Stanley Park feed on algae. The adult American bullfrog has a voracious appetite and is known to also eat birds, small mammals, snakes, other frogs and anything else it can fit in its mouth (BC MOE, 2012).

Threats:

- *Invasive Species*: One of the largest threats to our native amphibian populations is invasive species, in particular invasive amphibian species such as the American bullfrog and green frog. Both of these species compete for resources with native amphibians, including food and breeding locations. The American bullfrog possesses a more direct threat through predation (consuming both native frogs and salamanders).

- *Habitat Loss and Fragmentation*: Most amphibian species require wetland habitat as their primary habitat or at least for breeding. The loss of wetland habitat around the world and its degradation through invasive species and improper human management put all species that depend on wetlands at risk. For most local amphibians, the loss of large coarse woody debris through forest management practices also reduces important microhabitat sites. Fragmentation of habitat can be especially harmful to amphibian populations as they move from their breeding grounds near wetlands to the forest where they live. They are relatively slow moving, small and low to the ground, and are easily killed by cars as they try to cross roads.
- *Disease:* The two emerging infectious amphibian diseases of current concern in BC are chytridiomycosis, caused by *Batrachochytrium dendrobatidis* (Bd), and a suite of illnesses caused by ranaviruses in the family Iridoviridae (BC MOE, 2012). Direct evidence of disease-induced amphibian declines have been linked to chytridiomycosis and it is a major threat to amphibian populations globally (BC MOE, 2012).

Special Significance of this Group:

- Amphibians play an important role in food webs as both prey and predator species. Adults and juveniles are important predators of invertebrates and help in controlling natural insect populations. They are also preyed upon by a number of animals including aquatic invertebrates, reptiles, birds and some mammal species (ESI, 2010).
- Through the metamorphosis process many species of frogs and salamanders create a transfer of nutrients from aquatic to terrestrial ecosystems. Removing amphibians can alter natural cycles in algae communities, invertebrate populations, predator dynamics, leaf litter decomposition and nutrient cycling (ESI, 2010).
- Amphibians are widely used to monitor the environment for possible effects caused by acid rain, ultraviolet radiation, widespread parasite and fungal infections and climate change. Since they breathe through their skin they are very susceptible to pollution, and their disappearance or population declines can serve as an early warning sign of environmental degradation (Cook, 2012).

Wildlife Management Emphasis Areas:

- Wetlands, streams and riparian areas – Beaver Lake and Lost Lagoon, the areas of vegetation around them, and all streams.
- Deciduous Patches – stands dominated by alder or maple, including the area behind the Park Board works yard, south of Kinglet Trail, and in the old wildflower meadow.
- Old Growth Patches - between Pipeline Road and Tunnel Trail east of Beaver Lake.
- Ecotones - located throughout the park, any areas where two structurally distinct habitat types meet.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 . It is an offence to take or attempt to capture wildlife or be in possession of wildlife without an authorized license or permit.
- Species at Risk Act, 2002 - 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. 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 (such as red-legged frogs).

Documented Occurrences in Stanley Park:

- 1998 - A terrestrial amphibian survey conducted around Beaver Lake documented 9 ensatina and 4 redback salamanders (Lindskoog et al., 1999).
- 2007 - Spring terrestrial amphibian surveys along Merilees Trail uncovered seven adult redback salamanders (Elke Wind, pers. comm.).
- During the Restoration in 2007 many terrestrial salamanders were found by environmental monitors and relocated out of the way of machinery that was clearing fallen debris. A small stream running under Merilees Trail in blowdown area N1 served as refuge habitat for amphibians in the area and was utilized by more than five redback salamanders (Worcester, 2010).
- Ensatina and redback salamanders are frequently found during invasive species removal events by SPES staff and volunteers (Greg Ferguson, pers. comm.).
- 2007 - Amphibian trapping surveys conducted by biologist Elke Wind resulted in the capture of 21 green/bullfrog tadpoles, 1 bullfrog adult and 1 northwestern salamander larvae in Beaver Lake and in the biofiltration pond at Lost Lagoon (Worcester, 2010).
- 2009 –SPES amphibian trapping surveys resulted in the capture of green and bullfrog tadpoles, adult green frogs and northwestern salamander larvae in Beaver Lake and in the two ponds within the miniature train area (Moose Pond and Beaver Pond) (Worcester, 2010).
- Beaver Pond contained about 20 northwestern salamander egg masses in both 2008 and 2009; Moose Pond had 27 in 2008 and only 2 in 2009 (Worcester, 2010).
- Three years of RISC standard surveys as well as those conducted in 1998-1999 indicate that no Pacific chorus frogs or red-legged frogs have been found in the Park. These amphibians may be considered locally extirpated since they have not been recorded since the 1970s (Worcester, 2010).

Best Management Practices for Operations in Stanley Park:

- Locate developments, trails and roads away from key habitats for amphibians such as wetlands, streams, and intact upland forest sites (BC MOE, 2004). Create a survey to identify amphibian crossing “hot spots” and work towards putting in wildlife underpasses and directive fencing to minimize road kill and facilitate amphibian migration.
- Control the spread of nonnative animals and plants that compete with and prey on native amphibians, or can overtake native vegetation and alter wetlands. This can also include opportunistic predators such as raccoons that prey on amphibians and have artificially inflated numbers in the Park where they feed on garbage and human handouts (BC MOE, 2004).
- Encourage residents to take an interest in protecting these species by providing interpretive materials such as signs and brochures (BC MOE, 2004).
- For pond-breeding amphibians:
    - Preserve all wetlands, ponds, pools, shallow water areas, streams and their vegetation – however small or ephemeral. These areas serve as breeding habitat and cover for many amphibians (BC MOE, 2004).
    - Maintain the natural hydrological patterns of flooding and drying of wetlands; temporary wetlands often have few predators (BC MOE, 2004).

    - Maintain sufficient terrestrial habitat or access to terrestrial habitat for amphibians to complete all life history phases (BC MOE, 2004).
- For terrestrial salamanders:
    - Preserve intact, mature and old forest areas and large woody debris (BC MOE, 2004).
    - Moist, wooded areas such as skunk cabbage swamps, seepage areas, or ephemeral pools or streams may also be important (BC MOE, 2004).
    - Avoid removing downed logs and bark, especially large diameter pieces (BC MOE, 2004).
- Maintain the natural hydrology of wetlands and streams, so that important habitats continue to provide suitable conditions for semi-aquatic species over the long term (BC MOE, 2004).
- Retain natural vegetation whenever possible; the maintenance of natural ecosystem processes will promote high species diversity of amphibians (BC MOE, 2004).
- In upland habitats, avoid compaction and disturbance of the ground including soil, litter layer, and coarse woody debris; avoid removing natural vegetation and mowing grassy areas adjacent to wetlands (BC MOE, 2004).
- Maintain original connectivity of habitats and populations:
    - Avoid fragmentation of habitats; where habitats are already fragmented, provide habitat continuity that allows for movements of animals. Ensure that connectivity is maintained by setting aside undisturbed habitat for travel routes to these areas. Maintain a buffer zone of 30 to 50 meters of undisturbed vegetation around streams, so that a travel corridor is maintained (BC MOE, 2004).
    - Movement corridors must be of sufficient width and contain habitat attributes that are attractive to amphibians (BC MOE, 2004).
    - Protection of undisturbed riparian areas such as along creeks is an excellent option for maintaining connectivity of populations and habitats; however, it is crucial that no gaps of unsuitable habitat exist (BC MOE, 2004).
- Prevent the spread of disease into the Park, or from inside the Park out (we currently do not know if chytridiomycosis or ranaviruses is present - no testing has been done in Stanley Park to date). It is recommended that all people working in and around the Park's major wetlands follow the "Interim Hygiene Protocols for Amphibian Field staff and Researchers" which is available for download through the BC Ministry of Environment Ecosystems Branch website to prevent the spread of disease.

Habitat Enhancement Opportunities:

- Create buffers of undisturbed native vegetation around and adjacent to key amphibian habitats and discourage human access to these areas through fencing or natural barriers.
- Create landscape linkages to allow movements of animals between important seasonal habitats.
- Locate roads and infrastructure away from important amphibian breeding areas to minimize the road kill of animals migrating to and from upland habitats. Consider special road crossing structures where this is possible.

Operation Timing:

- Native pond breeding amphibians in Stanley Park move from terrestrial landscapes towards ephemeral and permanent ponds to breed and lay eggs in early to mid-spring, in some cases

(Red-legged frogs) as early as January. During this period, Park maintenance work should not take place around or in permanent or ephemeral ponds or in the Wildlife Management Emphasis Areas in between these habitats so as not to disrupt their migration or ability to breed successfully.

- During the remainder of the year Park maintenance work should not take place near known amphibian refuges (i.e.: the small stream running under Merilees Trail in blowdown area N1) or in areas with heavy coarse wood debris during extreme cold or dry weather as these are congregating areas for terrestrial salamanders during these extreme weather bouts.
- Invasive amphibians in the Park breed in early summer, later then native frogs, primarily in the permanent ponds (Beaver Lake, Lost Lagoon, Bio filtration Pond). It is more acceptable for Park maintenance work to take place in these areas during this time as the threat is not as high to native breeding amphibians.

Reptiles

Reptiles are vertebrates with dry waterproof skin (scales) which have more advanced circulatory and respiratory systems than amphibians.

Reptiles that have been found in Stanley Park include the following native and invasive species:

<u>*Native Species*</u>*:*

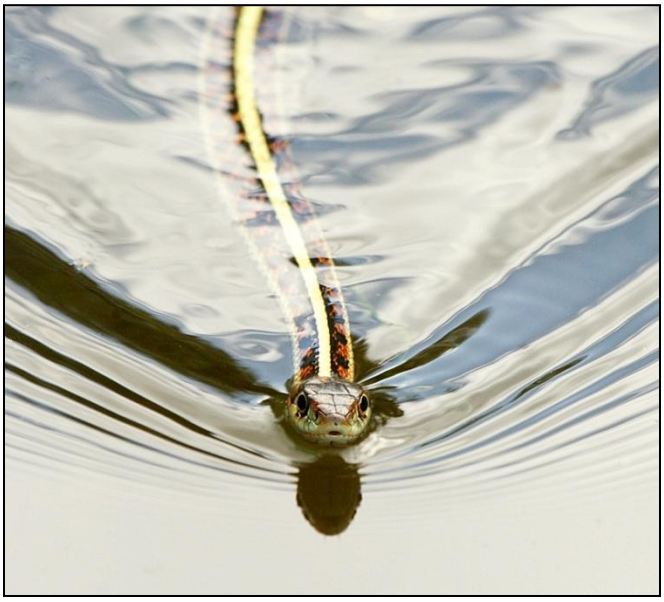
- Northern alligator lizard (*Eligaria coeruleus*)
- Northwestern garter snake (*Thamnophis ordinoides*)

<u>*Invasive Species*</u>*:*

- Red-eared slider (*Trachemys scripta*)

<u>*Extirpated Species:*</u>

- Western painted turtle (*Chrysemys picta*)
- Western terrestrial garter snake (*Thamnophis elegans*)
- Common garter snake (*Thamnophis sirtalis*)



Common garter snake swimming.
Photo: Martin Passchier.

Identification:
Northern alligator lizard: Adult snout to vent length (SVL) 7-13 cm, total length 25 cm; elongated body with short legs; distinctive fold of skin along the side of body reveals small, granular scales within when spread apart; juveniles have wide copper-tan band on back (St. John, 2002).

Western terrestrial garter snake: Adult average length 46-109 cm; local subspecies (wandering garter snake, *T.e. vagrans*) has dull yellow dorsal stripe that is narrow and usually infringed by dark spots giving an uneven zigzag appearance; side stripes dull yellow with light gray or brown between stripes and a pattern of well separated small, dark spots (St. John, 2002).

Northwestern garter snake: Adult length 30-61 cm; most variation in colour and pattern of any snake in the region; dorsal stripe wide and well defined although may be absent; colour ranges from bright yellow or red, through orange, greenish yellow, turquoise blue, white or dull yellowish tan (St. John, 2002). Best distinguishing feature is pale upper lip.

Common garter snake: Adult length 46-91 cm; local subspecies (Puget Sound garter snake, *T.s. pickeringii*) has very narrow, turquoise or greenish-yellow dorsal stripe and side stripes of the same colour; area between stripes is black, usually with light narrow bars and flecks that match the colour of the stripe or are pale orangey - red (St. John, 2002).

Red-eared slider: Adult shell length 10-36 cm; similar to painted turtle in appearance, with yellow stripes on back and legs; slider can be told apart by total lack of red on plastron (belly), instead having a yellow colouration with large, dark blotches; a bright red (sometimes yellow) patch on the side of the head behind eye (St. John, 2002).

Red-eared slider.
Photo: Martin Passchier

Behaviour:
When alarmed the western terrestrial garter snake and the common garter snake will retreat to the bottom of nearby water sources and hide under submerged rocks until the threat has passed. The northwestern garter snake, northern alligator lizard and the common garter snake will emit feces and a foul smelling musk when handled or threatened to repel potential predators (St. John, 2002; BC MOE and TRU, 2012). When red-eared sliders are threatened, their primary tactic is to flee and hide by quickly slipping into the water and disappearing (BC MOE and TRU, 2012).

Habitat Requirements:
Northern alligator lizard – Primarily coniferous forests. Tolerant of cool, damp environment but requires some sunny clearings. Found under logs, bark and boards at the edge of meadows, road cuts and areas with open tree canopies (St. John, 2002).

Western terrestrial garter snake – Primarily open coniferous forests. Found near water, especially in thick riparian vegetation despite its name (St. John, 2002).

Northwestern garter snake – Primarily damp, heavily vegetated areas such as grassy/brushy areas near forest edges, meadows, ditches and areas with open forest canopies (St. John, 2002).

Common garter snake – Primarily around aquatic habitats under logs, bark, rocks and boards or basking on floating logs and cattail mats (St. John, 2002).

Red-eared slider – Primarily ponds, lakes and rivers with muddy bottoms and thick aquatic vegetation (St. John, 2002).

Breeding:
Native snakes and lizards existing in Stanley Park overwinter in a hibernaculum. These are typically found on rocky, south facing slopes where many underground crevices are present and the aspect allows for maximum sun exposure (BC MOE and TRU, 2012). Mating occurs shortly after emergence from the hibernaculum on warm spring days. Among snakes and lizards , the young develop inside the female before she gives birth to live young (BC MOE and TRU, 2012). Broods are typically 2-6 for the northern alligator lizard and anywhere from 3-20 for all species of snakes. Native reptiles are typically born between July and September depending on the species (St. John, 2002).

Red-eared sliders are the only reptile found in the Park that lays eggs. They overwinter in logs or mud at the bottom of lakes or ponds. In early spring courtship begins and pairs breed at the bottom of lakes and ponds. After a 60 – 70 day incubation period, 2 – 25 eggs are laid in the summer (St. John, 2002, BC MOE and TRU, 2012). Although this species has been confirmed to lay eggs in the park, no hatching has been documented to date.

Food:
Northern alligator lizard – Large insects (beetles, caterpillars, grasshoppers, spiders and snails (BC MOE and TRU, 2012).

Garter snakes – Slugs, fish, earthworms, snails, small amphibians, insects, and sometimes small mammals, birds, frogs and other reptiles (BC MOE and TRU, 2012).

Red-eared slider – Algae, tadpoles, frogs and invertebrates (BC MOE and TRU, 2012).

Threats:
- Habitat Destruction – The destruction of native habitat affects many species including reptiles. Fragmentation of habitat limits genetic diversity and can increase mortality as species try to move from one fragment to another (CARCNET, 2011).
- Traffic Mortality – Reptiles are attracted to roads in the evening since the tarmac is warmer than the surrounding environment. When habitat is fragmented by roads, especially hibernacula from summer ranges, road kill mortality becomes high. Reptiles are long lived and slow breeding so even a slight increase in mortality can wipe out a population (CARCNET, 2011).
- Predators – Many species of snakes and turtles are prone to nest predation by raccoons and skunks. As populations of these animals tend to grow near urban areas, raccoon predation on nests can become intolerably high and wipe out a localized population (CARCNET, 2011).
- Contaminants – Reptiles are very sensitive to chemical contamination, which can result in eggs failing to hatch, birth defects and inability to breed (CARCNET, 2011).
- Pet Trade – Collecting wild animals to be sold as pets can have devastating effects on a population, especially one that is genetically isolated and already under stress from habitat fragmentation, invasive species or over predation (CARCNET, 2011). This has been speculated as one reason why there may be such a lack of reptiles in Stanley Park today.
- Introduced Species – Foreign reptiles such as the red-eared slider can have devastating effects on native reptile populations. These introduced species can out-compete native species for food and nesting sites causing their extirpation, this could be the case in Stanley Park with the extirpated western painted turtle (CARCNET, 2011).
- Persecution – Many people fear or do not like reptiles, particularly snakes, and will kill them on sight (CARCNET, 2011).

Special Significance of this Group:
- Reptiles play an important role in keeping rodent and insect populations under control. They are also a source of food for other vertebrate species (Worcester, 2010).
- They're an obligate species of many unique and rare ecosystems found in Stanley Park. The loss of these ecosystems directly affects their populations and long term survival.

- Currently, they are extremely rare in Stanley Park although they used to be fairly common at many locations (i.e.: alligator lizards at Third Beach).

Wildlife Management Emphasis Areas:

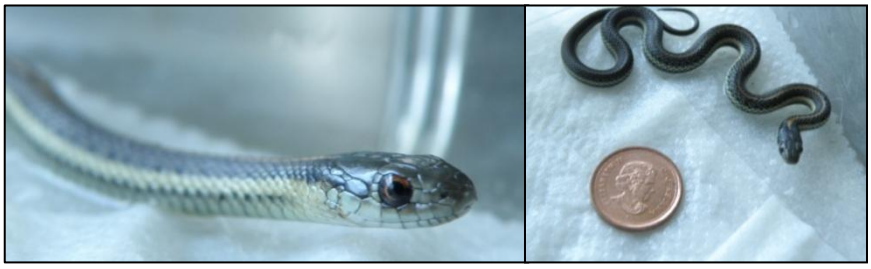
- Wetlands, streams and riparian areas – Beaver Lake and Lost Lagoon, the areas of vegetation around them, and all streams.
- Deciduous Patch – stands dominated by alder or maple, including behind the Park Board works yard, south of Kinglet Trail, and in the old wildflower meadow.
- Old Growth Patches – between Pipeline Road and Tunnel Trail east of Beaver Lake.
- Ecotones – located throughout the park, any areas where two structurally distinct habitat types meet.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 – It is an offence to take attempt to capture wildlife or be in possession of wildlife without an authorized license or permit.

Documented Occurrences in Stanley Park:

- Reptiles have been found in the areas surrounding Lost Lagoon and Beaver Lake, and also under logs, stumps, or along the bluffs and cliffs in the Park.
- Red-eared sliders are commonly seen in the Park's major water bodies.
- Summer 2004 - A large garter snake was seen near the trail on the east side of Lost Lagoon (Peter Woods, pers. comm.).
- Northern alligator lizards have been spotted in the rock areas near the Third Beach concession (John Gray, pers. comm.).
- Park reports from 1995 and 2002 cite SARA-listed western painted turtles as being present in Beaver Lake (Robertson and Bekhuys, 1995; Parks Canada, 2002), but it is not known if there were surveys conducted or if this was based on sightings from earlier reports.
- A survey was conducted for western painted turtles in the Park in 2008 as part of the windstorm restoration. This was only a short visual search, but local naturalists believe that this species is no longer present in the Park.



In November of 2010 this small (northwestern) garter snake was found in the old zoo hospital building in Stanley Park. It was the first reported sighting of a snake in the park since 2004
Photo: Robyn Worcester

Best Management Practices for Operations in Stanley Park:

- All species of reptiles:
    - Try to locate developments and roads away from key habitats for reptiles, such as wetlands, streams, and nesting and denning sites.
    - Maintain buffers of undisturbed native vegetation around and adjacent to key reptile habitats and discourage human access to these areas.

    - Minimize road kill of animals migrating between seasonal habitats by locating roads and infrastructure away from these areas; consider special road crossing structures where this is unavoidable.
    - Encourage residents to take an interest in protecting these species by providing interpretive materials such as signs and brochures.
    - Avoid removing downed logs and bark, especially large diameter pieces; downed wood in various stages of decay provides shelter and egg-laying sites.
- Painted Turtle:
    - Protect nesting habitats adjacent to wetlands from disturbance and human access; typically these sites are located on dry and light soils with little vegetative cover on a southern slope within 150 m from water.
    - Prevent and control the spread of invasive species and remove non-native competing reptiles.
- Lizards and Garter snakes:
    - Protect south-facing, rocky slopes, used as basking, hibernation, or nursery sites.
    - Retain rock outcrops with fissures and coarse woody debris which provide shelter for reptiles.
    - Provide access to wetland foraging areas for garter snakes.

Habitat Enhancement Opportunities:

- Provide suitable landscape linkages to allow movements of animals between important seasonal habitats; riparian management areas and greenways can connect habitats.
- Create nesting areas for native reptiles.
- Create talus slopes and rocky areas with southern exposure for reptiles.

Operation Timing:

- Native reptiles spend the winter months in a hibernaculum located on rocky, south facing slopes before leaving in early spring to mate. During this time no Park maintenance work should take place at known or potential hibernaculum sites so as not to disturb hibernating and breeding reptiles.

Bats

Bats are the only mammals capable of true flight. Their wings are specially developed hands with a thin skin membrane that allows them to fly. While bats can hear and see well, they also use echolocation for finding their food at night. These crepuscular, or active at dusk and dawn, mammals spend the majority of the day roosting in places such as caves, cracks in rocks, under tree bark or in tree cavities. Bats play an ecologically important role by eating large numbers of a variety of insects.

The first silver-haired bat ever documented in Stanley Park.
Photo: Brian Titaro

The below species have been confirmed in the Park:

- Little brown bat (*Myotis lucifugus*)*
- Yuma bat (*Myotis yumanensis*)
- Big brown bat (*Eptesicus fuscus*)
- Silver-haired bat (*Lasionycteris noctivagans*)
- Hoary bat (*Lasiurus cinereus*)

These species geographical range falls within Stanley Park's boundaries and may also be present:

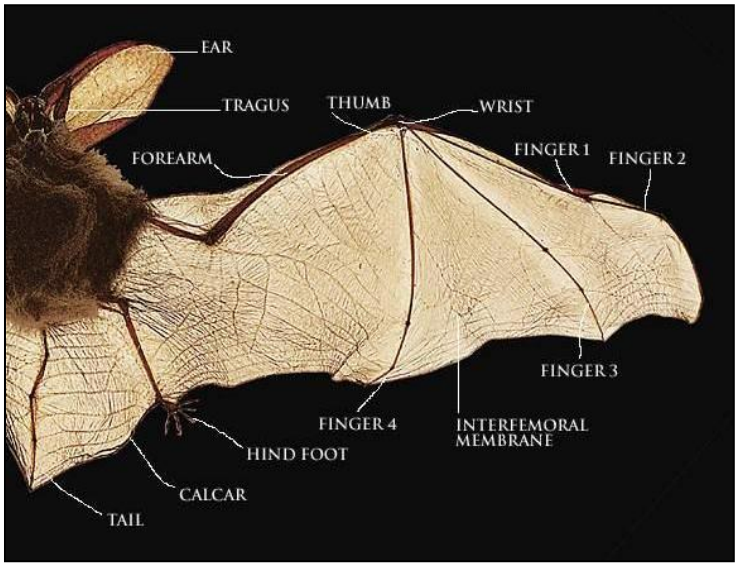
- Keen's Long-eared Myotis *(Myotis keenii)*
- Townsend's big-eared bat (*Corynorhinus townsendii)*
- California bat (*Myotis californicus)*
- Long-legged Myotis (*Myotis volans)*
- Western Long-eared Myotis (*Myotis evotis*)

** Species at risk*

Identification:

- *Little brown bat*: Wingspan: 22 – 27 cm. Small with dark brown fur on back and paler on undersides. Tips of hairs give a copper appearance. Wing and tail membranes are mainly unfurred (fur may appear on edges) (Eder and Pattie, 2001). Looks nearly identical to Yuma bat.
- *Yuma bat*: Wingspan: 23 cm. Medium with brown to black fur on back, lighter on underside. Ears can extend to nose when pushed forward. Looks nearly identical to little brown bat (Eder and Pattie, 2001).
- *Big brown bat*: Big and brown with lighter undersides and glossy appearance. Face, ears and flight membranes are black and mainly unfurred (Eder and Pattie, 2001). Well developed snout.

- *Silver-haired bat*: Wingspan: 28-30 cm. Fur nearly all black with long white tipped hairs on back giving frosty appearance in younger individuals. Light covering of fur over the entire surface of the tail membrane (Eder and Pattie, 2001).
- *Hoary bat*: Wingspan: 38-41 cm. Large with light brown to greyish fur, white hair tips give frosted appearance. Throat and shoulders are buffy yellow or toffee coloured. Ears are short, rounded and furred but edges are naked and black. The unusual rounded shape of the face is characteristic of this species (Eder and Pattie, 2001).



Bat anatomy.
Source:http://seattletimes.nwsource.com/pacificn/2002/1013/bat_anatomy.html

Behaviour:
All bats present in Stanley Park are in the 'evening bat' family (*Vespertilionidae).* True to their name, these bats are most active in the evening after sunset and again just before dawn. During these two periods they forage for their preferred insect prey. As a testament to their aerial skills and ability to catch food, the little brown bat can consume up to 900 insects an hour during these night flights, and the hoary bat typically fills its stomach within the first 15 minutes of foraging. While many local bat species will hibernate for the winter in trees or caves, hoary bats and silver-haired bats migrate south to warmer climates (Eder and Pattie, 2001).

Habitat Requirements:
Most bat species are highly adaptable and can survive in and around human activity. Little brown bats can be found living in buildings (attics, etc…), under bridges, and under the bark of trees. These sites are typically found in close proximity to water, usually within 1 km. Silver-haired bats and big brown bats prefer forested habitat, but are also commonly seen in parks and near cities. Yuma bats and hoary bats are more commonly found in grassland and shrub areas, with hoary bats preferring coniferous or deciduous forest habitat. Both species can also be commonly found foraging near water or over lakes (Eder and Pattie, 2001).

Breeding:
The bat species native to Stanley Park mate in the fall or during the hibernation period in the winter months. They will undergo delayed implantation, where sperm is stored within the female until fertilization takes place in the spring, with 1-2 young born in early summer. All bat species that overwinter or hibernate in BC typically do so in old buildings, tree cavities, caves or abandoned mines or under shingles or siding on south facing aspects. Many bat species native to Stanley Park will form maternity colonies, where the females roost together when rearing young, while some species such as the silver-haired bat and the hoary bat will roost alone in tree foliage. These maternity colonies may be very large, with little brown bats roosting in maternity colonies of up to 1000 bats. These

female maternity colonies used for raising young are most commonly found in hollow tree cavities, old buildings or under loose shingles (Eder and Pattie, 2001).

Food:
All bat species in Stanley Park are insectivores, although prey preference varies by species. Little brown bats feed primarily on night flying insects, while Yuma bats focus on insects hatched in the water. Hoary bats feed on moths, grasshoppers, flies and beetles, while silver-haired bats focus on moths and flies, and big brown bats prefer grasshoppers and beetles (Eder and Pattie, 2001). All bats are flexible in their food preferences and may shift their diets throughout the year.

Threats:

- Humans: Humans pose the biggest threat to bat populations. People commonly fear bats and some will go out of their way to kill them. Many bats are colonial and large numbers can easily be destroyed. Even people who do not mean to cause harm may do so accidentally. If hibernating bats are disturbed, they consume energy and increase the likelihood that the bat's stored fat will be insufficient to keep it alive for the rest of the winter (Brigham, 2011).

Little brown bats in hibernaculum displaying white nose syndrome.
Photo: Nancy Heaslip
(USGS, 2011)

- Insecticides: Bats eat millions of insects over their lives. If these insects have been treated with insecticides, toxic compounds can accumulate in the bat. These toxins can have health effects on the bat and cause death in high concentrations. These insecticides also cause decreases in the insect population that bats rely upon for food, reducing food for bats (Brigham, 2011).
- White Nose Syndrome (WNS): WNS is decimating bat populations across eastern North America, with mortality rates reaching up to 100 percent at many sites (USGS, 2011). First documented in New York in 2006, the disease has spread quickly into 16 states and four Canadian provinces. This syndrome is caused by a fungus called *Geomyces destructans* that forms characteristic white, fuzzy, fungal growths around the nose and wings of infected bats (COSEWIC, 2012). It is estimated that at least 5.7 million to 6.7 million bats have now died in the US and biologists expect the disease to continue to spread west (USGS, 2011).
- WNS is spreading at rates between 200 and 400 km/year and could encompass most of the species' range within two to three generations. Recent population counts of little brown bats at hibernacula in Canada show declines of 94-99% within two years of exposure (COSEWIC, 2012).
- Deforestation: Logging reduces the availability of natural roosting places such as wildlife trees and mature trees with shingling bark (Brigham, 2011).
- Wind turbines: Wind turbines are an emerging threat to bat populations, killing bats that come in contact with wind farms during their migratory period. Unfortunately very little long term data exists on population numbers, so it is difficult to determine definitive conclusions about its effects on their population (Brigham, 2011).

Special Significance of this Group:

- Bats provide tremendous value to the economy as natural pest control for farms and forests every year, while playing an essential role in helping to control insects that can spread disease to people (USGS, 2011).
- Bats are a major predator of night-flying insects, helping to control pest insects while avoiding impacts on valuable insects such as bees.
- Bat populations mirror the health of the environment. The conservation of bats and their habitat will benefit a wide spectrum of other wildlife (Entwistle et al., 2001).

Wildlife Management Emphasis Areas:

- Wetland, Riparian, and Streams – Seasonally wet areas around Prospect Point and Second Beach provide excellent foraging resources for bats. The areas of vegetation around Beaver Lake and Lost Lagoon as well as along all streams.
- Ecotones - located throughout the park, any areas where two structurally distinct habitat types meet.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 – it is an offence to take attempt to capture wildlife or be in possession of wildlife without an authorized license or permit.
- Species at Risk Act, 2002 - 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. 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.

Documented Occurrences in Stanley Park:

- Bats in the Park are commonly seen flying over the sea shore, Lost Lagoon, Beaver Lake, and open fields; they have also been seen under street lamps in the interior of the Park (Worcester, 2010).
- Preliminary bat studies conducted by SPES staff and volunteers in 2008 used mist nets over Beaver Lake near the outflow culvert. The initial bats identified included big brown bats, little brown bats and Yuma bats. Mist net surveys have been conducted every year since, capturing the same species.
- A maternity colony of Yuma, little brown and/or big brown bats exists in the attic of the Stanley Park Dining Pavilion. Early counts of the bats as they exited the roof in early August 2009 showed at least 163 bats in the colony, and regular colony counts have been ongoing ever since.
- In 2009-2010 a bat research and education project was conducted by two BC Institute of Technology students in the Fish, Wildlife and Recreation program, working in partnership with SPES staff. During the summer and fall of 2009 acoustic monitoring recorded the highest levels of activity along forest edges and close to water. Lost Lagoon and Beaver Lake had the highest level of activity, followed by sites located along the seawall. The largest percentage of echolocation activity was in the 40 kHz range, which indicates the Myotis genus. Activity was also observed in the 20-30 kHz range which could indicate big brown, silver-haired or hoary bats (Rutherford and Sinclair, 2010).

- During the Stanley Park BioBlitz in August 2011 mist net surveys along Beaver Creek captured both Yuma and little brown bats.
- A hoary bat was discovered and photographed in October, 2011, approximately 1 km outside Stanley Park on Barclay Street just west of Broughton Street.
- In April of 2010 a silver-haired bat was found and identified in Stanley Park by SPES staff near South Creek Trail. Later that year another silver-haired bat was found near Beaver Lake.

Best Management Practices for Operations in Stanley Park:

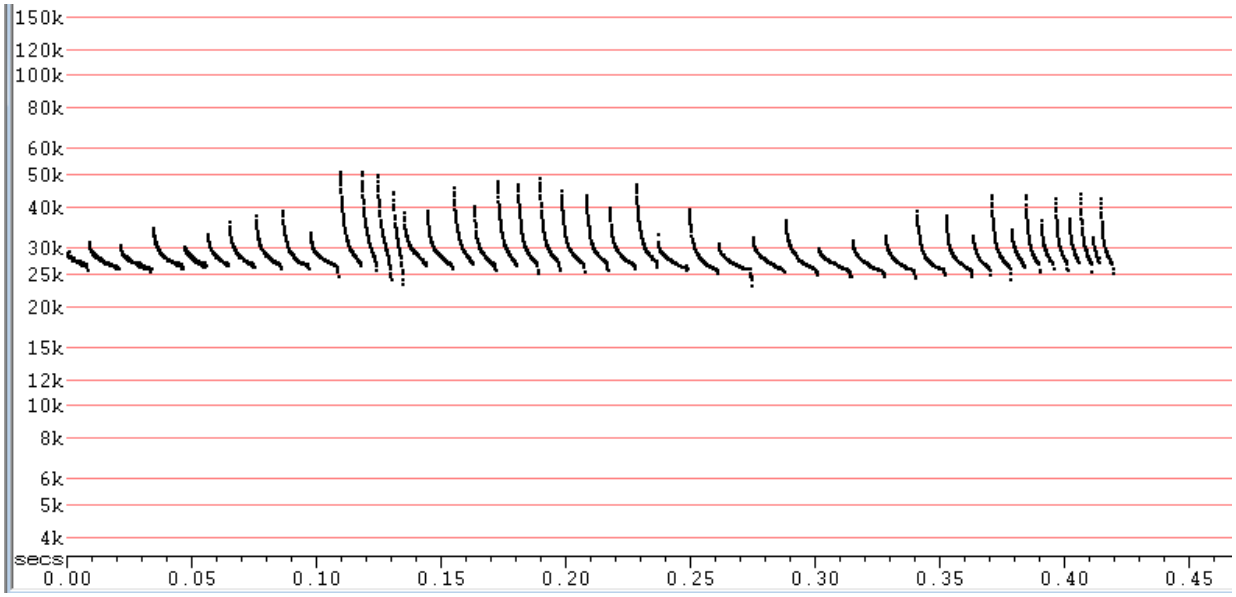
- Retain natural water body features such as shallows, pools and riffles that promote high insect diversity (Entwistle et al., 2001).
- Conserve open ponds and pools (seasonal) as insect breeding habitat. Promote variation in depth and type of bankside vegetation between ponds (Entwistle et al., 2001).
- Retain natural variation in vegetation along water bodies. Variation favours high insect and structural diversity. Grassy margins, scrub and overhanging vegetation provide excellent conditions for insects and foraging bats (Entwistle et al., 2001).
- Retain bankside trees. Overhanging branches and leaves provide shelter and food for insects, cover for bats, and cast shade on open water enhancing the range of conditions available for insects. Where trees must be removed due to danger replant gaps with suitable species (Entwistle et al., 2001).
- Increase the habitat values of forested areas. Manage forests to diversify structure, age and species of trees; this will support a high diversity of insects and increase foraging opportunities as well as habitat features (Entwistle et al., 2001).
- Retain wildlife trees, as they support a large number of insects. Standing dead trees should be left in place as food for insects and as potential roost sites (holes, crevices and space under bark in mature and decaying trees). Removing branches for safety is preferable to completely felling a dead tree. When working on wildlife trees, examine the tree for evidence of bats before performing work (Entwistle et al., 2001).
- Maintain meadows to provide foraging areas for bat species that prefer to feed in open spaces. Meadows have a wide variety of plants and support many different insects. Varying the grass height through selective cutting will assist in increasing insect diversity (Entwistle et al., 2001).
- Most insects on beaches are associated with rotting seaweed and driftwood. This material should be left undisturbed (Entwistle et al., 2001).
- Maintenance work on buildings should leave some crevices for bats (Entwistle et al., 2001) and extreme care should be taken around the maintenance of known maternity colonies (such as the Dining Pavilion attic), especially in spring and summer.

Habitat Enhancement Opportunities:

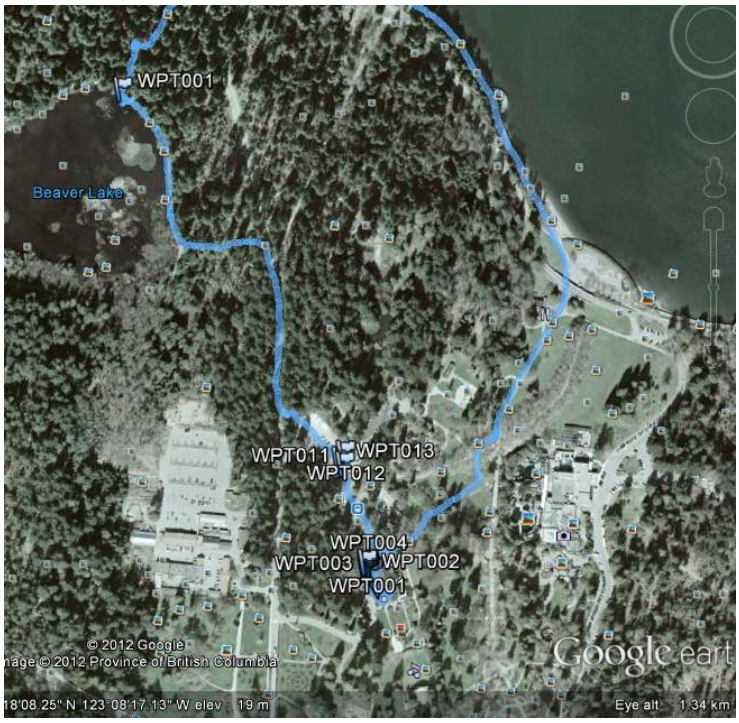
- Install bat boxes where natural cavities are sparse.
- Create artificial cavities in live trees, by removing a faceplate from the side of the tree, routing a hole or cavity and reattaching the faceplate (Fenger et al., 2006).
- Fill in gaps of bankside trees to provide a continuous corridor for bats to move between foraging sites (Entwistle et al., 2001).
- Remove invasive species such as Burdock (*Arctium minus*) and Himalayan Blackberry (*Rubus discolour*) that can snag and trap flying bats and reduce bat travel through an area.

Operation Timing:

- Park operations that involve working on wildlife trees should require staff to first examine the tree for evidence of roosting individual bats or hibernating colonies before performing work at all times of the year.
- Work taking place in and around bat foraging locations (wetlands, riparian areas, edges, etc…) should take place during the winter months so as not to adversely affect insect populations and change the abundance of food present for bat species.
- Extreme care should be taken around the maintenance of known maternity colonies (such as the Dining Pavilion attic) in summer (May – August).



(Above) Sonogram picture of big brown bat (*Eptesicus fuscus)* echolocation call recorded with Anabat detector outside the Stanley Park Dining Pavilion and displayed using AnalookW 3.8v software.



(Right) Map of waypoint locations of *Eptesicus fuscus* recordings taken on May 29, 2012.

Cavity Nesting Birds

Cavity nesting birds can be designated into two groups: primary cavity excavators and secondary cavity users.

Primary cavity excavators use their bills to excavate nesting cavities in the trunks or large limbs of 'wildlife' trees. They're further categorized as either weak or strong excavators. Weak excavators need decay-softened wood with the weakest excavators making their nest holes in trees that have been long dead with extensive rotting. Strong excavators favour live trees with some heart rot. This internal rotting allows for easy excavation while the outer shell provides thermal insulation and predatory protection. Each species of primary excavators has a distinct tree species preference but will use other species if necessary (Fenger et al., 2006).

Pileated woodpeckers excavating a cavity.
Photo: Mark White

Secondary cavity users are birds that use tree cavities for nesting, roosting or food storage but are physically unable to excavate holes themselves. These birds rely on either abandoned cavities made by primary cavity excavators or on natural cavities created by decay. Many secondary cavity users will also use artificial cavities for nesting or roosting while primary cavity excavators like woodpeckers will not (Fenger et al., 2006).

Wildlife trees in BC support more than 90 species of wildlife, many of which are provincially designated as threatened or endangered. Depending on the species and decay rate, these dead standing trees can provide habitat for wildlife for hundreds of years (Machmer and Steeger, 1995).The following are the primary cavity excavator birds that nest in Stanley Park, hereon after they may be referred to by the acronym following their name:

- Lewis's woodpecker (*Melanerpes lewis*) LEWO
- Red-breasted sapsucker (*Sphyrapicus ruber*) RBSA
- Yellow-bellied sapsucker (*Sphyrapicus varius*) YBSA
- Downy woodpecker (*Picoides pubescens*) DOWO
- Hairy woodpecker (*Picoides villosus*) HAWO
- Northern flicker (*Colaptes auratus*) NOFL
- Pileated woodpecker (*Dryocopus pileatus*) PIWO
- Black-capped chickadee (*Poecile atricapillus*) BCCH
- Chestnut-backed chickadee (*Poecile rufescens*) CBCH
- Red-breasted nuthatch (*Sitta canadensis*) RBNU

The following are the secondary cavity user birds that nest in Stanley Park, hereon after they may be referred to by the acronym following their name:

- Wood duck (*Aix sponsa*) WODU
- Common merganser (*Mergus merganser*) COME
- Western screech-owl (*Otus kennicottii*) WSOW
- Northern pygmy-owl (*Glaucidium gnoma*) NPOW
- Barred owl (*Strix varia*) BAOW
- Northern saw-whet owl (*Aegolius acadicus*) NSWO
- Vaux's swift (*Chaetura vauxi*) VASW
- Tree swallow (*Tachycineta bicolor*) TRES
- Brown creeper (*Certhia Americana*) BRCR

Wood ducks using a SPES nest box installed on Beaver Lake. Photo: Mark White

The western screech-owl and purple martin are the only cavity nesting birds in Stanley Park that are also species at risk. WSOW are known to breed in the park, but their population has been in decline for several decades. Purple martins have only been sighted in the Park, but may have bred here historically:

Western screech-owl (*Otus kennicottii*)
CDC Status: Blue
COSEWIC Status: Special Concern
BREEDING STATUS IN STANLEY PARK: Likely
Identification: Small owl; feathered ear tufts; gray or gray-brown with small black streaks on feathers (Cornell Lab, 2011) (See western screech-owl BMP for more information).

Purple martin *(Progne subis)*
CDC Status: Blue
COSEWIC Status: Not listed
BREEDING STATUS IN STANLEY PARK: Unlikely
Identification: The largest of the North American swallows (Cornell Lab, 2011). Male entirely glossy blue-black, above and below. Female is bluish black with dingy gray brown chest and paler belly (Cornell Lab, 2011). (See Purple martin BMP for more information).

Identification:
Table 3 below can be used to help identify which species of primary cavity excavators and secondary cavity users may be present in Stanley Park. By estimating the cavity entrance width and the diameter of the tree that the cavity is at as well as identifying the species of tree you can get an idea of which species created the cavity and which species are likely to be occupying it (Fenger et al., 2006).

Table 3: Cavity excavator nest tree and hole descriptions.

Primary Cavity Excavators		**Preferred Trees**		**Minimum Tree Diameter**	**Secondary Cavity Users (birds only)**
Species	*Entrance Width*	*Conifers*	*Hardwoods*		
Chickadees	3.5 cm	Spruce, Douglas-fir	Aspen, birch, red alder	10 cm	Chickadees
Nuthatches	3 – 4 cm	Douglas-fir	-	15 cm	Nuthatches
Sapsuckers and small woodpeckers	4 cm	Western larch, western hemlock, spruce	Aspen, cottonwood, maple, alder, birch	25 cm	Tree swallow
Hairy woodpecker	4.5 cm	Douglas-fir, western hemlock, spruce	Aspen, birch, alder	25 cm	Northern pygmy-owl, northern saw-whet owl, tree swallow
Lewis's woodpecker	6.2 cm	Douglas-fir	-	30 cm	-
Northern flicker	6.5 cm	Douglas-fir, western hemlock, lodgepole pine, spruce	Aspen, cottonwood, birch	30 cm	Western screech-owl
Pileated woodpecker	8 – 10 x 10 – 15 cm	Douglas-fir	Aspen, cottonwood	40 cm	Wood duck, Vaux's swift

Behaviour, Breeding and Habitat Requirements:
Primary cavity excavators:

- Primary cavity excavators inhabit forested areas during their breeding and non-breeding season including: deciduous forests, coniferous forests, mixed forests, open woodlands, wooded wetlands and stream sides and parks (Cornell Lab, 2012f,g,h,j,k) Woodpeckers use their stiff tails as a prop while they cling to the tree and use their stout, chisel-like bills to peel bark or excavate cavities in search of food and to make roosting sites (Sibley, 2000).
- Nuthatches climb trees using only their strong legs and feet with one foot placed lower used as a brace and the other foot placed higher, gripping the bark (Sibley, 2000).
- The following species build their own nesting cavity: RBSA, YBSA, DOWO, HAWO, NOFL, PIWO, BCCH, CBCH, RBNH (Cornell Lab, 2011).

Northern flicker occupying a tree cavity.
Photo: Martin Passchier

- The following species may use old cavities either created by primary users or through natural processes (limbs falling off trees and decay creating a cavity): NOFL, BCCH, CBCH, RBNH (Cornell Lab, 2011).
- The following species use nest boxes: BCCH, CBCH (Cornell Lab, 2011).

Secondary cavity users:

- Secondary cavity users inhabit a large variety of habitats during their non-breeding season from wetlands to forests (Cornell Lab, 2011).
- During the breeding season they require forested habitat with tree cavities in, which they can build their nest and raise their young.
- The following species nest in cavities created by primary cavity excavators or though natural processes (limbs falling off trees and decay creating a cavity): WODO, COME, WSOW, NSWO, NPOW, BAOW, VASW, TRES (Cornell Lab, 2011).
- Many secondary cavity users will also use man-made nest boxes and include: WODO, COME, WSOW, NSWO, NPOW, BAOW, TRES (Cornell Lab, 2011).
- BAOW will also use abandoned, open nests of hawks and crows (Cornell Lab, 2011).
- BRCR does not nest in cavities but builds its nest directly onto the tree, behind overhanging bark (Cornell Lab, 2011).
- Many other species of animals rely on the creation of nesting cavities for food and shelter.

Food:

All primary cavity excavators have a diet of predominately insects supplemented with various types of seeds and fruit. Insects of choice are primarily ants (especially carpenter ants), beetles (especially wood-boring beetles), larvae, bees, and wasps. It is through the insect foraging process that many of these species extract tree cavities (Cornell Lab, 2011).

Depending on the species in question, secondary cavity users eat a wide range of food including seeds, fruit, insects, amphibians, fish, small birds and small mammals (Cornell Lab, 2011).

Threats:

- Habitat loss: Most of these species require intact forested habitat to find appropriate nesting and feeding sites. Habitat loss due to human development and resource extraction pose serious threats to many primary and secondary cavity users.
- Wildlife tree loss: Forest management practices that include the removal of standing dead trees (snags) or decaying trees make it difficult for many primary cavity excavators to find food and create shelter. This in turn eliminates nesting habitat for secondary cavity users. Many wildlife trees are lost on private lands because they are often collected for firewood.
- Pesticides: The use of pesticides in any forests, grasslands or orchard habitats disrupts the ecological balance of the ecosystem by reducing the number of prey species available for primary and secondary cavity users that rely heavily on insect populations for food (Fenger et al., 2006).

Special Significance of the Species:

- Woodpeckers are considered “Keystone Species”. They inhabit all of the biogeoclimatic zones of BC except for the treeless alpine tundra and create (especially the strong excavator species)

essential nesting habitat for the many birds and mammals that are secondary cavity users (Fenger et al., 2006).

- Mammals such as squirrels, martin, and bats depend on the cavities made by these species for their habitat.
- All primary cavity excavator species and some secondary cavity users (TRES, VASW, BRCR) help maintain insect populations to normal low levels, delay the onset of insect epidemics and accelerate the decline of outbreaks after insect population have peaked (Fenger et al., 2006).
- Secondary cavity nesting owl species are top predators of forest rodents and shrews. They help control small mammal populations and are a good indicator of the overall integrity and health of a forest ecosystem (Fenger et al., 2006).

Wildlife Management Emphasis Areas:

- Riparian Areas – the areas of vegetation around Beaver Lake and Lost Lagoon as well as along all streams.
- Deciduous Patch – stands dominated by alder or maple, including behind the Park Board works yard, south of Kinglet Trail, and in the old wildflower meadow.
- Old Growth Patches - between Pipeline Road and Tunnel Trail east of Beaver Lake.
- Ecotones - located throughout the Park, any areas where two structurally distinct habitat types meet.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 – it is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Species at Risk Act , 2002
- Migratory Birds Convention Act, 1994 - no person shall disturb, destroy or take a nest, egg or nest shelter… of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.

Documented Occurrences in Stanley Park:

- Lewis's woodpecker: Casual (seen less than once/year) in fall (Weber et al., 1988). Not seen in recent years (Robyn Worcester, pers. comm.).
- Primary: Red-breasted sapsucker, downy woodpecker, hairy woodpecker, northern flicker, pileated woodpecker, black-capped chickadee, chestnut-backed chickadee and red-breasted nuthatch regularly recorded year-round during monthly bird counts and during spring breeding bird surveys (Robyn Worcester, pers. comm.).
- Yellow-bellied sapsucker – photographed by local naturalist in the summer of 2010, but otherwise rarely seen (Robyn Worcester, pers. comm.).
- Western screech-owl, barred owl, northern pygmy-owl and northern saw-whet owl: all recorded during annual owl breeding surveys. Only BAOW nests have been located (Robyn Worcester, pers. comm.).
- Common merganser - regularly recorded in winter during monthly bird counts but not seen in summer so it is suspected not to breed in the park (Robyn Worcester, pers. comm.).

- Vaux's swift - suspected of breeding in the park in 1989 (Robertson et al., 1989) but not found during the 2007-2011 breeding bird surveys (Worcester, 2010).
- Tree swallow - Commonly recorded during breeding bird surveys and monthly bird counts in March-July. Have likely always been breeding in Stanley Park but only recently begun using nest boxes (Robyn Worcester, pers. comm.).
- Brown creeper – commonly recorded year-round during monthly bird counts and during spring breeding bird surveys in all forested areas of the Park (Robyn Worcester, pers. comm.).
- Wood duck – year-round resident of Stanley Park. Have always been breeding in the Park but only recently begun using nest boxes (Robyn Worcester, pers. comm.).
- Purple martin – observed occasionally in the park in summer. Suspected pass through of birds nesting further down Burrard Inlet (nesting colonies exist at Maplewood Flats and in Port Moody) (Robyn Worcester, pers. comm.)

Best Management Practices for Operations in Stanley Park:

- Retain all trees with cavity sites that do not pose a direct threat to public safety. Even if these trees do not appear to be occupied, they are suitable future homes of secondary cavity users. A tree that has been suitable for cavity excavation on one occasion is likely to be used for additional cavities in the future (Fenger et al., 2006).
- Leave all downed wildlife trees in the forest as coarse woody debris to help recycle nutrients and provide habitat for many species of invertebrates that primary cavity excavators require (such as carpenter ants) (Fenger et al., 2006).

Habitat Enhancement Opportunities:

- Install nest boxes where natural cavities are scarce or secondary cavity users are present (such as WODO, WSOW, and swallows at Lost Lagoon and Beaver Lake).
- Create artificial cavities in live trees by removing a faceplate from the side of the tree, routing a hole or cavity and reattaching the faceplate. Cavity size and entrance should be based on secondary species present and their requirements from table 3 above under the "Identification" section (Fenger et al., 2006).
- Plant wildlife trees – This is best done in disturbed areas (after windstorms) and provides immediate habitat structure for primary excavators.

Operation Timing:

- Breeding bird season runs from March to July and all Park Board management activities should be limited to within 1.5 tree lengths from wildlife trees that have active nests.

Native Insect Pollinators

Mason Bee.
Source: BC MOAL, 2006

Native insect pollinators have co-evolved with flowering plants for millions of years and both have physical adaptations that reflect this. Plants developed specialized features to attract visiting insects which inadvertently distribute pollen grains aiding in plant reproduction (BC MOAL, 2009), and some insects developed better ways of finding and accessing plant rewards.

This document focuses on native insect pollinators that are considered moderate to good pollinators only and includes bees, wasps and flies. Bees are the most common pollinators with over 1,000 native species in Canada and around 450 species in BC (Pollination Canada, 2008). Bees tend to be the most effective pollinators of all flower-visiting insects, because they actively collect pollen and nectar to provision nests, and so visit more flowers and come into contact with pollen more often than other insects. Wasps are less well recognized pollinators but do consume flower nectar and use flowers to hunt for smaller insects and are therefore considered good pollinating insects. Flies can be important pollinators because they are so numerous.

Information in this document will be focused around the following representative species:

- Blue orchard mason bee (Osmia lignaria),
- Western yellowjacket (Vespula pensylvanica),
- Bald-faced hornet (Vespula maculata),
- Hoverflies (Syrphidae),
- Bee flies (Bombyliidae).

Behaviour:
Mason bees are solitary and complete their lifecycle on their own although most species nest close together, allowing for lower predation pressure and increased mating opportunity. They are shy and will fly away when disturbed; even at their nests, females will not display defensive behaviour even though they're capable of stinging. They collect nectar while foraging and store it underneath rows of stiff hairs under the abdomen called scopa (BC MOAL, 1996). Many other species of native bees, such as various species of bumblebees, are social and nest in colonies. They are also highly active even in poor weather, making them particularly useful in pollinating early blooming plants.

Both the western yellow jacket and bald-face hornet are social insects and live in a colony. Only the females have the ability to sting, which is well known to be very painful. They can sting multiple times, do not like to be disturbed and will attack to defend their nest. The majority of the colony is made up of female workers and only a few males, drones, for mating. Each winter the colony, including the

female queen, dies, and the new young, mated females hibernate under the soil and create a new colony in the spring (Pollination Canada, 2008).

Hoverflies are named after their distinctive behaviour of hovering and darting among wild flowers throughout the summer months. They mimic the stinging action of a wasp but cannot sting and are harmless. They can range in size from quite small to the size of bumblebees. Since they actively hover, large species do not necessarily come into contact with pollen but smaller hoverflies easily enter flowers, or push back petals to have better access to the nectar and pollen inside (Pollination Canada, 2008).

Beeflies have long proboscises ideal for probing flowers for nectar. The can hover with considerable skill over a flower and are much more agile and faster moving than a bee. They spread their wings open when they rest create and high-pitched sound when flying (Pollination Canada, 2008).

Habitat Requirements:
Mason bees occur in woodlands and along forest edges and appear in early spring when the first bushes and trees bloom (BC MOAL, 1996). They nest inside pre-existing wooden holes such as woodpecker drillings, insect holes and within hollow stems. They will also occupy human made mason bee homes (Pollination Canada, 2008). Many species found in the Lower Mainland also nest directly in the soil.

Yellowjackets and bald-faced hornets both live in colonies. Their nests are built by the queen out of wood fibres mixed with saliva to make a paper-like material. Yellow jacket nests can be attached to trees, eaves, wall cavities or made under the ground, while the nests of the bald-faced hornet can be found hanging to trees, bushes, low vegetation and buildings. Both species are common around plants whose flowers have easily accessible nectar sources and are regularly visited by other insects upon which they prey (Pollination Canada, 2008).

Hoverflies will lay their eggs near aphid colonies, bumblebee colonies, on plant stems and roots or in muddy water. They are most active around areas with both natural and cultivated flowers in the months of July, but can been seen as early as March on the South Coast (Pollination Canada, 2008).

Food:
Native bees feed on both the nectar and pollen of flowers, and are especially attracted to fruit blossoms. This makes them an excellent fruit pollinator (Pollination Canada, 2008).

Adult yellowjackets feed primarily on nectar and pollen of various flowers. Young yellowjackets however are carnivorous and eat insects and carrion that the adults collect for them. Human food is also attractive and they can become a nuisance at picnics. Bald-faced hornets drink flower nectar for energy while they hunt, and also use the flowers as a hunting ground for smaller insects that are also attracted to them (Pollination Canada, 2008).

Hoverfly larvae feed primarily on insects including aphids, scales and caterpillars but will also feed on plant material or scavenge other food sources. Adults use their tongues to access pollen and nectar (Pollination Canada, 2008).

Adult beeflies feed on flower nectar, while the larvae feed on immature insects such as beetles, wasps, butterflies, caterpillars and the eggs of grasshoppers (Pollination Canada, 2008). Our most common species of beefly is a parasitoids of solitary bees.

Threats:

- Habitat Loss: The largest threat to native pollinator insects is thought to be habitat loss, degradation and fragmentation. As native vegetation is removed and replaced by roads, manicured lawns, agriculture and non-native plant species, these insects lose the food sources and nesting sites essential for survival (USFWS, 2012).
- Chemical Pesticides: Evidence indicates that native pollinator insects are being negatively impacted by human created pesticides and herbicides and through the spread of pests and diseases (USFWS, 2012). Improper use of pesticides drastically impacts native pollinators as well as their habitat. Pesticides such as weed killers and insecticides are designed to prevent, destroy, repel or reduce pests but most are non-target and will impact additional species then the ones designed to destroy. Additionally, most pesticides pose some risk to humans, animals and the environment since by their nature they are designed to kill or adversely affect living organisms (USFWS, 2012).

Special Significance of this Group:

- Out of the hundred or so crops that make up the world's principle food supply, only 15% are pollinated by domestic bees, such as the honey bee. At least 80% of these crops are pollinated by native pollinating insects and other wildlife (Prescott-Allen and Prescott-Allen, 1990; Ingram et al., 1996a).
- Many species of native bees, such as bumblebees, have the potential of replacing introduced honeybees as the most important fruit tree pollinator. This is mainly due to the fact that they will forage and pollinate in drizzly, cloudy skies and cooler temperatures when other bees do not (Pollination Canada, 2008). Bees are widely considered to be the most significant pollinating insect in Canada.
- Yellowjackets do not transfer large amounts of pollen because of their hair-less bodies, but they do appear in great numbers and have a keen interest in nectar. Bald-faced hornets frequent flowers for both consumption of nectar and as hunting grounds for insects. This can be beneficial to many plant species as they're predators of insects that can damage plants. As a result, this places both species in the main pollinating insect group (Pollination Canada, 2008).
- Hoverflies can also be effective pollinators as they tend to visit the same species of flowers in succession. However, they tend to visit only a few flower species that are unattractive to bees making them important but not as significant as native bee species for direct pollination. Since hoverfly larvae prey on insects, primarily aphids, they're important natural pest control agents (Pollination Canada, 2008).
- Adults beeflies are frequent floral visitors and are moderately good pollinators. They do not eat pollen, but transfer it on their furry bodies from flower to flower in their search for nectar (Pollination Canada, 2008).

Wildlife Management Emphasis Areas:

- Ecotones: The edges, or interfaces between two distinct forest habitats. Forest -clearing edges, conifer forest – deciduous forest edges, etc.

Applicable Wildlife Laws:

- There are no applicable wildlife laws in place to protect native pollinating insects.

Documented Occurrences in Stanley Park:

- The following list of pollinating bees, wasps, bee flies and hoverflies was compiled by SPES from a variety of sources including (Scientists participating in the Stanley Park BioBlitz in 2011, local naturalists, and staff at UBC's Spencer Entomological Museum):

Bees, wasps, bee flies and hoverflies of Stanley Park

Scientific name	Common Name
Andrena sp.	Mining Bee
Anthidium manicatum	Wool Carder Bee
Apis mellifera	European Honey Bee
Bombus flavifrons	Bumblebee sp.
Bombus mixtus	Bumblebee sp.
Bombus rufocinctus	Bumblebee
Bombus sitkensis	Bumblebee
Bombus sp	Bumblebee
Bombus ternarius	Bumblebee
Bombus vagans	Bumblebee sp.
Bombus vosnesenskii	Yellow-faced Bumblebee
Calliphoridae ("blow flies")	
Chrysididae ("cuckoo" wasps) sp.	Cuckoo Wasp
Chrysotoxum sp.	
Crabronidae (includes "digger" wasps) sp.	
Duforea sp.	Sweat bee
Eristalinae ("hoverflies")	
Eristalis anthophorina	
Eristalis arbustorum	
Eristalis tenax	
Eumerus sp.	
Halictus rubicundus	Sweat bee
Halictus tripartitus	Sweat bee
Harpaphe haydeniana	Cyanide Millipede
Heliophilus sp.	
Hylaeus modestus	Yellow-masked bee
Ichneumon sp.1	Ichneumon Wasps
Lasioglossum subgenus dialictus	Sweat bee
Lasioglossum subgenus evylaeus	Sweat bee
Lasioglossum subgenus lasioglossum, species zonulum	Sweat bee
Lucila sp.	
Megachile rotundata	Alfalfa Leafcutter Bee
Megachile sp.1	Leafcutter Bee
Melanostoma sp.	
Osmia lignaria	Blue Orchard Mason Bee

Polistes sp.1	Digger Wasp
Pompilid sp.1	Spider Wasps
Sceliphron caementarium	Black and Yellow Mud Dauber
Sceliphron sp.	Mud Dauber
Seriocomyia sp.	
Siricid	Horntails
Sphecidae ("thread-waisted" wasps)	
Syrphidae ("flower flies or syrphid flies")	
Syrphus opinator	
Toxomerus sp.	
Trichiosoma triangulum	Sawfly
Urocerus gigas	Wood Wasp
Vespula maculata	Bald-faced Hornet
Vespula pensylvanica	Western Yellowjacket
Xylota sp.	

Best Management Practices for Operations in Stanley Park:

- Continue to not use pesticides to maintain any of the gardens in Stanley Park, as this will lead to tainted pollen and nectar that can kill native pollinating insects.
- Maintain forest edges and ecotones as habitat for native bee and other pollinator insects.
- Maintain wildlife trees and coarse woody debris that does not pose a direct threat to public safety as they act as nesting sites for native bees, wasps and beetles.
- Do not destroy or remove yellow jacket or bald-faced hornet colonies found on trees, buildings, underground or hanging on bushes or low vegetation unless they pose a direct threat to public safety (i.e.: directly next to a trail, on a picnic shelter, etc…).
- Plant species in Stanley Park gardens with native pollinators in mind. Plants should be native to the region, if possible as they are better adapted for the area and will provide more to pollinators. Ideally gardens will bloom continuously in sequence from spring to fall. Flowers with bright colours (especially blue, yellow, red and violet) are attractive to pollinators (Pollination Canada, 2008).

Habitat Enhancement Opportunities:

- Install and maintain additional mason bee condos around Stanley Park, including those at the Rose Garden and Dining Pavilion Garden but also at other suitable sites around Stanley Park were ecotones, meadows and gardens/wildflowers are abundant (i.e.: Prospect Point, Hollow Tree, Ceperly Creek field, Pitch and Putt Gardens, Native Plant Garden, etc…).

Operation Timing:

- Most species of native pollinator insects overwinter in larval stages (mason bee) or hibernate underground. Therefore, during the winter month's work on wildlife trees or coarse woody debris or on bare soil in the forest should be limited so as not to disturb overwintering native pollinating insects.

Salmonids

Juvenile coho salmon.
Photo: Brian Titaro

CDC: CCT Blue
COSEWIC: Not listed
BREEDING STATUS IN STANLEY PARK: Confirmed CCT, possible CO

Salmonids in Stanley Park include coho salmon (*Oncorhynchus kisutch*) and coastal cutthroat trout (*Oncorhynchus clarki clarki*) (Hereafter referred to as CO and CCT respectively). CCT have likely inhabited North Creek since before World War I, but were definitely provided access when a fish hatchery was constructed at Beaver Lake in 1916 (Worcester, 2010). Both species are found in Beaver Creek, one of four intact salmon-bearing streams remaining in the City of Vancouver. Further study is required to determine the long term survival of either population, but it is assumed that CO are only present as a result of students releasing fry into the creek as no spawning adults have been documented returning to Beaver Creek in recent years. It appears that CTT are maintaining their population through natural means.

Identification:
CO - Fry (Length 45 – 100mm). Parr marks on flanks, adipose fin uniformly pigmented; parr marks variable but spaces between marks usually wider than the marks themselves; anal fin sickle-shaped with a conspicuous white leading edge contrasting sharply with adjoining dark pigment.

Juvenile coastal cutthroat trout.
Photo: Brian Titaro

CCT – Fry (Length 45 – 100mm). Parr marks on flanks. Usually black spots on tail, even on fish less than 50 mm; melanophores on tail are starting to concentrate between the rays, often forming short dark streaks (precursors of spots); usually red or yellow marks under chin; hind margin of upper jaw usually reaches to or past hind margin of eye (McPhail and Carveth, 1994).

CO – Freshwater Adult (40 – 88 cm). Fresh run CO are bright silver with a metallic blue dorsal surface and a wide tail base with a few spots on their silver coloured tails. As they mature, the males become red on the side and green on the back and head, often darker on the belly. Females are less strongly coloured.

CCT – Freshwater Adult (20 - 40 cm). Fresh run CCT have a large mouth that extends well past the eye, and teeth in the throat at the back of the tongue. They also have many spots from front to back (DFO, 2009). **Note: If spawning adults are seen, please contact Stanley Park Ecology Society (604-718-6547) and the Department of Fisheries and Oceans' Community Advisor (604-666-0743) immediately.**

Behaviour:
Juvenile CO normally spend one year in freshwater streams and defend their territories through a series of manoeuvres including a complex shimmy-shake movement (DFO, 2008). Juvenile CO are typically more aggressive then juvenile CCT and displace them in stream pools, this makes riffles an especially important habitat for CCT. Both pools and riffles are important to these species for food and shelter (Cloud and Thorgaard, 1993).

Habitat Requirements:
Riparian vegetation shades streams keeping water temperatures cool in the summer months and to limit sedimentation from streamside erosion. CO favour small streams, sloughs and ponds, but are also found in lakes and large rivers. They require swift, shallow, clean freshwater streams. Ideal water temperature is 10-14^{o} C (DFO, 2008). CCT Prefer small, cool, gravelly, lowland streams and lakes. Optimal water temperatures are below 18^{o}C (BC MOE, 2011). Insufficient stream flow can strand sea-run smolts and cause increased competition; excessive flow can wash juveniles out to sea prematurely and destroy important steam characteristics (CRD, 2011).

Breeding:
Both species spawn in swift, shallow, clean freshwater streams. CO spawn between October and January, while CCT spawn in spring and early summer. They require clean gravel beds to build their redd (nest). Adult CO use their sense of smell along with other techniques to navigate back to their natal breeding stream. Unlike CO, CCT do not die after breeding and can breed several times (CRD, 2011).

Food:
CO fry – Feed on stonefly and mayfly nymphs, caddisfly larvae and other aquatic invertebrate. Also plankton and various land insects that fall into the water (DFO, 2002). Juvenile CCT and CO are both voracious predators and are known to feed on fry of the opposite species. CCT fry – Aquatic and drift insects, microcrustaceans, and occasionally smaller fish (BC CDC, 2012g).

Threats:
- Habitat Loss/Fragmentation - Dependence on small streams makes them vulnerable as these streams are easily altered, destroyed or overlooked in planning residential, agricultural and industrial developments or during forest harvesting (BC MOE, 2011). North Creek population is considered “geographically isolated” due to barrier between Beaver Lake and Beaver Creek. Both creeks have been significantly altered through the construction of the Stanley Park causeway, construction of an outflow weir and Stanley Park Drive in the late 1800’s that restricts fish movement from the ocean to only periods of high tide. North Creek, Beaver Lake and Beaver Creek are all fed (or augmented) by municipal tap water and the threat of rising water costs could lead to this supply of water being shut off and the corresponding creeks running dry for several months of the year (Worcester, 2010).

Special Significance of the Species:
- Link diverse ecosystems (deep ocean and forest) through their lifecycle (CRD, 2011).
- Important link in the food web as predator and prey species (CRD, 2011).
- CCT: Sensitive to pollution and are a good indicator species of stream health (CRD, 2011).

- CO: Culturally important to many First Nations groups in British Columbia (Vancouver Aquarium, 2003).

Wildlife Management Emphasis Areas:

- Riparian areas and Streams – North Creek, Beaver Lake and Beaver Creek and the areas of vegetation around them.

Applicable Wildlife Laws:

- CCT, CO Federal Fisheries Act, (R.S., 1985, c. F-14) – Fish habitat protection and pollution prevention.
- CCT, CO BC Provincial Water Act, [RSBC 1996] CHAPTER 483

Documented Occurrences in Stanley Park:

- 1916, a fish hatchery built on Beaver Lake is stocked with CCT.
- 1985, electrofishing in Beaver Lake found juvenile CCT near the mouth of North Creek and juvenile CO salmon and CCT in Beaver Creek at typical densities for a stream of its size and location. There was evidence of both species spawning and rearing juveniles in the creek, and one spawning redd and several young fry were observed.
- 1999, Capilano College found juvenile CO and CCT at the mouth of North Creek.
- 2002, Parks Canada staff confirmed the presence of a small population of the CCT.
- Over 2000 CO salmon are released annually into Beaver Creek by elementary school students in the City of Vancouver through the Department of Fisheries and Oceans' *Salmonids in the Classroom* Program.
- Fish monitoring surveys conducted monthly over the 2011 year have documented CO salmon in Beaver Creek and CCT in both North Creek and Beaver Creek.

Best Management Practices for Operations in Stanley Park:

- Protect riparian areas and vegetation near North Creek and Beaver Creek to provide shade and erosion control.
- Reduce or limit the creation of any additional trails directly adjacent to or crossing creeks. Provide setbacks from streams whenever trails are built or realigned. Provide signage along trails so that people are aware of the sensitivity of the habitat. Install bike barriers at trailheads to prevent the incidence of erosion from mountain biking (these already exist on Beaver Creek Trail).
- Reduce brushing and trail maintenance within 30 meters of North Creek and Beaver Creek from mid-September to early August.
- Leave coarse woody debris in North Creek and Beaver Creek to provide habitat.
- Limit instream work (drainage alterations, culvert replacement, etc…) in North Creek and Beaver Creek. Follow fisheries window openings for timing of vital works.
- Flushing of fire hydrants and water lines in the park should comply with Vancouver Fire Department and Metro Vancouver BMPs to ensure that chlorine and large volumes of water are not discharged into fish bearing streams.
- The DFO should be contacted for all instream work taking place in Beaver Creek and North Creek to ensure that the work complies with appropriate regulation.

Habitat Enhancement Opportunities:

- Remove invasive plant species and replace with native riparian vegetation along North Creek and Beaver Creek stream banks.
- Leave or place coarse woody debris in North Creek and Beaver Creek to provide habitat as needed.
- Increase suitable streambed gravel in North Creek and Beaver Creek.
- Where riparian vegetation will remain low, the use of other erosion controls such as willow wattles or silt fence may be added.
- Where possible re-construction of trails around streams should be done to restore traditional hydrology regimes and encourage trail runoff to enter streams as opposed to forming seasonal pools and lowering the natural stream water level.

Operation Timing:

- Breeding from October – January CO and spring to early summer CCT. Lowest risk period for fish streams is when no spawning is taking place, there are no eggs or alevin within the stream gravel and no early emergent juveniles are present – Avoid trailside brushing, coarse woody debris removal, trail maintenance, drainage alterations, culvert maintenance/replacement within 30 meters of North Creek and Beaver Creek from late October to late July as suggested by the Ministry of Environment's *Guidelines for Reduced Risk Instream Work Window.*

7.0 Migratory Birds

Migratory birds include a large number of species residing in and passing through Stanley Park. As it is located on the Pacific Migratory Flyway, the Park is frequently used by birds moving north and south on migration. Species of neotropical migrants such as warblers, flycatchers and swallows leave their southern wintering grounds in the tropics to seek out northern and inland breeding areas in BC. Wilson's warblers, black-throated grey warblers, barn swallows, and tree swallows are some of the species that regularly pass through and breed in significant numbers in the Park. Some migratory birds migrate from the south coast of BC to inland and northern breeding sites. Diving ducks such as Barrow's goldeneyes and surf scoter spend the winter off Stanley Park's shores and fly inland and northward to breed on interior lakes in the summer. Migratory bird species also include some resident birds such as Canada geese and American wigeon. These birds live in Vancouver year-round but are considered migratory species under the federal legislation.

The Migratory Birds Convention Act (MBCA, 1994) regulations ban the disturbance, destruction or removal of nests, eggs or duck boxes of migratory birds. However, some activities, such as egg addling, may be practiced with the appropriate permits. The regulations also ban the depositing of oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds. These laws protect the following species in Stanley Park: most waterfowl, shorebirds, coots and rails, songbirds (passerines), bitterns and herons, loons and grebes, and gulls and terns.

Waterfowl

(Family Anatidae)

Waterfowl are birds belonging to the Anatidae family that include ducks, geese, and swans. Stanley Park is important habitat for these birds, especially overwintering waterfowl that gather in large numbers during the winter months. The park contains two of the City of Vancouver's most important wetlands and offers sanctuary to ducks, geese and swans passing through on migration. The park is arguably one of the best places to view waterfowl in the Lower Mainland due to its accessibility, diversity of habitats and species, and the close proximity of the birds around trails. All of the waterfowl in the Park inhabit either the seashore or the wetlands of Lost Lagoon and Beaver Lake.

SPES staff and volunteers installed wood duck and swallow boxes in Beaver Lake and Lost Lagoon in the spring of 2009.
Photo: Mark T. White

The following 39 species of waterfowl have been recorded in Stanley Park:

Greater White-fronted Goose	*Anser albifrons*	Canvasback	*Aythya valisineria*
Snow Goose	*Chen caerulescens*	Redhead	*Aythya americana*
Brant	*Branta bernicla*	Ring-necked Duck	*Aythya collaris*
Cackling Goose	*Branta hutchinsii*	Tufted Duck **	*Aythya fuligula*
Canada Goose ****	*Branta canadensis*	Greater Scaup	*Aythya marila*
Mute Swan *	*Cygnus olor*	Lesser Scaup	*Aythya affinis*
Trumpeter Swan	*Cygnus buccinator*	King Eider **	*Somateria spectabilis*
Tundra Swan	*Cygnus columbianus*	Common Eider **	*Somateria mollissima*
Muscovy Duck *	*Cairina moschata*	Harlequin Duck	*Histrionicus histrionicus*
Wood Duck ****	*Aix sponsa*	Surf Scoter	*Melanitta perspicillata*
Gadwall	*Anas strepera*	White-winged Scoter	*Melanitta fusca*
Eurasian Wigeon	*Anas penelope*	Black Scoter	*Melanitta nigra*
American Wigeon	*Anas americana*	Long-tailed Duck ***	*Clangula hyemalis*
Mallard ****	*Anas platyrhynchos*	Bufflehead	*Bucephala albeola*
Blue-winged Teal	*Anas discors*	Common Goldeneye	*Bucephala clangula*
Cinnamon Teal	*Anas cyanoptera*	Barrow's Goldeneye	*Bucephala islandica*
Northern Shoveler	*Anas clypeata*	Hooded Merganser	*Lophodytes cucullatus*
Northern Pintail	*Anas acuta*	Common Merganser	*Mergus merganser*
Green-winged Teal	*Anas crecca*	Red-breasted Merganser	*Mergus serrator*
		Ruddy Duck	*Oxyura jamaicensis*

* Introduced species ** Accidental *** Species at risk (CDC blue-list) ****Breeding

Identification:

Geese: The most common species of goose in Stanley Park is the Canada goose. There are many subspecies (some migratory and some resident) and it may be easily confused with the cackling goose which looks like a miniature Canada goose. The greater white-fronted goose, snow goose and Brant look quite distinct from the other species. These migratory geese are found usually mixed into larger Canada goose flocks.

Swans: The most common swan in Stanley Park is the introduced mute swan which has an orange bill. Wild tundra and trumpeter swans appear occasionally and have black bills. They are distinguished by the presence of yellow on the lores (the area between the eye and bill) of the tundra swan and its absence in the trumpeter swan.

Ducks: There are many different species of duck and most are easily distinguished by their shape, colour and size. Some species closely resemble each other (such as greater and lesser scaup) while others are very unique (such as the long-tailed duck). Males are often more brightly and distinctly coloured than females or juveniles. In Stanley Park, most duck species are observed in winter when their plumage is at its best. Only those species that spend the summer here (such as mallards) are seen in their duller, non-breeding plumage, called eclipse plumage.

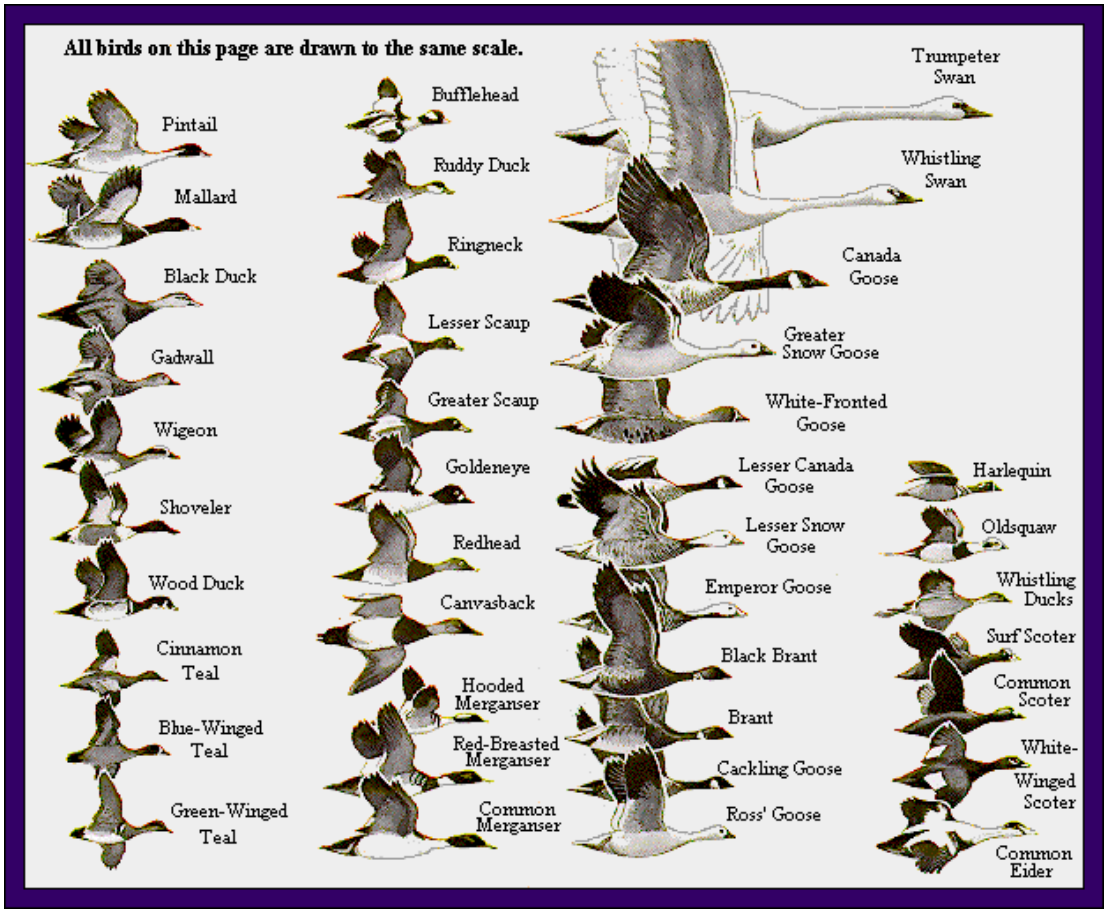


Figure 3: Waterfowl identification poster, including many of the species found in Stanley Park (USGS, 2006).

Behaviour:
The many species of ducks that use the park can be divided into dabbling or diving ducks. Dabbling ducks feed by tipping over and reaching underwater for aquatic plants and invertebrates. Diving ducks dive completely below the water surface to retrieve food such as mollusks and other marine invertebrates. Geese and swans act like dabbling ducks except their long necks allow them to reach farther underwater.

Waterfowl in the park can often be observed displaying courtship behaviour as pairs are commonly formed in the wintering areas prior to their migration to breeding sites.

Ring-necked duck on Lost Lagoon in winter.
Photo: Robyn Worcester

The Barrow's goldeneye is one of the few species of duck that defends a winter territory. Pairs of goldeneye can be found dotted along the seawall in winter defending their territory from other diving ducks.

Habitat Requirements:
Most waterfowl in the park are migratory. Most diving ducks and mergansers breed in the Interior of BC. Some species, such as the harlequin duck and common merganser, only migrate locally and may be found in breeding grounds along coastal rivers. Several species migrate to the arctic to breed including some ducks, snow geese and Brant geese.

While all waterfowl require aquatic habitats, some — such as Canada geese and mallards — readily use both salt and freshwater habitats, while others use only one type as their habitat. For example surf scoter and Barrow's goldeneye are always found on saltwater. Diving ducks can use deeper water, while dabblers are restricted to shallow marshes and shoreline habitat. Some dabblers such as mallards, Canada geese and American wigeon also use the lawn habitat in Stanley Park for grazing.

Breeding:
Canada geese, mallards and wood ducks are year-round residents and are the only waterfowl confirmed to be breeding in Stanley Park. They all require habitat specific to their nesting strategy to breed successfully. Canada geese prefer platforms high above the ground (such as buildings and topped trees) to prevent predation; mallards prefer dense vegetation where they can hide (often quite far from the water); and wood ducks use tree cavities close to the water or nest boxes for breeding.

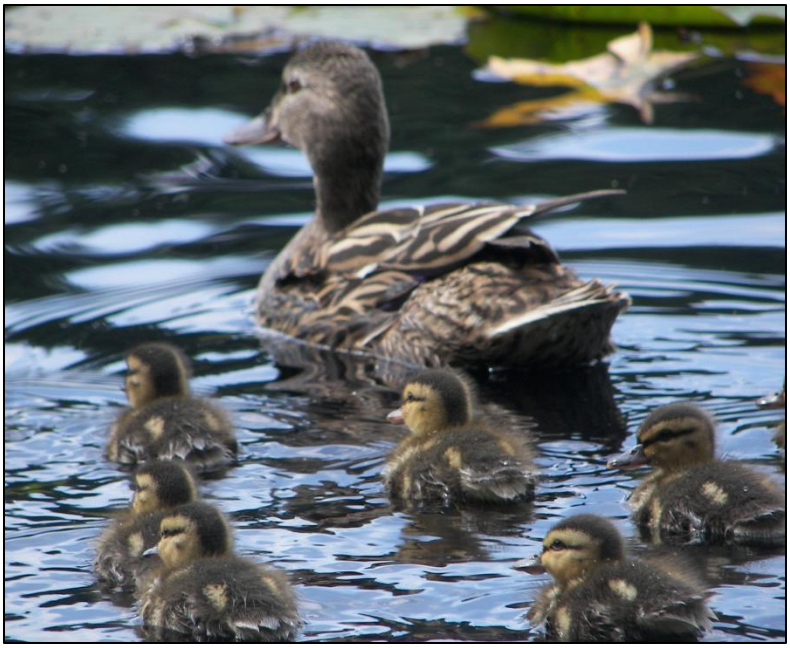
Most geese and swans mate for life, while ducks tend to be seasonally monogamous. Males of most waterfowl species do not participate in chick-rearing, with the exception of some species such as the geese and swans, which are excellent parents. Clutch size is variable within a species, but the average is 3 to 12 eggs per mating pair each season (EBO, 2012).

Waterfowl have precocial young (can feed themselves from hatching age) and lay their eggs synchronously (begin incubation all at once, rather than staggered) so that the young birds can follow their parents and find food immediately after hatching (EBO, 2012). The young hatch usually within about six hours of each other and are brooded in the nest by the female so that they become imprinted with her visual and auditory characteristics (EBO, 2012).

Food:
Diving ducks using intertidal areas feed on a variety of fish, aquatic plants and marine invertebrates. Many feed almost exclusively on the blue mussel (*Mytilus edulis).* Dabbling ducks mainly feed on aquatic vegetation but also consume aquatic invertebrates, seeds and grains. Mallards have been observed eating small fish and tadpoles on occasion. Geese and some dabbling ducks also feed on grass lawns surrounding the wetlands areas.

Supplemental feeding of waterfowl by humans is commonplace in Stanley Park. While seeds and grains are a natural part of these birds' diet, this type of feeding can result in negative impacts such as:

- The increased spread of disease
- Greater risk of injury and death from cars, dogs, and predators
- Increased levels of aggression towards people and other waterfowl
- Poor health and illness
- Abandonment of migration
- Elevated population levels
- Poor water quality and other human health risks.



Female mallard and ducklings on Beaver Lake in summer. Photo: Robyn Worcester

Although it is against park and city by-laws to feed birds and wildlife (Vancouver Park Board By Laws section 14(i); see Appendix 3), lack of enforcement and the encouragement of these activities in previous years (bird feeders were once installed in the Park) have caused the problem to reach critical levels in the Park. Although feeding by tourists is often believed to be the source of the problem, it is the "serial feeders" that come to the Park daily to feed animals who appear to cause the most lasting damage.

Threats:

- Degradation and loss of wetland habitat is a serious threat to all waterfowl populations. This is especially true in Stanley Park and the rest of Metro Vancouver where wetland habitat is scarce and often degraded.

- It has been reported by local naturalists and birders that have come to Stanley Park for decades that bird numbers have declined steadily over the years. At one time flocks of hundreds and even thousands of birds such as scaup would land on Lost Lagoon, but this has not been seen in recent years (Michael Price, pers. comm.).
- Social issues in Stanley Park such as off-leash dogs, off-trail activities and wildlife feeding have negative impacts on resident and migratory waterfowl by causing a direct disturbance to waterfowl and their nesting sites and providing unnatural food sources.
- Oil spills — One drop of oil can kill a waterbird because it causes them to lose the waterproofing in the feathers. Oil spills are an ever-present and increasing danger in the Port of Vancouver due to the present and potential increased shipping of oil through the port.
- Climate change — Historic breeding grounds could experience significant landscape changes and face more variable weather and precipitation, coastal marshes on wintering grounds could be inundated by rising sea levels, and changes in water availability will likely impact waterfowl habitat abundance (Ducks Unlimited, 2012).

A greater white-fronted goose grazing with Canada geese in the Rose Garden.
Photo: Robyn Worcester

- Disease — There is an increasing risk of bird diseases in North America such as West Nile virus, avian flu, avian cholera, and salmonellosis.
- Wildlife feeding — Ducks Unlimited does not recommend feeding wild waterfowl because:
    - It makes them more susceptible to harassment and attack by domestic dogs;
    - The birds can become nuisances by defecating on the grass and causing damage to park facilities through nesting and feeding activities;
    - It can create water-quality issues because of the high levels of fecal coliform and nitrogen in their waste;
    - Improper food can be fatal or can cause them to stop eating their natural foods which can result in them becoming malnourished; and
    - It may disrupt the natural cycle of migration.
- Pollution and poisoning — Dependence on aquatic habitats make waterfowl especially susceptible to water pollution. Some heavy metals, such as lead, are particularly damaging to waterfowl (like swans) feeding in marshes and wetlands.

Special Significance of this Group:

- English Bay and Burrard Inlet are set aside as an Important Bird Area (IBA) of Canada because of the large concentrations of waterbirds they support. The record number of waterfowl recorded in the IBA was in 1990 at 17,412 individuals within 50 species (IBA, 2009).
- Barrow's goldeneye numbers are also globally significant in this area with peak numbers of 7,126 individuals representing 4% of the world's population of this species (IBA, 2009).

- Waterfowl are good indicator of wetland habitat. When populations begin to drop it can be an indication that high quality wetland habitat is also disappearing.

Wildlife Management Emphasis Areas:

- Riparian areas, wetlands and streams — Zones of vegetation directly adjacent to freshwater watercourses. Distinct wildlife and plant communities are supported by high soil moisture and nutrients. Important features may include snags, downed logs, deciduous plants, and uneven age canopy.
- Intertidal — All of the littoral areas off of the seawall around Stanley Park including Coal Harbour and around Deadman's Island.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 — It is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 — No person shall disturb, destroy or take a nest, egg or nest shelter … of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.
- Species at Risk Act, 2002.

A typical Canada goose nest in Stanley Park is located on top of a tall red cedar stump. Photo: Robyn Worcester

Documented Occurrences in Stanley Park:

- In 1921, a newspaper article explained the state of waterfowl using the seashore around the entrance to the Park near Georgia Street. The paper explained that common birds included "bluebills [ruddy ducks], sawbills [mergansers], duffle heads (sic) [buffleheads], teal, wigeon, pintails and occasionally mallards," as well as "great blue herons, loons, grebes, and seagulls." These birds were observed feeding in Coal Harbour in the "salt marsh" areas next to Lost Lagoon and resting on the lagoon or on the "reedy beach" at the end of Pipeline Road. The report also claimed that flocks of mallards, pintail and teal commonly used Beaver Lake in "large numbers" supposedly escaping "unmolested" from the hunting season in the North and the "strenuous" seas of the Gulf of Georgia (Vancouver Province, 1921).
- A risk assessment for marine life commissioned by the Vancouver Port Corporation examined populations of marine birds using the outer and inner harbour around Stanley Park. The most common dabbling duck was the American wigeon while diving ducks were the most numerous birds (over 10,000 in the survey with 2,000 regularly seen off Stanley Park's shores) and about 10 species were considered to be regular winter residents (Sandwell et al., 1991).
- The BC Institute of Technology's Fish, Wildlife and Recreation program has engaged students to collect information on water bird species — using the Park's foreshore in cooperation with

the Canadian Wildlife Service — since 1999. Figure 4 shows the pattern of winter waterfowl abundance along the Park's shoreline in the winter of 2001/02.

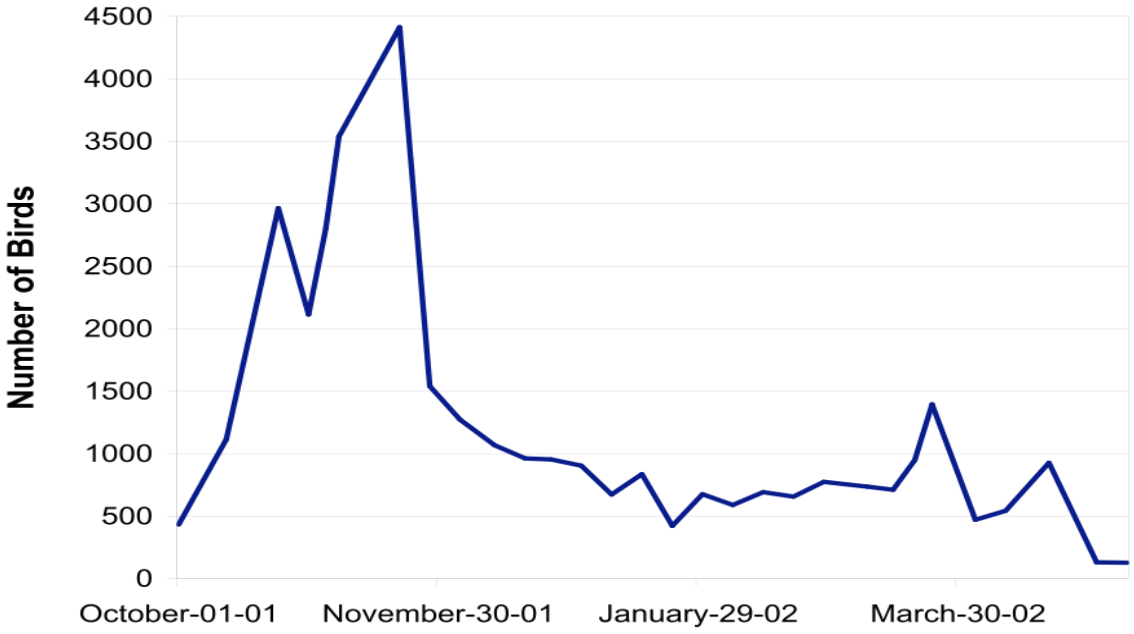


Figure 4: Total number of water birds seen along the Stanley Park shoreline between Oct 2001 and May 2002 (from Boisclair-Joly and Worcester, 2002).

- Wetland waterfowl in Stanley Park regularly use Beaver Lake and Lost Lagoon for habitat. Although there have been numerous surveys of Beaver Lake and Lost Lagoon for wetland birds over the years, the most current and complete data set has been collected by SPES staff and volunteers through monthly, standardized surveys since 2006. The total species diversity is fairly constant throughout the year, but seasonally the species composition changes greatly.
- Peak numbers of birds are usually seen in January and the lowest numbers are seen in May. Figure 5. below shows the total number of birds seen during monthly bird counts at Beaver Lake and Lost Lagoon between January 2006 and June 2009 (Worcester, 2010).
- Between August 1993 and July 1994, it was reported that peak numbers of birds (6,529) were seen in January and the lowest number (466) was seen in May on Lost Lagoon (Michael Price, unpublished data in Robertson and Bekhuys, 1995). These trends are similar to the more recent surveys but the peak numbers for 2006–2009 are much lower at 900 individuals (peak) and 300 individuals (lowest).

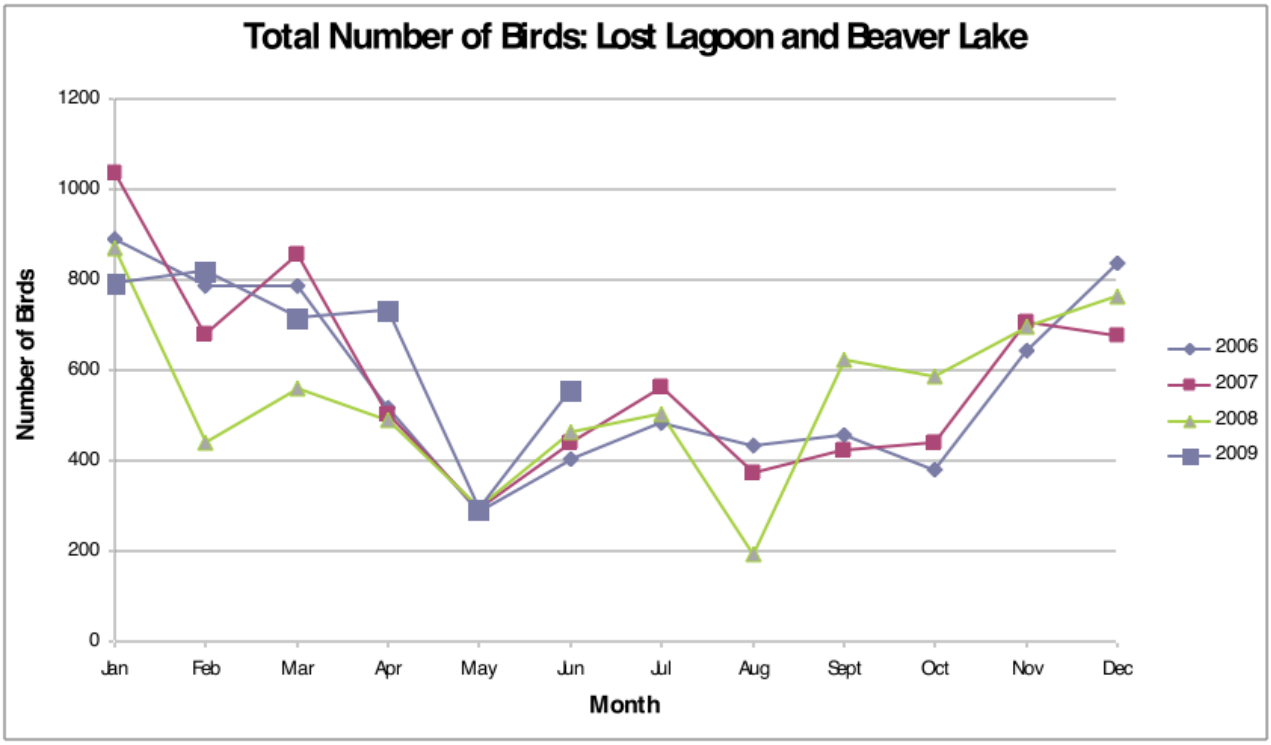


Figure 5: Total number of birds seen during monthly bird counts at Beaver Lake and Lost Lagoon between January 2006 and June 2009.

Best Management Practices for Operations in Stanley Park:

- Minimize all watercraft traffic around large groups of ducks around the shore of Stanley Park from October through April by enforcing a 250 meter exclusionary buffer around these groups.
- Continue to monitor populations of these species to better understand trends in their abundance and use of the park's habitat.
- Protect wetland and upland habitats and reduce disturbances in these areas.
- Stricter enforcement of "dogs-on-leash" by-laws in Stanley Park to minimize harassment by dogs near wetlands.
- Enforce no-feeding by-laws to prevent overpopulation, spread of disease, poor water quality and to improve the health of waterfowl populations using the park.
- Create intertidal gabions to create foraging habitat for mussel and barnacle feeding ducks. This has been tested successfully in the Port of Vancouver.
- Protect wildlife trees in and around wetlands as potential nesting sites for wood ducks and other waterfowl.
- Prevent pollution and oiling of aquatic habitats.

Habitat Enhancement Opportunities:

- Restore wetland and riparian habitat where natural vegetation has been removed or altered, by removing invasive plants and/or planting native plants.
- Create sheltered offshore areas where these birds can find refuge away from people with the creation of small islands, floating logs, and nest boxes in Lost Lagoon and Beaver Lake.

- Install seasonal buoys around key feeding areas in the water surrounding Stanley Park to restrict boat traffic in these areas during the winter feeding season.
- Retain dead-standing and fallen trees which are essential habitat for ducks. For example, wood ducks use these types of trees for nesting and many other species of waterfowl use them for resting.
- Reduce the amount of grass lawns as they can lead to the over population of Canada geese. These effects can also be minimized through the creation of shrub barriers between the grass and wetland areas.
- Enhance and protect mussel beds and rocky shoreline habitat on which these birds depend.
- Install educational signs at key points along the seawall to inform members of the public about giving seabirds their personal space.

Operation Timing:

- Breeding season for those species nesting in the park is March–July**.**
- Vancouver Park Board maintenance work around known and potential breeding locations (Beaver Lake and Lost Lagoon) should be limited to within 30 meters of known breeding/nesting sites.
- Overwintering marine waterfowl are in the Park's coastal waters from October through April and measures should be made to minimize all disturbances to them during this time.

Shorebirds

(Family Charadriiformes, excluding suborder Lari)

Shorebirds are small to medium sized birds with relatively thin bills and long legs. They frequent open shoreline habitat, foraging for small aquatic insects, worms and other animals by picking or probing the ground. Their habitat choices and foraging behaviour help identify the myriad of species. Bill shape and proportion to body are also important identification factors (Sibley, 2000).

The following species of gulls and terns have been recorded in Stanley Park, hereon after they may be referred to by the acronym following their name:

Resident or Common Visitors:

Killdeer *(Charadrius vociferous)*	KILL
Black Oystercatcher *(Haematopus bachmani)*	BLOY
Black Turnstone *(Arenaria melanocephala)*	BLTU
Sanderling *(Calidris alba)*	SAND

Less common Visitors:

Spotted Sandpiper *(Actitis macularia)*	SPSA
Solitary Sandpiper *(Tringa solitaria)*	SOSA
Greater Yellowlegs *(Tringa flavipes)*	GRYE
Lesser Yellowlegs *(Tringa tetanus)*	LEYE
Surfbird *(Aphriza virgate)*	SURF
Semipalmated Sandpiper *(Calidris pusilla)*	SESA
Western Sandpiper *(Calidris mauri)*	WESA
Least Sandpiper *(Calidris minutilla)*	LESA
Dunlin *(Calidris alpine)*	DUNL
Short-billed Dowitcher *(Limnodromus griseus)*	SBDO
Long-billed Dowitcher *(Limnodromus scolopaceus)*	LBDO
Wilson's Snipe *(Gallinago delicata)*	WISN

Rare sightings:

Black-bellied Plover *(Pluvialis squatarola)*	BBPL
Semipalmated Plover *(Pluvialis semipalmatus)*	SEPL
Baird's Sandpiper *(Calidris bairdii)*	BASA
Pectoral Sandpiper *(Calidris melanotos)*	PECA
Wandering Tattler *(Tringa incana)*	WATA
Whimbrel *(Numenius phaeopus)*	WHIM
Rock Sandpiper *(Calidris ptilocnemis)*	ROSA
Stilt Sandpiper *(Calidris himantopus)*	STSA
Wilson's Phalarope *(Phalaropus tricolor)*	WIPH
Red-necked Phalarope *(Phalaropus lobatus)*	RNPH
Red Phalarope *(Phalaropus fulicarius)*	REPH

Surfbird off seawall
Photo: Peter Woods

Identification:
Many species of shorebirds, especially the smaller species such as sandpipers, appear very similar and are quite challenging to identify. All species represent a variation on a similar design that involves long legs, a long bill, sharp dynamic wings and a streamlined body. These physiological features reflect the lifestyle in which these birds are adapted for living. The long legs allow for wading in water, marshes or exploring mudflats while the long bill is used to probe for tiny animals and insects. The long wings and streamlined body aid in the long distance migrations that these birds partake in annually (Morrisson, 2001).

This silhouette of a greater yellowlegs illustrates the anatomy of a typical shorebird which includes long legs, a long bill, long wings and a streamlined body (Morrisson, 2001).

KILL: Characteristic large, round head; large eyes and short bill; especially slender and lanky; long pointed tail and long wings; brownish-tan on top and white below; white chest is barred with two black bands; brown face is marked with black and white patches. Bright orange-buff rump is conspicuous in flight (Cornell Lab, 2011).

Killdeer sitting on eggs.
Photo: Curtis Ellis
Source: www.flickr.com/

Species at Risk:

Short-billed Dowitcher *(Limnodromus griseus)*
CDC: Blue
COSEWIC: not listed
BREEDING STATUS IN STANLEY PARK: unlikely
Identification: Large shorebird; reddish underneath with mottled brown above. Pale trailing edge on wings and distinctive white blaze up their backs during flight identifies them as dowitchers. Difficult to tell apart from the long-billed dowitcher. In breeding plumage, short-billeds typically have spotting on the sides of their breasts and in front of the wings, long-billeds are usually barred. The belly of the long-billed is typically reddish all the way back while the short-billed has some white (SAS, 2011).

Red-necked Phalarope (*Phalaropus lobatus*)
CDC: Blue
COSEWIC: not listed
BREEDING STATUS IN STANLEY PARK: unlikely
Identification: Smallest of the three phalarope and with the shortest bill. Black legs and lobed toes. Adult breeding female is dark with a grey breast and dark grey back with brown stripes. Head and

cheeks are dark and neck is rufous with a white throat patch and small white spot above the eye. Male looks similar but is not as brightly coloured and is whiter over the eye making an eye-line rather than a spot. Non-breeding adults are grey above and white below; white head and face and dark ear patch. RNPH back is streaked grey while REPH back is un-streaked (SAS, 2011).

Behaviour:
Shorebirds use a probing method to find their food under the sand or between the cracks of rocks. Certain species such as the BLTU have oddly shaped bills designed to flip and turn over stones, algae and sticks to look for food. The design and length of their beaks is a direct indicator to the types of food they eat and the habitat they frequent (Cornell Lab, 2011).

Most shorebirds are shy around humans and take flight when approached. KILL, however, are common around human habitats and, while still shy, often run away rather than fly. They typically stop and bob up and down while examining the intruder. They're one of the best known practitioners of the broken-wing display — an attempt to lure predators away from their nests by acting like they have a broken wing (Cornell Lab, 2011).

Wintering shorebirds will minimize heat loss by sitting on their legs, tucking one leg under the breast feathers or tucking their beaks among their feathers; a combination of any of these techniques are common. They will also fluff out their feathers to increase their insulation properties (Ehrlich et al., 1988).

Habitat Requirements:
Shorebirds, as their name indicates, inhabit a variety of coastal, shoreline habitats. Of those species found in Stanley Park, habitat requirements include:

- Mudflats and sandbars with grassland vegetation. For example, KILL are typically found in grassy areas where the grass is short (less than an inch in length). KILL are also common near drier areas away from water such as lawns, sport fields, golf courses, etc. (Cornell Lab, 2011).
- Rocky seacoasts and islands. BLOY, BLTU. BLTU are found on beaches near rocky coasts while BLOY are less likely to frequent beaches (Cornell Lab, 2011).
- Sandy beaches. This is the preferred habitat for SAND (Cornell Lab, 2011).

Wilson's snipe near Rose Garden.
Photo: Mark T. White

Breeding:
Of all the shorebirds found in Stanley Park, KILL is the only species known to breed in the park. The remaining species are either here during the winter season or passing through on their migratory routes. KILL breed in fields, meadows, pastures, mudflats, freshwater margins and occasionally on the coast (Ehrlich et al., 1988). Nests are typically

built far from water and consist of simple scrapes placed on a slight rise in open. KILL may make several scrapes close to one another before choosing one to lay eggs in; this practice may be used to confuse predators (Ehrlich et al., 1988; Cornell Lab, 2011).

Of the other common seabirds in the park, BLOY breed on rocky coasts and islands, and both SAND and BLTU breed in the tundra on dry sedge, barren or snowy areas (SAND) or coastal salt grass habitats (BLTU) (Ehrlich et al., 1988).

Food:
Shorebirds commonly found in Stanley Park feed on a variety of food sources including terrestrial and aquatic invertebrates (earthworms, snails, grasshoppers, beetles, crustaceans, barnacles, crayfish, larvae) and molluscs (mussels and limpets). KILL also follow farmers' plows to retrieve unearthed invertebrates, larvae and seeds. They have also been known to eat frogs and dead minnows (Cornell Lab, 2011).

Pectoral sandpiper at Beaver Lake.
Photo: Peter Woods

Threats:

- Habitat Loss: Unsustainable forestry practices and careless shoreline development often lead to the loss of important nesting sites and valuable feeding habitat including beaches, eelgrass meadows and subtidal benthic communities (CRD, 2011a).
- Decline of prey species: Human harvesting practices and shoreline development impact fish, crustaceans and mollusc populations which in turn impact the populations of seabirds that rely on them for food (CRD, 2011a).
- Lead poisoning: shorebirds often mistake lead pellets and weights as prey items or ingest them as grit which they need in their gizzards to help grind up food. The lead is dissolved in the digestive system and enters the bloodstream where it can impair the bird's ability to fly, eat, mate or care for its young, eventually resulting in the death of the bird (CRD, 2011a).
- Human disturbance: Most places where shorebirds feed are also recreational sites. Disturbance by dogs and people chasing birds can cause serious stress. Migratory birds need to feed intensely to build up body fat and energy reserves for long distance flights. Time spent fleeing attacks can result in less time eating and using up valuable energy. Too much disturbance can cause bird populations to abandon nesting or feeding sites (CRD, 2011a).
- Pollution and litter: Marine pollution such as heavy metals, oil, gas, pesticide and fertilizers can cause birds to become ill. Oils are particularly harmful by reducing the insulative properties of feathers. Birds will often ingest litter, such as plastic, which releases toxins that can make the bird sick as well as fill up the bird's stomach, resulting in starvation (CRD, 2011a).

Special Significance of this Group:

- As a result of their intercontinental migrations, successful conservation programs for shorebirds need to take place on an international scale (Morrisson, 2001).
- Obtaining information on the population size of shorebirds is difficult as they're spread out over enormous distances, winter in remote regions and quickly pass through areas, making it difficult to determine total numbers (Morrisson, 2001).
- Shorebirds depend on wetland habitats for survival and are an excellent indicator of the state and health of these important ecosystems (Morrisson, 2001).
- KILL are a useful species to farmers as pest control agents because of their large appetite for nuisance insects (Morrisson, 2001).

Wildlife Management Emphasis Areas:

- Intertidal — All of the littoral areas off of the seawall around Stanley Park including Coal Harbour and around Deadman's Island.
- Rocky outcrops and surficial geology — Cliffs and rock outcrops that form a unique habitat type in Stanley Park. Found primarily around Prospect Point, Siwash Rock and Ferguson Point.
- Riparian areas, wetlands and streams — Zones of vegetation directly adjacent to freshwater watercourses. Distinct wildlife and plant communities are supported by high soil moisture and nutrients.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 — It is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 — No person shall disturb, destroy or take a nest, egg or nest shelter … of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.

Documented Occurrences in Stanley Park:

- KILL regularly observed using Deadman's Island year-round (Robyn Worcester, pers. comm.).
- SPSA and SOSA observed using the BC Hydro salmon stream (Robyn Worcester, pers. comm.).
- SPES Data (2001–2011): BLOY, BLTU, SAND, KILL recorded during winter bird surveys along the seawall; WISN observed in the biofiltration pond and in the Rose Garden. LBDO and PESA observed at Beaver Lake.
- BBPL, SURF, SPSA, off seawall on west side of the Park (Peter Woods, pers. comm.).
- RNPH:
    - Rare in summer and fall (Weber et al. 1988)
    - Flock of approximately 30 observed on Lost Lagoon in 1998 (Peter Woods, Pers. Comm. 2007)
    - SPES Data (1985–2002): 2 sightings recorded, 1–2 birds per sighting at Lost Lagoon.

- SBDO:
    - Casual (seen less than once/year) sightings in spring (checklist) (Weber et al., 1988)
    - Observed feeding in biofiltration pond and in wet grass north of the marsh in 2005. Observed on concrete apron on south side of Lost Lagoon in 2006 (Peter Woods, Pers. Comm.)
- WATA: Rarely observed at Ferguson Point or Upper Coal Harbour at low tide (Weber and Kautesk, 1988).

Best Management Practices for Operations in Stanley Park:

- Maintain natural features and limit the use of any more "hard" structures along the shoreline. Beach plants and wildlife need natural features, but hard shores (e.g., rocks and seawall) can exacerbate erosion and alter natural sand movement; therefore, limit use of "hard" materials on beaches (BSC, 2009).
- Avoid placing hard infrastructure, such as roads and parking lots, adjacent to beaches (BSC, 2009).
- Stricter enforcement of "dogs-on-leash" by-laws in Stanley Park on beaches (Lumberman's, Second and Third Beaches) to minimize harassment by off-leash dogs when shorebirds are feeding. Most shorebirds are present in Stanley Park during the winter months and therefore do not have to compete with summer beachgoers for habitat.
- During the KILL breeding season (early March to late August), Park Board maintenance activities including brushing, thinning, mowing, etc. near any known KILL breeding habitats, or nests should be limited to within 30 meters.
- Retain natural wetland vegetation and hydrology.
- Restrict higher impact human recreation activities in or near sensitive nesting areas (BSC, 2009).
- Let grass grow unmowed wherever possible, mowing only once every 2–3 years. Leave buffer strips that are mowed infrequently along forest edges (VBPR, 2009).
- Avoid removing natural vegetation and mowing grassy areas adjacent to wetlands.
- Survey and map important habitat areas for shorebirds, to better understand their distribution and requirements in the Park.
- Monitor populations of shorebirds to better understand trends in their abundance and use of the Park's habitat.

Habitat Enhancement Opportunities:

- Restore intertidal habitat where natural vegetation has been removed or altered, by removing invasive plants and/or planting using native plants.
- Install educational signs at key points along the seawall (Second and Third Beaches) to inform members of the public about not feeding or harassing shorebirds and giving them space.
- Restore and enhance wetland habitats.

Operation Timing:

- Park Board maintenance work should be limited to within 30 meters of known KILL breeding/nesting sites from early March to late August.
- Seawall maintenance and repair should ideally occur in mid-summer when shorebird use of intertidal areas is lowest.

Coots and Rails

(Family Rallidae)

American coot.
Photo: JR Compton.
Source: www.hancockwildlife.org

All of the coots and rails found in Stanley Park are part of the Rallidae family and are known to inhabit marshy wetlands where they feed on plants and small animals. Rails tend to be very secretive while coots are more duck-like in their behaviour (Sibley, 2000). The foraging habits differ greatly between the species.

The following species of coots and rails have been recorded in Stanley Park, hereon after they may be referred to by the acronym following their name:

Virginia Rail (*Rallus limicola*)	VIRA
Sora (*Porzana carolina*)	SORA
American Coot (*Fulica americana*)	AMCO

These birds are not listed under the BC Conservation Data Center as being at risk in British Columbia or under COSEWIC as being at risk in Canada.

Identification:
VIRA: Small, chicken-like bird; compact body with short tail; rufous throat and breast; grey cheeks; long, slightly curved bill. Chicks are all black; juveniles have blackish brown on upper parts with some rufous feather edges; underparts densely marked with dark brown or blackish; face is greyish brown (Cornell Lab, 2011).

SORA: Small bird; triangular body shape with deep rear end; slate grey body; short yellow bill; short tail often held upright showing white underneath; black face and bib. Juveniles similar to adult but without black face or throat; buffy brownish chest (Cornell Lab, 2011).

Virginia rail.
Photo: Terry Sohl.
Source: www.hancockwildlife.org

AMCO: All black; white bill with black mark near the tip; distinctive white frontal shield on head; bill triangular like a chicken's; lobed toes. Young have bald red head; juvenile similar to adult but dull grey with lighter face and chest (Cornell Lab, 2011; Sibley, 2000).

Behaviour:
VIRA: Probes water and mud with bill to find food.
SORA: Forages along ground for food.
AMCO: Plucks at plants while walking and dabbles while swimming or fully dives underwater to find food. Clumsy and laboured flights. Can gather in winter flocks of several thousand, mixing with other waterfowl. Known to steal food from others including ducks.
Rails are incredibly shy, secretive and elusive birds (Ehrlich et al., 1988).
Coots and rails perform their migration at night (Ehrlich et al., 1988).

Sora.
Photo: Richard Cameron
Source: www.hancockwildlife.org

Habitat Requirements:
All of the coots and rails that inhabit Stanley Park are dependent upon freshwater wetland habitats characterized by dense emergent vegetation. The VIRA will sometimes inhabit salt marshes as well.

Breeding:
All coots and rails that live in Stanley Park are present during their breeding season and require freshwater wetland habitat with either partial or complete dense emergent vegetation (Cornell Lab, 2011).

AMCO also require at least some depth of standing water within the dense vegetation and therefore during drought years are limited to permanent wetlands (Cornell Lab, 2011).

VIRA build their nests directly on the ground while SORA and AMCO build their nests on floating platforms over water (Cornell Lab, 2011).

Food:
VIRA: Insects, larvae, aquatic invertebrates, fish and frogs.
SORA: Seeds and aquatic invertebrates.
AMCO: Mainly aquatic plants (algae, duckweed, sedges, etc.), insects, crustaceans, snails, tadpoles and salamanders.

Threats:
- VIRA: Populations are declining in places in the United States but they're offered no protection or special designation by any branch of government (Cornell Lab, 2011).
- SORA: Hunted in numerous states and provinces (Cornell Lab, 2011).
- VIRA and SORA are secretive, shy birds and can be easily disturbed while feeding and at breeding sites by human activities.

- Degradation and loss of wetland habitat is a serious threat to all coot and rail populations. This is especially true in Stanley Park and the rest of Metro Vancouver where wetland habitat is scarce and often degraded.

Special Significance of this Group:

- The elusive behaviour of rails makes it difficult for ecologists to gather efficient information on population size and determine appropriate management practices (Ehrlich et al., 1988).
- AMCO are good indicator of wetland habitat. When AMCO populations begin to drop it is an indication that high quality wetland habitat is also disappearing (Ehrlich et al., 1988).

Wildlife Management Emphasis Areas:

- Riparian areas, wetlands and streams - Zones of vegetation directly adjacent to freshwater watercourses. Wildlife and plants are supported by high soil moisture and nutrients. Important features may include snags, downed logs, deciduous plants and uneven age canopy.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 — It is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 — No person shall disturb, destroy or take a nest, egg or nest shelter … of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.

Documented Occurrences in Stanley Park:

- VIRA: Virginia rails became a common sight near Lost Lagoon in the winter of 2009 (Peter Woods, pers. comm.). Seen and heard at Beaver Lake by SPES staff in December 2011 (Brian Titaro, pers. comm.).
- AMCO: Regularly seen on Lost Lagoon during the winter months (SPES Data 2006–2011).

Best Management Practices for Operations in Stanley Park:

- Reduce brushing in potential habitat (riparian and wetland).
- Maintain a minimum buffer of 1.5 tree lengths, consisting of undisturbed natural vegetation, around nest sites.
- Stricter enforcement of “dogs-on-leash” by-laws in Stanley Park to minimize harassment by dogs near wetlands.
- All unnecessary disturbances around wetland and riparian habitat in the Park should be minimized so as not to disturb the more secretive VIRG and SORA.

Habitat Enhancement Opportunities:

- Restore wetland and riparian habitat where natural vegetation has been removed or altered, by removing invasive plants and/or planting using native plants.

- Create sheltered offshore areas where these birds can find refuge away from people (i.e., through the creation of island habitats in Lost Lagoon).

Operation Timing:

- All rails and coots present are potentially breeding in Stanley Park in the summer months. VPB maintenance work around known and potential breeding locations (Beaver Lake, Lost Lagoon) should maintain a 30 meter buffer zone surrounding known breeding/nesting sites.

Songbirds

(Order: Passeriformes)

The Pacific wren is a common forest breeding bird in Stanley Park.
Photo: Robyn Worcester

Songbirds, also called passerines, include a diverse array of small perching birds in Stanley Park from at least 23 different families. They have unique adaptations, such as distinctive feet (three toes pointed forward, one toe pointed backward), and consist of five broad ecological forms: thrushes, flycatchers, creepers, warblers, and sparrows (RISC, 1999). In BC, passerines make up 40% of the avifauna ranging in size from the raven to the ruby-crowned kinglet, and can be found in almost all terrestrial habitats (RISC, 1999).

There are many different species of passerines that breed in Stanley Park and many that are year-round residents. The highest diversity of species in the Park is found in the spring and fall when many species stop here during their migrations. Many songbirds using the Park as a breeding site or stopover as they head farther north are called “neotropical” migrants. These birds winter in Central and South America but breed in Canada during the summer. Stanley Park is also an important overwintering site for many small songbirds. Species such as juncos, thrushes and chickadees that nest at higher elevations in the summer come down to the Park to spend the winter. Wildlife feeding likely inflates these numbers in areas like Beaver Lake and Lost Lagoon, but this seasonal movement is natural and many birds enjoy the mild climate that Vancouver offers.

The following is a list of songbird groups existing in Stanley Park. A full list of species can be found at the end of this section in Table 4.

Tyrant Flycatchers (TYRANNIDAE)
Shrikes (LANIIDAE)
Vireos (VIREONIDAE)
Jays, Magpies, and Crows (CORVIDAE)
Larks (ALAUDIDAE)
Swallows (HIRUNDINIDAE)
Chickadees and Titmice (PARIDAE)
Bushtits (AEGITHALIDAE)
Nuthatches (SITTIDAE)
Creepers (CERTHIIDAE)
Wrens (TROGLODYTIDAE)
Tanagers (THRAUPIDAE)
Kinglets (REGULIDAE)
Dippers (CINCLIDAE)
Thrushes (TURDIDAE)
Starlings and Allies (STURNIDAE)
Waxwings (BOMBYCILLIDAE)
Longspurs and Snow Buntings (CALCARIIDAE)
Wood-Warblers (PARULIDAE)
New World Sparrows (EMBERIZIDAE)
Grosbeaks and Allies (CARDINALIDAE)
Blackbirds and Allies (ICTERIDAE)
Finches and Allies (FRINGILLIDAE)
Old World Sparrows (PASSERIDAE)

Identification:
Songbirds can be identified by both sight and sound, but the most common method for inventories for these birds is by song during the breeding season. During point counts, observers record the number and location of birds by their territorial songs. The survey is repeated at the site over a number of days to determine breeding bird presence and abundance.

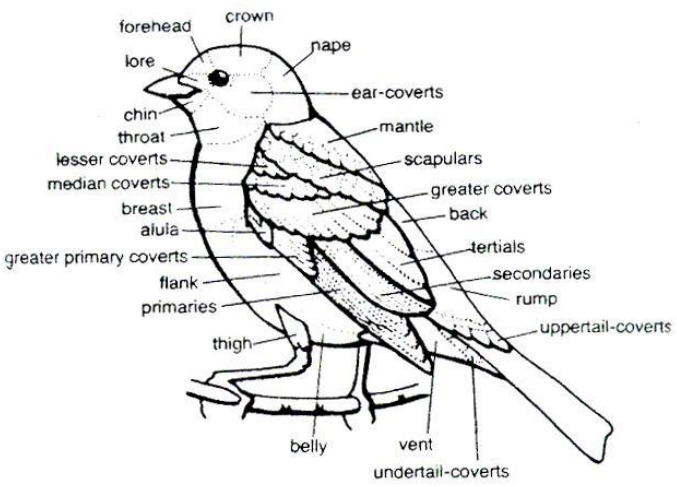


Image by: birding.com
www.birding.com/bird_identification.asp

In the non-breeding season and during the migratory periods, bird identification is attempted through songs, calls and visual observations. Bird identification during fall migration can be difficult for observers. Many of the brightly coloured males of the breeding season have moulted into non-breeding plumage and juvenile birds have yet to take on their adult plumage, making it difficult to distinguish the species (RISC, 1999).

To identify songbirds, it helps to understand the different parts of the bird to determine characteristics, such as golden crowns or red backs, etc. It also helps to understand the major differences between groups, such as their feeding habits, posture and preferred habitats.

Behaviour:
Songbird behaviour has been found to be based primarily on instinct although they're also capable of learning. Their behaviours are diverse and suited for the different niches they inhabit. In general, males must compete for mating opportunities and must learn songs that are used to establish and hold territories. Females are generally responsible for selecting an appropriate mate and rearing the offspring. These birds are often territorial in their breeding areas, but not while on migration or in wintering sites.


Savannah sparrow.
Photo: Peter Woods

Songbirds will act differently and display a variety of behaviours depending on the time of year, the age and the sex of the bird. For example, a male chickadee will be highly aggressive towards other adult males near the nest site in spring, but will flock together with these males in the winter. The male chickadee also has different ways of communicating, such as singing "cheese-bur-ger" to attract females and defend territory in the

spring, and calling “chick-a-dee-dee-dee” to alert of danger in the fall and winter.

Habitat Requirements:
Songbirds are found in every habitat of Stanley Park. They live mainly in terrestrial habitats and most nest in the forest, but they also inhabit wetlands and gardens and use intertidal areas. The mature forest in the Park supports a rich diversity of resident birds and migratory songbirds that come here specifically to breed in the spring. Most neotropical migrants using the Park, such as warblers, flycatchers, and tanagers, nest in coniferous and deciduous stands. Standing dead trees and fallen woody debris are important habitat for forest nesting birds. Woody debris is used for finding food or as territorial markers, and root wads are used as nesting sites for some species such as the Pacific wren. Many passerines in the Park are also primary cavity excavators (red-breasted nuthatch and black-capped chickadee) and secondary cavity nesters (Vaux’s swift and tree swallow) (See Cavity Nesting Birds BMP for more info).

Deciduous forest patches and woody understory shrubs are the most important nesting habitat for a majority of songbird species. These patches of deciduous trees and thickets of shrub communities provide the richest habitat for these birds and have shown to contain the highest diversity of species in the Park (see the documented occurrences section).

Riparian areas (vegetation directly adjacent to freshwater watercourses) and wetlands are also vitally important to many species of songbirds. Blackbirds, some warblers and species of flycatcher nest in these areas, while other species, such as swallows and sparrows, depend on these areas as sources of food.

Ruby-crowned kinglet.
Photo: Peter Woods

Breeding:
Songbird breeding season in southern BC, when most species of songbirds are in their territories, is from May 1 into the first week of July (RISC, 1999). However, many birds arrive as early as March and can be found breeding until mid-August.

The breeding strategies of individual species are as diverse as their habitats. Many species can breed more than once per season if conditions are suitable or the nest become predated. Most species are seasonally monogamous, while others, such as blackbirds, are polygamous. In some species, such as bushtits, both the male and female participate in raising the young, while the males of many other species provide no rearing assistance. Nest parasitism is a strategy that is used by brown-headed cowbirds and has been documented in

Stanley Park. This is when the female cowbird lays her eggs in the nest of another bird (such as a tree swallow). Since the cowbird young are usually much larger than the host young, they out compete them for food and cause the host young to perish. This can be detrimental to host species, especially where cowbirds are invasive (such as in BC).

Most breeding songbirds have some kind of courtship display or song and hold a nesting territory. The young of passerines are hatched altricial (small, blind and naked) and require intense parental care for the first part of their life. Songbirds are quick, however, to fledge the nest and usually become completely separated from their parents a short time later. Some, such as barn swallows and chickadees, take a little longer and can be seen being fed by their parents for some time even after they have left the nest.

The location of nests in the landscape is quite varied with some birds nesting in trees, while many others nest in low lying shrubs. Only a few species in Stanley Park are ground nesters (such as the spotted towhee).

Food:
Bird diet is relative to the individual species and its habitat. Species such as towhees, thrushes, and juncos forage on the ground for worms, grubs and beetles. Some, like chickadees, creepers, and kinglets, take insects gleaned from leaves and bark, while others, such as swallows and flycatchers, specialize in taking insects on the wing. Some, like sparrows, are more varied in their diet, while others, like crossbills, are more specialized. Songbirds, in general, eat seeds, berries, nectar, fruit, and insects.

Threats:

- Habitat loss is by far the largest current threat to the province's avifauna and continues to result in population declines (Fenneman, 2011). For neotropical migrants, habitat loss throughout North, Central and South America has had the greatest impact on their populations.
- Pesticide and herbicide use in their wintering tropical habitats is also a major concern (Reshetiloff, 2010).
- Nest predation and parasitism resulting from habitat fragmentation is part of the cause for continent-wide declines of some migrants (Houde, 2007). Nesting on edges leaves eggs and chicks more vulnerable to predation by other birds, such as jays and crows, and mammals, such as raccoons and cats (Reshetiloff, 2010).
- Loss of natural nesting sites, especially wildlife trees with cavities (Pearson and Healy, 2011).

Adult tree swallow feeding newly fledged young.
Photo: Peter Woods

- Predation by domestic pets, primarily house cats (Pearson and Healy, 2011). Studies have shown that cats kill millions of birds each year. Fledgling birds are especially vulnerable (Reshetiloff, 2010).
- Windows kill many small ground birds as they are the most susceptible to flying into windows and die either from their injuries or shock.
- Invasive plant and animal species threaten songbirds. Native plants that are necessary for songbird habitat can be outcompeted by alien invasive plants. For example, native cattail marshes taken over by invasive purple loosestrife and yellow flag iris are no longer suitable habitat for blackbirds. Invasive animals such as Eastern grey squirrels and Norway rats predate songbirds, as well as their nests and eggs. Invasive bird species such as house finches and European starlings out-compete native species such as purple martin and tree swallows for cavity nests.
- Human disturbance, such as people using forest trails, can affect the normal behaviour of wildlife. Wildlife may respond in a variety of ways depending on the species and the individual. Overall, research has shown that disturbances to forest birds in urban areas are detrimental to all but a few tolerant species, and may result in the actual loss of some species of birds from an area (Environment Canada, 2006).

Special Significance of this Group:

- Birds are the best form of natural insect control, eating tonnes of insects annually and preserving the health of our forests and grasslands.
- Many songbirds are also primary cavity nesters and secondary cavity users, creating and maintaining wildlife trees for other wildlife species.
- Songbirds attract birdwatchers, who spent $18.1 billion in the United States in 1991 on expenses related to birds, including memberships, optical and photographic equipment, and birding trips (Reshetiloff, 2010).

Figure 6: Breeding bird survey locations in Stanley Park.

Wildlife Management Emphasis Areas (WMEAs):

- Deciduous patches — Small patches of deciduous trees, thickets of shrub communities and pioneering species that provide habitat for birds and other wildlife.
- Riparian — The areas of vegetation around Beaver Lake and Lost Lagoon as well as along all streams.
- Ecotones — Located throughout the Park everywhere that two structurally distinct habitat types meet.
- Wetlands and streams — Zones of vegetation directly adjacent to freshwater watercourses and permanent or seasonally wet areas with distinct wildlife and plant communities and important features (snags, downed logs, uneven age canopy, etc.).
- Old growth trees — The veteran trees in the Park and small groups of old growth are especially important to certain species that rely on large trees for habitat.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 — It is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 — No person shall disturb, destroy or take a nest, egg or nest shelter … of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.
- Species at Risk Act, 2002.

Documented Occurrences in Stanley Park:

- In the spring of 1989, Robertson et al. recorded a total of 40 species, 13 of which displayed definite breeding behaviour and nine more of which were considered potential breeders; the most common were American robin and black-capped chickadee.
- Robertson and Bekhuys (1995) conducted studies comparing bird use in deciduous stands to conifer stands and found higher species richness in deciduous plots, especially during the winter.

The Wilson's warbler is a common neotropical migrant breeding in Stanley Park in summer.
Photo: Robyn Worcester

- A report by the Vancouver Natural History Society (Nature Vancouver) in 1988 indicated that the peak migration period for forest birds was from April to May and that there was a high use of ornamental trees and shrubs in the Park by these birds for habitat (VNHS, 1988).
- Winter bird species richness was also found to be highest in the deciduous stands, but the most birds per hectare occurred in the mature coniferous plot (Robertson et al., 1989).
- To mitigate the effect of removing trees and woody debris on breeding birds in Stanley Park during the 2007–2008 restoration efforts, bird surveys were conducted in May and June of 2007 to find nest sites. The surveys were performed under the direction of lead biologist Sally Leigh-Spencer and were carried out by several Registered Professional Biologists (R.P.Bios) and SPES staff. Data from these surveys is available from SPES.
- Additional bird surveys were carried out at all the blowdown sites and in several control areas, as an in-kind service provided by Jacques Whitford Consulting in cooperation with SPES and volunteer birders. These surveys provided great coverage of the Park and helped to instigate SPES's long-term monitoring efforts.
- Breeding bird surveys were initiated by SPES from 2007–2009 at all long-term monitoring stations and these surveys have been continued by staff and volunteers as a long-term monitoring program (data is available from SPES). See Figure 6 above.
- A study of the impacts of Himalayan blackberry on bird diversity was done in Stanley Park as a master's research project. The study found that the number of birds in the natural habitat outnumbered the birds in invasive blackberry habitat by almost 2:1. In addition, 24 different species of birds were detected in the natural habitat while only 11 were found in the blackberry. Based on the findings of this study, it appears that monocultures of blackberry have a negative impact on breeding bird diversity (Astley, 2010).

Best Management Practices for Operations in Stanley Park:

- Control domestic pets — Use an animal control by-law (such as dog-on-leash laws, cat licensing and/or feral cat trapping) to prevent domestic pets from accessing the preferred habitat of songbirds. Produce and distribute information on the dangers that pets pose to songbirds in the City of Vancouver and Stanley Park (Pearson and Healy, 2011).
- Reduce pesticide use — Ban insecticide and herbicide use for cosmetic purposes on lands within jurisdiction. Eliminate insecticide and herbicide use on local government lands, including rat poison (Pearson and Healy, 2011).
- Retain wildlife trees and coarse woody debris — Whenever possible and especially in wildlife MEAs. Felled danger trees in areas of elevated fire risk (trail sides, internal access trails, fuel type S1–S2) should be retained as coarse woody debris (CWD), — branches bucked and the logs laid to ground level (VBPR, 2009). Felled danger trees away from areas of fire risk may be left intact, especially in wet areas (VBPR, 2009).
- Observe breeding bird season — Limit all operational activities in forested areas, particularly wildlife MEAs from March through July and particularly in May through June. Use hand tools wherever appropriate for operational activities such as brushing and thinning. Retain non-competing vegetation. Avoid brushing in April, May and June, and in wildlife MEAs in July.

Conduct breeding bird surveys and mark nests if brushing is to occur in May/June (hand tools only in these months) (VBPR, 2009).

- Avoid collisions with buildings — Place hawk silhouettes or other obstructions in windows of all Park buildings to prevent songbird mortality (see Figure 7 below).
- Avoid fragmentation — Where habitats are already fragmented, provide habitat continuity that allows for movements of animals. Ensure that connectivity is maintained by setting aside undisturbed habitat for travel routes to these areas (BC MOE, 2004).
- Reduce invasive species — Control and reduce the spread of invasive plants and animals that compete with and prey on native wildlife and destroy valuable habitat. Avoid the importation of soil material into or near the forest unless it is verified as being weed free. Avoid exposing bare soil during trail and road maintenance operations. Cover any incidental scalping of forest soil with mulch (> 5 cm). Allow no large scale removal during the breeding season (unless nesting surveys are completed). Removed biomass and habitat should be replaced by adding mulch and/or planting species equivalent in wildlife value (i.e., salmonberry replaces blackberry, salal replaces ivy) (VBPR, 2009).
- Conserve wetlands — Maintain buffers of undisturbed native vegetation around and adjacent to these habitats and discourage human access to these sensitive areas. Maintain linkages between wetlands and other habitats through the use of vegetation corridors, raised boardwalks, large culverts and intact riparian areas. Maintain natural hydrology of wetlands and streams, so that these habitats continue to provide suitable conditions for semi-aquatic species over the long term (BC MOE, 2004).
- Allow for ground foraging — Let grass grow wherever possible, mowing only once every 2–3 years. Leave buffer strips that are mowed infrequently along forest edges. Mowing near eagle nest trees should be restricted to at least 10 m from the tree base to avoid root damage (VBPR, 2009).

Habitat Enhancement Opportunities:

- Maintain patches of deciduous trees, thickets and shrubs where present in Stanley Park including behind the Vancouver Park Board works yard, south of Kinglet Trail and in the old wildflower meadow. Allow natural succession to take place in other parts of Stanley Park instead of planting coniferous trees so that deciduous habitat is allowed to persist for natural periods of time.
- Maintain riparian areas, wetlands, ecotones, old growth patches and other wildlife MEAs that currently exist in the Park as valuable habitat.
- Reduce the amount of lawn and add native grasses, flowers, shrubs and trees to cultivated areas. The seeds, berries, fruits and nectar are important food sources for birds while forests, hedges and meadows provide nesting and roosting habitat as well as protection from predators.
- Install and maintain nesting boxes.
- Create sheltered areas where birds can find refuge away from people (i.e., through the creation of island habitats in Lost Lagoon).

- Reduce fragmentation of forested habitat by reducing or eliminating trails and roads wherever possible.
- Maintain and install new nest boxes at Beaver Lake and Lost Lagoon to increase nesting and breeding opportunities for cavity nesting songbirds.
- Leave small blowdowns in Wildlife MEAs. Those in other management areas also may be left as they are, or they may be bucked to ground level and the area replanted, depending on the surrounding fire fuel type (VBPR, 2009).
- Survey and map important habitat areas for this group of species, to better understand their distribution and requirements in the Park.
- Monitor populations of passerines to better understand trends in their abundance and use of the Park's habitat.

Operation Timing:

- Passerine nesting season in BC extends from March through late July (RISC, 1999).
- Operations in the Park around active nests should be minimized to reduce disturbance to parents raising and feeding young.

Table 4: Songbird species on record for Stanley Park.

* invasive species	*** CDC Red listed species at risk
** CDC Blue listed species at risk	**** SARA — Threatened or Endangered

Tyrant Flycatchers (TYRANNIDAE)	
Contopus cooperi	olive-sided flycatcher****
Contopus sordidulus	western wood-pewee
Empidonax trailii	willow flycatcher
Empidonax hammondii	Hammond's flycatcher
Empidonax oberholseri	dusky flycatcher
Empidonax difficilis	Pacific-slope flycatcher
Sayornis nigricans	black phoebe
Shrikes (LANIIDAE)	
Lanius excubitor	northern shrike
Vireos (VIREONIDAE)	
Vireo cassinii	Cassin's vireo
Vireo huttoni	Hutton's vireo
Vireo gilvus	warbling vireo
Vireo olivaceus	red-eyed vireo
Jays and Crows (CORVIDAE)	
Cyanocitta stelleri	Steller's jay
Corvus caurinus	northwestern crow

Corvus corax	common raven

Larks (ALAUDIDAE)

Eremophila alpestris strigata	horned lark ****

Swallows (HIRUNDINIDAE)

Tachycineta bicolor	tree swallow
Tachycineta thalassina	violet-green swallow
Stelgidopteryx serripennis	northern rough-winged swallow
Hirundo riparia	bank swallow
Petrochelidon pyrrhonota	cliff swallow
Hirundo rustica	barn swallow **
Progne subis	purple martin **

Chickadees (PARIDAE)

Poecile atricapillus	black-capped chickadee
Poecile gambeli	mountain chickadee
Poecile rufescens	chestnut-backed chickadee

Bushtits (AEGITHALIDAE)

Psaltriparus minimus	Bushtit

Nuthatches (SITTIDAE)

Sitta Canadensis	red-breasted nuthatch
Sitta carolinensis	white-breasted nuthatch

Creepers (CERTHIIDAE)

Certhia Americana	brown creeper

Wrens (TROGLODYTIDAE)

Thryomanes bewickii	Bewick's wren
Troglodytes pacificus	Pacific wren

Dippers (CINCLIDAE)

Cinclus mexicanus	American dipper

Kinglets (REGULIDAE)

Regulus satrapa	golden-crowned kinglet
Regulus calendula	ruby-crowned kinglet

Thrushes (TURDIDAE)

Myadestes townsendi	Townsend's solitaire
Catharus ustulatus	Swainson's thrush

Catharus guttatus	hermit thrush
Turdus migratorius	American robin
Ixoreus naevius	varied thrush

Starlings (STURNIDAE)

Sturnus vulgaris	European starling *

Waxwings (BOMBYCILLIDAE)

Bombycilla cedrorum	cedar waxwing

Snow Buntings (CALCARIIDAE)

Plectrophenax nivalis	snow bunting

Wood-Warblers (PARULIDAE)

Oreothlypis celata	orange-crowned warbler
Vermivora ruficapilla	Nashville warbler
Dendroica petechia	yellow warbler
Dendroica coronata	yellow-rumped warbler
Dendroica nigrescens	black-throated Gray warbler
Dendroica townsendi	Townsend's warbler
Mniotilta varia	black-and-white warbler
Setophaga ruticilla	American redstart
Seiurus noveboracensis	northern waterthrush
Oporornis tolmiei	MacGillivray's warbler
Geothlypis trichas	common yellowthroat
Wilsonia pusilla	Wilson’s warbler

New World Sparrows and Allies (EMBERIZIDAE)

Pipilo maculatus	spotted towhee
Spizella passerina	chipping sparrow
Passerculus sandwichensis	savannah sparrow
Ammodramus savannarum	grasshopper sparrow ***
Passerella iliaca	fox sparrow
Melospiza melodia	song sparrow
Melospiza lincolnii	Lincoln’s sparrow
Zonotrichia albicollis	white-throated sparrow
Zonotrichia querula	Harris’s sparrow
Zonotrichia leucophrys	white-crowned sparrow
Zonotrichia atricapilla	golden-crowned sparrow
Junco hyemalis	dark-eyed junco
Calcarius mccownii	McCown’s longspur
Piranga ludoviciana	western tanager

Grosbeaks, and Allies (CARDINALIDAE)

Pheucticus melanocephalus	black-headed grosbeak
Passerina amoena	lazuli bunting

Blackbirds and Allies (ICTERIDAE)

Agelaius phoeniceus	red-winged blackbird
Xanthocephalus xanthocephalus	yellow-headed blackbird
Sturnella neglecta pop.1	western meadowlark ***
Euphagus cyanocephalus	Brewer's blackbird
Molothrus ater	brown-headed cowbird
Icterus bullockii	Bullock's oriole

Finches and Allies (FRINGILLIDAE)

Carpodacus purpureus	purple finch
Carpodacus mexicanus	house finch
Loxia curvirostra	red crossbill
Loxia leocoptera	white-winged crossbill
Carduelis flammea	common redpoll
Carduelis pinus	pine siskin
Carduelis tristis	American goldfinch
Coccothraustes vespertinus	evening grosbeak

Old World Sparrows (PASSERIDAE)

Passer domesticus	house sparrow *

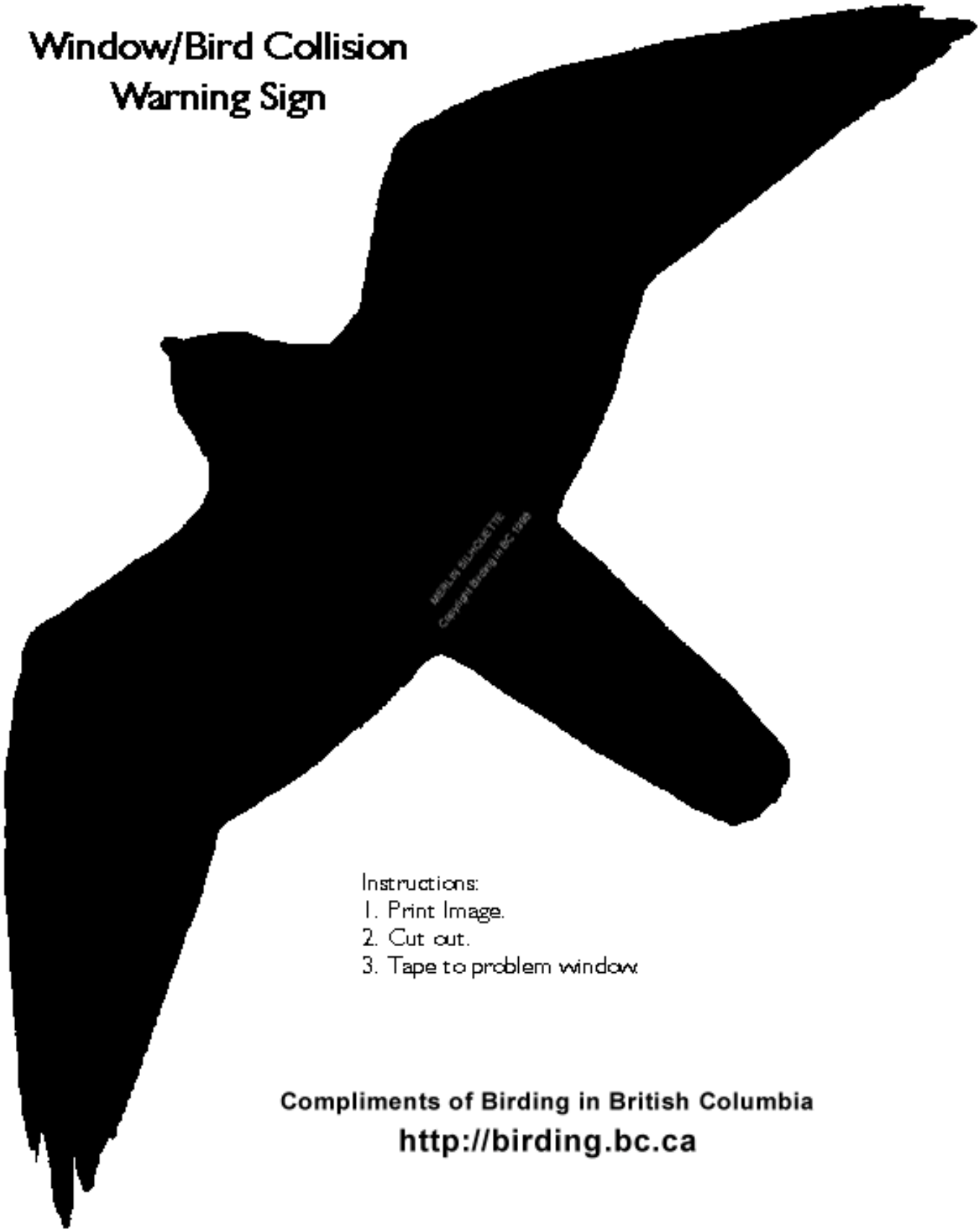


Figure 7: Merlin Silhouette to use in the prevention of songbird collision.

Bitterns and Herons

(Family Ardeidae)

Bitterns and herons are in the Ardeidae family and are all long-legged wading birds. They have long necks and pointed bills used to spear fish and other prey. American bitterns are secretive and well camouflaged marsh birds that are more easily heard than seen. Great blue herons are the largest and heaviest of the bitterns and herons, and also one of the most vocal. They generally hunt at night in quiet waters. Great egrets gather in loose flocks and feed on fish captured in the open ocean. Green herons are solitary and secretive and fish along wooded streams and ponds. Black-crowned night herons are stocky, nocturnal birds that roost during the day in trees or marshes and hunt at night near shallow ponds and marshes (Sibley, 2010).

American bittern.
Photo: Robyn Worcester

This BMP does not address the Pacific great blue heron (*Ardea herodias fannini)* in detail as this information is covered extensively in a great blue heron management plan for Stanley Park (VBPR, 2006).

The following species of bitterns and herons have been recorded in Stanley Park. Hereinafter they may be referred to by the standard alpha codes as follows:

American bittern (*Botaurus lentiginosus*)	AMBI
Great blue heron (*Ardea Herodias*)	GBHE
Great egret (*Ardea alba*)	GREG
Green heron (*Butoridesvirescens*)	GRHE
Black-crowned night heron (*Nycticoraxnycticorax*)	BCNH

Of this list, only the great egret is not a Species at Risk in BC.

Great blue heron.
Photo: Robyn Worcester

American bittern (*Botaurus lentiginosus*)

CDC: Blue
COSEWIC: not listed
BREEDING STATUS IN STANLEY PARK: possible
Identification: Medium-sized (60–85 cm). Adult plumage brown above (finely flecked with black) and heavily

streaked with brown and white below; legs and feet greenish-yellow; terrestrial locomotion slow and stealthy; flight rapid and usually low. When disturbed, often freezes in upright, concealing posture, with head and bill upturned; sexes similar (BC CDC, 2012; Cornell Lab, 2011).

Green heron (*Butorides virescens*)
CDC: Blue
COSEWIC: not listed
BREEDING STATUS IN STANLEY PARK: possible
Identification: Small (size: 41–46 cm). Relatively short legs (dull yellow; bright orange in breeding males); long, dark, straight bill, and short tail; mostly deep chestnut neck often kept pulled in tight to body; greenish-black crown, green/blue-grey upper parts; eyes orange or yellow (BC CDC, 2012; Cornell Lab, 2011).

Green heron.
Photo: Robyn Worcester

Black-crowned night Heron (*Nycticorax nycticorax*)
CDC: Red
COSEWIC: not listed
BREEDING STATUS IN STANLEY PARK: unlikely
Identification: Medium (size: 58–66 cm). Stocky; short neck and thick black bill; black cap and back; wings grey and under parts white. Juveniles brown with white spots on wings; broad indistinct streaks on under parts; bill mostly yellow (Cornell Lab, 2011).

Pacific great blue heron (*Ardea herodias fannini)*
CDC: Blue
COSEWIC: SC: Special Concern (Mar 2008)
BREEDING STATUS IN STANLEY PARK: confirmed
Identification: Large (size: 97–137 cm). Long legs; long "S" shaped neck; bluish grey back, wings and belly; reddish or grey neck; shaggy feathers on neck and back; black plume extending from behind the eye to off the back of the neck; white crown stripe; long thick, yellow bill. Juveniles similar to adult but with grey crown; dark upper bill; rusty-brown edging to back feathers; lacks body plumes (Cornell Lab, 2011).

Identification:
Great egret: Large (size: 94–104 cm). All white; long legs and feet; yellow bill is long, stout and straight; flies with its neck pulled back in "S" shaped curve. Juveniles look like nonbreeding adults (Cornell Lab, 2011).

Behaviour:
Bitterns and herons use a stalking method to catch their prey, which involves walking slowly, standing and stabbing their prey with quick lunges of the bill. The exception is BCNH, which do not stab, but grasp their prey (Cornell Lab, 2011).

AMBI have a stiff and fairly clumsy flight with rapid wing beats. Territorial males approach one another hunkered down, heads lowered to the level of their backs, neck drawn in and revealing white plumes at their shoulders. GRHE are known to drop bait (bread crusts, insects and twigs) onto the water to attract desirable fish to the surface. BCNH will disgorge their stomach contents if they're disturbed (Cornell Lab, 2011).

Habitat Requirements:
The primary habitat preference for all bitterns and herons in Stanley Park is wetlands of various types which may include salt, brackish and freshwater marshes, swamps, streams and lakes. Ideally this habitat contains tall, emergent vegetation such as bulrushes and sedges which provide cover in which to hide. GBHE are also commonly found along calm seacoasts (Cornell Lab, 2011).

During the winter, AMBI move to water bodies that don't freeze, especially near the coast, and occasionally frequent brackish marshes. Managed wetlands such as wildlife refuges seem to be important winter habitat (Cornell Lab, 2011). Populations that live near areas where water freezes are strongly migratory; however, populations that live in milder areas such as BC's south coast will likely stay in the same area year-round (SAS, 2011).

Breeding:
Herons found in Stanley Park nest in trees and often together with others of the same species in colonies. Open water and wetland habitats are important requirements for all breeding bitterns and herons in Stanley Park (Cornell Lab, 2011). GBHE typically build large platform nests high in trees and form dense colonies. GRHE nest in trees and shrubs in small colonies or alone directly over water (known breeding location at Ambleside Park). BCNH nest in trees or cattails in dense colonies. AMBI are primarily solitary and build nests on emergent vegetation several inches above the water (Cornell Lab, 2011).

Food:
The primary source of food for all bitterns and herons is fish. Other food sources include aquatic invertebrates, amphibians, lizards, reptiles, snakes, small mammals, crustaceans and eggs (Cornell Lab, 2011).

Threats:
- AMBI — This shy bird is easily disturbed by recreational boats. Acid precipitation is also a threat to the population. However, the most significant threat is habitat loss (Seattle Audubon Society).
- GBHE — Disturbance caused primarily by human activities and predation during the breeding season may lead to nest failure or colony abandonment (SAS, 2011).

- GRHE — Predator control at fish hatcheries where GRHE commonly frequent, and disturbance during the nesting season are considered threats to the population (SAS, 2011).
- BCNH — Found to be more susceptible to pesticide contamination than other heron species, BCNH was greatly affected by DDT until its use was discontinued. Water pollution likely still heavily influences this species (SAS, 2011).
- Degradation and loss of wetland habitat is a serious threat to all bittern and heron populations. This is especially true in Stanley Park and the rest of Metro Vancouver where wetland habitat is scarce and often degraded.

Special Significance of this Group:

- Most of the species of bitterns and herons found in Stanley Park are species at risk (AMBI, GRHE, BCNH and a subspecies of GBHE).
- The GBHE breeding colony in Stanley Park is one of the largest urban heronries in North America.
- These birds are top predators and important indicators of changes in the environment.

Wildlife Management Emphasis Areas:

- Riparian areas, wetlands and streams — Zones of vegetation directly adjacent to freshwater watercourses. Distinct wildlife and plant communities are supported by high soil moisture and nutrients. Important features may include snags, downed trees, deciduous plants, and uneven age canopy.
- Intertidal — All of the littoral areas off of the seawall around Stanley Park including Coal Harbour and around Deadman's Island.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 — It is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Species at Risk Act , 2002
- Migratory Birds Convention Act, 1994 — No person shall disturb, destroy or take a nest, egg or nest shelter … of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.

Documented Occurrences in Stanley Park:

- GBHE:
    - Great blue herons are regularly seen in Stanley Park at Beaver Lake and Lost Lagoon.
    - This species has occupied a breeding colony near the VPB offices and tennis courts since 2001 and has been breeding in Stanley Park since at least 1921.
- AMBI:
    - Seen regularly and photographed at Beaver Lake (SPES data).
- GRHE:

- Rare in summer and fall, not recorded in winter or spring (Weber et al. 1988)
- Observed feeding in the slough near the stone bridge, in the northernmost section of Ceperley Creek and in the biofiltration wetland (Peter Woods, Pers. Comm. 2007).
- Observed at Beaver Lake by SPES staff (Patricia Thomson, Brian Titaro, Pers. Comm. 2010).
- A pair was observed being chased by crows at Lost Lagoon in May 2012 (Robyn Worcester, Pers. Comm. 2012).

Best Management Practices for Operations in Stanley Park:

- Follow the Stanley Park Great Blue Heron Management Plan (VBPR, 2006) as a guiding document for the management of that species.
- Maintain wetlands of sufficient size to provide habitats at various stages of succession including the growth of emergent vegetation (Dechant et al., 2003).
- Protect wetlands from siltation, eutrophication, chemical contamination and other forms of pollution (Dechant et al., 2003).
- Maintain tall, dense, upland vegetation adjacent to wetlands, by avoiding maintenance disturbance. Mowing, brushing, etc. should ideally not be done more often than every 2–5 years (Dechant et al., 2003).
- Avoid removing natural vegetation and mowing grassy areas adjacent to wetlands (BC MOE, 2004).
- At AMBI, GRHE and BCNH nest sites, maintain a minimum buffer of 1.5 tree lengths, consisting of undisturbed natural vegetation.
- Survey and map important habitat areas for these species to better understand their distribution and requirements in the Park.
- Monitor populations of these species to better understand their use of the Park's habitat and trends in their abundance.

Habitat Enhancement Opportunities:

- Restore wetland and riparian habitat where natural vegetation has been removed or altered, by removing invasive plants and/or planting native plants.
- Continue tree-wrapping at GBHE nest colony to stop raccoons from predating nests.
- Plan for the movement of the GBHE colony at some point in the future. Protect or enhance groves of (mainly deciduous) native tree species that may become the site of a future heron colony.
- Trees along the corridor from the existing GBHE heronry to Nelson Street and beyond may be colonized as the heronry grows. Expansion of the fencing may be necessary along the perimeter. Regular review of the areas used by the herons is needed (VBPR, 2006).
- Maintain a wide vegetative margin around wetlands to protect breeding habitat and to deter nest predators (Dechant et al., 2003).
- Encourage residents to help protect these species by providing interpretive materials such as signs.

Operation Timing:

- A detailed operation timing chart for GBHE exists in Appendix 11 of the Stanley Park Heronry Management Plan (VBPR, 2006).
- AMBI, GRHE and BCNH are breeding the Park between April and October. Vancouver Park Board maintenance work around known and potential breeding locations (such as the southern shore of Beaver Lake) should be limited to at least 30 metres from these sites.

Loons and Grebes

(Family Gaviidae and Podicipedidae)

Overwintering horned grebe.
Photo: Peter Woods

Loons and grebes are all diving birds that commonly visit the intertidal areas and wetlands of Stanley Park while on migration or for wintering or breeding habitat. Loons are larger water birds while grebes tend to be smaller. Both groups tend to breed on freshwater lakes in summer and migrate to the ocean to overwinter. Loons and grebes of Stanley Park feed primarily on small fish and other aquatic organisms.

The following 8 species of loons and grebes have been recorded at Stanley Park:

Common Loon *(Gavia immer)*	COLO
Pacific Loon *(Gavia pacifica)*	PALO
Red-throated Loon *(Gavia stellata)*	RTLO
Eared Grebe *(Podiceps nigricollis)*	EAGR
Horned Grebe (Podiceps auritus)	HOGR
Pied-billed Grebe (*Podilymbus podiceps*)	PBGR
Red-necked Grebe (*Podiceps grisegena)*	RNGR
Western Grebe (*Aechmophorus occidentalis)*	WEGR

CDC Status: Red
COSEWIC Status: not listed
BREEDING STATUS IN STANLEY PARK: Unikely
Identification: Medium-sized waterbird (size: 55-75 cm); black back and face; white neck and underside; long neck; long, thin bill; sexes look alike; immature similar to adult (BC CDC, 2012i)

Western grebe.
Photo: Peter Woods

Identification:

- Loons are water birds like ducks, geese, and grebes. All loons have greyish feathers in the winter, and immature birds tend to resemble adult birds in winter plumage. The white feathers of the belly and wing linings are present year-round. Loons tend to swim low in the water and resemble the grebes, but can be identified by their larger size, thicker necks, and longer bills (Environment Canada, 2011).
- Grebes are generally smaller than loons, have lobed toes, and their feet are placed far back on their body. Grebe bills vary from short and thick to long and pointed, depending on the diet,

which ranges from fish to freshwater insects and crustaceans. Like loons, grebes often, swim low in the water with just the head and neck exposed.

Behaviour:

- Loons and grebes both dive underwater for food, in open water and among aquatic vegetation.
- Loons and grebes tend to avoid flying and instead respond to danger by diving.
- The young of loons and grebes often ride on the backs of their swimming parents. The young ride between the wings on the parent's back, and may even go underwater with them during dives (Cornell Lab, 2011).

Habitat Requirements:

- All three species of loon migrate to warmer areas around the west coasts of North America for the nonbreeding season, and return to northern lakes to breed when the ice melts in spring (Environment Canada, 2011).
- Grebes breed on seasonal or permanent freshwater ponds with dense stands of emergent vegetation, bays and sloughs. They use most types of wetlands and the seashore in winter (Cornell Lab, 2011).

Breeding:

- The only species known to be breeding in Stanley Park is the pied-billed grebe (PBGR).
- PBGR lay 3-10 bluish-white eggs in an open bowl nest on a platform of floating vegetation (Cornell Lab, 2011).
- The PBGR chicks can leave the nest soon after hatching, but do not swim well and do not spend much time in the water (Cornell Lab, 2011).
- By the age of four weeks, the young grebes are spending day and night on the water. For the first ten days their response to danger is to climb onto a parent's back. After that, when danger threatens, they dive under water (Cornell Lab, 2011).

Pied-billed grebe adult with chick on Beaver Lake, June 2012.
Photo: Peter Woods

Food:

- Loons and grebes are predators. Their diet can consist of fish, frogs, snails, insects, salamanders, and mollusks, crabs, marine worms, and leeches (Environment Canada, 2011).

Threats:

- Large scale threats that may influence wintering loon and grebe populations in Burrard Inlet include: industrial pollution including tanker ballast and oil spills (exports of petroleum and canola), overfishing, habitat degradation, urban encroachment, and the negative effects of climate change such as changes in mussel bed distribution and fish spawning habitat.
- Local threats that have been documented to negatively affect birds using the shoreline include: direct disturbance by people and off-leash dogs using the beaches as well as by personal watercraft in intertidal areas such as jet skis, kayaks and paddleboards.
- Most species are not just affected by the conditions of their wintering grounds, but also by the availability and quality of their breeding habitat. Recent studies have shown cause for concern about low breeding success for species such as the common loon (*Gavia immer*) (Environment Canada, 2011). These birds nest on interior lakes and are susceptible to the effects of pollution, development, and disturbance often leading to the abandonment of their nesting areas (HWW 2011). Loss of habitat results from lakeshore development and physical interference with nests or young, and increased boat wake on lakes which may swamp or destroy nests (Environment Canada, 2011).

Special Significance of this Group:

- English Bay and Burrard Inlet were named an Important Bird Area of Canada in part because of the large concentrations of overwintering western grebes found here (IBA, 2009). However, in the last 20-30 years those numbers have been in steep decline and they are now a species at risk in BC.
- Recent research in Stanley Park has also shown declines in all species of loons and grebes using the park's foreshore over the past 10 years (Worcester, 2011).

Wildlife Management Emphasis Areas:

- Riparian areas, wetlands and streams — Zones of vegetation directly adjacent to freshwater watercourses. Distinct wildlife and plant communities are supported by high soil moisture and nutrients. Important features may include snags, downed logs, deciduous plants, and uneven age canopy.
- Intertidal — All of the littoral areas off of the seawall around Stanley Park including Coal Harbour and around Deadman's Island.

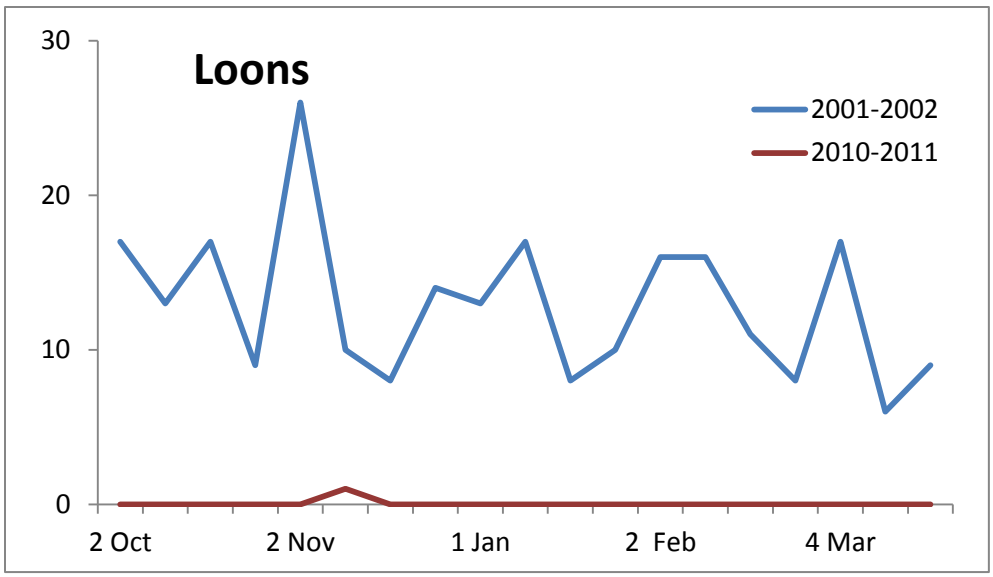
Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 — It is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 — No person shall disturb, destroy or take a nest, egg or nest shelter … of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.
- Species at Risk Act, 2002.

Documented Occurrences in Stanley Park:

- A risk assessment for marine life commissioned by the Vancouver Port Corporation found that loons were not particularly numerous, but grebes were readily seen, including a flock of western grebes that was composed of 4,000 individuals (Sandwell et al., 1991).
- In 1921, a newspaper article explained that common birds included "loons, grebes, and seagulls". These birds were observed feeding in Coal Harbour in the "salt marsh" areas next to Lost Lagoon and resting on the Lagoon or on the "reedy beach" at the end of Pipeline Road (Vancouver Province, 1921a).
- Listed as abundant in spring, fall and winter, and fairly common in summer in seasonal checklist of birds of Stanley Park (Weber et al. 1988).
- Seen in deep waters (pelagic) from Stanley Park (VNHS 2006).
- WEGR: Commonly seen off Brockton Point. Congregate in groups of thousands off Ferguson Point in spring, and can be seen performing courtship displays (VNHS 1995).
- In June 2012 the first family of pied-billed grebes in recent history was observed at Beaver Lake (Robyn Worcester, pers. comm. 2012).
- Trend in loon and grebe populations have shown declines over the past 10 years (Worcester, 2011). See figures 8 and 9.

Figure 8: Loon abundance along the Stanley Park seawall between October and April 2001-2002 and 2010-2011. Species observed include: COLO, PALO, RTLO and unidentified loon species.



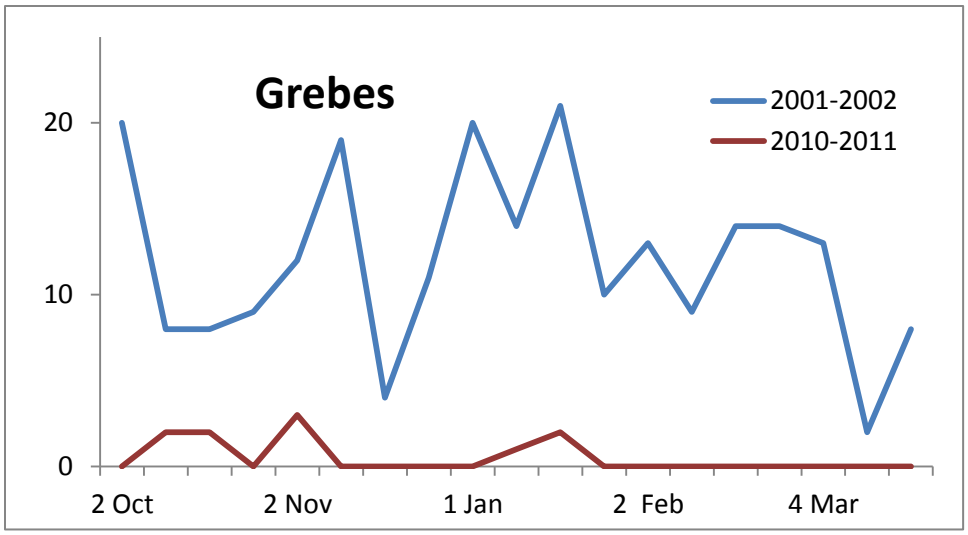


Figure 9: Grebe abundance along the Stanley Park seawall between October and April 2001-2002 and 2010-2011. Species observed include: HOGR, WEGR, and RNGR.

Best Management Practices for Operations in Stanley Park:

- Minimize all watercraft traffic around these species off the shore of Stanley Park from October through April by enforcing a 250 meter exclusionary buffer.
- Continue to monitor populations of these species to better understand trends in their abundance and use of the Park's habitat.
- Protect wetland and upland habitats and reduce disturbances in these areas.
- Stricter enforcement of "dogs-on-leash" by-laws in Stanley Park to minimize harassment by dogs near wetlands.
- Prevent pollution and oiling of aquatic habitats.

Juvenile common loon.
Photo: Peter Woods

Habitat Enhancement Opportunities:

- Restore wetland and riparian habitat where natural vegetation has been removed or altered, by removing invasive plants and/or planting native plants.
- Create sheltered offshore areas where these birds can find refuge away from people with the creation of small islands, floating logs, and nest boxes in Lost Lagoon and Beaver Lake.
- Install seasonal buoys around key feeding areas in the water surrounding Stanley Park to restrict boat traffic in these areas during the winter feeding season.
- Enhance and protect shoreline and intertidal habitat on which these birds depend.
- Install educational signs at key points along the seawall to inform members of the public about giving these birds their space.

Operation Timing:

- Breeding season for pied-billed grebes is March–July**.**
- Vancouver Park Board maintenance work around known and potential breeding locations (Beaver Lake and Lost Lagoon) should be limited to within 30 meters of known breeding/nesting sites.
- Overwintering marine waterfowl are in the Park's coastal waters from October through April and measures should be made to minimize all disturbances to them during this time.

Gulls and Terns

(Suborder Lari)

Glacous-winged gull.
Photo: Robyn Worcester

Gulls are generally conspicuous and sociable birds that prefer open areas and are often attracted to man-made concentrations of food. There are 15 species on record for Stanley Park, and most of these belong to the genus *Larys*. Large gull species are omnivorous and mix freely when food is plentiful. Smaller species form large flocks but do not mix as freely with other species. Many species are difficult to identify and hybridization between species does occur. Terns are in the same order as gulls but are generally smaller and more slender with straight, pointed bills and feed almost exclusively on fish (Sibley, 2000).

The following species of gulls and terns have been recorded in Stanley Park, hereafter they may be referred to by the acronym following their name:

Residents or Common Visitors:

Glaucous-winged Gull (*Larus glaucescens*)	GWGU
Bonaparte's Gull (*Chroicocephalus Philadelphia*)	BOGU
Mew Gull (*Larus canus*)	MEGU
Ring-billed Gull (*Larus delawarensis*)	RBGU
Western Gull (*Larus occidentalis*)	WEGU
California Gull (*Larus californicus*)	CAGU
Herring Gull (*Larus argentatus*)	HERG
Thayer's Gull (*Larus Thayeri*)	THGU
Caspian Tern (*Hydroprogne caspia*)	CATE
Common Tern (*Sterna hirundo*)	COTE

Rare or Uncommon Visitors:

Black-headed Gull (*Chroicocephalus ridibundus*)	BHGU
Little Gull (*Hydrocoloeus minutus*)	LIGU
Franklin's Gull (*Larus pipixcan*)	FRGU
Heermann's Gull (*Larus heermanni*)	HEEG
Iceland Gull (*Larus glaucoides*)	ICGU
Glaucous Gull (*Larus hyperboreus*)	GLGU
Sabine's Gull (*Xema sabini*)	SAGU
Arctic Tern (*Sterna paradisaea*)	ARTE
Forster’s Tern (*Sterna forsteri*)	FOTE

Gull Identification:
Gulls are medium to large seabirds. The smallest local gull is the LIGU with a wingspan of 60 cm while the largest local gull is the GLGU with a wingspan of 152 cm. Our most common species, the GWGU has a wingspan of 147 cm (Sibley, 2000). Gull plumage differs depending on their age and the time of year making identification difficult even among the same species (Ehrlich et al. 1988). Most gulls in the area are in non-breeding plumage. They have yellowish or pinkish legs (Sibley, 2000), squared tails and webbed feet (Columbia Encyclopedia, 2008, Avian Web, 2010). Juveniles do not resemble adults and have a distinct streaked brown plumage. As the birds mature, the plumage changes to reflect the individual species of gull (Ehrlich et al. 1988). It takes two years for smaller gulls to reach adult plumage and up to four years for larger gulls (Avian Web, 2010).

Tern Identification:
Terns are medium to large seabirds. The smallest local tern is the COTE with a wingspan of 76 cm while the largest local tern is the CATE with a 127 cm wingspan (Sibley, 2000). Terns in the area are primarily in non-breeding plumage which consists of white flanks and belly, white or grey primaries and greyish wings. Head colour is white with a black cap or black behind the eyes and/or nape. All have black legs, except for FOTE which has orange legs. All have long, pointed black bills except for the CATE which has a distinct red bill (Sibley, 2000). Terns are distinguished from gulls by their smaller size, narrower wings and more slender build. Their bill and wings are more sharply pointed and their tails are forked instead of squared (Avian Web, 2010).

Species at Risk:

Ring-billed gull
Photo: Robyn Worcester

California Gull (*Larus californicus*)
CDC: Blue
COSEWIC: not listed
BREEDING STATUS IN STANLEY PARK: unlikely
Identification: 47–54 cm; red ring of skin around eyes (Cornell Lab, 2011).

Caspian Tern (*Hydroprogne caspia*)
CDC: Blue
COSEWIC: not listed
BREEDING STATUS IN STANLEY PARK: unlikely
Identification: 47–54 cm; Largest tern, bill large, thick, and brilliant red with dark tip (BC CDC, 2012; Cornell Lab, 2011).

Forster's Tern (*Sterna forsteri*)
CDC: Red
COSEWIC: data deficient (1996)
BREEDING STATUS IN STANLEY PARK: unlikely
Identification: 33–36 cm; white with curved, black mask covering eye and ear region; bill black (Cornell Lab, 2011).

Behaviour:
Gulls and terns deploy a number of behavioural techniques to get their food. Ground foraging involves capturing prey while walking or swimming. Certain species are also known to dip food from surface of the water, steal food from other birds and drop large, hard food items on rocks or sand to break them open. Soaring behaviour involves capturing food near the surface of the water or on shore and is displayed by THGU, WEGU (Cornell Lab, 2011). Dabblers, such as the BOGU and LIGU, will also fly along and pluck food from the surface of the water, or plunge into the water to pick up food (Cornell Lab, 2011). Aerial diving involves flying over the water and then plunging down into the water; COTE and FOTE are known to hover before diving (Cornell Lab, 2011).

In general, gulls are very resourceful and highly intelligent birds that have demonstrated complex methods of communication and social structure (Avian Web, 2010). Gulls can often be observed chasing their predators, such as bald eagles. Studies have shown that gulls are attracted to their predators especially when dead gulls are present, possibly to learn about the predators and thus increase the likelihood of survival (Ehrlich et al., 1988).

Habitat Requirements:
Gulls and terns are most frequently found in Stanley Park and the south coast of BC while they are either wintering or on their seasonal migratory routes. All gulls and terns found in the Stanley Park area prefer coastal habitat along the marine shoreline or that of large bays and rivers. Specific habitat types include pelagic areas, intertidal zones, beaches, bays, estuaries and mudflats (Cornell Lab, 2011).

Certain species are also found near human habitats including farm fields, lawns, pastures, parking lots, marinas and garbage dumps. These species include BOGU, RBGU, CAGU, HERG, THGU, GWGU, MEGU, and WEGU (Cornell Lab, 2011).

Breeding:
Of all the gulls and terns that are found in the area surrounding Stanley Park, only the GWGU and the RBGU breeding range falls near Stanley Park (Cornell Lab, 2011). GWGU regularly nest on building rooftops in the West End adjacent to Stanley Park and in the rest of Vancouver. These gulls have also been seen nesting on the Lions Gate Bridge buttresses and on the cliffs near Prospect Point. Most gulls begin to breed when they're between two (ring-billed) and four years old (California, western), while most terns reach breeding age between three and four years old (Ehrlich et al. 1988; Avian Web, 2010).

These following species nest primarily near lakes, ponds, rivers, swamps or other freshwater sources: BOGU, BAGU, LIGU, FRGU, MEGU, GLGU, SAGU, CATE, COTE, FOTE.

These species nest primarily on marine coastal islands and steep cliffs, however some species, like the CAGU, breed on islands on freshwater bodies: HEEG, MEGU, WEGU, CAGU, HERG, THGU, ICGU, GWGU, GLGU, CATE, COTE, ARTE.

The RBGU, GLGU, COTE and ARTE species nest primarily on beaches, mudflats or other open coastal environments.

Food:
Gulls are opportunistic and adaptive feeders, allowing them to be successful in a wide variety of habitats. They regularly eat a wide variety of foods including fish, shellfish, eggs, invertebrates, grain, fruit, and eggs and chicks of other bird species or the eggs and chicks of their own species (Cornell Lab, 2011). Many species of gulls have learned to co-exist with humans and are frequent scavengers in harbours and bays, and are often seen near the wakes of ships and garbage dumps (Columbia Encyclopedia, 2008). Of all the gull species found in Stanley Park, the BOGU are the only ones known to not feed on garbage and carrion (Cornell Lab, 2011). Terns feed almost exclusively on fish, although they are also known to eat invertebrates and to a lesser extent squid, shrimp and crabs (Cornell Lab, 2011; Avian Web, 2010).

Threats:
- While populations of the CAGU have increased over the last 100 years in the United States, the species is still blue-listed in BC due to their low numbers and habitat loss (Cornell Lab, 2011).
- CATE numbers have increased across North America through habitat enhancements such as man-made dredge spoil islands and dikes used during breeding, however the population continues to decline in Europe and is blue-listed in BC because of its scattered breeding colonies and the vulnerability of nesting areas to disturbance and predation (Cornell Lab, 2011).
- FOTE is a red-listed species in BC and is of special concern in many states, especially the midwestern states, where declining populations have been attributed to loss of wetland habitat (Cornell Lab, 2011).
- Many species that rely primarily on small fish (such as CATE, FOTE, COTE and BOGU) are in decline in English Bay which may be due to the decline in small fish stocks in the area (Worcester, 2010).
- Many gulls and terns migrate to all corners of the world and require protected breeding, migration and wintering habitat in various countries to ensure population stability.
- Since all of the gulls and terns found around Stanley Park rely primarily on shoreline habitat and the surrounding marine environments, they are very sensitive to potential oil spills and chemical contamination of the water.

Special Significance of this Group:
- Gulls and terns are one of the most easily identifiable groups of sea birds in the world.
- Many gulls and terns perform incredibly long distance yearly migrations. The ARTE may travel up to 40,000km in a single year, the furthest yearly journey of any bird in the world (Cornell Lab, 2011).
- During the autumn migration, the CAGU is the most abundant gull in pelagic waters off the BC and Washington coast (BC CDC, 2012).

Wildlife Management Emphasis Areas:

- Riparian areas, wetlands and streams — Zones of vegetation directly adjacent to freshwater watercourses. Distinct wildlife and plant communities are supported by high soil moisture and nutrients. Important features may include snags, downed logs, deciduous plants, and uneven age canopy.
- Intertidal — All of the littoral areas off of the seawall around Stanley Park including Coal Harbour and around Deadman's Island.
- Rocky outcrops and surficial geology — Cliffs and rock outcrops that form a unique habitat type in Stanley Park. Found primarily around Prospect Point, Siwash Rock and Ferguson Point.

Applicable Wildlife Laws:

- BC Provincial Wildlife Act, 1996 — It is an offence to take, harm, or destroy the birds, their nests, or their eggs.
- Migratory Birds Convention Act, 1994 — No person shall disturb, destroy or take a nest, egg or nest shelter … of a migratory bird or have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.

Documented Occurrences in Stanley Park:

- A risk assessment for marine life commissioned by the Vancouver Port Corporation examined populations of marine birds using the outer and inner harbour around Stanley Park. Gulls were the second most numerous birds and were documented as having nightly movements across Lost Lagoon towards their English Bay open water roost (Sandwell et al., 1991). This roost was first recorded in 1973 and still seems to exist today.

- GWGU:
    - Observed nesting at Siwash Rock and the rocky cliffs below Prospect Point (Robertson and Bekhuys, 1995; Peter Woods, pers. comm. 2007; Worcester, 2010).
- CAGU:
    - Fairly common in fall, uncommon in spring and rare in summer and winter (Weber et al., 1988).
- Regularly observed resting on foreshore off Ferguson Point (Peter Woods, Pers. Comm. 2007).
    - Six sightings recorded — two to fifteen birds per sighting — at Lost Lagoon, Coal Harbour and from Seawall (SPES historical data 2001–2005).
- CATE:
    - Uncommon in spring, rare summer and fall, casual in winter (Weber et al. 1988).
    - Commonly seen flying between Coal Harbour and English Bay across Lost Lagoon and offshore from Second Beach (Peter Woods, Pers. Comm. 2007; Monica Schroeder, Pers. Comm. 2007).
    - Fifteen sightings recorded — 1–2 birds per sighting — at Lost Lagoon (SPES historical data 2005–2006).

- FOTE:
    - Recorded sightings in the fall along English Bay and Burrard Inlet (Weber et al., 1988)

Best Management Practices for Operations in Stanley Park:

- GWGU breeding season begins as early as mid-May and runs until late September (Pacific Wildlife, 2011). During this period there is a high level of public activity near the known breeding areas surrounding Siwash Rock and the rocky cliffs below Prospect Point. Therefore, all Vancouver Park Board activities should be limited to within 30 meters of any known breeding birds or active nesting sites so as to not create any additional disturbance to breeding birds.
- The winter bird season in the south coast region runs from October to April. It is during this time that most gulls and terns are found in Stanley Park, including the CAGU, CATE and FOTE which are species at risk. While in their wintering habitat, it is important that they're not unnecessarily disturbed. To ensure this:
- Minimize boat traffic around large groups of migratory gulls and terns off the shore of Stanley Park from October to April.
- Enforce a 100 meter buffer for all local boat traffic around gull and tern flocks.
- Stricter enforcement of "dogs-on-leash" by-laws in Stanley Park to minimize harassment by dogs.
- Install educational signs at key points along the seawall to inform members of the public about giving seabirds their space.
- Survey and map important habitat areas for this group of species, to better understand their distribution and requirements in the Park.
- Monitor populations of the gull and tern species to better understand trends in their abundance and use of the Park's habitat,

Habitat Enhancement Opportunities:

- Install seasonal buoys around key gathering areas off of Stanley Park to restrict boat traffic in these areas during the wintering season.
- Install floating docks, piers or logs for resting habitat away from the busy shoreline.

Operation Timing:

- Vancouver Park Board maintenance work near Siwash Rock and the rocky cliffs below Prospect Point should be limited to within 250 meters when GWGU are known to be nesting and/or breeding.
- Many species of gulls and terns, in particular those at risk, are only in our coastal waters from October to April and, as such, measures should be made to minimize all disturbances to them during this time.

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