# Alaksen National Wildlife Area

## Management Plan 2025

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Canada

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# About Environment and Climate Change Canada's Protected Areas and Management Plans

### What are Environment and Climate Change Canada Protected Areas?

Environment and Climate Change Canada establishes marine and terrestrial National Wildlife Areas for the purposes of conservation, research and interpretation. National Wildlife Areas are established to protect migratory birds, species at risk, and other wildlife and their habitats. National Wildlife Areas are established under the authority of the *Canada Wildlife Act* and are, first and foremost, places for wildlife. Migratory Bird Sanctuaries are established under the authority of the *Migratory Birds Convention Act, 1994* and provide a refuge for migratory birds in the marine and terrestrial environment.

### How has the federal government's investment from Budget 2018 helped manage and expand Environment and Climate Change Canada's National Wildlife Areas and Migratory Bird Sanctuaries?

The Nature Legacy represents a historic investment over five years of $1.3B and will help Environment and Climate Change Canada expand its national wildlife areas and migratory bird sanctuaries to contribute to Canada's biodiversity targets and increase Environment and Climate Change Canada's capacity to manage its protected areas.

Environment and Climate Change Canada will be conserving more areas, and have more resources to effectively manage and monitor the habitats and species who reside in its protected areas

### What is the size of the Environment and Climate Change Canada Protected Areas Network?

The current Protected Areas Network consists of 64 National Wildlife Areas and 92 Migratory Bird Sanctuaries, comprising more than 15 million hectares across Canada.

### What is a Management Plan?

A management plan provides the framework in which management decisions are made. They are intended to be used by Environment and Climate Change Canada staff to guide

decision making, notably with respect to permitting. Management is undertaken in order to maintain the ecological integrity of the protected area and to maintain the attributes for which the protected area was established. Environment and Climate Change Canada prepares a management plan for each protected area in consultation with First Nations, the public and other stakeholders.

A management plan specifies activities that are allowed and identifies other activities that may be undertaken under the authority of a permit. It may also describe the necessary improvements needed in the habitat, and specify where and when these improvements should be made. A management plan identifies Aboriginal rights and allowable practices specified under land claims agreements. Further, measures carried out for the conservation of wildlife must not be inconsistent with any law respecting wildlife in the province in which the protected area is situated.

**What is Protected Area Management?**

Management includes monitoring wildlife, maintaining and improving wildlife habitat, periodic inspections, enforcement of regulations, as well as the maintenance of facilities and infrastructure. Research is also an important activity in protected areas; hence, Environment and Climate Change Canada staff carries out or coordinates research in some sites.

**The series**

All of the National Wildlife Areas are to have a management plan. All of these management plans will be initially reviewed 5 years after the approval of the first plan, and every 10 years thereafter.

**To learn more**

To learn more about Environment and Climate Change Canada's protected areas, please visit our website at https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas.html or contact the Canadian Wildlife Service in Ottawa.

# The Alaksen National Wildlife Area

Established in 1976, the Alaksen National Wildlife Area (NWA) protects important migration and over-wintering habitats for waterfowl and other birds. Located in the Fraser River delta in southwestern British Columbia, the NWA is a significant part of a vital link in a network of important Pacific coastal habitats that stretch from Siberia to South America. The Fraser River delta is unique in that no other site in Canada supports the diversity and number of birds in winter (at least half a million), and no comparable site exists along the Pacific coast between California and Alaska (Butler and Campbell 1987). The international importance of the Alaksen NWA has been recognized by its inclusion within Fraser River Estuary, a site of Hemispheric Importance in the Western Hemisphere Shorebird Reserve Network (WHSRN). The NWA is also part of the Boundary Bay - Roberts Bank - Sturgeon Bank Important Bird Area (IBA), and is within the Fraser River Delta RAMSAR site, a complex that provides internationally important migratory stopover sites for the Western Sandpiper (*Calidris mauri*), as well as providing feeding and roosting sites to approximately 250,000 migrating and wintering waterfowl and 1 million shorebirds.

The NWA overlaps with the George C. Reifel Migratory Bird Sanctuary (MBS), which is also a federal protected area within Environment and Climate Change Canada's (ECCC's) protected areas network. The MBS was established in 1967. The British Columbia Waterfowl Society (BCWS) manages a portion of the lands designated as the NWA and MBS under an Agreement with the Canadian Wildlife Service (ECCC-CWS), this area is commonly known as the George C. Refiel MBS. For a small fee, the BCWS Managed Refuge allows visitors to walk the trails and view wildlife from a number of viewing platforms, blinds and a tower.

A large portion of the Alaksen NWA is managed as a farm, providing important forage for wintering and migrating waterfowl, including the tens of thousands of lesser snow geese (*Chen caerulescens*) that arrive each October from their breeding grounds on Wrangel Island in Russia. Historically, these birds and other waterfowl, including American wigeon (*Mareca americana)*, mallard (*Anas platyrhynchos)* and trumpeter swans (*Cygnus buccinator*) used the varied habitats afforded by mudflats, foreshore marshes and seasonally flooded fields during migration and to over winter. Soil-based agriculture now serves an ecological function similar to seasonally flooded wet meadows.

In addition to agricultural fields, the Alaksen NWA contains estuarine habitats suitable for a large variety of birds from great blue heron (*Ardea herodias*) to dowichers (*Limnodromus spp.*) and trumpeter swans (*Cygnus buccinator*). Remnant wetlands also contain many dabbling and diving ducks such as green-winged teal (*Anas crecca*), northern pintail (*Anas acuta*), bufflehead (*Bucephala albeola*) and gadwall (*Mareca strepera*). Depending on the time of year, various passerines, woodpeckers, and raptors can be found in the ponds, ditches, hedgerows, wooded and riparian forests present on the property. Old field habitats in the NWA host a variety of species including Wilson's snipe (*Gallinago delicate*) and several raptors such as the short-eared owl (*Asio flammeus*) - listed as Special Concern under the Species at Risk Act.To protect important wildlife values, all activities within the Alaksen NWA are restricted unless otherwise permitted. Agricultural activities are permitted under specified conditions laid out in individual agreements and permits between each farmer and ECCC-CWS. Additionally, walking on designated dyke trails within the NWA during regular business hours is allowed.For greater certainty, nothing in this management plan shall be construed so as to abrogate or derogate from the protection provided for existing aboriginal or treaty rights of the Aboriginal peoples of Canada by the recognition and affirmation of those rights in section 35 of the Constitution Act, 1982.

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# 1. DESCRIPTION OF THE PROTECTED AREA

The Alaksen National Wildlife Area (NWA) is located at the northern end of Westham Island in the Fraser River delta, in the Pacific Coast region of British Columbia. The NWA is adjacent to the provincial Crown foreshore and private agricultural lands, and overlaps with the George C. Reifel Migratory Bird Sanctuary (MBS).

**Table 1: Information on the Alaksen National Wildlife Area**

| | |
|---|---|
| **Protected Area Designation** | National Wildlife Area |
| **Province or Territory** | British Columbia |
| **Latitude and Longitude** | 49º 06', 123º 10' |
| **Size** | 349 hectares |
| **Protected Area Designation Criteria (Protected Areas Manual)** | Historic: protection of important habitat for migration stopover and wintering area for migratory birds.<br>Current: The area supports a population of a species or subspecies or a group of species which is concentrated, for any portion of the year. |
| **Protected Area Classification System** | A: (High) species or critical habitat conservation |
| **International Union for Conservation of Nature (IUCN) Classification** | IV |
| **Order-in-Council Number** | 1977-2958; amending OIC 1978-1439 |
| **Directory of Federal Real Property (DFRP) Number** | 16671 |
| **Gazetted** | 1967 (MBS), 1976 (NWA) |
| **Additional Designations** | Fraser River Delta Ramsar site (1982); Western Hemisphere Shorebird Reserve Network site (2011); Important Bird Area site (2001); George C. Reifel Migratory Bird Sanctuary (1967). |
| **Faunistic and Floristic Importance** | Rare and sensitive estuarine and freshwater marsh habitat |
| **Invasive Species** | Eastern grey squirrel *(Sciurus carolinensis),* red-eared slider *(Trachemys scripta elegans)* green frog (*Lithobates clamitans*), bull frog (*Rana catesbeiana*), common carp (*Cyprinus carpio*), pumpkinseed (*Lepomis gibbosus*).<br><br>Purple loosestrife *(Lythrum salicaria*), Canada thistle (Cirsium *arvense*), sow thistle (*Sonchus arvensis*) yellow flag iris (*Iris pseudacorus*), oxeye daisy (*Chrysanthemum leucanthemum*), Himalayan and evergreen blackberry (*Rubus armeniacus* and *Rubus laciniatus*), scotch broom (*Cytisus scoparius*), bull thistle (*Cirsium vulgare*), english holly (*Ilex aquifolium*), English ivy (*Hedera helix*), cherry laurel (*Prunus laurocerasus*), reed canary grass (*Phalarus arundinacea),* |

| | |
|---|---|
| | yellow archangel (*Lamiastrum galeobdolon),* butterfly bush (*Buddleja davidii*), and asparagus (*Asparagus officinalis)*. |
| **Species at Risk** | Great blue heron (*Ardea herodias*), western painted turtle (*Chrysemys picta bellii*), barn owl (*Tyto alba*), barn swallow (*Hirundo rustica*), short-eared owl (*Asio flammeus*), horned grebe (*Podiceps auritus*), western grebe (*Aechmophorus* occidentalis), olive-sided flycatcher (*Contopus cooperi*), black swift (*Cypseloides niger*), peregrine falcon (*Falco peregrinus pealei*), little brown bat (*Myotis lucifugus*), Pacific water shrew (*Sorex bendirii)*, water Vancouver Island beggartick (*Bidens amplissima*), western bumble bee (*Bombus occidentalis*), Audouin's night-stalking tiger beetle (*Omus audouini*) |
| **Management Agency** | Environment and Climate Change Canada (Canadian Wildlife Service) |
| **Public Access and Use** | Agricultural production by agreement. Public access only on designated dyke trails during designated hours. |

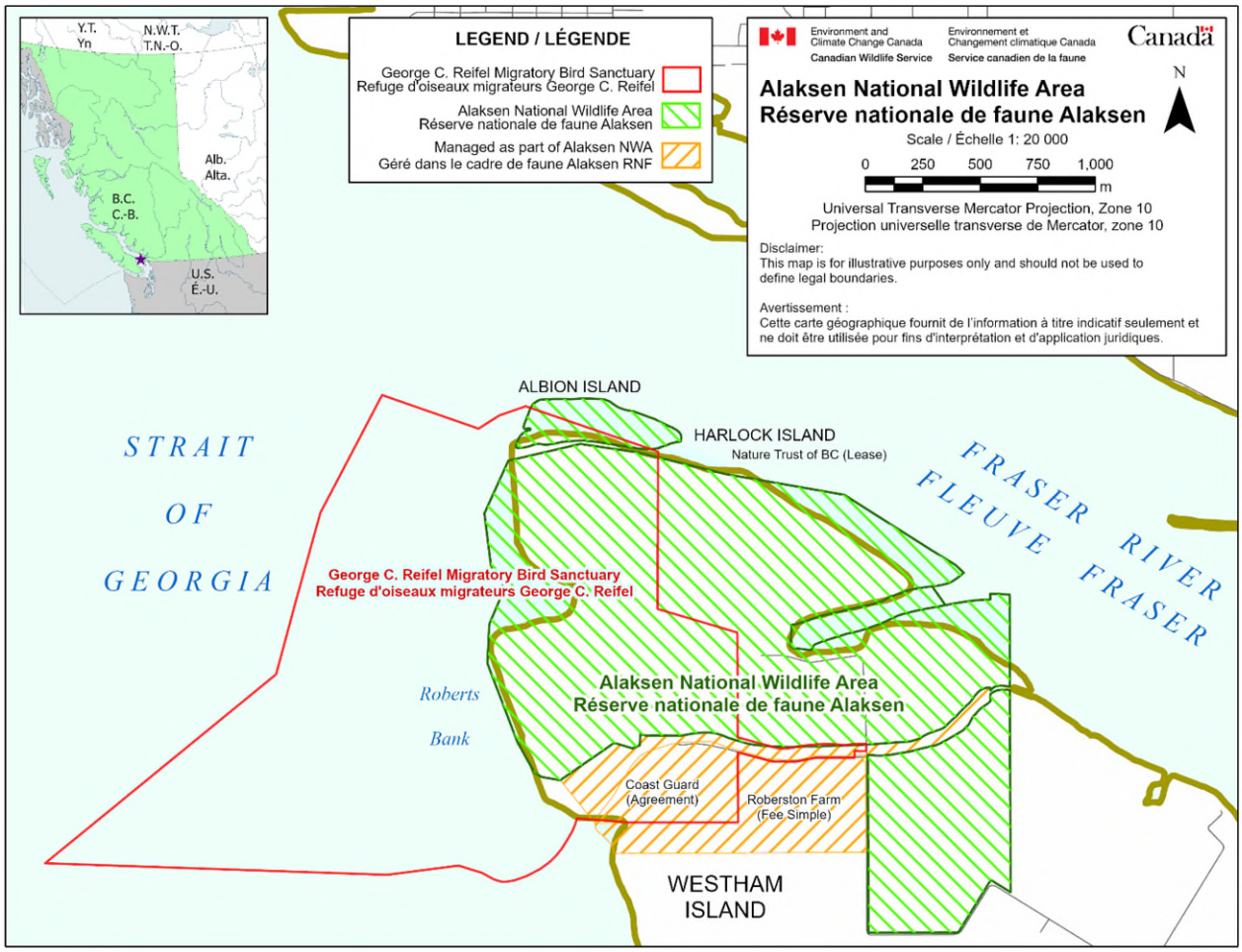


**Figure 1: The location of the Alaksen National Wildlife Area**

## 1.1. REGIONAL CONTEXT

The Alaksen NWA is located at the northern end of Westham Island and occupies 349 ha of sea-level elevation habitats in the Fraser River delta (Fig. 1). The delta covers an area of roughly 67,000 ha (Ward et al. 1992) and consists of a variety of habitats including remnant wetlands, riparian forests, agricultural areas, estuarine habitats and urbanized zones. The Fraser River delta is in close proximity to the major urban centres of Delta, Richmond, Surrey and Vancouver. Both its large size and the inherent productivity of deltaic systems make the Fraser River delta important to migratory birds. While much of the delta is used for agriculture, expansion of transportation infrastructure and commercial and residential developments continues to remove important wildlife habitat.

The productivity of the Fraser River delta has attracted agricultural development since the mid-1800s. Variations in crop types over time have affected bird habitat use and diversity. Vegetable crops (such as peas and carrots) which are used to some extent by waterfowl in the winter months, have been replaced with crops such as blueberries, strawberries and cranberries which are largely unused by waterfowl or shorebirds. The increase in the amount of agricultural acreage in the delta lost to commercial and residential development and greenhouses raises concerns about the loss of upland habitat available to wildlife.

Agricultural land provides much of the wildlife habitat seen today on the Fraser River delta, and this is reflected in the management of the NWA. Cultivated fields make up approximately 140 ha (over 40%) of the total NWA where farming is the main management tool. Other habitats within the NWA are riparian areas, open habitats, old fields, pasture, woodlots, estuarine marshes, slough and pond habitats. These habitats, combined with the adjacent foreshore marsh outside the NWA boundaries (but within the MBS and adjacent protected areas) make up an important complex of habitats for migratory birds.

The NWA provides an overwintering site for many birds, particularly waterfowl, and is a significant winter foraging site for Canada geese (*Branta canadensis*), snow geese (*Anser caerulescens*), mallards (*Anas platyrhynchos*), northern pintail (*Anas acuta)*, green-winged teal (*Anas crecca)* and American wigeon (*Mareca americana*). Management of the NWA has generally been focused on these species. Habitat management on the NWA is also intended to help draw birds away from the private agricultural lands adjacent to the combined protected areas (NWA and MBS), to alleviate waterfowl impacts to those lands.

The NWA is composed of three administrative units: The Alaksen NWA and the George C. Reifel MBS and BCWS Managed Refuge. Within these there are one or more habitat types and a mixture of land titles.

In recognition of the large numbers and diversity of birds and fish using the Fraser River Estuary and subsequently the NWA, the Alaksen NWA has received several international, national, and provincial designations, including the following:

- Designation of the Alaksen NWA as a Ramsar site in 1982 and inclusion in the expanded Fraser River Delta Ramsar designation of 2012, which exceeds the Ramsar criteria for wetlands of international significance by over 100-fold for shorebirds and by up to 50-fold for waterfowl.
- The Fraser River Estuary Western Hemispheric Shorebird Network Site (2005) - the estuary exceeds the criterion for inclusion as a shorebird area of international significance by up to ten-fold.
- Important Bird Area (IBA) (2001) – The Fraser River Estuary is one of 600 sites in Canada designated by the Canadian co-partners with Bird Life International
- Provincial Wildlife Management Areas– most of the otherwise unprotected crown lands of the Fraser Estuary, including the foreshore marsh outside the NWA boundaries, have been designated as Wildlife Management areas under the BC *Wildlife Act*. The lands surrounding the Alaksen NWA are in the Roberts Bank Wildlife Management Area, designated in 2011.

<u>Administrative Unit I the Alaksen National Wildlife Area</u>

The Alaksen NWA is managed for wildlife, although viewing and other activities are permitted provided they do not interfere with wildlife management objectives. The unit also includes the Pacific Wildlife Research Centre (PWRC) which houses the regional offices of the CWS, as well as offices for ECCC Science & Technology, and academic partners from both Simon Fraser University and the University of British Columbia. This unit contains both agricultural and non-agricultural fields, hedgerow, dyke, woodlot, slough, and pond habitat types, as well as the office grounds and buildings.

<u>Administrative Unit II George C. Reifel Migratory Bird Sanctuary</u>

George C. Reifel MBS includes some of the dyked uplands and most of the adjacent foreshore marshes, with a small portion of the foreshore and riverine marsh lying within the boundaries of the NWA (see Fig. 1), in addition to a portion of the foreshore overlapping with the Roberts Bank Wildlife Management Area. No development will take place in this marsh, which will be left in its natural state, although rehabilitation may take place where necessary.

Administrative Unit III BCWS Managed Refuge

The British Columbia Waterfowl Society (BCWS) Managed Refuge, commonly referred to as the George C. Reifel MBS, is managed to provide wildlife viewing access and interpretive education to the public on the Fraser River estuary. The BCWS Managed Refuge is included within both the federally designated MBS and the NWA. The BCWS Managed Refuge offers a public program providing and supporting nature interpretation, research, and habitat for waterfowl, operated under a renewed 30-year lease, from August 2026 to 2056, with Environment and Climate Change Canada (ECCC). Thousands of people visit the area every year (e.g. approximately 85 000 visitors in 2017). Habitat types in the BCWS Managed Refuge encompass some estuarine marsh in addition to the sloughs, ponds, fields, wooded dykes, and the grounds and buildings located in the uplands.

### 1.2. HISTORICAL BACKGROUND

The resources of the Fraser River estuary have sustained human settlement for at least 9,000 years. Prior to European settlement, the Coast Salish First Nations used the river for trade and transportation. The Musqueam and Tsawwassen nations had winter villages in the Fraser River estuary, in the present-day City of Delta, from which they harvested shellfish, salmon, ducks, geese, and probably smelt and oolichans. Salmon provided their main food source and a valuable trading commodity. The Musqueam called their campsite A-lak'sen, which means "a flat piece of land facing seaward".

Colonist settlement in the lower Fraser River area started around 1827 (see Appendix 2). Westham Island was settled in 1870, but it was not until 1884 that most of the lands at the north end of the island were claimed by European settlers. Dyke construction began in 1898 on Westham Island, permanently changing the character of the land (D. Smith, pers. comm.).

In 1928, George C. Reifel acquired a crown grant on what is now known as Ewen Slough. He purchased the adjacent land, where he constructed the buildings now known as the Pacific Wildlife Research Centre, which houses the Regional Headquarters for ECCC and the

CWS, Pacific Region (D. Smith, pers. comm.). The Reifel family acquired and farmed Reifel Island, originally Smoky Tom Island, with adjoining properties, and eventually consolidated approximately 230 ha through a system of causeways and dykes. The connected properties came to be known as Reifel Island, and were joined to Westham Island across the channels forming Ewen, Fuller, Robertson, and London sloughs. The proximity to the rich waterfowl habitat of the foreshore resulted in the farm supporting an abundance of wildlife (D. Smith, pers. comm.).

In 1961, a group of people interested in waterfowl and waterfowl habitat conservation formed the BCWS. George H. Reifel, the son of the original landowner, agreed to lease 40 ha of land to the Society as a sanctuary site in 1963. The Society then approached the Provincial Government to have adjacent provincial Crown foreshore lands preserved as a game reserve (D. Smith, pers. comm.).

In 1963, the provincial Order-in-Council (OIC) 2595 established the “George C. Reifel Waterfowl Refuge” on 283 ha of intertidal land west of Reifel Island, adjacent to the 40 ha leased by the BCWS. In 1967, the federal OIC from Privy Council 1967-2224 established a federal Migratory Bird Sanctuary incorporating the Provincial reserve and the adjacent private lands leased to the BCWS. This sanctuary has since been known as the “George C. Reifel Migratory Bird Sanctuary”. The boundaries of the sanctuary are essentially the same as those of the Provincial game reserve, with the added inclusion of Robertson Slough and the land leased from the Reifels by the BCWS. As of March 2018, both Robertson and Ewen sloughs are protected by a 30 year Section 16 Reserve agreement with the Province of British Columbia.

In 1972, ECCC purchased farm holdings on Westham Island from George H. Reifel. The additional 40 ha, leased by the BCWS since 1963, was donated to ECCC and, in 1976, Transport Canada transferred administrative control of 7 ha of land adjacent to the NWA to ECCC. Collectively, these lands became the Alaksen NWA in 1976 through a federal OIC.

In 1990, Transport Canada purchased another adjacent property, the 30 ha Robertson Farm, as partial compensation for lost habitat and wildlife values associated with the expansion of the Vancouver International Airport. Administrative control of the Robertson Farm was transferred to ECCC in 1994, and the area is in the process of being merged into the NWA. The total area of the NWA, excluding Robertson Farm, is approximately 349 ha.

Together, the Alaksen NWA and the MBS, which includes the area designated as a provincial game reserve and the area leased to the BCWS (the “BCWS Managed Refuge”), account for roughly 600 ha of protected land, managed primarily for migratory birds.

### 1.3. LAND OWNERSHIP

The surface title for all parcels within the Alaksen NWA are federal, held by His Majesty the King in Right of Canada. The subsurface mineral rights for all parcels are held by the provincial Crown.

The sole right of way on title is a Statutory Right of Way owned by the City of Delta. Access to, and use of, any of this right of way is subject to agreements between the City of Delta and ECCC.

### 1.4. FACILITIES AND INFRASTRUCTURE

**Table 2: Facilities & Infrastructure in the Alaksen National Wildlife Area**

Alaksen NWA

| Type of Asset[1] | Approximate Size[2] | Responsibility |
|---|---|---|
| Main Lodge | 1116 sq m | CWS |
| Annex | 278 sq m | CWS |
| Barn #1 | 400 sq m | CWS |
| Barn #2 | 250 sq m | CWS |
| Visitor Washrooms | 150 sq m | CWS |
| Visitor parking lot | 800 sq m | CWS |
| Main parking lot | 1000 sq m | CWS |
| Dyke trails | ~ 5 kms | CWS |
| Gate | N/A | CWS |

BCWS Managed Refuge

| Type of Asset[3] | Approximate Size[4] | Responsibility |
|---|---|---|
| Residence | 200 sq m | BCWS |
| Gift shop | 150 sq m | BCWS |
| Museum and Equipment shop | 350 sq m | BCWS |
| Warming hut | 40 sq m | BCWS |
| Fuller lookout area | 20 sq m | BCWS |
| Viewing platform | 70 sq m | BCWS |
| Observation tower | 20 sq m | BCWS |
| Parking lot | ~1000 sq m | BCWS |

[1] Building, lighthouse, fence, trail, garage, barn
[2] Size in metres square or linear metres
[3] Building, lighthouse, fence, trail, garage, barn
[4] Size in metres square or linear metres

# 2. ECOLOGICAL RESOURCES

## 2.1. TERRESTRIAL AND AQUATIC HABITATS

The protected estuarine marshlands are located primarily on the estuary to the west, in the MBS. Some intertidal and freshwater marsh habitats also occur on the NWA along the Fraser River, particularly in, and adjacent to, East Ewen Slough, and Albion and Harlock Islands nearer the mouth of the river. Mudflat occurs at the lowest tidal elevation and in tide channels, providing prime waterfowl and shorebird feeding and loafing habitats. The vegetated marsh occurs in zones of jointed rush (Juncus articulatus), common three-square bulrush (Schoenoplectus pungens ), soft-stemmed bulrush (Schoenoplectus tabernaemontani) and lyngbye's sedge (Carex lyngbyei) at lower elevations. Common cattail (Typha latifolia), invasive yellow-flag iris (Iris pseudacorus), willows (Salix spp.), non-native narrow leaved cattail (Typha angustifolia), non-native hybrid cattail (Typha x glauca) and other plants are nearer to the dyked uplands.

The dyked uplands on the NWA have been under cultivation for more than 65 years. Agricultural fields at the Alaksen NWA are used and managed within an integrated management framework using commercial crop production as a habitat management tool primarily to produce food for staging and wintering waterfowl.

There are three use types of fields in the NWA at any given time: fields that receive little or no agricultural use, fields where agricultural activities are less intensive, and fields where intensive agriculture is used as a management tool. The level of agricultural use is dependent on the capacity of soils to support sustainable agricultural practices beneficial to migratory birds and other wildlife. Crops, typically potato, turnip, cabbage, barley/forage, hay or pasture, are planted on a five-year rotation.

Old-field habitats have been, and continue to be, created in areas that are unsuitable for agriculture due to poor growing conditions (e.g. too wet or too salty). Some dyke tops and other corners remain uncultivated and are managed for vegetation similar to that of old fields. These areas support small rodent populations that benefit avian predators. Previously manicured lawn areas around the PWRC office buildings have been allowed to mature into tall grasses except for a mowed fire-break directly adjacent to building structures. Small mammals making use of these habitats benefit great blue herons (*Ardea herodias*), barn owls (*Tyto alba*), other birds of

prey, as well as other wildlife such as mink (*Neovison vison*). A cedar split rail fence separates the buildings from vegetation with a lawn firebreak that is maintained close to the buildings.

Linear areas of woody vegetation are considered hedgerows. These generally follow dyke margins, field edges, and fence lines and may or may not contain large trees. A number of native species occur in the hedgerows including: Pacific crab apple (*Malus fusca*), Pacific ninebark (*Physocarpus capitatus*), black hawthorn (*Crataegus douglasii)*, lodgepole pine (*Pinus contorta*), black cottonwood (*Populus trichocarpa*), bitter cherry (*Prunus emarginata*), Douglas-fir (*Pseudotsuga menziesii*), oak (*Quercus spp.*), cascara (*Rhamnus purshiana*), nootka rose (*Rosa nutkana*), thimbleberry (*Rubus parviflorus*), salmonberry (*Rubus spectabilis*), Pacific willow (*Salix lucida***)**, red elderberry (*Sambucus racemosa*), sitka mountain ash (*Sorbus sitchensis*), common snowberry (*Symphoricarpos albus*), Oregon ash (*Fraxinus latifolia*), pacific dogwood (*Cornus nutttallii*), black twinberry (*Lonicera involucrata*), paper birch (*Betula papyrifera),* and ferns. Himalayan blackberry (*Rubus discolor*) is a common non-native invasive species on the property. See Tables A3 to A6 in the Appendices for a full list of species found in the NWA.

Woodlots are wooded areas with a diversity of age-classes and species of trees. The woodlots in the NWA are largely deciduous, with a large central area of dense, similarly aged alder. The understory is largely grasses and forbs, with very little shrub undergrowth and frequent flooding of the area during the winter. Large ditches/sloughs extend into these areas.

Ditches are located around field perimeters and along the inside of interior dykes. Ditches associated with farmlands are shallower, older, and in many cases beginning to infill with grasses, shrubs, and cattails. Access to some ditches adjacent to agricultural areas has been difficult due to overgrown shrubs above their edges. Riparian vegetation has been managed to allow periodic ditch cleaning without significant impact to existing riparian hedgerows. In addition, a mixed grass or hedgerow field margin has been maintained on agricultural fields adjacent to ditches or sloughs.

Sloughs and ponds occur throughout the NWA. The sloughs were originally natural tidal channels until the ends were blocked with fill to join the deltaic islands for farming purposes. Stop-log, screw gate and flap gate structures were installed to regulate the inflow and outflow of water, and are used for water retention as well as drainage (See Appendices Figure A1). Ducks Unlimited Canada (DUC) has completed several improvements and repairs on existing water

control structures throughout the area under an agreement with the CWS. Under the terms of the agreement, DUC is responsible for the maintenance of the water control structures on the property with the goal of providing and improving habitat for waterfowl and other wildlife. The sloughs and ponds have subsequently reverted to fresh water, although there is some salt intrusion through their sandy bottoms. With time, silt and organic deposits will seal the bottoms from the underlying saline waters. In some cases, siltation and deposition of organic matter has significantly reduced channel depth and water flow. Unlike the sloughs and ponds of the Alaksen NWA, the pond system at the BCWS Managed Refuge does not take water from the river side, but from the seaward side, so some salinity is introduced but is dissipated by rainfall over the winter months. As there are no connections between the BCWS Managed Refuge pond system and the agricultural fields at the other areas of the Alaksen NWA, the slightly brackish waters in the ponds are not a management issue and agricultural crops are not affected.

Ditches, sloughs and ponds in both the NWA and the BCWS Managed Refuge provide habitat for muskrat beaver, river otter, mink, waterfowl, herons, amphibians, and fish. Riparian habitat next to ditches provides additional habitat for migratory birds, raptors, beneficial insects, and many other species of wildlife. Although some waterfowl breeding activity occurs in overgrown ditches, which provide brood cover, the most important benefits of riparian areas include field drainage, and safe access to fields for wintering waterfowl. The dykes of the NWA serve two primary purposes:

1) The outer dykes isolate and protect the NWA and surrounding private properties from flooding resulting from the direct influence of the Fraser River to the northeast and tidal action from the Fraser River estuary to the west. The river dykes are the most critical, as they must withstand strong currents, daily tidal fluctuations, and the wash produced from shipping traffic. Currently, the foreshore dykes are protected from the open Strait of Georgia by extensive shallow mudflats and dense marsh vegetation.
2) Interior dykes serve to manage water movement within the NWA, enabling management units to be maintained somewhat independently. Complete independence of the units is not possible as the flatness of the terrain and the nature and location of existing water control structures and dykes, often require water to be moved through one unit to reach another.

The dykes also serve the secondary functions of access for maintenance, management, wildlife viewing, and wildlife habitat. Secondary uses, particularly wildlife habitat, can conflict with the primary function of the dykes. This conflict largely centres on the presence and size of trees growing on the dykes. Some of the largest stands of Douglas-fir occur on the outer dykes, which may eventually compromise the integrity of those dykes as trees die or are blown down in strong winds. Observations of windfall Douglas-fir show that they tend to break off within a few feet of ground level and large uprooting has not occurred, although some repairs may eventually become necessary as the roots decay within the dyke structure. Douglas fir trees currently growing on the dykes were planted more than 65 years ago, and many are not growing at optimal rates because of marginal conditions on the narrow, slightly elevated strips of land which are often barely drained enough to support the firs. These trees are less of a hazard as their stunted growth makes them more resistant to damage by high winds. Coniferous trees removed for dyke maintenance and security (e.g. East Ewen Slough North Dyke) may need to be replaced.

Few areas on the NWA have soil conditions optimal for Douglas fir (*Pseudotsuga menziesii*). Western red cedar (*Thuja plicata*) and sitka spruce (*Picea sitchensis*), which will be used to replace the Douglas fir, are more suited to the wet non-agricultural areas that may be planted to restore coniferous woodlot habitats to the NWA. These species originally grew in similar conditions elsewhere on the Fraser River delta (North and Taversham 1984). Western red cedar or sitka spruce will be planted in Ewen Slough South and Cross Dykes based on soil and moisture conditions of the area to be planted. Replacement trees may take over 30 years to mature.

### 2.2. WILDLIFE SPECIES

Thousands of lesser snow geese (*Anser caerulescens*) and other waterfowl, including American wigeon (*Mareca americana*), mallards (*Anas platyrhynchos*) and trumpeter swans (*Cygnus buccinator*) use the mudflats, foreshore marshes, and seasonally-flooded fields during migration and to over winter.

In addition to the internationally significant numbers of waterfowl for which the NWA was created, the NWA provides seasonal and year-round habitat for many wildlife species such as songbirds, raptors, waterfowl, mustelids, coyotes, amphibians, reptiles, fish, and a large diversity of plants. Past monitoring work on the NWA has documented four reptile species, two amphibian species, six fish species, eighteen mammal species, and approximately one hundred

plant species. Two-hundred and forty-six species of birds have been documented as occurring at the Alaksen NWA throughout the year. A current, thorough, and systematic inventory of the diversity of wildlife on the NWA, which could reveal additional species, is warranted.

### 2.3. SPECIES AT RISK

As of 2018, fifteen species listed under the *Species at Risk Act* (SARA) are known to, or have the potential to, occur on the NWA (Table 3). Additionally, two SARA listed migratory bird species more common to the southern interior of the province, the Lewis's woodpecker (*Melanerpes lewis*) (2011) and yellow-breasted chat (*Icteria virens*) (in 2010), have only also been sighted on recent rare occasions. Critical Habitat has also been identified in the proposed Recovery Strategy for the western painted turtle – pacific coast population (*Chrysemys picta bellii*) in the NWA.

Two COSEWIC assessed species (not listed under SARA) are known to, or have the potential to, occur on the NWA: western bumble bee (*Bombus occidentalis),* and black swift *(Cypseloides niger).*

**Table 3 Species at Risk that are known to or have the potential to occur at the Alaksen NWA**

| Common and scientific names of species | Status | | | Presence or Potential of Presence[4] |
|---|---|---|---|---|
| | Canada | | British Columbia | |
| | SARA[1] | COSEWIC[2] | Provincial ranking [3] | |
| **Birds** | | | | |
| Barn owl (Western population)<br>*Tyto alba* | Threatended | Threatened | Blue | Confirmed |
| Barn swallow<br>*Hiundo rustica* | Threatened | Special Concern | Yellow | Confirmed |
| Great blue heron<br>*Ardea herodias fannini* | Special Concern | Special Concern | Blue | Confirmed |
| Horned grebe<br>*Podiceps auritus* | Special Concern | Special Concern | Yellow | Confirmed |
| Western grebe<br>*Aechmophorus occidentalis* | Special Concern | Special Concern | Red | Confirmed |
| Olive-sided flycatcher<br>*Contopus cooperi* | Special Concern | Special Concern | Yellow | Potential |
| Short-eared owl<br>*Asio flammeus* | Special Concern | Threatened | Blue | Confirmed |
| Peregrine falcon<br>*Falco peregrinus pealei* | Special Concern | Special Concern | Blue | Confirmed |
| Black swift<br>*Cypseloides niger* | Endangered | Endangered | Blue | Confirmed |
| **Mammals** | | | | |
| Pacific water shrew<br>*Sorex bendirii* | Endangered | Endangered | Red | Potential |
| Little brown myotis<br>*Myotis lucifugus* | Endangered | Endangered | Blue | Confirmed |
| **Reptiles** | | | | |
| Western painted turtle (Pacific Coast Population)<br>*Chrysemys picta bellii* | Threatened | Threatened | Red | Confirmed |

| Common and scientific names of species | Status | | | Presence or Potential of Presence[4] |
|---|---|---|---|---|
| | Canada | | British Columbia | |
| | SARA[1] | COSEWIC[2] | Provincial ranking [3] | |
| **Invertebrates** | | | | |
| Audouin's night-stalking tiger beetle<br>*Omus audouini* | Threatened | Threatened | Red | Potential |
| Western bumble bee<br>*Bombus occidentalis* | Threatened | Threatened | Yellow | Confirmed |
| **Vascular Plants** | | | | |
| Vancouver Island beggarticks<br>*Bidens amplissima* | Special Concern | Special Concern | Blue | Confirmed |

1. *Species at Risk Act*: Extinct, extirpated, endangered, threatened, special concern, not at risk (assessed and deemed not at risk of extinction) or no status (not rated)
2. Committee on the Status of Endangered Wildlife in Canada: the same status names as the SARA status
3. Provincial ranking using provincial codes, if applicable
4. List as ‘confirmed’, ‘probable’, or ‘potential’

# 3. MANAGEMENT CHALLENGES AND THREATS

The NWA is situated within prime agricultural and estuarine habitat of the Fraser River delta. Many of the management challenges and threats faced by the NWA are directly related to the broader landscape of the delta, which includes mitigating risks related to sea-level rise and other climate change impacts. Challenges include: the restoration and management of important habitats and ecosystems, particularly for wintering populations of migratory birds, and the control of invasive species including: yellow-flag iris, purple loosestrife, English ivy, English holly, reed canary grass, Canada thistle, sow thistle, and extensive patches of Himalayan and evergreen blackberry.

## 3.1. IMPACT OF AGRICULTURAL LAND USE ON HABITAT AND FOOD SUPPLY OF MIGRATORY BIRDS

In the lower Fraser Valley, agricultural lands are the primary focus for habitat conservation for waterfowl, which benefit from the remnants of commercial crops left unharvested and from the distribution of culled produce onto harvested fields. For example, culled potatoes redistributed into the fields provide food for waterfowl. Additionally, cost-shared stewardship programs in the surrounding area support the planting of winter cover crops and the establishment of old-field set asides which meet waterfowl foraging needs and benefit soil conservation.

While much of the delta is within the provincially designated Agricultural Land Reserve (ALR), where agriculture is recognized as the priority land use and non-agricultural developments are controlled, some land has been developed commercially and/or residentially as a result of applications to exclude and withdraw this land from the ALR. Transportation and commercial and residential development continue to remove important wildlife habitat from the Fraser River delta. Changes in crop types and the construction of greenhouses are further limiting the amount of agricultural habitat available to wildlife. Other related challenges are summarized in Table 4.

Within this context, habitat conservation in the surrounding area and the maintenance of connectivity between the remaining habitats on the delta is becoming increasingly important. The value of the NWA as habitat is significantly enhanced by the diminished availability of habitat in surrounding areas. Despite the decreasing amount of habitat available to wildlife in the delta, some waterfowl populations continue to increase, placing additional demands on the

remaining habitat. The NWA therefore faces a future carrying-capacity challenge. This challenge leads directly to one of the management goals for the NWA articulated below: to maximize the number of days that birds can spend in the NWA feeding, resting, and preparing for migration. To accomplish this, careful management of the agricultural lands is necessary.

Drainage of the agricultural fields on the NWA presents one management challenge. Without proper drainage, fields remain wet into the spring, delaying the planting and, consequently, the harvesting of crops; this in turn delays the planting of cover crops meant to sustain wintering populations of waterfowl. If cover crops are planted too late they do not become sufficiently well established before the arrival of fall-migrating waterfowl and cannot withstand the initial grazing pressure. As a consequence, they end up supporting only a fraction of the number of bird-days possible. Some improvements have been made to the field drainage system over the years from laser-leveling, which needs to be repeated periodically as fields slowly become dish-shaped over time through cultivation activities and drain less efficiently.

### 3.2. POTENTIAL HABITAT LOSS DUE TO POPULATION GROWTH AND INDUSTRIAL AND URBAN DEVELOPMENT

As of 2021, the population of the Lower Mainland of Coastal BC was 3,050,000 people. By 2040, it is estimated that an additional one million people will be living in the Lower Mainland region, with the Fraser River becoming an increasingly significant economic driver (Richmond Chamber of Commerce, 2014). In addition to increasing port activity and development on the Lower Fraser River, the area supports a broad range of other activities, including commercial and sport fisheries, forest products facilities, a majority of British Columbia's agricultural production, eco-tourism and outdoor recreation. Population and economic growth and development in the Fraser River Delta place great pressure and importance on the protected areas for resident and migratory bird populations and other wildlife.

### 3.3. INVASIVE SPECIES

The eastern grey squirrel (*Sciurus carolinensis*) and common cat (*Felis felis)* are the only invasive mammal species on the NWA. Eastern grey squirrel is a threat to populations of native squirrels due to competition and disease (parapoxvirus). This species also impacts bird populations by displacing them from their nesting habitat, and foraging on eggs and nestlings.

Provincially listed noxious invasive plants species at the Alaksen NWA are: purple loosestrife (*Lythrum salicaria*), yellow-flag iris (*Iris pseudacorus*), Canada thistle (*Cirsium arvense*), sow thistle (*Sonchus spp.*), and oxeye daisy (*Leucanthemum vulgare*). Invasive plant

species were mapped on the NWA in 2018, and results showed that Himalayan and evergreen blackberry (*Rubus armeniacus, Rubus laciniatus)* and reed canarygrass (*Phalaris arundinacea)* to be the most abundant invasive plants found in the assessed locations. Other invasive species of concern on the NWA include: scotch broom (*Cytisus scoparius),* European bittersweet (*Solanum dulcamara*), butterfly bush (*Buddleja davidii*), morning glory (*Convolvulus arvensis*), English ivy (*Hedera helix*), English holly (*Ilex aquifolium*), Bull thistle (*Cirsium vulgare*), and yellow archangel (*Lamiustrum galeobdolon*). Currently, limited and seasonal manual control of invasive species occurs on the NWA. Cordgrass species (*Spartina densiflora, Spartina anglica,* and *Spartina patens)* are invasive plants known to threaten shorelines along the BC Coast. As of 2018, there were no infestations found at the Alaksen NWA.

Currently, the only amphibians found at the Alaksen NWA are the non-native bullfrogs (*Lithobates catesbeiana*) and green frogs (*Lithobates clamitans*). While the extent of their impact on native species of frogs is uncertain, both non-native species are known to prey upon and/or compete with native frogs for food and habitat, possibly resulting in the elimination of native frogs on the island.

Common carp (*Cyprinus carpio*), an invasive species that is found in most of the major river systems in B.C., occur in the sloughs within the NWA. These fish are versatile and easily penetrate into new watersheds. Carp are considered to be a pest because they destroy vegetation, alter river ecosystems, and have negative impacts on water quality and native fish as well as other aquatic species such as amphibians. Pumpkinseed (*Lepomis gibbosus)* is an another invasive fish species found at the Alaksen NWA. Pumpkinseed are found in slower moving stream and lakes across southern British Columbia. They consume amphibans and small fish and compete with native fish species for diet and resources.

### 3.4. IMPACT OF AGRICULTURAL LAND USE ON WATER AND AIR QUALITY

Water management has been somewhat improved through the maintenance of existing ditches and the creation of new ditches where old ones cannot be rehabilitated. Subsoil drainage may be installed in some areas where levelling is not as effective, but can be very costly with no guaranteed effectiveness.

Due to on-site agriculture, contamination from excessive nutrients, heavy metals and pesticides has the potential to become an issue. Water sampling of sloughs on the Alaksen NWA in 2008 and 2009 showed several types of chemicals in the water. All were at levels below the Canadian Council of Ministers of the Environment (CCME) guidelines, but the sub-

acute, chronic and long-term effects, and the effects of mixtures of chemicals are unknown. Futher, a 2018 single sampling effort found arsenic and phosphorous exceeded Canadian water quality guidelines, while arsenic, chromium, copper, iron, manganese, nickel, and phosphorus exceeded sediment quality guidelines. Additional collection and testing of sheet water and slough water, although expensive, would be necessary to monitor levels of contaminants and better understand waterfowl exposure to them, and what restoration options are available to improve water quality and sediment quality at the Alaksen NWA. A study is warranted to determine any possible effects of pesticide use on air quality both indoors and outdoors at PWRC.

The NWA contains a contaminated site of approximately 1.8 hectares adjacent to London Slough on the far north portion of Field Number 3 (Appendices, Figure A1). This is the old Westham Island Wood Preservative Demonstration site which was established in 1977. The site was used for the testing of commercial wood preservatives to test the effectiveness of the preservatives for both below ground and above ground applications including the testing of poles, stakes, decking, siding roofing and joinery and had designated areas for each type of wood product. The testing was phased out in the late 1990's and wood products were removed from the site.

Environmental site assessments were conducted after closure of the operations to investigate potential impacts from the wood testing operations. The investigation included evaluation of the soils, sediments, surface and groundwater for chemicals related to wood preservatives. The assessment identified that there was contamination associated with the former operations and full delineation and characterization of the impacted areas was completed.

In 2015, the data was used to conduct a Preliminary Quantitative Human Health and Ecological Risk Assessment to determine if the contamination posed a risk potential human health or the environment. The assessment identified that there was no risk to human health and was potential low to moderate risks to ecological receptors. Further studies are planned for 2018 to determine if the former operations pose any long term ecological risks.

In a 2007 report on the state of federal protected areas, the Alaksen NWA was not listed among the threatened protected areas. However, it is anticipated to be categorized into a higher level of threat in the future due to the growth in population, development, and changes in surrounding land use.

# 4. GOALS AND OBJECTIVES

## 4.1. VISION

The long-term vision for the Alaksen NWA is to create the best stopover habitat on the Pacific coast by maximizing the number of days that birds can spend feeding, resting, and preparing for migration in the NWA. To accomplish this, careful management of the agricultural lands on the NWA is necessary.

## *4.2.* GOALS AND OBJECTIVES

Historically, the NWA was established to protect and conserve migratory birds, particularly over-wintering waterfowl such as snow geese, Canada geese, and American wigeon. The NWA, along with the MBS, continues to be managed primarily for the benefit of migratory waterfowl through preserving, maintaining, restoring, and enhancing agricultural and non-agricultural upland and wetland habitats. This has secondary benefits for other wildlife, fish, and plant species, especially those considered rare, threatened, or endangered. The protection of rare or endangered wildlife on federal lands is legislated through SARA (since 2003).

The goals and objectives of this management plan are to maintain, restore, and enhance a high-quality habitat complex for native wildlife species on the NWA. In particular, habitat will be provided for migrating and over-wintering waterfowl, such as snow geese, mallards, green-winged teal, and American wigeon. At the same time, the goals and objectives seek to enhance values for other native wildlife species including those dependent on wet meadows, old field, and riparian habitat.

ECCC's goals to produce tangible benefits for habitat and wildlife over the long term are:

**Goal 1:** Manage habitat and forage to support populations of migrating waterfowl.

<u>Objective 1.1</u>: Plant crops on a five-year rotation with an average of 29 hectares (out of 131 hectares) devoted solely to waterfowl habitat (pasture, forage, barley, or hay) each year.

<u>Objective 1.2:</u> Work with industry experts to research and evaluate alternative agricultural techniques that will maximize waterfowl feeding opportunities and improve ecological integrity for the broader NWA landscape including adjacent habitat types (e.g. woodlots, hedgerows, sloughs, etc.)

Objective 1.3: Plant annually an average of 54 ha of cover crops in late August to early September to provide food for wintering waterfowl during the fall and winter months.

Objective 1.4: Maintain approximately 27 ha of old field habitats, including seasonally flooded old fields, so that populations of raptors and other birds of prey, specifically Species at Risk such as barn and short-eared owls and great blue herons are sustained and/or residences and habitats are created or restored.

Objective 1.5: Conduct small-mammal trapping to determine relative prey abundance for birds of prey in old-field and grassland set-asides on the property.

**Goal 2**: Actively manage non-agricultural habitat for the benefit of wildlife with emphasis on Species at Risk

Objective 2.1: Maintain or restore approximately 62 hectares of wooded habitats (including riparian habitat, hedgerows and woodlots) so that breeding and migration staging habitat for migratory birds – passerines in particular – is maintained and habitats for other priority riparian species are maintained or restored.

Objective 2.2: Maintain wetland habitats, including shallow open water and estuarine and freshwater marsh totaling 77 ha, through active management of invasive species for the benefit of western painted turtle and other wetland wildlife populations.

**Goal 3**: Reduce the abundance of invasive species and adopt an early-detection-rapid-response to identify any new entrants throughout the Alaksen NWA.

Objective 3.1: Update the invasive plant species census, and continue to monitor invasive animal species throughout the Alaksen NWA by fall of 2025.

Objective 3.2: Continually develop treatment strategies for invasive species at the Alaksen NWA in coordination with stakeholders, guiding principles, and ongoing programs.

Objective 3.3: Implement treatment strategies so that the abundance of invasive plant species at the Alaksen NWA is diminished by at least 25% by 2025, as compared to the 2018 census study.

Objective 3.4: Monitor the estuarine marsh for invasive cordgrass (*Spartina alterniflora*, *Spartina anglica*, *Spartina densiflora*, and *Spartina patens*) and respond accordingly (following the BC *Spartina* Response Plan 2010, and the BC *Spartina* Treatment Plan 2016 as guidelines). The Alaksen NWA has never been surveyed for *Spartina* spp, however *Spartina* spp have been found in neighbouring marshes as recently as 2019.

Objective 3.5: Monitor eastern grey squirrel (*Sciurus carolinensis*) populations within the Alaksen NWA to quanity the extent of the problem.

Objective 3.6: Continue to monitor and reduce the abundance of the invasive red-eared sliders (*Trachemys scripta elegans*) at the Alaksen NWA.

Objective 3.7: Continue the implementation of existing ecological restoration initiatives and development of new ecological restoration projects within the Alaksen NWA.

**Goal 4**: Maintain or improve water and air quality for the benefit of people and wildlife.

Objective 4.1: Sustain or improve the quality of slough water in the Alaksen NWA, in accordance with the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines for the Protection of Aquatic Life.

Objective 4.2: Sustain the air quality below the acceptable level of contaminants in the atmosphere, established by the Canadian Ambient Air Quality Standards (CAAQS)

**Goal 5:** Evaluate and manage habitat needs of species at risk within the NWA

Objective 5.1: Complete a thorough and systematic inventory of the diversity of wildlife on the NWA, by 2025

**Goal 6:** Increase the NWA's resiliency to sea-level rise and associated climate change impacts

Objective 6.1: Evaluate dyke management options for applicability and feasibility by 2025

Objective 6.2: Begin implementation of dyke management options towards increasing the NWA's resiliency to sea-level rise and associated climate change impacts by 2028

### 4.3. EVALUATION

Annual monitoring will be performed within the limits imposed by the availability of financial and human resources. The management plan will be reviewed 5 years after its initial approval and reviewed and updated every 10 years thereafter. The evaluation will take the form of an annual review of data obtained from the monitoring and research projects outlined below. This will be used to establish priorities for action and to allocate resources.

# 5. MANAGEMENT APPROACHES

This section and the following table (Table 4) contains a description of all of the possible approaches that could be used in the management of the Alaksen NWA. However, management actions will be determined during the annual work planning process and will be implemented as human and financial resources allow.

**Table 4: Management Challenges & Threats**

| Management challenge and/or threat | Goal and objective(s) | Management approaches (actions, including level of priority)[1] |
|---|---|---|
| IMPACT OF AGRICULTURAL LAND USE ON HABITAT AND FOOD SUPPLY OF MIGRATORY BIRDS<br><br>- maximize habitat and food supply for wintering waterfowl on agricultural lands. | **Goal 1:**<br>Manage habitat and forage to support populations of migrating waterfowl<br><br>**Objective 1.1:** Plant crops on a five-year rotation with an average of 29 hectares (out of 131 hectares) devoted solely to waterfowl habitat (pasture, forage, barley, or hay) each year.<br><br>**Objective 1.2:** Research and evaluate alternative agricultural techniques that will maximize waterfowl feeding opportunities and improve ecological intergrity for the broader NWA landscape including adjacent habitat types (e.g. woodlots, hedgerows, sloughs, etc.)<br><br>**Objective 1.3:** Plant annually an average of 54 ha of cover crops in late August to early September to provide food for wintering waterfowl during the fall and winter months.<br><br>**Objective 1.4:** Maintain approximately 27 ha of old field habitats, including seasonally flooded old fields, so that populations of raptors and other birds of prey, specifically Species at Risk such as barn and short-eared owls and great blue herons are sustained and/or residences and habitats are created or restored.<br><br>**Objective 1.5:** Conduct small-mammal trapping to determine relative prey abundance for birds of prey in old-field and grassland set-asides on the property. | 1. Work with DUC under the Master agreement to maintain the function of recently improved control structures and drainage improvements, including identifying additional hydrological upgrading options (priority 2).<br><br>2. Identify areas where pastured cattle have damaged riparian areas and erect fencing to keep cattle out and restore riparian areas (priority 1).<br><br>3. Develop field specific management strategy, and review on an annual basis to update as required (priority 2).<br><br>4. Work with partners to investigate feasibility for restoring the old fields in Fields 8 and 9 to a tidally influenced marsh ecosystem to provide enhanced opportunities for migratory birds and species at risk (priority 1).<br><br>5. Monitor migratory and overwintering populations of waterfowl and waterbirds and assess the changes of population numbers over time in comparison to agricultural practices employed (priority 2). |
| POTENTIAL HABITAT LOSS DUE TO POPULATION | **Goal 2:**<br>Actively manage non-agricultural for the benefit of wildlife with emphasis on Species at Risk | 1. Departmental support for sustainable development strategies, regional land use planning initiatives, and sustainable agricultural practices. Participate |

| Management challenge and/or threat | Goal and objective(s) | Management approaches (actions, including level of priority)[1] |
|---|---|---|
| GROWTH AND INDUSTRIAL AND URBAN DEVELOPMENT<br><br>- Regional population growth and development and industrial and urban expansion in the area; reduction in agricultural activity; all resulting in habitat loss in the surrounding habitat and loss of soil-based agriculture on the delta. | **Objective 2.1:** Maintain or restore approximately 62 hectares of wooded habitats (including riparian habitat, hedgerows and woodlots) so that breeding and migration staging habitat for migratory birds – passerines in particular – is maintained and habitats for other priority riparian species are maintained or restored.<br><br>**Objective 2.2:** Maintain wetland habitats, including shallow open water and estuarine and freshwater marsh totaling 77 ha, through active management of invasive species for the benefit of western painted turtle and other wetland wildlife populations. | in integrated landscape planning with the goal of managing the landscape to increase the amount of conservation or beneficial agricultural lands around the NWA (priority 1). |
| PRESENCE OF INVASIVE SPECIES | **Goal 3:**<br>Reduce the abundance of invasive species and adopt an early-detection-rapid-response to identify any new entrants throughout the Alaksen NWA.<br><br>**Objective 3.1:** Update the invasive plant species census, and continue to monitor invasive animal species throughout the Alaksen NWA by fall of 2023.<br><br>**Objective 3.2:** Continually develop treatment strategies for invasive species at the Alaksen NWA in coordination with stakeholders, guiding principles, and ongoing programs.<br><br>**Objective 3.3**: Implement treatment strategies so that the abundance of invasive plant species throughout the Alaksen NWA is diminished by at least 25% by 2025.<br><br>**Objective 3.4:**. Monitor the estuarine marsh for invasive cordgrass (*Spartina alterniflora, Spartina anglica, Spartina densiflora,* and *Spartina patens*) and respond accordingly (following the BC Spartina Response Plan 2010, and the BC Spartina Treatment | 1. Conduct regular site inspections to monitor for new invasive species establishing within the Alaksen NWA and adopt an early-detection-rapid-response approach for treating new infestations. (priority 1).<br><br>2. Develop and implement an annual plan to control invasive species and restore the treated areas to desired conditions. Conduct restoration activities in a step-wise manner so that there is always sufficient net available habitat within the NWA to support wildlife populations. (priority 2). |

| Management challenge and/or threat | Goal and objective(s) | Management approaches (actions, including level of priority)[1] |
|---|---|---|
| | Plan 2016 as guidelines). The Alaksen NWA has never been surveyed for Spartina spp, however Spartina spp have been found in neighbouring marshes as recently as 2019.<br><br>**Objective 3.5**: Monitor eastern grey squirrel (*Sciurus carolinensis*) populations within the Alaksen NWA to quantify the extent of the problem.<br><br>**Objective 3.6:** Continue to monitor and reduce populations of the invasive red-eared sliders (*Trachemys scripta elegans*) at the Alaksen NWA.<br><br>**Objective 3.7:** Continue the implementation of existing ecological restoration initiatives and development of new ecological restoration projects within the Alaksen NWA. | |
| IMPACT OF AGRICULTURAL LAND USE ON WATER AND AIR QUALITY | **Goal 4:**<br>Maintain or improve water and air for the benefit of people and wildlife.<br><br>**Objective 4.1:** Sustain or improve the quality of slough water in the Alaksen NWA, in accordance with the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines for the Protection of Aquatic Life.<br><br>**Objective 4.2:** Sustain the air below the acceptable level of contaminants in the atmosphere, established by the Canadian Ambient Air Quality Standards (CAAQS). | 1. Monitor water quality in sloughs and ditches at the Alaksen NWA to determine if conditions are appropriate for the protection of desired aquatic life. Develop a consistent record of number and quantity of pesticides in the water. Keep a record of the Alaksen NWA pesticide treatments through each season. Work with ECCC staff and other departments to identify alternative means to control pests and conduct farming practices that meet water quality objectives (priority 2).<br><br>2. Conduct a study using current science to determine the air quality both indoors and outdoors at PWRC (priority 2).<br><br>3. Maintain staff and visitor OHS requirements through communication of scheduled pesticide applications (priority 1). |

| Management challenge and/or threat | Goal and objective(s) | Management approaches (actions, including level of priority)[1] |
|---|---|---|
| IMPACTS TO AT-RISK POPULATIONS OF WILDLIFE AND THEIR HABITATS | **Goal 5:**<br>Evaluate and manage habitat needs of species at risk within the NWA<br><br>Objective 5.1: Complete a thorough and systematic inventory of the diversity of wildlife on the, by 2025 | 1. Complete an inventory of wildlife at Alaksen NWA by 2025, and catalogue and compare data to existing population and presence data (priority 2). |
| CLIMATE CHANGE AND ASSOCIATED IMPACTS | **Goal 6:**<br>Increase the NWA's resiliency to sea-level rise and associated climate change impacts<br><br>Objective 6.1: Evaluate dyke management options for applicability and feasibility by 2025<br><br>Objective 6.2: Begin implementation of dyke management options towards increasing the NWA's resiliency to sea-level rise and associated climate change impacts by 2028 | 1. Procure civil engineering firm to provide options analysis for the NWA's dykes by spring 2025 (priority 1).<br><br>2. Analyze options and identify short and long term strategies towards mitigating greatest risks to sea-level rise and associated climate change impacts (priority 2).<br><br>3. Implement measures towards completion of identified strategies (priority 2).<br><br>4. Monitor and adapt strategies when new information is identified and considered (Priority 2) |

5. Level of Priority: 1 (from 0 to 3 years); 2 (from 4 to 6 years); 3 (from 7 to 10 years)

## 5.1. HABITAT MANAGEMENT

### 5.1.1. Agricultural Fields

Agriculture is a primary management tool for providing habitat for migratory birds at the Alaksen NWA. Waterfowl use agricultural areas, including the intertidal marshes, crop residues and cover crops, on the Fraser River estuary for migration staging and wintering. Waterfowl have learned to feed on the agricultural land on the NWA which stands in for the intertidal marshes that were there prior to Westham Island being dyked. The Alaksen NWA will continue to operate as a working landscape, with ongoing integration of agricultural uses with wildlife habitat uses, and sustainable management of agricultural fields. Sustainability rests on the principle that the needs of the present are met without compromising the needs of the future.

Current agricultural practices in the NWA allow for tenants to profit economically while making required reinvestments to improve fields for the benefit of both future agricultural productivity and wildlife habitats. All farmers agree to manage the fields according to the CWS the Alaksen NWA 5-year-rotation plan. For each field under their management, they are “credited” for specific, prescribed farming practices undertaken to enhance wildlife and waterfowl habitat values and “debited” for deemed rental value of the field when it is in a commercial crop.

The current crop mix provides a win-win situation for both the farmers and the wildlife, provided the crops are harvested and a cover crop is planted in the early fall. While peas and carrots may provide better forage for waterfowl, these crops are not currently economically viable for farmers, and ECCC-CWS would need to pay farmers to plant these crops. Potatoes, rutabagas, cabbages and barley/forage are currently the primary crops at the Alaksen NWA. During wet years, potatoes become too difficult to harvest and are left in the fields, providing a large amount of forage for waterfowl. In other years, the primary crops are harvested and a cover crop is planted in the early fall, providing forage for waterfowl throughout the winter. Crops will continue to be evaluated from rotation to rotation to ensure the optimal and most cost-effective scenario is in place for managing wildlife habitat within this working landscape.

Cover crops should be planted before the end of September in order to allow successful germination and establishment to provide food for wintering waterfowl. Agricultural crops should be harvested before mid-September to allow time for cover crops to become well established. The primary crop planted on the Alaksen NWA is potato. All varieties planted within the NWA should be early varieties (typically maturing within 90-100 days) to allow adequate time after

harvest for cover crops to become well established. For this recommendation to be met, 90-day variety potatoes should be planted before June 15th. Drainage improvements through ditching and laser levelling will result in drier fields and allow earlier crop planting in order to meet the target date. Other methods of drainage, such as tilling in the fields or actively pumping water out of the sloughs and over the dykes, should be explored. For details on management of each individual field, see Appendix I.

Pasture is another important field type within the NWA, as geese and wigeon in particular tend to forage in fields with short grass. Cattle are used to keep the grass short in these fields for the arrival of these waterfowl.

Farmers in the NWA employ Integrated Pest Management (IPM) practices. All agricultural activities are subject to an IPM approach, which is a decision-making process that uses a combination of techniques to suppress pests effectively, economically, and in an environmentally sound manner. Pesticides are currently used on the property, with the exception of granular pesticides, neonicitinoids and Diazinon.

Preliminary discussions have taken place with tenant farmers on the viability of engaging in sustainable organic production on the NWA. A Transition Team has been established to research and evaluate alternative agricultural techniques. This Team is made up of researchers from local post-secondary institutions. Research will include exploring agricultural techniques that maintain soil productivity, are economically feasible, and work to maintain habitats and biodiversity. The goal is to transition the NWA to a biologically based- organic agricultural pest management regime. In addition, the research conducted as part of this transition will identify opportunities for restoring and improving surrounding ecosystems (e.g. hedgerows, woodlots, ditches, sloughs, and marshes).

#### 5.1.2. Old Fields

Where fields are too wet or saline to cultivate crops (i.e. Field 8 and 9, western portion of Field 5 and 19), they will be left in their current mixture of wet adapted grasses: rushes (*Juncus* spp.), sedges (*Carex spp.)*, and cattail (*Typha latifolia)*. Wet or saline fields will be considered for return to active agriculture if drainage works can improve soil conditions sufficiently to enable crop productivity. Old fields will be managed to conserve the vegetation and water levels required to maintain current habitats for raptors and passerines. Where identified, ecological restoration

practices will be conducted to restore old field habitats to a more naturalized state, as informed by native reference ecosystems, while considering environmental change.

For example, The Alaksen NWA Northwest Dyke remains in an old-field state but is heavily infested with Himalayan blackberry. Himalayan blackberry and other shrubs growing through the centre of this area should be removed, and this area maintained as an old-field meadow.

Invasive species such as purple loosestrife and yellow flag iris will be identified and removed.

#### 5.1.3. Estuarine Marsh

No active management is proposed in the estuarine marsh area. The marsh will be left in a natural condition to maintain prime waterfowl feeding and loafing habitats. Monitoring will be conducted to identify invasive species threats and/or other new threats to the estuarine marsh. Known invasive species in the estuarine marsh include yellow flag iris, narrowleaf cattail and hybrid cattail. There have been no known instances of *Spartina* yet but an early-detection-rapid-response treatment would be employed if any patches of *Spartina* are found. Where identified, restoration treatments will be conducted to restore the marsh, as informed by native reference ecosystems, while considering environmental change.

#### 5.1.4. Woodlots

Woodlots will be managed primarily for coniferous/deciduous forest and forest-edge-dwelling migratory birds and raptors. To protect woodlot habitats, fencing will be erected, and existing fencing will be repaired to prevent trampling by cattle and dairy cows. Additionally, any trees removed from the dykes for safety and security reasons will be replaced with new plantings. Where restoration treatments will be informed by native reference ecosystems, while considering environmental change. Specific planting plans will be guided by the principles of ecological succession as they apply to vegetation assemblies within the Coastal Douglas Fir- Moist Maritime (CDFmm) biogeoclimatic subzone. The Biogeoclimative Ecosystem Classification (BEC) system links vegetation assemblages to trends in soils, topography, and regional climate, and acts as a model for describing which plant species are commonly present, given certain site conditions. Ecological succession is the process by which ecosystems change over time. Consideration of ecological succession in planting plans at the Alaksen NWA will result in examination of how plant assemblages within the NWA will change over time in response to changing physical and biological conditions and pressures.

### 5.1.5. Dykes

Dykes are used as access routes for management, inspection and maintenance purposes, as well as for wildlife viewing. Existing trails along the dyke top will be maintained with regular mowing.

Some dykes will be managed as woodlots, except where the integrity of the dyke must be considered. Woodlots on dykes will be managed to balance wildlife habitat values and dyke integrity. Dyke rebuilding projects, where appropriate and feasible, will incorporate habitat restoration considerations. For details on management of each individual dyke, see Appendix II.

## 5.2. WATER QUALITY

Agricultural run-off from cultivated fields is the primary source of pollution into the adjacent ditches, sloughs and ponds. Pesticides are a principle contaminant, specifically persistent organic pollutants (POPs) such as chlorocarbons (HCB), organochlorines (Lindane), and chlorinated hydrocarbons (Dieldrin). Two seasons of water sampling were conducted in 2008 and 2009. While all quantities of individual pesticide contaminants remain below the CCME Guidelines for Aquatic Health, many of the compounds in the sloughs and ditches on the NWA were in higher quantities than found elsewhere in the lower mainland (Environment and Climate Change Canada, Water Quality, unpublished data). Most of the areas had samples containing up to 20 different contaminants; the synergistic, antagonistic or cumulative effects of these mixtures on aquatic organisms is unknown.

Further, water and sediment sampling for heavy metals and nutrients was completed within the sloughs in 2018. In this single sampling event, arsenic and phosphorous exceeded Canadian water quality guidelines, while arsenic, chromium, copper, iron, manganese, nickel, and phosphorus exceeded sediment quality guidelines.

Ongoing water quality monitoring will be conducted, as resources allow, to determine whether pesticide, heavy metal and nutrient levels are increasing or decreasing, and what pesticides are present. Information from these surveys will help inform management decisions related to agricultural practices and which pesticides are appropriate for use in the NWA.

## 5.3. INVASIVE SPECIES

### 5.3.1. Mammals

Eastern grey squirrels occurring within the NWA have large ecological impacts. Recent monitoring of numbers of eastern grey squirrels on the property will continue in the short term to quantify the extent of the problem. Consideration of successful management techniques and possible strategies will occur once the problem has been properly delineated.

### 5.3.2. Plants

Where invasive species (especially non-native plants) disrupt native plant communities or associated native flora/fauna, ecological restoration plans will be made to control or eradicate these species, and replace them with native species. Eradication will be considered where the species is not well established and treatment effort is deemed manageable with available staff and resources. Control will be considered where the extent and coverage of the species is extensive. The management focus for well established invasive plant species is containing existing patches and limit the spread. Purple loosestrife and yellow flag iris are high priority species for control due to the threat posed to wetland habitats. Both are extensively established within the dykes, fields and foreshore. Management may include various methods including: mechanical removal, mowing, and shading and the introduction of bioagents, where practicable.

Himalayan Blackberry and Evergreen Blackberry are overabundant at the Alaksen NWA and can aggressively overtake open fields and the understory of forested areas. Both species provide limited foraging opportunities for migratory birds, as well as cover for a variety of wildlife species (Sandiford et al. 1999). Areas with blackberry cover on the property may be reduced or contained by planting native quick growing trees such as red alder or cottonwood – and replanting with native berry producing plants. Shading out blackberry with red alder or cottonwood will not affect other important native berry producing plants such as salmonberry and thimbleberry, which are shade resistant (Polster 2004). Planting fast growing trees also encourages more stratified stands of riparian areas and hedgerows, which has been shown to increase breeding bird diversity (Astley 2010). Mature cottonwood trees provide an additional benefit for heron roosting sites.

While *Spartina* has not yet been detected within the NWA and MBS boundaries, it is present locally and poses a significant threat to the major staging area and stopover for millions of shorebirds and waterfowl during spring and fall migrations of the Fraser Delta. In B.C., there are three confirmed invasive species of cordgrass - *Spartina anglica*, *Spartina densiflora* and

*Spartina patens*. All three species continue to invade ecologically important habitat within the intertidal and low marsh communities of estuaries along the Pacific coast including the Fraser delta (Boundary Bay, Roberts Bank, Burrard Inlet). Cordgrass forms dense monocultures that disrupt the ecology, structure and function of mudflats and intertidal habitat, which provide the basis for a complex food web that includes invertebrates, fish, shorebirds and waterfowl (Williams 2009). The B.C. *Spartina* Response Plan (2010) states that "the goal of *Spartina* management in B.C. is to work towards eradication while preventing the establishment and spread of any invasive *Spartina* species in BC estuaries and coastal wetlands". Consistent monitoring for the presence of cordgrass within the NWA and MBS boundaries by researchers studying bulrush on the foreshore, will continue. If detected, active eradication in the early stages will be conducted.

#### 5.3.3. Amphibians, Reptiles and Fish

Currently, the only amphibians found on the island, and subsequently all of the Alaksen NWA, are non-native bull frogs (*Lithobates catesbeianus*) and non-native green frogs (*Lithobates clamitans)*. While the extent of their impact on native species of frogs is uncertain, both non-native invasive species are known to prey upon, or compete with, native frogs for food and habitat, possibly resulting in the elimination of native frogs on the island. A pilot study was conducted in the spring and summer of 2017 to determine the feasibility of eradicating invasive bullfrogs and green frogs from Westham Island with the aim of promoting native amphibian diversity within the NWA. As habitat at the Alaksen NWA is highly complex, control (rather than eradication) of invasive amphibians is recommended. Control of invasive amphibians will be explored using various tools including: ecosystem modification, restoration, trapping, etc.

Common carp (*Cyprinus carpio*) and pumpkinseed (*Lepomis gibbosus*) are invasive fish species that occur in the sloughs and ditches of the Alaksen NWA. Management actions to limit and control carp and pumpkinseed populations in sloughs and ditches will be considered in conjunction with the management and potential removal of bullfrogs and green frogs.

The Alaksen NWA contains Critical Habitat polygons for the western painted turtle – pacific coast population (*Chrysemys picta bellii*) per the 2018 draft Recovery Strategy. The draft 2018 Recovery Strategy contains a population objective to: "maintain, or to increase (where biologically and technically feasible), the number of individuals within extant population units and the distribution of extant population units within the species' range in coastal B.C." Therefore, research and studies are under way to determine the feasibility of increasing the population of western painted turtle at the Alaksen NWA likely via headstarting or reintroduction. Studies are

underway to analyze water quality and sediment quality to determine if they are of sufficient quality to support western painted turtles at each critical life stage. Measures to increase the western painted turtle population will be completed in tandem with relevant conservation partners including the Western Painted Turtle Recovery Team and CWS Species at Risk biologists.

Unfortunately, an introduced turtle species, red-eared sliders (*Trachemys scripta*), may act as resource competitors and disease agents for other turtle species, or prey on young turtles. Base-line population data for the red-eared slider at the Alaksen NWA, collected in 2011, suggests that because they outnumber native turtles they are likely competing for ideal basking, foraging, and nesting sites, and may be negatively affecting western painted turtles on site. Management actions to control the red-ear slider population will need to occur in concert with western painted turtle population augmentation studies.

## 5.4. WILDLIFE MANAGEMENT

ECCC will manage the NWA primarily for migratory waterfowl, species at risk, and a diversity of wildlife and plant species. ECCC's management options will favour certain species, particularly those, such as waterfowl, that have historically occurred here in larger numbers and have depended on the estuary and adjacent uplands for migration and wintering habitat. The *Species at Risk Act* requires that species at risk identified under SARA be managed in an integrated fashion with provincially-listed species at risk and other wildlife, while prioritising those species at greatest risk. Consideration will also be given to those species that may serve as indicators of environmental health. Where there may be broader implications, ECCC-CWS will consult with adjacent landowners and other key stakeholders.

### 5.4.1. Waterfowl

Emphasis will continue to be placed on managing the NWA for migrating waterfowl, primarily as a spring and fall staging area, and as a wintering area. Emphasis will remain on waterfowl species feeding in agricultural fields (e.g. lesser snow goose, Canada goose, mallards, and American wigeon). Waterfowl production (i.e.. nesting) is not a priority, although developing programs for enhancing wintering and migrating waterfowl habitat may incidentally provide benefits for nesting and brood rearing.

Waterfowl use a variety of natural and agricultural areas on the estuary for migration staging and wintering, including the intertidal marshes, crop residues and cover crop. Agricultural land stands in for the intertidal marshes that existed on the estuary prior to dyking, and waterfowl have learned to feed on them.

Agricultural production on the NWA is used as a management tool to provide enough food to support large numbers of waterfowl, especially during hunting, migratory and overwintering seasons. There is heavy waterfowl use of the Alaksen NWA during the fall hunting season despite the balance of the island being three times larger. Waterfowl surveys have been conducted from October to March of 2012 to present by CWS staff. Preliminary data show waterfowl use of the NWA (Table 5, Figure 2). More information on waterfowl use within the NWA is provided in Smith et al. 2000

**Table 5. Count of birds observed by species group and year in the Alaksen Winter Waterbird Surveys**

| **Species Group/** *Survey Year* | **Waterfowl** | **Waterbird** | **Shorebird** | **Landbird** | **Unidentified** |
|---|---|---|---|---|---|
| *2011-2012* | 75,221 | 1,647 | 1,431 | 341 | 0 |
| *2012-2013* | 40,503 | 643 | 268 | 164 | 16 |
| *2013-2014* | 42,032 | 321 | 118 | 100 | 0 |
| *2014-2015* | 23,532 | 612 | 765 | 115 | 136 |
| *2015-2016* | 100,768 | 1,082 | 5,433 | 146 | 80 |
| *2016-2017* | 50,181 | 1,797 | 3,521 | 397 | 1 |
| *2017-2018* | 24,770 | 800 | 958 | 435 | 10 |
| *2018-2019* | 22,302 | 583 | 35 | 311 | 23 |
| *2019-2020* | 37,022 | 548 | 56 | 223 | 6 |

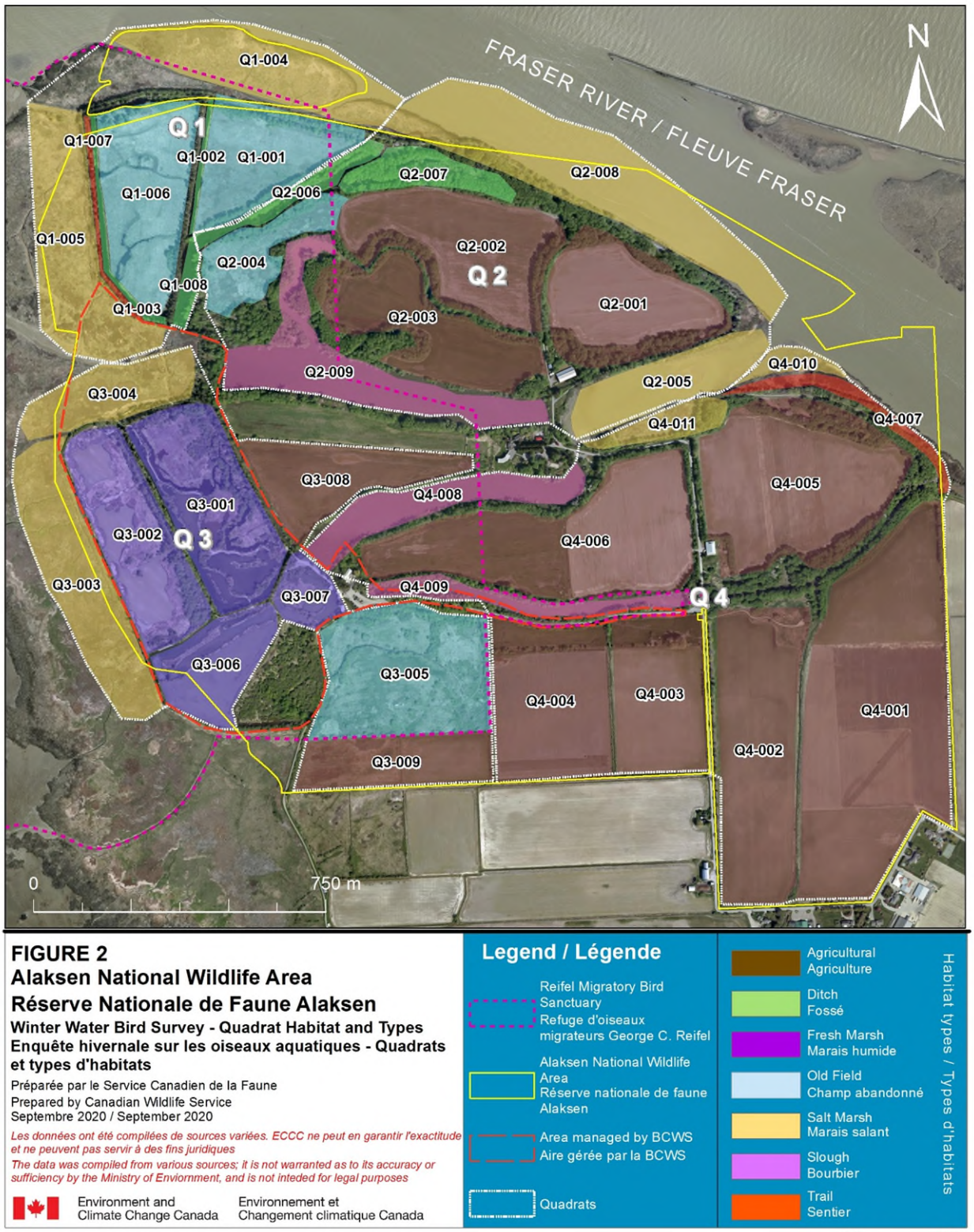


**FIGURE 2**
**Alaksen National Wildlife Area**
**Réserve Nationale de Faune Alaksen**
**Winter Water Bird Survey - Quadrat Habitat and Types**
**Enquête hivernale sur les oiseaux aquatiques - Quadrats et types d'habitats**

Préparée par le Service Canadien de la Faune
Prepared by Canadian Wildlife Service
Septembre 2020 / September 2020

*Les données ont été compilées de sources variées. ECCC ne peut en garantir l'exactitude et ne peuvent pas servir à des fins juridiques*
*The data was compiled from various sources; it is not warranted as to its accuracy or sufficiency by the Ministry of Enviornment, and is not inteded for legal purposes*

Environment and Climate Change Canada / Environnement et Changement climatique Canada

**Legend / Légende**

- Reifel Migratory Bird Sanctuary / Refuge d'oiseaux migrateurs George C. Reifel
- Alaksen National Wildlife Area / Réserve nationale de faune Alaksen
- Area managed by BCWS / Aire gérée par la BCWS
- Quadrats

Habitat types / Types d'habitats

- Agricultural / Agriculture
- Ditch / Fossé
- Fresh Marsh / Marais humide
- Old Field / Champ abandonné
- Salt Marsh / Marais salant
- Slough / Bourbier
- Trail / Sentier

Canada

**Figure 2. Overview of Winter Waterbird Survey study areas and habitat types**

Snow Goose Management

The tidal marshes and adjacent upland farms of the Fraser River delta, including the NWA, provide wintering habitat for an internationally significant population of lesser snow geese that breeds in Russia during the spring and summer months. Ongoing monitoring indicates that this population is increasing, which in turn increases the risk of aircraft strikes at the nearby Vancouver International Airport, and damage to commercial crops outside the NWA. In consultation with the Province of BC, CWS may amend its approach to management of snow geese if it is deemed that snow geese populations are reaching overabundance. The NWA serves an important safety role by attracting snow geese away from the airport and other commercial farming operations. Snow geese forage primarily on bulrush rhizomes in the adjacent tidal marshes and are dependent on these marshes exclusively during extended freezing periods when the uplands are no longer an option. This poses a risk of depleting bulrush rhizomes to a point where geese are unable to meet their energy requirements (Boyd, 1995). Snow geese benefit from the waterfowl management programs on the NWA that provide refuge from hunting and increase food supply during the winter months (Section 5.4.1).

### 5.4.2. Other Birds

Wooded areas and other non-agricultural habitats of the NWA are used by a variety of birds (including marsh birds, shorebirds, raptors, and songbirds) for nesting and migration. The existing avian diversity in the NWA will be maintained. More detailed information regarding species found in the NWA is available in the Appendices to this document.

### 5.4.3. Mammals, Reptiles and Amphibians

Managing dykes, field perimeters, woodlots, and other areas for habitat diversity will continue to provide habitats for a variety of mammals, reptiles, amphibians, as well as fish and plants. Some wildlife populations on the NWA will be monitored for any possible maintenance problems or economic loss on private property that they may cause. To date, the only reported problems associated with increased populations of local wildlife have been water impoundment and possible dyke damage caused by beavers. The CWS, in cooperation with the City of Delta, has worked to remove the dams in order to lower high water levels in London Slough.

### 5.4.4. Species at Risk

Of the fifteen species at risk known, or having the potential, to occur at the Alaksen NWA (Table 3), the NWA provides year-round and seasonal habitat for three species listed under Schedule 1 of SARA (the barn owl, western painted turtle and great blue heron) and two species

listed by COSEWIC (the barn swallow and western bumble bee). Species-specific recovery strategies and action plans are, and will continue to be, key drivers of management activities on the NWA. Management will be adapted as more recovery strategies and action plans are completed and posted on the Species at Risk Public Registry.

Species at risk identified under SARA will be managed in an integrated fashion with provincially-listed species at risk and other wildlife. Overlapping and conflicting habitat needs will be evaluated and habitat management will be based on providing the greatest benefit to the greatest number of species at risk, while prioritising those species at greatest risk.

Barn Owl (*Tyto alba*) (Special Concern, Schedule 1)

The eastern population of the barn owl is listed as Special Concern on Schedule 1 of SARA. The Lower Fraser Valley is the northern limit of its North American range and offers the best habitat in Canada for this species. The barn owl favours open habitats, pasture, and old fields, and is closely associated with large areas of agricultural lands common in the Lower Fraser Valley. It nests primarily in buildings and other structures and its reproduction is correlated with the density of small mammals, such as the Townsend's Vole (*Microtus townsendii*), and the severity of winters (Andrusiak and Cheng 1997).

The Alaksen NWA contains ideal habitats for Barn Owls. Nesting structures have been installed (four mini-barns) at various locations throughout the Alaksen NWA to replace and augment nesting sites lost due to the demolition of two derelict barn buildings. Owls have used these mini-barns for roosting and nesting, and have bred successfully. The barn owl will continue to be a management priority at the NWA. An opportunity exists for increased monitoring of this species by interested groups or individuals in cooperation with the CWS.

Barn Swallow (*Hirundo rustica*) (Threatended, Schedule 1)

The barn swallow has been assessed as Threatened by COSEWIC. For several years researchers have monitored barn swallow use of the Alaksen NWA buildings for breeding. In 2010, there were 25 breeding pairs - 23 on the main building, one on Barn #2 and one on the caretaker's residence. Many of those nests were depredated before fledging chicks and only 25% of the nests successfully fledged. Barred owls, which also breed on the property, were the suspected predator. In 2011, the colony was down to 17 pairs and the depredation rate was as high or higher. In 2011, it also appeared that clutch sizes were smaller and there was less re-nesting after a nest was predated. Video footage captured during the nesting season in 2011

confirmed barred owls as the predator. This species will continue to be monitored on the property.

Western Painted Turtle (*Chrysemys picta bellii*) (Endangered, Schedule 1)

The Pacific Coast Population of the western painted turtle is listed as Endangered on Schedule 1 of SARA. In 2009, western painted turtles were identified for the first time in the NWA, and this site became one of the few known western painted turtle-occupied sites in the Lower Mainland. The NWA contains excellent habitat for western painted turtle, including sloughs with a great deal of submergent and emergent woody debris, which serves as important basking habitat for turtles. Some surrounding upland habitat within 50 m from the water's edge, composed of sandy substrate, is an open, south-facing area which may serve as nesting habitat for turtles. However, these areas are becoming overgrown with invasive vegetation (mainly blackberry).

Identified threats to this population on the Alaksen NWA include water pollution as a result of agricultural practices; invasive species, such as red-eared sliders, carp, pumpkinseed, bullfrogs and green frogs, which have all been confirmed at this site; road related mortality; and collection. Impacts from invasive turtles and frogs at this site are unlikely to be a large threat to adult turtles due to the extensive essential aquatic habitat. Since the population at the Alaksen NWA is very small and isolated from other populations of western painted turtles, with no evidence of reproduction, it is vulnerable to catastrophic change events.

Great Blue Heron (*Ardea herodias fannini*) (Special Concern, Schedule 1)

The NWA contains important farmland, grassland and marshland habitat for many waterbirds, including the great blue heron. Herons are confirmed to use the NWA year-round, and winter habitat use and monitoring studies of waterbirds including great blue heron are conducted annually (Table 6)

**Table 6. Count of Great Blue Heron (*Ardea herodias fannini*) observed by year in the Alaksen Winter Waterbird Surveys**

| Survey Year | Count |
|---|---|
| 2011-2012 | 268 |
| 2012-2013 | 308 |
| 2013-2014 | 141 |
| 2014-2015 | 197 |
| 2015-2016 | 363 |
| 2016-2017 | 483 |
| 2017-2018 | 380 |
| 2018-2019 | 339 |
| 2019-2020 | 340 |

Species at Risk that have the potential to be on the NWA are as follows:

Pacific Water Shrew (*Sorex bendirii*) (Endangered, Schedule 1)

In Canada, this species is confined to the lower Fraser River valley region in extreme southwestern B.C., and is generally found in riparian and wetland habitats in close proximity to water. The Pacific water shrew is associated with skunk cabbage marshes, red alder riparian habitat, and dense, wet forests of western red cedar. Although riparian and forested habitats are important, in B.C. the species has also been found in non-forested grassy habitats bordering ditches and sloughs, which are common at the Alaksen NWA. As initial small mammal trapping at the Alaksen NWA and the neighboring MBS in 2011 did not reveal this species, more targeted trapping is warranted.

Short-eared Owl (*Asio flammeus*) (Special Concern, Schedule 3)

The short-eared owl can be found in a wide variety of open habitats, including grasslands, marshes, and old pastures. It also occasionally breeds in agricultural fields and high marsh zones. This species generally heads southward in the winter and is found in open habitats along the extreme southern coast of B.C. and in southern Ontario. The Alaksen NWA contains habitat suitable for the short-eared owl, which has been observed on the NWA and in neighboring lands on Westham Island, including the marsh and fields just south of the adjacent Singh farm.

Western Bumble Bee (*Bombus occidentalis occidentalis*)

The western bumble bee has been assessed as Threatened in British Columbia by COSEWIC. This species can be found in grasslands and agricultural areas and was once abundant in the greater Fraser Valley area. The Alaksen NWA contains suitable habitat for the

Western Bumble Bee on old fields as well as fields left in grasses or forage, and its presence on the NWA has been confirmed (see Table 3).

### 5.5. MONITORING

Monitoring bird use of habitat is an effective way to determine whether current management practices are meeting the primary management goal of the Alaksen NWA. The data can used to evaluate applied management activities and improve management strategies for meeting the primary goal. This adaptive management approach allows ongoing changes to be made to management practices for the benefit of a variety of wildlife species.

Data on bird use in the NWA and adjacent lands has been collected inconsistently since 1995. Surveys performed over the winters of 1995 through 1997 indicate that, during the non-breeding season, monthly waterfowl numbers are much greater on the Alaksen NWA than on the rest of Westham Island, an area about three times the area of the NWA. If waterfowl use of the NWA continues to exceed that of adjacent lands, this will be an indication that the primary objective of providing for the needs of migratory waterfowl is being met. Monitoring over-wintering populations of migratory waterfowl is important and will be continued as a part of the winter waterbird surveys at the Alaksen NWA. Due to the periodic high visitor use at the BCWS Managed Refuge, species which seem to have very select roost or nest sites and become vulnerable when disturbed are also monitored (black-crowned night herons (*Nycticorax nycticorax*), northern saw-whet owl (*Aegolius acadicus*), long-eared owls (*Asio otus*), barn owls, sandhill cranes (*Antigone canadensis*), etc.).

Effective and efficient monitoring requires careful planning and a coordinated approach. Monitoring will also be carried out in a manner that contributes to meeting species at risk recovery strategy and action plan objectives. Ongoing monitoring needs are as follows:

1. Ongoing monitoring of waterfowl use at the Alaksen NWA;
2. Monitor distribution and abundance of species at risk known to occur in the Alaksen NWA (Table 3);
3. Survey for additional species at risk that have potential to be on the property (Table 3);
4. Monitor raptor and bird of prey abundance, distribution, and habitat use;
5. Monitoring the distribution and abundance of small mammals within the NWA;
6. Map and monitor changes in the extent and distribution of the various habitat types found within the NWA;
7. Monitor the distribution and density of non-native invasive plant species within the NWA;

8. Monitor sheetwater, slough and ditch water, and sediments for concentration of pesticides, herbicides, nitrogen, phosphorus, heavy metals, relative to the CCME guidelines for aquatic life.
9. Monitor the distribution and abundance of Bull Frogs and Green Frogs within the NWA;
10. Monitor the western painted turtle population and habitat requirements as well as red eared slider population growth rate and change over time.
11. Assess the abundance and ecological impact of invasive Carp in the sloughs at the Alaksen NWA to determine if eradication or control is both desirable and practical, particularly within the context of water quality restoration opportunities;
12. Monitor air quality to ensure that the level of contaminants in the atmosphere is below the acceptable level established by the Canadian Ambient Air Quality Standards (CAAQS);
13. Monitor dykes for failing or dangerous trees;

### 5.6. RESEARCH

Research activities will be considered for permitting when the results obtained through research have the potential for the following:

1. Determining the air quality in the NWA and suggesting methods for improving air quality;
2. Improving agricultural practices for the benefit of wildlife;
3. Protecting, maintaining, restoring, or enhancing habitat for wildlife;
4. Conserving migratory birds;
5. Recovering species at risk;
6. Increasing benefits and improving balance between wildlife and agricultural activities;
7. Reducing the encroachment of invasive species in the NWA;
8. Maintaining wetlands and marshlands in a state most beneficial to wetland and marshland dependent wildlife.

To obtain a permit in order to conduct research in the Alaksen NWA and to receive instructions concerning guidelines for a research proposal, please contact:

Environment and Climate Change Canada
Canadian Wildlife Service
5421 Robertson Rd.
Delta, B.C. V4K 3N2
Canada

### 5.7. PUBLIC INFORMATION AND OUTREACH

As of 2014, some public use occurs in a portion of the Alaksen NWA during regular working hours, but is restricted to walking on dyke-top roads and trails. The scale of this use is estimated at about 8,000 visits annually on average.

Public access to the majority of the NWA for recreational purposes is subject to the *Wildlife Area Regulations* and is generally not permitted. However, since this NWA is located close to a major urban center, some public access is available for walking on trails, wildlife viewing and education.

Most of the public use and subsequent outreach are concentrated within the BCWS Managed Refuge. The BCWS, in cooperation with the CWS, has put in place trails, bird viewing towers and a parking lot in the BCWS Managed Refuge. The BCWS manages the public portion of the MBS under license from ECCC. It runs interpretation and education programs with the goal of encouraging interest in migratory birds and their habitats in the Fraser River estuary, as well as conservation initiatives in this coastal region. The total visitor use for the MBS in 2016 was 84,848 people. In 2021, BCWS implemented an online reservation system to manage visitor numbers. Improved signage, a stronger web presence, and enhanced programming may increase visitation and federal recognition. Limited parking facilities at the MBS currently inhibit visitation numbers. Increased parking, with attendant loss of habitat, would be required to promote increased visits.

Under the auspices of the Connecting Canadians to Nature initiative, ECCC has identified the Alaksen NWA as one of the NWAs that will benefit from funding through the initiative. This initiative is meant to aid in fostering an appreciation for nature in all Canadians with the goal of building a "community of stewards". One of the goals of the Connecting Canadians to Nature initiative is to increase public access to some National Wildlife Areas. Visitation will be managed to ensure that any activities do not interfere with the conservation of wildlife.

Funding from this initiative has been used for basic infrastructure to make the site more accessible, to create new or expanded trails and viewing platforms, and to support a variety of low-impact public uses and to provide on-site programs delivered through collaborative partnerships.

# 6. AUTHORIZATIONS AND PROHIBITIONS

In the interest of wildlife and their environment, human activities are minimized and controlled in NWAs through the implementation of the *Wildlife Area Regulations*. These regulations set out activities that are prohibited (subsection 3(1)) in the wildlife area and provide mechanisms for the Minister of the Environment and Climate Change to authorize certain activities to take place in NWAs that are otherwise considered prohibited. The regulations also provide the authority for the Minister to prohibit entry into NWAs.

Certain activities may be authorized by obtaining a permit from the Minister of the Environment and Climate Change.

## 6.1. PROHIBITION OF ENTRY

Under the *Wildlife Area Regulations*, the Minister may publish a notice in a local newspaper or post notices at the entrance of any wildlife area or on the boundary of any part thereof prohibiting entry to any wildlife area or part thereof. These notices can be posted when the Minister is of the opinion that entry is a public health and safety concern or when entry may disturb wildlife and their habitat.

For the Alaksen NWA, entry is not prohibited during regular business hours. Public access is prohibited outside of business hours. Authorized activities and those activities that will be considered for permitting are described below.

## 6.2. AUTHORISED ACTIVITIES

Authorized activities with special restrictions:

1. Wildlife viewing and interpretation in the BCWS Managed Refuge;
2. Walking and wildlife viewing within the balance of the NWA: designated trails only;
3. Fishing: provincial and federal restrictions apply; no lead sinkers or lead jigs that weigh less than 50 grams;
4. Picnic: designated areas only;
5. Photography: access to viewing areas from designated trails only.

Note: If there is a discrepancy between the information presented in this document and the notice, the notice prevails as it is the legal instrument authorizing the activity.

Permits may be issued for activities that are required to implement this management plan and for research and monitoring as described in section 5.5 and 5.6 above. Permits may also be

issued for activities not required for implementation of the plan but otherwise consistent with its goals and objectives, such as allowing access for maintenance of utility rights of way, and for invasive species control. Most notably, permits are issued on an annual basis for agricultural activity within the Alaksen NWA as the primary wildlife management tool and for management of the infrastructure in the NWA including buildings, parking lots, roads, fences, gates, etc.

Permits will be issued with terms and conditions to ensure that any potential damage to the NWA by permitted activities are avoided or mitigated to the extent possible.

### 6.3. AUTHORISATIONS

Permits authorizing an activity may be issued only if the Minister is of the opinion that the activity is scientific research relating to wildlife or habitat conservation, or the activity benefits wildlife and their habitats or will contribute to wildlife conservation, or the activity is not inconsistent with the purpose for which the NWA was established and is consistent with the most recent management plan.

The Minister may also add terms and conditions to permits in order to minimize the impact of an activity on wildlife and wildlife habitat.

All requests for permits or authorizations must be made in writing to the following address:

Environment and Climate Change Canada
Canadian Wildlife Service
5421 Robertson Rd.
Delta, B.C. V4K 3N2
Canada

**Email:** scfpacpermitscwspacpermits@ec.gc.ca

For further information, please consult the Environment and Climate Change Canada guidance when considering permitting in National Wildlife Areas designated under the *Wildlife Area Regulations* and protected marine areas designated under the *Canada Wildlife Act*. (2023). This ECCC policy document is available on the Protected Areas website at https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/permits-activities/protected-areas/permit-guidance.html.

### 6.4. EXCEPTIONS

The following activities will be exempt from the requirements for permitting and authorizations:

- Activities related to public safety, health or national security, that are authorized by or under another Act of Parliament or activities that are authorized under the *Health of Animals Act* and the *Plant Protection Act* to protect the health of animals and plants;
- Activities related to routine maintenance of NWAs, to the implementation of management plans, and enforcement activities conducted by an officer or employee of ECCC.

### 6.5. OTHER FEDERAL AND PROVINCIAL AUTHORIZATIONS

Depending on the type of activity, other federal or provincial permits or authorisations may be required to undertake an activity in the Alaksen NWA.

Contact your regional federal and provincial permitting office for more information.

# 7. HEALTH AND SAFETY

In the case of environmental emergencies, contact will be made with the Canadian Environmental Emergencies Notification System at the following address:

Emergency Management British Columbia
Ministry of Justice
**1-800-663-3456**

All reasonable efforts will be made to protect the health and safety of the public including adequately informing visitors of any known or anticipated hazards or risks. Further, ECCC staff will take all reasonable and necessary precautions to protect their own health and assure safety as well as that of their co-workers. However, visitors (including researchers and contractors) must make all reasonable efforts to inform themselves of risks and hazards and must be prepared and self-sufficient. Natural areas contain some inherent dangers and proper precautions must be taken by visitors, recognising that ECCC staff neither regularly patrol nor offer services for visitor safety in NWAs.

## 7.1. HANTAVIRUS

Hantavirus pulmonary syndrome is an infection caused by a virus carried by some rodents, particularly deer mice. While rare, the virus can be transmitted to humans when exposed to urine, saliva or droppings of infected rodents. The barns on the Alaksen NWA may contain deer mice, and staff should not be working inside the barn without taking appropriate precautions. If it is part of an employee's duties to work within the barns, it is the responsibility of management to ensure workers are properly fitted with personal protective equipment needed to deal with unexpected contact.

## 7.2. PESTICIDE APPLICATION

Canadian Wildlife Service offices are located at the Alaksen NWA in the Pacific Wildlife Research Center (PWRC) and CWS staff occupy the offices anywhere from 0700 to 1800hrs year round. Visitors, public and contractors are frequently on the NWA property during the farming season. ECCC is thus responsible for assuring that farming practices on the NWA comply with the National Joint Council Occupational Health and Safety Directive (Part X – Pesticides). The Directive is implemented through formal Agreements with the Farmers, and the use of annually issued National Wildlife Area Permits and Statements of Work. These formal Agreements between ECCC and the Farmers specify the requirements with which the Farmers

must comply to properly manage their use of pesticides for public safety. As of 2017, new Agreements between CWS and Farmers at the Alaksen NWA require the Farmers to provide signage in the fields where field treatments occur alerting the public not to touch or walk on treated plants or areas. Signs will also indicate the following:

a. date of application;
b. name of pesticide used;
c. PCP Registration number;
d. reason for application;
e. telephone number for information; and
f. safe re-entry date.

Additionally, the Farmers are required to announce their real time pesticide use plans by submitting their notifications to the ecoNotify electronic pesticide notification system. The ecoNotify system will automatically pass the information along to employees and affiliates.

Neonicotinoid chemicals and the organophosphate Diazinon are banned from use on the property. Farmers treat their fields with pesticides according to their IPM program, and often only a small window of opportunity is available for application, based on wind and weather conditions which may not allow notification far in advance of use. A comprehensive study determining indoor and outdoor air quality at PWRC will occur in 2017.

Incidents or emergencies can be reported to:

1. RCMP (911)

2. ECCC Wildlife Enforcement Office, Pacific and Yukon Region (604-664-9100, 401 Burrard Street, Vancouver, BC, V6C 3S5)

3. BC Ministry of Environment Conservation Officer Service (Report All Poachers and Polluters (RAPP) line (toll-free 1-877-952-7277)

4. City of Delta Fire and Emergency Services 9-1-1 (emergency) 604-946-4411 (non-emergency); Waterworks Emergencies 604-946-3260 (regular office hours) 604-946-4141 (after office hours and holidays)

# 8. ENFORCEMENT

The management of NWAs is based on three acts and the regulations thereunder:

- *Migratory Birds Convention Act, 1994,* and *Migratory Birds Regulations*
- *Canada Wildlife Act* and *Wildlife Area Regulations*
- *Species at Risk Act*

Active on-the-ground management and/or periodic enforcement are required to promote compliance and prevent prohibited activities from taking place. The *Migratory Birds Convention Act, Species at Risk Act,* and the *Canada Wildlife Act* prohibit several activities on all CWS conservation holdings.

Officers monitor compliance with the *Canada Wildlife Act* on an ongoing basis and will initiate investigations as required. The *Wildlife Area Regulations* list prohibited activities in section 3 and include:

- destroying or disturbing any wildlife, their habitats, or eggs;
- possession of any wildlife or carcass, nest, egg, or parts thereof;
- cutting, picking, removing, or wilfully damaging any vegetation;
- disturbing or removing soils, sand, gravel, rock, or related material;
- removing, defacing, damaging, or destroying any artefact, building, fence poster, sign, or other structure;
- camping or campfires;
- vehicle use;
- dumping or depositing waste or other refuse materials or substances that would degrade or alter the quality of the environment

As the NWA is federal land for the purposes of the *Canada Wildlife Act*, the general prohibitions of the *Species at Risk Act* (sections 32 and 33) apply to all species listed on Schedule 1 as extirpated, endangered, or threatened. Individuals of such listed species shall not be killed, harmed, harassed, captured, or taken, and residences shall not be damaged nor destroyed. If critical habitat of a listed species is identified within the NWA, a description of that habitat must be published in the *Canada Gazette* and SARA section 58, which prohibits the destruction of the critical habitat, subsequently applies. SARA is also enforced by wildlife enforcement officers.

Public education and awareness are fundamental to promoting compliance. Preventative measures such as strategic use of signage, public outreach activities, and events combined with an on-the-ground presence will be used to achieve effective compliance.

# 9. PLAN IMPLEMENTATION

The management plan will be implemented over a 10-year period. Annual work plans will be developed in accordance with priorities and budgets and the details of management plan implementation will be developed through ECCC's annual work planning process and will be implemented as human and financial resources allow. An adaptive management approach will be favoured for the implementation of the management plan. The implementation of the plan will be evaluated five years after its publication, on the basis of the actions identified in Table 4.

**Table 7 : Implementation Strategy timeline for the Alaksen National Wildlife Area**

| Activity | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Restoration and management of key habitats in accordance with the goals above | X | X | X | X | X | X | | | | | |
| Monitoring bird, mammal, reptile and amphibian populations on the property | X | X | X | X | X | X | | | | | |
| Improved fencing for fields with cattle in cooperation with farmers | X | | X | | X | | | | | | |
| Monitoring and controlling invasive species | X | X | X | X | X | X | | | | | |
| Monitor slough and ditch water for water quality, heavy metals, nutrients, and concentration of pesticides | X | X | X | X | X | X | | | | | |
| Development of a habitat map | X | | | | | | | | | | |
| Continued maintenance and installation of signage. Removal of discontinued, damaged, or unnecessary signs | X | | X | | X | | X | | X | | X |
| Coordination of management activities with local conservation stakeholders including NGOs and residents | X | X | X | X | X | X | X | X | X | X | X |

## 9.1. MANAGEMENT AUTHORITIES & MANDATES

ECCC-CWS (Pacific) is responsible for site management of the Alaksen NWA.

Ducks Unlimited Canada is responsible for the construction and maintenance of water control structures.

British Columbia Waterfowl Society (BCWS) is responsible for the operation of the BCWS Managed Refuge area, commonly referred to as the George C. Reifel Migratory Bird Sanctuary

## 9.2. MANAGEMENT PLAN REVIEW

Evaluation will take the form of a review of data obtained from the monitoring, surveys and research projects. Monitoring, surveys and research at the Alaksen NWA will be performed within the limits imposed by financial and human resources. The data collected will be reviewed annually and used to inform future management at the NWA. Furthermore, these data will be used to evaluate federal contributions towards accomplishing the mandates specific to ECCC-CWS for which the protected area was established.

This management plan will be reviewed 5 years after its formal approval by ECCC-CWS and every 10 years thereafter. Information may be appended to the document as required to aid in site management and decision-making.

# 10. COLLABORATORS

Meeting the goals and objectives for the management of an NWA requires close cooperation among various resource agencies, tenant farmers, adjacent property owners, First Nations, and community groups. The NWA Management Plan presents an opportunity to integrate land stewardship principles to provide wildlife habitat through sustainable agriculture.

Collaboration with local agencies and sector organizations to contribute to the protection and conservation of wildlife species and their habitats in the NWA will be favoured. Many of the programs and projects described within the NWA have involved collaborative arrangements between the ECCC-CWS and Fraser River delta stakeholders. These arrangements include both formal and informal agreements that have enabled many programs on the NWA.

British Columbia Waterfowl Society (BCWS)

The CWS and the BCWS are working together to create a continuous protected area on the Delta for the conservation of waterfowl and other wildlife, and their habitats. The BCWS Managed Refuge provides a public interpretive program operated under a renewed 30-year lease, from August 1995 to 2025, with ECCC. This lease is currently in the process of renewal for a 30-year period from August 2026 to 2056. Ongoing and continued collaboration with the BCWS and communication between the MBS and the NWA regarding activities, issues, and management practices enables both to be managed in a consistent manner.

Ducks Unlimited Canada (DUC)

The CWS and DUC have a long standing collaborative relationship at the Alaksen NWA. Agreements for management of water control structures on the NWA and the MBS between DUC and the CWS were first signed in 1986. This was renewed in 1996 for a 30-year term. The agreement commits DUC to maintain water control structures installed for the purposes of allowing effective water management in the NWA. Maintenance activities are conducted under the auspices of a permit.

Other Collaborators

Several organizations have expressed an interest in continuing cooperation with the CWS and the NWA. Some of these include The Nature Trust of B.C., Tsawwassen First Nation, and the Delta Farmland and Wildlife Trust. Cooperative agreements and collaborations for improved management will continue to be explored as opportunities present themselves.

# 11. LITERATURE CITED

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# 12. APPENDICES

## Appendix 1 The Alaksen NWA Fields and Water Control Structures

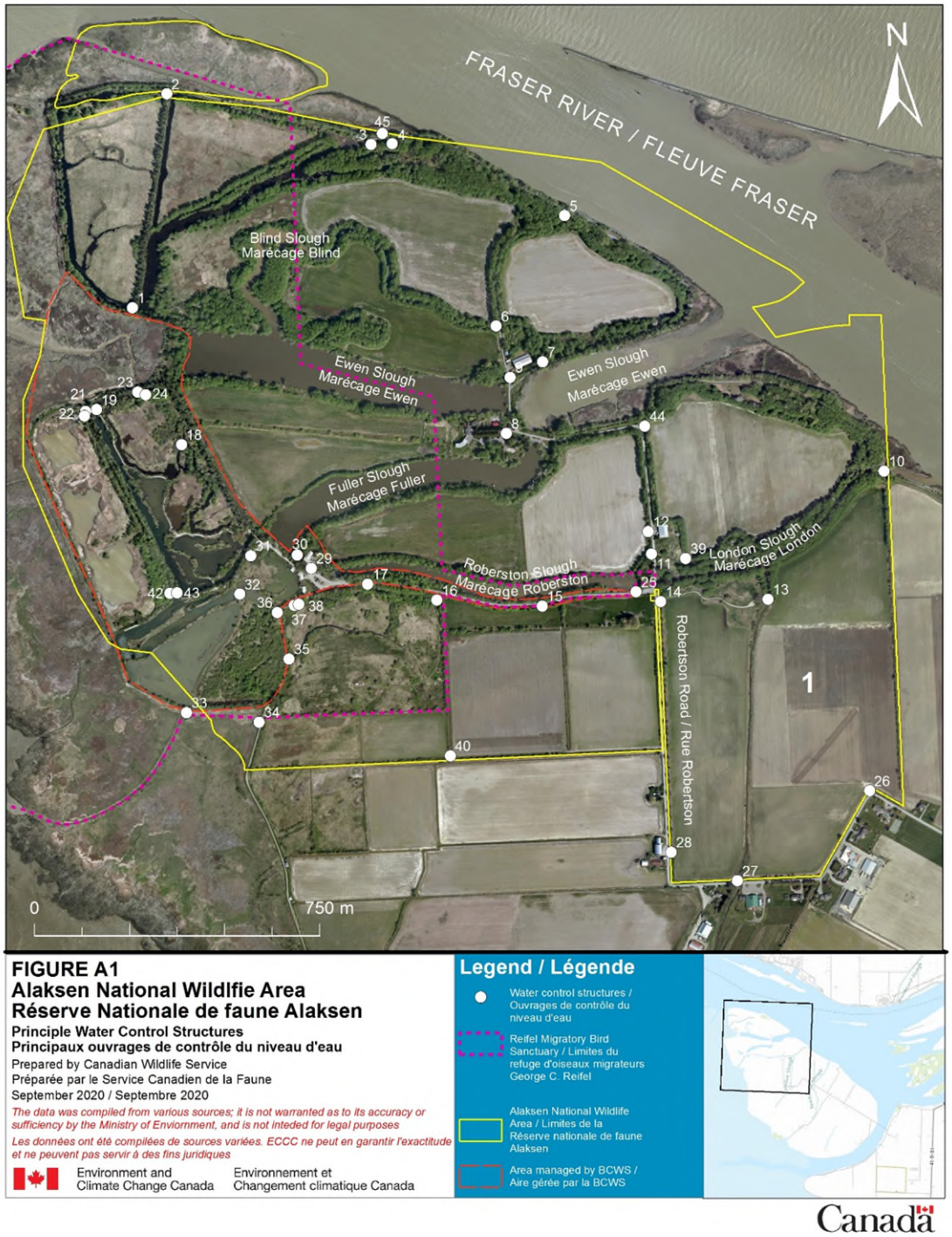


**FIGURE A1. The Alaksen National Wildlife Area Agricultural Fields and Principal Water Control Structures (2020)**

**TABLE A1 The Alaksen NWA Water Control Structure Inventory and Status as of 2016**

| Culvert ID | Length (m) | Diameter (mm) | Material | Condition | Control Structure | Responsibility |
|---|---|---|---|---|---|---|
| 1 | 10.0 | Casing 600, Liner 450 | CSP lined with plastic Weholite | Fair | Y | DUC/CWS |
| 2 | 13.1 | Casing 750, Liner 600 | CSP lined with plastic Weholite | Good | Y | DUC/CWS |
| 3 | 11.0 | Casing 800, Liner 533 | CSP lined with plastic Weholite | Good | Y | DUC/CWS |
| 4 | 9.4 | Casing 900, Liner 534 | CSP lined with plastic Weholite | Not Assessed | Y | DUC/CWS |
| 5 | 14.0 | 750 | CSP | Fair | N | DUC/CWS |
| 6 | 20.3 | 750 | Concrete | Good | N | DUC/CWS |
| 7 | 20.0 | 900 | CSP | Good | Y | DUC/CWS |
| 8 | 12.0 | 450 (Estimate) | CSP | Not Assessed | N | DUC/CWS |
| 9 | 10.0 | 600 (Estimate) | - | Submerged | N | DUC/CWS |
| 10 | 20.0 | 600 (Estimate) | Assume plastic lined CSP | Good/Fair | N | Delta |
| 11 | 19.0 | Casing 600, Liner 450 | CSP lined with plastic Weholite | Fair | Y | DUC/CWS |
| 12 | 6.4 | 600 | Concrete | Fair | N | DUC/CWS |
| 13 | 6.1 | 600 | CSP | Fair | N | DUC/CWS |
| 14 | 12 (Estimate) | 600 (Estimate) | - | Submerged | N | DUC/CWS |
| 15 | 11.7 | 600 | Concrete | Good | N | DUC/CWS |
| 16 | - | 600 (Estimate) | Concrete | Fair/Poor | N | DUC/CWS |
| 17 | 16.0 | 450 | CSP | Poor | Y | DUC/CWS |
| 18 | 6.1 | 600 | CSP | Fair | Y | DUC/CWS |
| 19 | 8.2 | 450 | CSP | Fair | Y | DUC/CWS |
| 20 | 8.0 | 450 | Plastic Weholite | Not Assessed | Y | DUC/CWS |
| 21 | 12.0 | Casing 600, Liner 450 | CSP lined with plastic Weholite | Fair | Y | DUC/CWS |
| 22 | 5.9 | - | - | Submerged | N | DUC/CWS |
| 23 | 27.4 | 450 | CSP | Fair | Y | DUC/CWS |
| 24 | 8.3 | 450 | Plastic Weholite | Fair | Y | DUC/CWS |
| 25 | 8.7 | 600 | Concrete | Good | N | DUC/CWS |
| 26 | 5.6 | 600 | Concrete | Good | N | DUC/CWS |
| 27 | 16 (Estimate) | 300 (Estimate) | Concrete | Fair | N | DUC/CWS |

| Culvert ID | Length (m) | Diameter (mm) | Material | Condition | Control Structure | Responsibility |
|---|---|---|---|---|---|---|
| 28 | 6.0 | 600 | CSP | Fair | N | DUC/CWS |
| 29 | 12.1 | 600 (Estimate) | CSP | Fair | N | DUC/CWS |
| 30 | 12.5 | 600 | CSP | Fair/Poor | Y | DUC/CWS |
| 31 | 18.0 | 450 | CSP | Fair | Y | DUC/CWS |
| 32 | 5.4 | Casing 600, Liner 450 | CSP lined with plastic Weholite | Good | Y | DUC/CWS |
| 33 | 18.8 | Casing 600, Liner 450 | CSP lined with plastic Weholite | Good | Y | DUC/CWS |
| 34 | 15.2 | 300 | CSP | Fair/Poor | N | DUC/CWS |
| 35 | - | - | - | Not assessed | N | DUC/CWS |
| 36 | 12.3 | 450 | CSP | Poor | N | DUC/CWS |
| 37 | 12.0 | 300 | CSP | Poor | Y | DUC/CWS |
| 38 | 3.9 | - | - | Not assessed | N | DUC/CWS |
| 39 | 7.6 | 450 (Estimate) | Concrete | Good/Fair | N | DUC/CWS |
| 40 | 5.9 | 600 | CSP | Not assessed | N | DUC/CWS |
| 41 | - | - | - | Not assessed | N | DUC/CWS |
| 42 | 8.0 | 450 | CSP | Good/Fair | Y | DUC/CWS |
| 43 | 12.4 | Casing 600, Liner 450 | CSP lined with plastic Weholite | Good/Fair | Y | DUC/CWS |
| 44 | 5.7 | 300 | Assumed concrete | Not assessed | N | DUC/CWS |
| 45 | 14.2 | Casing 900, Liner 750 | CSP lined with plastic Weholite | Good/Fair | Y | DUC/CWS |
| 46 | 10.0 | 450 | Plastic Weholite | Not assessed | Y | DUC/CWS |
| 47 | 10.0 | 450 | Plastic Weholite | Not assessed | Y | DUC/CWS |
| 48 | 9.0 | 450 | Plastic Weholite | Not assessed | Y | DUC/CWS |
| Data in table adapted from: Klohn Crippen Berger (2016). | | | | | | |

**TABLE A2 Agriculture and Agri-Food Canada Overview of Classification Methodology for Determining the Alaksen National Wildlife Area (ANWA) Land Capability for Agriculture**

| Classes | ANWA Fields | Description |
|---|---|---|
| 1 | 1, 2, 14, 17, 18, 19E | Soils in this class have no significant limitations in use for crops. |
| 2 | 1, 2, 3, 5, 6E, 14, 15, 17, 18, 19E | Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices. |
| 3 | 4, 5, 6E, 6W, 8, 14, 19E, 19W | Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices. |
| 4 | 5, 6W, 8, 9, 19W | Soils in this class have severe limitations that restrict the range of crops or require special conservation practices. |
| 5 | 7, 19W | Soils in this class gave very severe limitations that restrict their capability in producing perennial forage crops, and improvement practices are feasible. |
| 6 | | Soils in this class are capable only of producing perennial forage crops, and improvement practices are not feasible. |
| 7 | 7, 8, 9, 10, 11, 12, 13 | Soils in this class have no capacity for arable culture or permanent pasture. |
| 0 | | Organic Soils (not placed in capability classes). |

## Appendix 2 WILDLIFE AND PLANT SPECIES AT THE ALAKSEN NWA

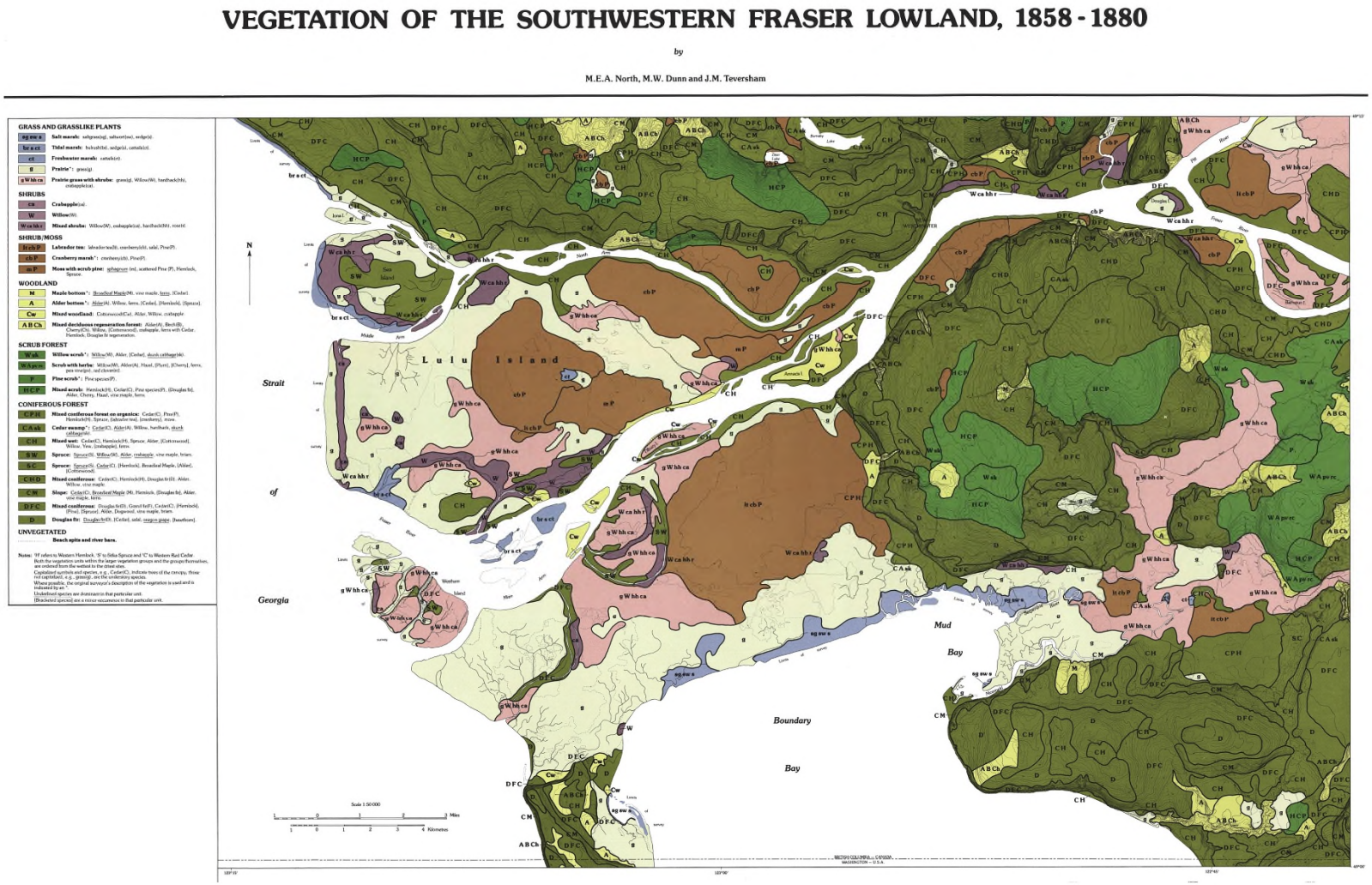


**FIGURE A2: The Vegetation of the Southwestern Fraser Lowland, 1858 – 1880**

**TABLE A3: Mammals known to occur at the Alaksen NWA**

| Common Name | Genus Species | Native or Introduced | At Risk |
|---|---|---|---|
| Townsend's Vole | *Microtus townsendii* | Native | No |
| Vagrant shrew | *Sorex vagrans* | Native | No |
| American Beaver | *Castor canadensis* | Native | No |
| Muskrat | *Ondatra zibethicus* | Native | No |
| Coyote | *Canis latrans* | Native | No |
| Mink | *Neovison vison* | Native | No |
| River Otter | *Lontra canadensis* | Native | No |
| Racoon | *Procyon lotor* | Native | No |
| Douglas' Squirrel | *Tamiasciurus douglasii* | Native | No |
| Gray Squirrel | *Sciurus griseus* | Native | No |
| Eastern Grey Squirrel | *Scirirus carolinensis* | Introduced | No |
| Roof Rat | *Rattus rattus* | Introduced | No |
| Norway Rat | *Rattus norvegicus* | Introduced | No |
| Deer Mouse | *Peromyscus* maniculatus | Native | No |
| Pacific Jumping Mouse | *Zapus trinotatus* | Native | No |
| Little Brown Bat | *Myotis lucifugus* | Native | YES |
| Big Brown Bat | *Eptesicus fuscus* | Native | No |
| Yuma Myotis | *Myotis yumanensis* | Native | No |

**TABLE A4: Reptiles, amphibians and fish species known to occur at the Alaksen NWA**

| Common Name | Genus Species | Native or Introduced | At Risk | Status |
|---|---|---|---|---|
| Green Frog | *Lithobates clamitans* | Introduced | No | No Status |
| Bull Frog | *Rana catesbeiana* | Introduced | No | No Status |
| Red-eared Slider | *Trachemys scripta elegans* | Introduced | No | No Status |
| Western Painted Turtle | *Chrysemys picta bellii* | Native | YES | **Schedule 1, Special Concern** |
| Common Garter Snake | *Thamnophis sirtalis* | Native | No | No Status |
| Northwestern Garter Snake | *Thamnophis ordinoides* | Native | No | No Status |
| Three-Spined Stickleback | *Gasterosteus aculeatus* | Native | No | No Status |
| Common Carp | *Cyprinus carpio* | Introduced | No | No Status |
| Pumpkin Seed | *Lepomis gibbosus* | Introduced | No | No Status |

| | | | | |
|---|---|---|---|---|
| Prickly Sculpin | *Cottus asper* | Native | No | No Status |
| Brown Bullhead Catfish | *Ameiurus nebulosus* | Introduced | No | No Status |
| Brassy Minnow | Hybognathus hankinsoni | Native | Yes | **Provincial Blue listed** |

**TABLE A5: Plants known to occur at the Alaksen NWA**

| Common Name | Genus Species | Native or Introduced | At Risk |
|---|---|---|---|
| American Winter Cress | *Barbarea orthoceras* | Native | No |
| Arrowhead | *Sagittaria latifolia* | Native | No |
| Bitter Cherry | *Prunus emarginata* | Native | No |
| Black Cottonwood | *Populus trichocarpa* | Native | No |
| Black Medic | *Medicago lupulina* | Introduced | No |
| Black Twinberry | *Lonicera involucrata* | Native | No |
| Bracken Fern | *Pteridium aquilinum* | Native | No |
| Broad-leaved Plantain | *Plantago major* | Introduced | No |
| Bull Thistle | *Cirsium vulgare* | Introduced | No |
| Canada Thistle | *Cirsium arvense* | Introduced | No |
| Cascara | *Rhamnus purshiana* | Native | No |
| Cleavers | *Galium aparine* | Introduced | No |
| Common Dandelion | *Taraxacum officinale* | Introduced | No |
| Common Hawthorn | *Crataegus monogyna* | Native | No |
| Common Horsetail | *Equisetum arvense* | Introduced | No |
| Common Rush | *Juncus effusus* | Native | No |
| Common Snowberry | *Symphoricarpos albus* | Native | No |
| Common St. John's Wort | *Hypericum perforatum* | Introduced | No |
| Cow Parsnip | *Heracleum lanatum* | Native | No |
| Creeping Buttercup | *Ranunculus repens* | Introduced | No |
| Cud Weed | *Gnaphalium uliginosum* | Introduced | No |
| Curled Dock | *Rumex crispus* | Introduced | No |
| Cut Leaf Water Horehound | *Lycopus americanus* | Native | No |
| Deer Fern | *Blechnum spicant* | Native | No |
| Douglas' Water Hemlock | *Cicuta douglasii* | Native | No |

| | | | |
|---|---|---|---|
| Douglas-fir | *Pseudotsuga menziesii* | Native | No |
| English Holly | *Ilex aquifolium* | Introduced | No |
| English Ivy | *Hedera helix* | Introduced | No |
| European Bittersweet | *Solanum dulcamara* | Introduced | No |
| Evergreen Blackberry | *Rubus laciniatus* | Introduced | No |
| Fireweed | *Epilobium angustifolium* | Native | No |
| Fringed Cup | *Tellima grandiflora* | Native | No |
| Hairy Cat's-ear | *Hypochaeris radicata* | Introduced | No |
| Henderson's Checker-mallow | *Sidalcea hendersonii* | Native | No |
| Herb-Robert | *Geraniun robertianum* | Native | No |
| Himalayan Blackberry | *Rubus armeniacus* | Introduced | No |
| Lady Fern | *Athyrium filix-femina* | Native | No |
| Lady's Thumb | *Polygonum persicaria* | Introduced | No |
| Lamb's Quarter | *Chenopodium album* | Introduced | No |
| Large-leaved Aven | *Geum macrophyllum* | Native | No |
| Lodgepole Pine | *Pinus contorta var. latifolia* | Native | No |
| Morning Glory | *Convolvulus arvensis* | Introduced | No |
| Narrow-leaved Plantain | *Plantago lanceolata* | Introduced | No |
| Nodding Beggarticks | *Bidens cernua* | Native | No |
| Nootka Rose | *Rosa nutkana* | Native | No |
| Oak | *Quercus spp* | Native | No |
| Oregon Ash | *Fraxinus latifolia* | Native | No |
| Oxeye Daisy | *Leucanthemum vulgare* | Introduced | No |
| Pacific Crabapple | *Malus fusca* | Native | No |
| Pacific Dogwood | *Cornus nutttallii* | Native | No |
| Pacific Ninebark | *Physocarpus capitatus* | Native | No |
| Paper Birch | *Betula papyrifera* | Native | No |
| Pearly Everlasting | *Anaphalis margaritacea* | Native | No |
| Perennial sow-Thistle | *Sonchus arvensis* | Introduced | No |
| Perennial Sow-thistle | *Sonchus arvensis* | Introduced | No |
| Pineapple Weed | *Matricaria matricarioides* | Introduced | No |
| Purple Leaved Willowherb | *Epilobium ciliatum* | Native | No |
| Purple Loosestrife | *Lythrum salicaria* | Introduced | No |
| Red Alder | *Alnus rubra* | Native | No |

| | | | |
|---|---|---|---|
| Red elderberry | *Sambucus racemosa* | Native | No |
| Red-osier Dogwood | *Cornus stolonifera* | Native | No |
| Redroot Pigweed | *Amaranthus retroflexus* | Introduced | No |
| Reed Canary Grass | *Phalaris arundinacea* | | |
| Salmonberry | *Rubus spectabilis* | Native | No |
| Scotch Broom | *Cytisus scoparius* | Introduced | No |
| Sheep Sorrel | *Rumex acetosella* | Introduced | No |
| Shepherd's Purse | *Capsella bursa-pastoris* | Introduced | No |
| Sitka Alder | *Alnus crispa ssp. sinuata* | Native | No |
| Sitka Mountain | *Sorbus sitchensis* | Native | No |
| Skunk Cabbage | *Lysichiton americanum* | Native | No |
| Spiny Sow Thistle | *Sonchus asper* | Introduced | No |
| Stinging Nettle | *Urtica dioica* | Introduced | No |
| Sweet Cherry | *Prunus avium* | Introduced | No |
| Sweet Gale | *Myrica gale* | Native | No |
| Sword Fern | *Polystichum munitum* | Native | No |
| Thimbleberry | *Rubus parviflorus* | Native | No |
| Trailing Blackberry | *Rubus ursinus* | Native | No |
| Vetch | *Vicia spp* | Introduced | No |
| Wall Lettuce | *Lactuca muralis* | Introduced | No |
| Water Lily | *Nymphaea odorata* | Introduced | No |
| Western Red Cedar | *Thuja plicata* | Native | No |
| White Clover | *Trifolium repens* | Introduced | No |
| White Rein Orchid | *Platanthera dilatata* | Native | No |
| White Sweet-clover | *Melilotus alba* | Introduced | No |
| Wild Asparagus | *Asparagus officinalis* | Introduced | No |
| Willow | *Salix spp* | Native | No |
| Yarrow | *Achillea millefolium* | Native | No |
| Yellow archangel | *Lamiastrum galeobdolon* | Introduced | No |
| Yellow Flag Iris | *Iris pseudoacorus* | Introduced | No |

**TABLE A6: The Alaksen NWA Winter Bird Observations (2011 through 2017) and Current SARA Species Listing**

| **Species Name:** | **Genus Species:** | **COSEWIC status:** | **Schedule:** | **SARA Status:** |
|---|---|---|---|---|
| American Bittern | *Botaurus lentiginosus* | Not at Risk | No Schedule | No Status |

| | | | | |
|---|---|---|---|---|
| American Coot | *Fulica americana* | Not at Risk | No Schedule | No Status |
| American Pipit | *Anthrus rubescens* | Not at Risk | No Schedule | No Status |
| American Widgeon | *Mareca americana* | Not at Risk | No Schedule | No Status |
| Bald Eagle | *Haliaeetus leucocephalus* | Not at Risk | No Schedule | No Status |
| Barn Owl | *Tyto alba* | Threatened | Schedule 1 | Special Concern |
| Barn Swallow | *Hirundo rustica* | Threatened | No Schedule | No Status |
| Black-bellied Plover | *Pluvialis squatarola* | Not at Risk | No Schedule | No Status |
| Black-crowned Night-Heron | *Nycticorax nycticorax* | Not at Risk | No Schedule | No Status |
| Black swift | *Cypseloides niger* | Endangered | No Schedule | No Status |
| Blue-Winged Teal | *Spatula discors* | Not at Risk | No Schedule | No Status |
| Bufflehead | *Bucephala albeola* | Not at Risk | No Schedule | No Status |
| Cackling Goose | *Branta hutchinsii* | Not at Risk | No Schedule | No Status |
| Canada Goose | *Branta canadensis* | Not at Risk | No Schedule | No Status |
| Canvasback | *Aythya valisineria* | Not at Risk | No Schedule | No Status |
| Cinnamon Teal | *Spatula cyanoptera* | Not at Risk | No Schedule | No Status |
| Common Goldeneye | *Bucephala clangula* | Not at Risk | No Schedule | No Status |
| Common Loon | *Gavia immer* | Not at Risk | No Schedule | No Status |
| Common Merganser | *Mergus merganser* | Not at Risk | No Schedule | No Status |
| Cooper's Hawk | *Accipiter cooperii* | Not at Risk | No Schedule | No Status |
| Cormorant | *Phalacrocorax* | Not at Risk | No Schedule | No Status |
| Double-crested Cormorant | *Phalacrocorax auritus* | Not at Risk | No Schedule | No Status |

| | | | | |
|---|---|---|---|---|
| Dowicher | *Limnodromus* | Not at Risk | No Schedule | No Status |
| Dunlin | *Calidris alpina* | Not at Risk | No Schedule | No Status |
| Eurasian Widgeon | *Anas penelope* | Not at Risk | No Schedule | No Status |
| Gadwall | *Anas strepera* | Not at Risk | No Schedule | No Status |
| Glaucous-winged Gull | *Larus glaucescens* | Not at Risk | No Schedule | No Status |
| Golden-crowned Kinglet | *Regulus satrapa* | Not at Risk | No Schedule | No Status |
| Goldeneye | *Bucephala* | Not at Risk | No Schedule | No Status |
| Gray-bellied Hawk | *Accipiter poliogaster* | Not at Risk | No Schedule | No Status |
| Great Blue Heron | *Ardea herodias* | Special Concern | Schedule 1 | Special Concern |
| Greater Scaup | *Aythya marila* | Not at Risk | No Schedule | No Status |
| Greater White-fronted Goose | *Anser albifrons* | Not at Risk | No Schedule | No Status |
| Greater Yellowlegs | *Tringa melanoleuca* | Not at Risk | No Schedule | No Status |
| Green-winged Teal | *Anas crecca* | Not at Risk | No Schedule | No Status |
| Herring gull | *Larus argentatus* | Not at Risk | No Schedule | No Status |
| Hooded Merganser | *Lophodytes cucullatus* | Not at Risk | No Schedule | No Status |
| Horned Grebe | *Podiceps auritus* | Special Concern | No Schedule | No Status |
| Killdeer | *Charadrius vociferus* | Not at Risk | No Schedule | No Status |
| Lesser Scaup | *Aythya affinis* | Not at Risk | No Schedule | No Status |
| Lesser Yellowlegs | *Tringa flavipes* | Not at Risk | No Schedule | No Status |
| Long-billed Dowitcher | *Limnodromus scolopaceus* | Not at Risk | No Schedule | No Status |
| Long-tailed Duck | *Clangula hyemalis* | Not at Risk | No Schedule | No Status |

| | | | | |
|---|---|---|---|---|
| Mallard | *Anas strepera* | Not at Risk | No Schedule | No Status |
| Mallard | *Anas platyrhynchos* | Not at Risk | No Schedule | No Status |
| Marsh Wren | *Cistothorus palustris* | Not at Risk | No Schedule | No Status |
| Merlin | *Falco columbarius* | Not at Risk | No Schedule | No Status |
| Mew Gull | *Larus canus* | Not at Risk | No Schedule | No Status |
| Mute Swan | *Cygnus olor* | Not at Risk | No Schedule | No Status |
| Northern Flicker | *Colaptes auratus* | Not at Risk | No Schedule | No Status |
| Northern Goshawk | *Accipiter gentilis* | Not at Risk | No Schedule | No Status |
| Northern Harrier | *Circus cyaneus* | Not at Risk | No Schedule | No Status |
| Northern Pintail | *Anas acuta* | Not at Risk | No Schedule | No Status |
| Northern Saw-Whet Owl | *Aegolius acadicus* | Not at Risk | No Schedule | No Status |
| Northern Shoveller | *Anas clypeata* | Not at Risk | No Schedule | No Status |
| Northern Shrike | *Lanius excubitor* | Not at Risk | No Schedule | No Status |
| Northwestern Crow | *Corvus caurinus* | Not at Risk | No Schedule | No Status |
| Oriole | *Icterus spp.* | Not at Risk | No Schedule | No Status |
| Pacific Loon | *Gavia pacifica* | Not at Risk | No Schedule | No Status |
| Pelagic Cormorant | *Phalacrocorax pelagicus* | Not at Risk | No Schedule | No Status |
| Peregrine Falcon | *Falco peregrinus* | Special Concern | Schedule 1 | Special Concern |
| Pied-billed Grebe | *Podilymbus podiceps* | Not at Risk | No Schedule | No Status |
| Pileated Woodpecker | *Dryocopus pileatus* | Not at Risk | No Schedule | No Status |
| Red-breasted Merganser | *Mergus serrator* | Not at Risk | No Schedule | No Status |

| | | | | |
|---|---|---|---|---|
| Red-Necked Grebe | *Podiceps grisegena* | Not at Risk | No Schedule | No Status |
| Red-tailed Hawk | *Buteo jamaicensis* | Not at Risk | No Schedule | No Status |
| Red-throated Loon | *Gavia stellata* | Not at Risk | No Schedule | No Status |
| Ring-billed gull | *Larus delawarensis* | Not at Risk | No Schedule | No Status |
| Ring-necked Duck | *Aythya collaris* | Not at Risk | No Schedule | No Status |
| Ring-necked Pheasant | *Phasianus colchicus* | Not at Risk | No Schedule | No Status |
| Rough-legged Hawk | *Buteo lagopus* | Not at Risk | No Schedule | No Status |
| Ruddy Duck | *Oxyura jamaicensis* | Not at Risk | No Schedule | No Status |
| Sandhill Crane | *Grus canadensis* | Not at Risk | No Schedule | No Status |
| Sharp-shinned Hawk | *Accipiter striatus* | Not at Risk | No Schedule | No Status |
| Short-eared Owl | *Asio flammeus* | Special Concern | Schedule 1 | Special Concern |
| Short-billed Dowitcher | *Limnodromus griseus* | Not at Risk | No Schedule | No Status |
| Snow Goose | *Chen caerulescens* | Not at Risk | No Schedule | No Status |
| Sooty Shearwater | *Ardenna grisea* | Not at Risk | No Schedule | No Status |
| Sora | *Porzana carolina* | Not at Risk | No Schedule | No Status |
| Spotted Sandpiper | *Actitis macularia* | Not at Risk | No Schedule | No Status |
| Thayer Gull | *Larus thayeri* | Not at Risk | No Schedule | No Status |
| Tree Swallow | *Tachycineta bicolor* | Not at Risk | No Schedule | No Status |
| Trumpeter Swan | *Cygnus buccinator* | Not at Risk | No Schedule | No Status |
| Violet green swallow | *Tachycineta thalassina* | Not at Risk | No Schedule | No Status |
| Western Grebe | *Aechmophorus occidentalis* | Special Concern | Schedule 1 | Special Concern |

| | | | | |
|---|---|---|---|---|
| Western Meadowlark | *Sturnella neglecta* | Not at Risk | No Schedule | No status |
| Western sandpiper | *Calidris mauri* | Not at Risk | No Schedule | No Status |
| Whimbrel | *Numenius phaeopus* | Not at Risk | No Schedule | No Status |
| Wilson's Snipe | *Gallinago delicata* | Not at Risk | No Schedule | No Status |
| Wood Duck | *Aix sponsa* | Not at Risk | No Schedule | No Status |

## Appendix 3 Assessment of the occurrence of species listed on schedules 1 or 3 of the Species at Risk Act that are confirmed or likely to occur within the Alaksen NWA

| Species | Status | Recovery strategy/Management Plan | RS | MP | AP | Links |
|---|---|---|---|---|---|---|
| **Endangered** | | | | | | |
| Little brown myotis, *Myotis lucifugus* | **SARA:** 1- Endangered (2014)<br><br>**COSEWIC:** Endangered (2013)<br><br>**BC list:** Yellow<br><br>**Provincial Rank:** S4 (2015) | ECCC Recovery Strategy (2015) | | | | Little Brown Myotis Species Profile<br><br>ECCC Recovery Strategy<br><br>Little Brown Myotis Response Statement |
| Painted turtle: Pacific Coast population *Chrysemys picta* | **SARA:** 1- Endangered (2007)<br><br>**COSEWIC:** Threatened (2016)<br><br>**BC list:** Red | ECCC Recovery Strategy (2018).<br><br>BC Ministry of Environment Recovery Strategy (2016). | ECCC 2018<br><br>BC 2016 | | | Western Painted Turtle Pacific Coast pop Species Profile<br><br>Painted Turtle Response Statement |

| Species | Status | Recovery strategy/Management Plan | RS | MP | AP | Links |
|---|---|---|---|---|---|---|
| | **Provincial Rank:** S1S2 (2018) | | | | | ECCC Recovery Strategy |
| Brassy minnow *Hybognathus hankinsoni* | **SARA:** No Schedule<br><br>**COSEWIC:** Not Listed<br><br>**BC list:** No Status<br><br>**Provincial Rank:** S4(2011) | | | | | |
| **Threatened** | | | | | | |
| Barn owl *Tyto alba* | **SARA:** 1-Threatened (2018)<br><br>**COSEWIC:** Threatened (2010)<br><br>**BC list:** Red<br><br>**Provincial Rank:** S2 (2015) | BC Ministry of Environment Recovery Plan (2014). | BC 2014 | | | Barn Owl Species Profile<br><br>Barn Owl Response Statement |
| Barn swallow, *Hirundo rustica* | **SARA:** 1-Threatened (2017)<br><br>**COSEWIC:** Threatened (2011)<br><br>**BC list:** Blue | | | | | Barn Swallow Species Profile<br><br>Barn Swallow Response Statement |

| Species | Status | Recovery strategy/Management Plan | RS | MP | AP | Links |
|---|---|---|---|---|---|---|
| | **Provincial Rank:** S3S4B (2015) | | | | | Barn Swallow Response Statement |
| Northern goshawk, laingi subspecies *Accipiter gentilis laingi* | **SARA:** 1-Threatened (203)<br><br>**COSEWIC:** Threatened (2013)<br><br>**BC list:** Red<br><br>**Provincial Rank:** S2 (2010) | ECCC Recovery Strategy (2017).<br><br>BC Ministry of Environment Recovery Strategy (2008).<br><br>BC Ministry of Forests, Lands, and Natural Resource Operations Management Plan (2013). | ECCC 2017<br><br>BC 2008 | BC 2013 | PC 2016 | Northern Goshawk Species Profile<br><br>Northern Goshawk Response Statement<br><br>ECCC Recovery Strategy<br><br>Multi-species action Plan (Gwaii Haanas) |
| Northern saw-whet owl *Aegolius acadicus* | **SARA:** 1-Threatened (2007)<br><br>**COSEWIC:** Threatened (2017)<br><br>**BC list:** Yellow<br><br>**Provincial Rank:** S5B, S5N (2009) | Parks Canada Agency Recovery Strategy (2014) | PC 2014 | | | Northern Saw-whet Owl Species Profile<br><br>Northern Saw-whet Owl Response Statement<br><br>PC Recovery Strategy |
| **Special Concern** | | | | | | |
| Black swift, *Cypseloides niger* | **SARA:** No schedule, no status | | | | | Black swift Species Profile |

| Species | Status | Recovery strategy/Management Plan | RS | MP | AP | Links |
|---|---|---|---|---|---|---|
| | **COSEWIC:** Endangered (2015)<br><br>**BC list:** Blue<br><br>**Provincial Rank:** S2S3B (2015) | | | | | Black Swift Response Statement |
| Great blue heron, fannini subspecies | **SARA:** 1-Special Concern (2010)<br><br>**COSEWIC:** Special Concern (2008)<br><br>**BC list:** Blue<br><br>**Provincial Rank:** S2S3B, S4N (2018) | ECCC Management Plan (2017). | | ECCC 2017 | | Great Blue Heron Species Profile<br><br>ECCC Management Plan<br><br>Great Blue Heron Response Statement |
| Peregrine falcon, anatum/tundrius subspecies *Falco peregrinus anatum* | **SARA:** 1-Special Concern (2012)<br><br>**COSEWIC:** Not at Risk (2017)<br><br>**BC list:** Red<br><br>**Provincial Rank:** S2 (2011) | ECCC Management Plan (2017) | | ECCC 2017 | | Peregrine Falcon Species Profile<br><br>ECCC Management Plan<br><br>Peregrine Falcon Response Statement |

| Species | Status | Recovery strategy/Management Plan | RS | MP | AP | Links |
|---|---|---|---|---|---|---|
| Peregrine falcon, pealei subspecies *Falco peregrinus pealei* | **SARA:** 1-Special Concern (2003)<br><br>**COSEWIC:** Special Concern (2017)<br><br>**BC list:** List<br><br>**Provincial Rank:** S3 (2010) | | | | PC 2016, 2018 | Peregrine Falcon Species Profile<br><br>Peregrine Falcon Response Statement<br><br>Multi-species action Plan (Gwaii Haanas)<br><br>Multi-species Action Plan (Gulf Islands) |
| Horned grebe *Podiceps auritus* | **SARA:** 1-Special Concern (2017)<br><br>**COSEWIC:** Special Concern (2009)<br><br>**BC list:** Yellow<br><br>**Provincial Rank:** S4B, SNRN (2015) | | | | PC2018 | Horned Grebe Species Profile<br><br>Horned Grebe Response Statement<br><br>Multi-species Action Plan (Gulf Islands) |
| Short-eared owl *Asio flammeus* | **SARA:** 1-Special Concern (2012)<br><br>**COSEWIC:** Special Concern (2008) | ECCC Management Plan (2018) | | ECCC 2018 | | Short-eared Owl Species Profile<br><br>ECCC Management Plan<br><br>Short-eared Owl |

| Species | Status | Recovery strategy/Management Plan | RS | MP | AP | Links |
|---|---|---|---|---|---|---|
| | **BC list:** Blue<br><br>**Provincial Rank:** S3B, S2N (2015) | | | | | Response Statement |
| Western grebe *Aechmophorus occidentalis* | **SARA:** 1-Special Concern (2017)<br><br>**COSEWIC:** Special Concern (2014)<br><br>**BC list:** Red<br><br>**Provincial Rank:** S1B, S2N (2015) | | | | PC 2018 | Western Grebe Species Profile<br><br>Western Grebe Response Statement<br><br>Multi-species Action Plan (Gulf Islands) |