

Widgeon Marsh Regional Park Reserve

Biophysical Summary



March 2016



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Widgeon Marsh Regional Park Reserve



Legend

-  Regional Park Boundary
-  Waterbodies

Orthophoto 2014.
0.25 m resolution

0 500 1,000
Metres



Figure 1: Map. Widgeon Marsh Regional Park Reserve

Widgeon Marsh Regional Park Reserve Biophysical Summary

Background

In 1992, Metro Vancouver, Duck Unlimited and Nature Trust of BC, on behalf of the Pacific Estuary Conservation Program, partnered to purchase 580 hectares of land to establish Widgeon Marsh Regional Park Reserve (WMRPR). Since the original purchase, successive purchases and land donations have expanded the land base to 626 hectares of wetland, second-growth forest and minimally disturbed areas with road access. The site is managed as a regional park reserve, essentially a park-in-waiting. No park facilities have been developed and access is limited to a small group of residents and researchers under permit.

In 2015, Metro Vancouver initiated a park planning process with the goal of developing a plan that will eventually see WMRPR open as a regional park. This report provides an overview of the biophysical and built features of the park-reserve based on available information at the outset of the planning process. It is intended to inform the park plan.



Figure 2: WMRPR. Looking north over marsh

Widgeon Marsh Context

Situated at the confluence of Pitt Lake, Widgeon Creek and the lower Pitt River, Widgeon Marsh Regional Park Reserve (WMRPR) protects some of the most ecologically sensitive lands in the region. The park reserve encompasses 626 hectares of wetland and uplands on the west side of the Pitt River near the mouth of Pitt Lake. The park reserve is bordered by Pinecone-Burke Provincial Park to the west, Widgeon Valley National Wildlife Reserve to the north and the Katzie First Nation to the north east (Figure 1). The southern portion of the reserve is within the City of Coquitlam, while the northern half lies within Electoral Area A. Access to the reserve is via Quarry Road, an un-paved municipal road or via small watercraft on Widgeon Slough.

The park reserve is part of a regionally and nationally significant tidal wetland and wilderness area. The wetland complex is recognized as the largest freshwater marsh in southwestern BC, and is an important stop over on the Pacific flyway, providing wintering habitat for a variety of wetland birds, including green-winged teal, gadwall, American wigeon, trumpeter swans, ring-necked ducks, wood ducks, buffleheads and hooded mergansers. The wetlands also provide year round or breeding habitat for a variety of species including sandhill crane, great blue heron, American bittern, bald eagle, osprey, beaver and river otter. The Pitt-Widgeon wetland complex is surrounded by a vast wilderness area that includes Pinecone Burke, Golden Ears and Garibaldi Provincial Parks, making it one of the largest protected areas in south-western British Columbia. Situated on the doorstep of this vast wilderness area, the park reserve offers untapped opportunities for nature appreciation and wilderness recreation (Map Appendix A1).

Cultural History

The park reserve falls within the asserted territories of Katzie First Nation, Kwikwetlem First Nation, Stó:lō Nation, Stó:lō Tribal Council, Tsawwassen First Nation, Soowahlie First Nation, Seabird Island Band, Shxw'ow'hamel First Nation, and Skawahlook First Nation. The Katzie, in particular, have a strong connection with the area. Ethnographic records show an ancient and rich history of Katzie use of the Pitt Lake watershed, including Widgeon marsh, slough and the adjacent upland forest (Katzie Development Corporation Archaeology, 2015). A Katzie village site was situated adjacent to Widgeon Marsh (on what is now IR #4). Both the Katzie and the Kwikwetlem First Nation have place names for many geographic and cultural features present in the marsh (Katzie Development Corporation Archaeology, 2015).

Widgeon Marsh was, and continues to be an important resource to the Katzie First Nation. The marsh, river and upland forest provide an abundant supply of large game, fish, freshwater mussels, roots and berries which were and continue to be an important resource for the Katzie people:

Katzie continue, as they have done for millennia, to harvest the resources located throughout Widgeon Marsh. In particular Widgeon Marsh is the one of the last remaining sites where wapato (*Sagittaria lattiifolia*), a starchy semi-aquatic herbaceous tuber, similar to a potato grows in abundance. Katzie are renowned for their ancient attachment to this important resource. Archaeological evidence suggests that Katzie management of wapato and other wetland resources stretches back at least 4000 years. (Katzie Development Corporation Archaeology, 2015).

The Katzie consider the wapato population within Widgeon Slough a critical resource as it represents the only known population where the lack of urban development and/or industry ensures the tubers are free of pollutants and safe to eat. Wapato is harvested annually from at least three locations on Widgeon Slough in January and February (Roma Leonne, pers. Comm). The population is stable and appears to be growing.

Geomorphology

The present landscape is a product of glacial and fluvial processes. During the Pleistocene period at least three major glacial advances occurred – the last of which, the Fraser glacial period, ended approximately 11,000 years ago. During the glacial periods, ice covered the region to a depth of at least 2500 meters, scouring out U-shaped valleys in the Coast Mountain Range along north-west and north-east joint lines. As the ice retreated at the end of the last glacial period, it left numerous fiords and elongated lakes in interior valleys. In the early post-glacial period the location of the shore fluctuated as a result of complex interaction of sea level rise and isostatic rebound. Melt-water from retreating glaciers cut through valley bottoms, forming new rivers and bringing massive amounts of sediment to form moraines and deltas.

Widgeon Valley is a typical U-shaped valley. The valley is approximately 4 to 5 km wide at the bottom and is bordered by Coquitlam Mountain and Widgeon Peak to the west and an un-named ridge to the east that separates the Widgeon Valley from the Upper Pitt River Valley. Widgeon Valley connects to the lower Pitt River Valley near the mouth of Pitt Lake. Evidence suggest that that Widgeon Valley and Pitt Lake were former fiords that were sealed off with the rapid expansion of the Fraser River Delta approximately 8000 years ago (Roddick & Armstrong, 1965).

WMRPR is situated at the confluence of Widgeon Valley and the Pitt River Valley, the park reserve includes the wetland margins of Widgeon Creek and Widgeon Slough, all of Siwash Island and the lower slope of Mount Burke. Topography ranges from depressions or flat in wetland areas to very gently sloping on adjacent lands and very steeply sloping (up to 90%) on the valley sides. ([Map Appendix A2](#))

Wetland morphology is strongly shaped by tidal processes. Flood tides carry Fraser River sediments upstream on the Pitt River where they are deposited at the mouth of Pitt Lake forming a unique reverse delta, the largest reverse delta in North America (FREMP Water and Land Use Committee, 2005). In general, coarser material is deposited in the Pitt River on flood tides and finer silts are deposited at the southern end of Pitt Lake on ebb tides. These materials are virtually identical in composition and structure to materials deposited in the lower Fraser Delta (Luttmerding, 1981) suggesting a shared origin. The material in Widgeon Slough and Siwash Island are similar in character but have slightly different composition, indicating a different pattern of deposition that is not well understood (Ashley, 1977).

Soils

Siwash Island and lands adjacent to Widgeon Creek and Widgeon Slough are characterized by recent alluvial deposits and/or medium-textured sediments overlain with decomposed organic materials (Luttmerding, 1981) ([Map Appendix A3](#)) In contrast, upland soils are primarily glacial till, coarse-textured fluvial fan deposits or colluvium from the steep sided slopes. The steepest slopes have

exposed bedrock. The lower slopes of Mount Burke within WMRPR are classified as quartz diorite – a mixture of quartz, feldspar and hornblende minerals that frequently break along joint lines (Roddick & Armstrong, 1965). Rocks and boulders are various sizes litter the bottom of steep slopes and there is evidence of past landslides at a number of locations, with the most recent slide occurring in March 2013.

	SOIL NAME	SOIL MATERIAL	DRAINAGE
WETLAND SOILS	ADDINGTON	15 – 40 cm of organic material over medium textured mixed floodplain materials	Very poor. High ground water, subject to flooding
	GLEN VALLEY	More than 160 cm of decomposed organic material mainly reeds, sedges and grasses	Very poor, high ground water table
	STURGEON	Medium textured mixed floodplain deposits	Poor to very poor, high ground water table
	WIDGEON	40-160 cm of organic deposits over medium-textured mixed floodplain deposits	Very poor, high ground water, subject to flooding
UPLAND SOILS	BUNTZEN	Moderately coarse to medium textured glacial till	moderately well drained
	CANNEL	10-50 cm of moderately coarse textured glacial till or colluvium over bedrock	Well to rapid
	DEAN	Course textured alluvial fan deposits	Moderately well
	EUNICE	More than 10 cm of organic material over bedrock	Well to rapid
	ISAR	Course textured alluvial fan deposits	Well to rapid
	PATON	Coarse textured alluvial-colluvial fan deposits	Well
	SHALISH	Course textured alluvial fan deposits	Moderately well to well

Figure 3: Soils of WMRPR

Hydrology

Widgeon Creek drains water from the steep mountain slopes to the valley floor forming a slow-moving wetland stream that flows into the Pitt River to the Fraser River and the Strait of Georgia. Widgeon Creek, Widgeon Slough and the Pitt River and Pitt Lake are strongly influenced by tidal processes, which vary seasonally. In general, water levels on Widgeon Slough and Widgeon Creek follow the stage levels in the Strait of Georgia. Rising water levels in the strait retard the flow of the Fraser River, raising the elevation, or stage level, progressively eastward. When water level at the confluence of the Fraser and Pitt River reaches a level that is higher than the Pitt River, the flow on the Pitt River reverses and water is diverted from the Fraser to the Pitt River. As the stage level falls in the strait, flows on the Fraser River accelerate and the surface level is lowered progressively eastward until the level at the Pitt-Fraser confluence is lower than that of the Pitt. Flow then reverses in the Pitt and drains to the sea.

The influence of tides varies seasonally. During the winter months, water levels follow the tidal patterns on the Strait of Georgia, but with reduced tidal range and considerable lag-time. Ashley (Ashley, 1977) recorded an average lag of 5 hours and 15 minutes for flood tides and an even longer lag of 6 hours 20 minutes for ebb tides in winter. In contrast, the average lag time between high tide on the strait and high tide at the mouth of Pitt Lake was more than 15 hours during spring freshet. If water levels on the Pitt River and Fraser are very high the Pitt River may not reverse course at all.

Seasonal variation is largely a result of changes in basin discharge. Tidal influence is greatest during winter months (December to February) when basin drainage accounts for less than 5% of water flowing through the Pitt River (Ashley, 1977). River currents – both flood and ebb – are generally stronger in fall and winter when tidal influence is greater. In contrast, drainage from the Pitt and Fraser River basins may contribute more than 50% of flows during freshet (May to July). During freshet, water added by streams draining into the lake raises the surface level by as much as 3 meters. The elevation of the Fraser River is also increased and the net effect is a decrease of flow into the Pitt River. The raised lake elevation also accentuates the time-stage asymmetry of the tidal cycle and changes the proportion of flood and ebb flows. In summer, the ebb current flows for a longer period of time (65 – 75% or total) at a lower discharge rate than in winter. Ashley recorded a mean tidal range of 1.4 meters in December, 0.45 meters in June and 0.64 meters in September 1977. Water levels can vary by as much as 4 meters on extreme tide events (FREMP Water and Land Use Committee, 2005).

A number of streams flow from the steep mountain slopes through WMRPR to feed Widgeon Creek and Widgeon Slough. The largest of these is Stewart Creek. Stewart Creek (aka Stuart Creek) is a high energy, third-order stream that is fed by a number of small lakes above 800 meters, cascades through a series of waterfalls and crosses under the bridge on Quarry Road before flowing into Widgeon Slough. There is an abandoned water intake structure and pipe on the upper falls (elevation 60 meters) that was originally created to divert water for domestic consumption and a failed crayfish rearing enterprise. The dam was abandoned when rock falls damaged diversion pipes (Ron Wood, personal communication).

Nathan Creek is the local name given to an unnamed creek flowing from Burke Mountain with branches flowing east through the wetland basin to Widgeon Creek and south-east to a man-made pond before flowing into Widgeon Slough. The lower reaches of the creek are tidal. Water is diverted from the upper reach at 40 meter elevation level to a cistern that provides water for the residences. The weir and cistern are located just outside the park border on Pinecone-Burke Provincial Park lands. The water licence is incorrectly assigned to Stewart Creek.

An unnamed stream near the southern end of the property flows from the mountain slopes through a culvert to a human-made pond on the former Edward property. The pond was excavated by the former resident to 3 m (10 feet) at one end (south) and 0.3 m at the other end (Styx, 2007). It drains through a 2 meter diameter arched culvert that is inverted with the flat bottom on the top and the arch at the bottom to allow passage of salmonids. The outlet connects to a constructed channel through wetland to Widgeon Slough. The channel, which is accessible at high tides, was created by the former resident to provide boat access.

Wetland Ecosystems

Widgeon Slough and Widgeon Creek

Widgeon Slough and Widgeon Creek are technically outside the park boundary. Widgeon Slough is the jurisdiction of the Vancouver Fraser Port Authority, and Widgeon Creek is the jurisdiction of the Province. These waterways are significant features of the park and have a profound influence on wildlife and species assemblages. Numerous marsh birds including American bittern, sandhill cranes, common yellowthroats and marsh wrens nest in the sedges and grasses adjacent to the slough. In winter, the calm waters attract large numbers of green-winged teal, gadwall, mallards, wood ducks, American wigeon, trumpeter swans, bufflehead and hooded mergansers. Greater and lesser yellowlegs forage on mudflats at low tides and bald eagles, northern harriers and osprey hunt over the open water and marshes year round. River otters, beavers, mink and muskrat move through streams into adjacent channels and marshes. Coho, chum, sockeye, cutthroat trout and steelhead spend time in Widgeon Creek and Widgeon slough before migrating to the ocean (BC Ministry of the Environment). The slough and creek are spawning grounds for a unique population of late-run sockeye salmon. Recognized as a distinct conservation unit (CU), this population of river-type sockeye arrives later than and is genetically distinct from the Pitt Lake sockeye salmon that spawn in the tributaries of the Upper Pitt and rear in Pitt Lake.

Widgeon (River-Type) Sockeye are possibly the most unique CU in the Fraser Watershed. This population is adapted to the tidal conditions of Widgeon Slough. The fish move back and forth between Pitt Lake and Widgeon Slough with the tides, moving into the slough to spawn on high tides and moving into Pitt Lake on low tides. Due to consistent Sockeye movement into the slough, a channel has developed through which they migrate, facilitating the counting of fish. Sockeye also move into areas in Widgeon Slough where eel grass covers the spawning gravel, though it is unclear whether they do this for protection from predators (defense) or for spawning. Water levels are very low during low tide (de-watered) with only sufficient cover for egg incubation, therefore, atypical of the Sockeye species, females cannot remain with their nests until they die. Overall, the spawning area is very small (~100 m in length) and visibility of Sockeye is good. Widgeon Sockeye migrate to the ocean after gravel emergence and do not rear in lakes as juveniles. Widgeon (River-Type) Sockeye are also the smallest adults in the watershed. (Grant , et al., 2011)

The Widgeon population spawns from mid to late November. Escapement (adult males, females) was estimated at 137 in 2015, 31% of the ten-year average of 444. (Fisheries and Oceans Canada, 2015).



Figure 4: Widgeon Slough and wetland communities

Wetland Plant Communities

The wetland communities were mapped and classified in 2015 by RainCoast Applied Ecology (Page & Schaefer, 2015) following the methodology described in *Land Management Handbook #52: Wetlands of British Columbia: A Guide to Identification*. (McKenzie & Moran, 2004). ([MAP appendix A4](#)). The study area for this inventory includes Widgeon Creek and Widgeon Slough, which are outside the park boundary but are integral to the ecology of the park. Page and Schaefer identified seventeen distinct wetland plant associations representing aquatic, marsh, bog, fen, swamp and floodplain-forest communities. Most were native plant communities, but three were dominated by non-native plants. The descriptions below are derived from *Widgeon Marsh Regional Park Reserve: Terrestrial Ecosystem Mapping, Rare Plant Survey and Vegetation Assessment* (Page & Schaefer, 2015).

Aquatic Communities (AQ)

Aquatic communities consist of rooted submerged and floating-leaved vegetation in still or slow-moving shallow open water. Page and Schaefer identified five aquatic plant associations based on dominant plants in vegetation plots: bur-reed (*Sparganium* sp.); broad-leaved arrowroot or wapato (*Sagittaria latifolia*), Ussarian water-milfoil (*Myriophyllum ussuriense*); yellow pond lily and non-

native bulbous rush (*Juncus bulbosus*). Other aquatic species present include pondweed (*Potamogeton* sp), western water-millfoil (*Myriophyllum hippuroides*), flat-leaved bladderwort (*Utricularia intermedia*), greater bladderwort (*Utricularia macrorhiza*), pygmyweed (*Crassula aquatic*) and wild rice (*Zizania aquatica* var. *aquatica*). Because the species assemblages were frequently intermixed, there was no attempt to delineate specific aquatic plant assemblages. A total of 55.8 ha of wetland were mapped as “aquatic communities.” These include areas in Widgeon Slough and Widgeon Creek that are outside the park boundary as well as narrow tidal reaches within the park boundary.

Marsh

McKenzie and Moran (2004) define a marsh as “a permanent to seasonally flooded non-tidal mineral wetland dominated by emergent grass-like vegetation.” Marshes are typically found in shallow potholes and depressions, and along lake and river margins. They are often floristically simple plant communities dominated by one or two aggressive plant species that are well adapted to fluctuating water levels (McKenzie & Moran, 2004). At WMRPR, the hydrological regime is also influenced by daily tidal cycles and active sedimentation. Thus, the plant communities may share characteristics in common with estuarine ecosystems. However, unlike typical estuarine ecosystems, where plant species are adapted to repeated (diurnal) flooding sedimentation and brackish water, the plant communities at WMRPR are exposed only to fresh water. Salt intrusion rarely extends to the confluence of the Pitt and Fraser Rivers (FREMP Water and Land Use Committee, 2005).

Marshes are critically important wetland ecosystems for many wildlife species. They are the most heavily used wetland type for most wetland-obligate wildlife species, as they support a large amount of palatable vegetation, plankton, and aquatic invertebrates. Page and Schaefer (2015) mapped 155.8 ha of marsh in the study area, 115 ha of which was dominated by native vegetation. Five ecological communities were identified. Three of these are consistent with site associations described in *Wetlands of British Columbia*. The marsh plant associations were frequently intergraded from one to another, or were mixed and as a result were frequently mapped as complexes of two or three community types. The following descriptions are ordered from the wettest to driest.

Wild rice marsh (WR): Wild rice (*Zizania aquatica* var. *aquatica*) was first recorded in Widgeon Marsh in 2004 by J. Saarela and C. Sears (2006). In some locations, wild rice is co-dominant or associated with aquatic plants, including Rocky Mountain pond-lily (*Nuphar polysetum*), western water-milfoil (*Myriophyllum hippuroides*) and/or pondweed (*Potamogeton*) species. As the plant community is based on an uncommon non-native species, there is no corresponding plant community in the *Wetlands of British Columbia*.

Swamp horsetail – Beaked sedge marsh (SH): This provincially blue-listed community is found infrequently in the Interior Region of BC, but also occurs along the Outer Coast in tidal reaches of large rivers above saltwater influence (MacKenzie and Moran, 2004). Swamp horsetail (*Equisetum fluviatile*) tolerates extreme variations in water rates and high rates of sedimentation. It is often co-dominant with Beaked Sedge-Marsh. In WMRPR, swamp horsetail is the dominant plant in the community, accounting for 35-80% cover; beaked sedge (*Carex utriculata*) is absent or a very minor component. This plant community covers approximately 90 hectares. Other native plants present include three-way sedge (*Dulichium arundinaceum*), hemlock water-parsnip (*Sium suave*), skullcap speedwell (*Veronica scutellata*), field mint (*Mentha arvensis*). Two blue listed (threatened) species

are also present: the aquatic Ussurian water-milfoil (*Myriophyllum ussuriense*) on wet sites and mountain sneezeweed (*Helenium autumnale* var. *grandiflora*) on drier sites at the margins of mud flats. Non-native plants include bog loosestrife (*Lysimachia terrestris*), Canada rush (*Juncus canadensis*), brown-fruit rush (*J. pelocarpus*) and purple loosestrife (*Lythrum salicaria*).

Sitka sedge – Hemlock-parsley marsh (SM): This provincially blue listed community occurs in the Georgian Depression and the Coast Region in basins, and along slow moving streams, ponds and lakeshores, where it often appears as a mono-culture of sitka sedge (*Carex sitchensis*) (McKenzie & Moran, 2004). At WMRPR, this plant association accounts for approximately 4.7 hectares. Sitka sedge is the dominant plant with an average 70% cover. Hemlock-parsley (*Oenanthe sarmentosa*) does not appear to be present. Other native species noted by Page and Schaefer (2015) include swamp horsetail, three-way sedge (*Dulichium arundinaceum*), skunk cabbage (*Lysichiton americanum*), hemlock water-parsnip, and Douglas' water-parsnip (*Cicuta douglasii*), bluejoint reedgrass (*Calamagrostis canadensis*) and tufted hairgrass (*Deschampsia cespitosa*). Non-native species present include bog loosestrife and reed canarygrass (*Phalaris arundinacea*).

Bluejoint reedgrass marsh (BJ): There is no provincial equivalent site series for this plant community. Bluejoint reedgrass (*Calamagrostis canadensis*) is relatively common in Widgeon Marsh. Usually associated with swamps and flood ecosystems, bluejoint reedgrass occurs predominantly in the transition zone between marsh and sweet gale swamp in WMRPR, where it accounts for an average of 64% cover. It occurs with Sitka sedge averaging 18% cover, but ranging from 0.5 to 40%. Associated plants include marsh cinquefoil (*Comarum palustre*), hardhack (*Spiraea douglasii* ssp. *douglasii*), tufted hairgrass (*Deschampsia cespitosa*), skunk cabbage, field mint, Douglas' aster (*Symphotricum subspicatum*), and king gentian (*Gentiana sceptrum*).

Reed canarygrass marsh (RG): McKenzie and Moran identify reed canarygrass (*Phalaris arundinacea*) dominated plant association as a disclimax community - a self-perpetuating community that strongly differs in species composition from edaphic or climatic climax for the site (McKenzie & Moran, 2004). At WMRPR, Reed canarygrass averages 82% cover, reaching 90-100% cover and choking out native species on some sites. Other species present in this plant community Sitka sedge and blue joint reedgrass and, to a lesser extent, skunk cabbage, field mint and purple loosestrife (the latter also an invasive) on wetter sites.

Generic Marsh (GM): Page and Schaefer (2015) used this classification to identify marsh communities that were not visited in the field. The generic marsh unit was used for approximately 21 ha.

Fen

Fens are nutrient-medium peatland ecosystems typically dominated by sedges and brown mosses, where mineral-bearing groundwater is within the rooting zone. Low shrub or graminoid cover is typical, as the high water table precludes tall shrubs and trees (MacKenzie and Moran, 2004). Fens develop where permanently saturated soil conditions are maintained. Although fens are the most common wetland class in the province of BC (MacKenzie and Moran, 2004), they are relatively rare in the Lower Mainland and are highly valued ecosystems.

Sweet gale – Sitka sedge fen (SX): This red-listed ecosystem is located along the northern boundary of the park. Here sweet gale, the dominant shrub averaging 70% cover, is stunted and typically less

than 40 cm tall (compared to 1.5m tall in the sweet gale shrub swamp). Bog cranberry (*Vaccinium oxycoccos*) is a common associate in the shrub layer, averaging just over 10% cover. Sitka sedge is present although at low cover (average of 4%). Herbaceous species not found in the marshes or swamps of the study area are also found here. These include few-flowered sedge (*Carex pauciflora*), white beak-rush (*Rynchospora alba*) and the non-native tawny cotton-grass (*Eriophorum virginicum*). The bryophyte layer is well-developed, with an average 80% cover of peat-mosses, mostly magellanic peat-moss (*Sphagnum magellanicum*). The closest fit of this ecological community to the classification system for wetlands of BC (MacKenzie and Moran, 2004) is the Sweet Gale – Sitka Sedge Fen (Wf52), although Sitka sedge is much less common in these occurrences than typical, cottongrass is common and the peat-moss layer is significantly more developed. Almost 18 ha hectares of this fen type were mapped.

Swamp

Swamps are nutrient-rich wetland ecosystems with flowing or fluctuating semi-permanent near-surface water table (MacKenzie and Moran, 2004). They are characterized by a high cover of tall shrubs and/or trees plus a typically well-developed herb layer. The length and depth of flooding and the degree of water flow are primary factors affecting species composition. At WMRPR swamp communities may be affected by extreme high tides and seasonal flooding associated with local run-off and annual freshet. Thus, they share characteristics in common with flood ecosystems and estuarine environments. Swamps are important habitats for wildlife. Swamps often contain skunk cabbage, an important food item for black bears. They have more vertical structure than other wetland classes and therefore provide cover and nesting habitat for many bird species.

Sweet gale shrub swamp (GB): Sweet gale shrub swamps are the dominant ecological community in WMRPR, occupying approximately 247 ha. There is no corresponding site series identified in the *Wetlands of British Columbia*. This community are likely transitional between swamp and Sweet gale – Sitka sedge fen described in McKenzie and Moran (Page & Schaefer, 2015). It is found closer to river channels compared to the fen community described above, thereby receiving periodic flooding and some input of nutrients. Skunk cabbage is occasionally present, a species more typical of swamps than of fens. Shrubs are taller and denser. Sweet gale forms a dense thicket of typically 1.5 m, at an average of 75% cover. Hardhack is sub-dominant averaging 14% cover. The herbaceous layer is occupied by bluejoint reedgrass on some sites (14% cover); sitka sedge is present but at very low cover (2% on average). Species richness overall is very low. Peat-moss abundance is highly variable, only occurring in one third of the plots studied, but averaging 30% cover at those sites.

Hardhack – Sitka sedge shrub swamp (HG): Although hardhack is relatively common throughout the sweet gale and pacific crab apple swamps, there are few areas where hardhack is the dominant shrub. Although Sitka sedge was not present in assessed plots, this plant community is consistent with Hardhack-Sitka sedge swamp (Ws:50) in *Wetlands of BC*. Diversity is generally low, with a dense shrub layer of hardhack (45-75% cover). Sweet gale (*Myrica gale*) is a lesser dominant. Reed canarygrass is often intermixed, and skunk cabbage is present at low cover in some areas. Unlike other swamp communities, hardhack shrub swamps are typically low in diversity and are less used by wildlife (Page & Schaefer, 2015). This plant association, which covers approximately 0.65 hectares, is yellow-listed (not at risk) in British Columbia.

Pacific crabapple shrub swamp (CB). Pacific crabapple shrub swamp occupies approximately 31.6 ha in WMRPR. This plant association is characterized by thickly vegetated overstorey of Pacific crabapple (5–10 m tall), comprising approximately 80% cover. Salmonberry (*Rubus spectabilis*), hardhack and cutleaf evergreen blackberry (*Rubus laciniatus*) make up the shrub layer. False lily-of-the-valley (*Maianthemum dilatatum*) and few-flowered sedge (*Carex pauciflora*) are found where shrub density is reduced, often beneath dense crabapple. Bryophytes are abundant with magellanic peat-moss (*Sphagnum magellanicum*) averaging 27% cover (although ranging from 1-60%) and haircap moss (*Polytrichum* sp.) at approximately 6% cover. The same community was also documented by Page and Schaefer in three plots in the Pitt Polder Ecological Reserve in 2012 (Page & Schaefer, 2015). MacKenzie and Moran (2004) describe a flood site association of Pacific crabapple – False lily-of-the-valley (*Maianthemum dilatatum*), occurring on BC's outer coast at the upper limit of tidal influence in the transition between the upland forest and estuarine ecosystems. There is no provincial wetland code for the site association it has not been assessed for rarity.

Paper birch swamp (BH). One occurrence of a paper birch (*Betula papyrifera*) swamp is found within the study area. The canopy is quite open (30% cover) and the largest trees are 10-15m in height. The shrub layer is dominated by birch saplings with some hardhack present. Peat moss occupies most of the forest floor. Bluejoint reedgrass and sitka sedge are found in the herbaceous layer; skunk cabbage is also found in the wetter pockets. There is no provincial wetland code listed for this swamp, as it likely represents an early seral stage, perhaps of a climax community of Western red cedar / Sitka spruce – Skunk cabbage (CWHdm/12). This swamp type accounts for 1.1 ha of the study area.

Bog

A bog is a nutrient-poor peat-moss (*Sphagnum*) dominated ecosystem in which the rooting zone is isolated from mineral-enriched groundwater, soils are acidic, and few minerotrophic plant species occur (MacKenzie and Moran, 2004). True bogs only receive water inputs as precipitation. There was one forested bog unit located in the northeast portion of the study area. There was also a smaller unit in the National Wildlife Area to the north. While the bog community of Widgeon Marsh may receive some groundwater input and therefore not be a true bog, it is best encompassed in the BC wetland classification system as a bog community based on its floristic and physiognomic characteristics (Page & Schaefer, 2015). MacKenzie and Moran (2004) describe a Georgia Basin bog unit as an associated ecological community. Under the provincial terrestrial ecosystem mapping system, the bog is also classified as a forested ecosystem and is designated as Lodgepole Pine / Peat-moss (site series 11) of the Coastal Western Hemlock Dry Maritime Subzone (CWHdm).

Lodgepole pine / Peat-moss bog (LS): The northeastern portion of the study area contains a treed bog. Lodgepole pine or shore pine (*Pinus contorta*) trees accounted for 30% cover on average. Tree growth was variable including older trees, as well as young trees with rapid growth. Labrador-tea (*Rhododendron groenlandicum*) was abundant in the shrub layer, covering roughly two-thirds of the bog. Western bog-laurel (*Kalmia microphylla*) is present in varying amounts among the Labrador-tea and bog blueberry (*Vaccinium uliginosum*) oval-leaved blueberry (*Vaccinium ovalifolium*) and bog cranberry (*Oxycoccus oxycoccus*). Cloudberry (*Rubus chamaemorus*) is also found at these sites, but at very low cover. The bog floor is dominated by peat moss, usually common red peat-moss (*Sphagnum capillifolium*) averaging 40% cover, and magellanic peat-moss at 20% cover in half the

plots. Haircap moss is a frequent associate in the bryophyte layer. The bog area accounted for 17.4 ha of the study area.

Floodplain

Like bog forests, floodplains are classified both as wetlands and terrestrial ecosystems. Flood ecosystems occur in narrow benches along streams and are classified according to height of bench, and frequency and duration of flooding. These ecosystems are dominated by willows, dogwoods and deciduous trees that are tolerant of extended flooding, deposition and erosion.

Cottonwood-red alder/salmonberry (CD). Page and Schaeffer identified a narrow strip of medium bench broadleaf forest adjacent to Widgeon Creek. This blue listed ecosystem is consistent with Cottonwood-red alder-Salmonberry (Wf50) site association described in *Wetlands of BC* (McKenzie & Moran, 2004) and Cottonwood-Red osier dogwood (CWHdm/09) described in *Field Guide to Site Identification and Interpretation for the Vancouver Forest Region* (Green & Klinka, 1994). This site association covers approximately 1.5 hectares.

Terrestrial Ecosystems

Forested Ecosystems

WMRPR lies within the Coastal Western Hemlock dry maritime (CWHdm) biogeoclimatic zone. Approximately 295 hectares of the lands are forested. Blackwell and Associates (2006) identified seven CWHdm forested site series soil moisture and nutrient regimes and floristic composition (Pojar, Klinka, & Demarchi, 1991). (Map Appendix A5) Five are provincially blue-listed (of special concern) and one is red-listed (endangered or threatened) (BC Conservation Data Centre, 2013). Forest stands range in age from approximately 30 years to 100 years. The most recent logging occurred in the mid-1980s when approximately 42 hectares were logged. The logged areas were assessed in 1992 and were observed to be regenerating naturally.

Western hemlock - flat moss: This blue listed site series covers an estimated 100 hectares, accounting for approximately 34% of the forested lands at Widgeon. Soils are slightly dry to fresh with a very poor to medium nutrient regime. The site series typically occurs on middle slopes and gently sloping heights of land. Associated soils are sandy to loamy-skeletal and are moderately deep to deep. Western hemlock, Douglas-fir and western red cedar are the dominant species forming dense stands. Shrub and herb layers are typically poorly developed in mature stands. Vine maple, salal, huckleberry and Oregon grape and sword fern may be present in forest gaps and openings. The moss layer is well-developed, featuring Oregon beaked-moss (*Kindbergia oregano*) in early successional stages, and *step moss (Hylocomium splendens)*, lanky moss (*Rhytidiadelphus loreus*), and flat moss (*Plagiothecium undulatum*) in later successional stages.

Douglas-fir - Western hemlock – salal: This blue-listed site series accounts for approximately 32 hectares or 11% of the forested lands in WMRPR. It occurs with or above the Western-hemlock flat moss site series on water shedding sites. This association is characterized by moderately dry and nutrient very poor to medium soils. Sites are dominated by Douglas-fir, with smaller amounts of western hemlock and western red cedar. Tree growth is generally slower on these sites due to a

sever nitrogen deficiency and summer water deficit. In contrast to the Western hemlock-flat moss site series, the shrub layer is well developed with salal the dominant shrub species and Oregon grape and huckleberry scattered throughout. The herb layer is very poorly developed with bracken fern as the only constant species. The moderately developed moss layer includes primarily Oregon beaked moss and step moss.

Red cedar - sword fern: This blue-listed site series accounts for approximately 30% of the forested lands at Widgeon marsh reserve. The site series is characterized by slightly dry to fresh, nutrient rich to very rich sites. It occurs primarily on mid slopes and is dominated by western red-cedar, douglas-fir and western hemlock. Big leaf maple and red alder occur on younger sites. The shrub layer is moderately well developed with vine maple and Oregon grape the dominant species. The herb layer is dominated by sword fern. The moss layer is poorly developed and includes flat moss, lanky moss and coastal leafy moss (*Plagiomnium insigne*)

Red cedar - foam flower: This blue-listed site series covers approximately 17% (50 hectares) of forested lands. It occurs with or below Cw-sword fern site series on water receiving sites. Soils are moist to very moist and rich to very rich in nutrients. Western red cedar, hemlock and Douglas-fir are dominant tree species along with red alder and big leaf maple. This is a floristically rich site series. Vine maple and salmonberry are the dominant shrubs and devils club may be present in seepage areas. The herb layer is well developed with sword fern, lady fern, wood fern, deer fern and foam flower. Mosses include flat moss, lanky moss, coastal leafy moss, palm tree moss (*Leucolepis menziesii*) and common feather moss (*Kindbergia praelonga*).

Western Hemlock-Red cedar - Deer Fern: This site series is provincially red-listed (endangered or threatened). Blackwell et al identified three small stands totalling approximately 6 hectares, or 2% of the forested lands at Widgeon. A fourth stand adjacent to the View House was identified by Styx and Associates (2007), this area was not included in the forest inventory by Blackwell. The site series is characterized by moist to very moist, nutrient poor (very poor to medium) soils. Dominant tree species include western hemlock, western red cedar and douglas-fir. The shrub layer is dominated by Ericaceae shrubs – red huckleberry, Alaskan blueberry, false azalea and salal. Deer fern, spiny wood fern, sword fern, kinnikinnik and bunchberry make up the herb layer.

Redcedar - Sitka spruce - skunk cabbage: This blue listed site series is consistent with a swamp-forest wetland. It is associated with wet nutrient medium to very rich sites at lower elevations and accounts for approximately 1% of the forested lands at Widgeon. Vegetation is strongly affected by micro-topography with western red cedar, Sitka spruce and western hemlock occurring on drier organic mounds. Red alder is found on younger sites and may persist in depressions. Salmonberry dominates the moderately well-developed shrub layer, and herb, including skunk cabbage, false lily of the valley, bunchberry, lady fern, deer fern and foam flower are generally confined to depressions. The moss layer is also well developed with common feather moss the dominant species.

Lodgepole Pine – sphagnum: This site series is consistent with a treed bog, and may be classified as wetland or a terrestrial ecosystem. Lodgepole pine is the dominant tree species with smaller amount of western red cedar. It is characterized by wet, acidic nutrient poor soils. Labrador tea and bog laurel are the dominant shrubs, other Ericaceae shrubs – including red huckleberry, blueberry,

cranberry and salal are also present. Sphagnum is the dominant moss and is crucial in maintaining an acidic environment. Although this site series is provincially yellow listed (not-at-risk), bogs are sensitive ecosystems that depend on a unique set of ecological characteristics. They are relatively rare in the Lower Mainland and are priorities for environmental protection in Metro Vancouver Parks.

Non-forested terrestrial Ecosystems

The rocky-outcrops, boulders and exposed slopes support unique plant assemblages that vary depending on the availability of light, moisture and soil development. These areas are home to plants that are able to grow in shallow, water shedding sites, often exposed to full sun. Mosses and lichens predominate, with ferns such as parsley fern, maidenhair fern and licorice fern in shady cracks and crevices. A few western red cedar and shrubs such as salal, serviceberry and ocean spray have established in areas where shallow soils have developed. Scotch broom has become established on some rocky knolls.

Disturbed Sites

Disturbed sites refers to areas that have been significantly altered. Buildings, trails, parking lots and lawns are included here. (Map Appendix A6 and A7) These areas generally have much lower wildlife values than natural areas, however they may provide additional shelter foraging areas for wildlife. For example, American robins, and northern flicker often feed on worms and insects in manicured lawns. Killdeer nest in gravel lots, and garter snakes sunbathe on gravel roads and clearings. American goldfinches, house finches, white crowned sparrows, golden crowned sparrows, song sparrows and dark-eyed juncos feed on seeds of weedy species that grow along trail edges and in planted areas. Bats, barn owls and barn swallows may nest in abandoned buildings. Tree swallows nest in bird boxes and forage over manicured lawns and man-made ponds. Brush and log piles may provide cover for small mammals, reptiles and amphibians.

An expansive lawn area (approx. 7 hectares) dotted with mature trees provides nesting and foraging habitat for a wide range of birds including woodpeckers, hummingbirds, flycatchers, sparrows, thrushes, swallows, waxwings and warblers. The lawn and meadow areas on either side of Stewart Creek are frequented by larger wildlife including black bears, bobcats and mule deer. The caretaker's residence is home to a colony of little brown bats. During the day bats roost in spaces between the outer walls and siding, emerging at night to feed over lawns, ponds and marshes. Big brown bats have also been observed flying over open fields at dusk, but their roost has not been identified.

Sites that are severely disturbed, such as former building sites and storage areas may be candidates for restoration and/or for new facility development. Clean-up work has been started on the log storage area and shed sites where debris was left by a previous owner.



Figure 5: Meadow with Mt Burke

Mountain Streams and Riparian Areas

The lower reaches of Stewart Creek and Nathan Creek are tidal and suitable habitat for salmon rearing. The middle reaches of Stewart Creek below the waterfall, have a series of runs, pools and shallow gravel beds that create excellent salmon spawning habitat. Coho, chum and cutthroat trout have all been reported. Tailed frog tadpoles have been observed in Stewart Creek, just below the lower falls (Castagner, pers. comm). This blue-listed coastal species lay eggs in cold fast moving mountain streams in fall. The developing tadpoles attach to rocks and boulders, clinging to rocks via an oral sucker. It can take up to four years for tadpoles to metamorphose into adults and several more years for froglets to reach sexual maturity. American dippers nest in riparian areas and forage for insects in fast moving streams, catching their prey under water. Dippers have been observed in Stewart Creek below the upper falls and are likely to nest in riparian areas within the park. Red-listed Pacific Water Shrew have been confirmed in and around mountain streams within the Widgeon valley and at Munroe Creek just south of WMRPR and are likely to occur in the park.



Figure 6: Stewart Creek

Ponds

Two constructed ponds at Widgeon marsh reserve were created by former residents. The pond on the Ecogift property is a natural shaped perched pond covering approx. 2000 m². Plant species around pond margins include small flowered bulrush, common rush and common cat-tail. The pond is fed by a mountain stream that crosses Quarry Road through a culvert and drains to a dredged channel through wetland marsh leading to Widgeon Slough. Until 2007 the pond and channel were maintained by the former resident, who installed a fish ladder annually to allow passage of salmonids. Sivak (2003) observed chum and coho spawning in the gravel beds in the lower reaches of the stream feeding the pond. Strix (2003) observed amphibian eggs, possibly Northwestern salamanders and non-native bullfrogs in the pond in 2007. Bullfrogs could be heard calling in July 2015. No further studies have been undertaken and it is not clear if the pond is still accessible to salmonids.

The second pond near the caretaker's residence is a shallow rectangular depression approximately 35 x 60 meters surrounded by native vegetation, primarily sedges on three sides and lawn on the other. The pond is fed by and drains to Nathan Creek. No amphibian surveys have been done, but green frogs were observed around pond margins and in the pond in August 2015.



Figure 7: Pond connected to Nathan Creek

Invasive Species

A small percentage of the plants and animals that occur at Widgeon are non-native species. These have become established in disturbed areas alongside roads and clearings, and to a lesser extent in open native plant communities such as rock outcrops and wetland areas. Exotic plants may have arrived on industrial equipment, on vehicles or through dispersal by wind and water or animals. A few have been purposely planted and have spread into the park or are at risk of spreading through disposal of garden waste, soil movement or seed dispersal. The majority of exotic species at Widgeon are associated with disturbed areas, including residential properties, clearings, buildings and roadways.

Appendix C provides a list of exotic species identified in Widgeon plant inventories. A subset of these are invasive species. Invasive species pose a significant threat to the ecological integrity of natural areas. They may reduce biodiversity by displacing native species – including rare species and/or by forming monocultures that exclude virtually all other species. Some invasive plants can severely degrade ecosystem function by changing nutrient regimes, limiting natural succession or altering hydrological processes. Invasive animals may outcompete or prey on native species or carry diseases that decimate sensitive populations.

At Widgeon, most terrestrial species are in the earliest stages of invasion. Invasive species of concern at Widgeon Marsh Reserve include Himalayan blackberry (*Rubus discolor*, *Rubus armeniacus*) and evergreen blackberry (*Rubus laciniatus*), Japanese knotweed (*Fallopia japonica*), Scotch broom (*Cytisus scoparius*), yellow archangel (*Lamiastum galeobdolon*), orange hawkweed (*Hieracium auranticum*), reed canarygrass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*) and American bullfrog (*Lithobates catesbeiana*). These are described below.

Terrestrial Invasive Plants

MV employs an integrated management approach to manage invasive plants that threaten the composition, structure or function of the park's natural ecosystems. Emphasis is placed on prevention, early detection and response and management of invasive species in the earliest stages of invasion. Species and areas are prioritized based on stage of invasion, invasive species biology and potential threat, ease of treatment and ecosystem sensitivity. MV utilizes a variety of tools including mechanical, biological, cultural and chemical controls (Metro Vancouver, 2012). Eradication (the complete removal of all plants and seeds) of invasive exotics is difficult, time consuming, expensive and next to impossible to confirm with certainty. Chances of success are greatest when species are in the earliest stages of invasion and ecosystems are intact and resilient.

Most of these species are in the early stages of invasion. Invasive plants were inventoried and mapped in 2015 ([Map Appendix A8](#)) and an integrated pest management program was initiated. The goal is to eradicate species in the earliest stages of invasion and to prevent their spread of established into sensitive areas. It is expected that invasive plant management will be an ongoing program for the park.

[Scotch Broom](#) occurs on disturbed sites and on rock outcrops along Quarry Road. These outcrops support a unique community of mosses, lichens and forbs that tolerate shallow nutrient-poor soils, limited moisture, and full sun; Scotch broom poses a significant risk to these communities by altering soil nutrient regimes and shading out sun-loving plants. They are a high priority for invasive species management.

Mapped occurrences of Scotch broom were removed from rocky outcrops and from open areas in 2015. As the seed bank may persist for decades, these areas should be inspected regularly and seedlings removed before they can mature. Plants can be removed using a weed wrench or cut back at or below ground level before seed-set. Pulling is generally preferred, as cut plants may sprout multiple stems, making later removal with a weed wrench more difficult.

[Japanese Knotweed](#) is an aggressive colonizer of moist areas that can rapidly displace native species in open areas and along edges of native plant communities. Once established, knotweed is extremely difficult to eradicate. Knotweed reproduces easily from root (rhizome) and stem fragments and can quickly colonize new sites when root or stem fragments are moved by water and or mechanical means. Small fragments left in the ground or moved through the removal process can generate new colonies. Furthermore cutting around the plant may encourage lateral roots to sprout, resulting in renewed vigor and growth several meters from the parent plant.

At Widgeon isolated patches of Japanese knotweed are found along the road, in the meadows and in the developed areas near buildings where it was likely planted as an ornamental. MV has been

treating knotweed in Widgeon marsh reserve since 2011. Mature stems are injected with glyphosate in early summer. This initial treatment is followed with targeted spraying in fall, if new growth is present. Treated patches are inspected annually and retreated if new growth is present. It will likely take several years to locate and successfully treat every trace of knotweed at WMRPR.

As new infestations may occur through the movement of contaminated soil, care must be taken to avoid soil disturbance in areas where knotweed is known to occur.

[European mountain-ash](#) is well adapted to moist nutrient-poor organic soils. It will grow in sun or shade and can become established in bogs and other sensitive ecosystems. Berries are attractive to birds and seeds can be spread some distance from parent plant. European mountain-ash was planted in the upper meadow area and has since spread to the forest edges and along the margins of the bog forest near the mid –park landing. Left unchecked, mountain-ash it is likely to spread into the bog, where it may displace native vegetation and change structure of this unique ecosystem.

MV began a mountain-ash removal program in 2015. Approximately 50 trees were removed in December 2015. The remaining seedlings will be targeted for pulling. This could be done as a potential volunteer program, but will likely take several years to locate and pull all seedlings and exhaust the seed bank.

[Orange Hawkweed](#) is an aggressive colonizer that forms dense mats. It is typically found in disturbed areas, but has locally invaded sensitive sub-alpine areas where it out-competes native species. A single patch of orange hawkweed to in the Widgeon lawn area was identified and treated with glyphosate in 2014. The area should be monitored to ensure that it has not spread beyond the initial patch.

[Yellow Archangel](#) is a very aggressive, rapidly spreading, shade tolerant ground cover. It was intentionally planted in the former residence gardens and has since spread to the north side of Quarry Road where garden waste was dumped at one time. It is a threat to native herb and ground-layer plants in forests and forest edge. Mapped occurrences of yellow archangel were treated in 2015. Plants were sprayed with glyphosate in spring and early fall. Follow up treatments may be required for several years to eradicate the plant.

[Purple loosestrife](#) is a perennial plant of wetlands. A few scattered plants are present on lands adjacent to the spit and in the log storage area. Control programs have not been initiated, but flower heads were snipped off in 2015 to prevent seed dispersal.

[Sticky Ragwort](#) was reported in the 2007 Strix inventory growing atop the rock outcrop and cliff in the upland forest area of the former Edwards property. Although the plants were well-spaced and scattered across this area the authors expressed a concern that an increase in density could result in the destruction of habitats for native plant species (forbs and bryophytes). Sticky ragwort has not been inventoried and no treatment plan has been developed.

[Himalayan Blackberry](#) and [evergreen blackberry](#) are present in scattered patches along Quarry Road and in disturbed areas. Small patches are also present in the mixed shrub swamp and mixed forest edges surrounding the Edwards property and the boat landing. A few larger patches are present close to out buildings and meadows. Although currently limited to disturbed areas,

Himalayan blackberry can spread to riparian areas and natural clearings through seed dispersal and vegetative growth where it can displace native species and inhibit succession.

As blackberry is still fairly limited at Widgeon marsh reserve, small patches adjacent to sensitive areas should be cut back and roots grubbed out. Repeated cuttings, done over several years may exhaust the root system and eliminate blackberry from fields or open areas. Blackberry can also be cut-back in spring to encourage new growth and the regrowth treated with glyphosate. This may be an appropriate treatment for larger patches in open areas and disturbed areas slated for future park developments.

English ivy is present near the log storage area, the old cottage and in the small clearing north of Quarry Road where garden waste has been dumped. English ivy has the potential to spread over the ground, destroying herb-layer and moss-layer plants and engulfing nearby trees. The seeds may be dispersed by to forested areas by birds, such as American Robin.

English ivy should be pulled from ground and cut from trees at breast height. The work is labour-intensive and is suitable for volunteer work parties.

In all cases successful management of invasive plants requires a commitment to on-going monitoring and long term management.

Aquatic Invasive Plants

Aquatic invasive plants pose significant management challenges. Fewer tools are available to manage invasive species in sensitive aquatic ecosystems, there are few barriers to recruitment from adjacent areas and the chance of re-infestation from adjacent areas is extremely high. Managing aquatic invasive species in Widgeon slough and marsh will require a watershed approach involving multiple agencies. The chances of success are low.

Purple loosestrife is present and appears to be spreading in Widgeon slough and the tidal marshes. Loosestrife was not listed in the 2007 inventory, 1993 aquatic plant survey by BCIT students nor the 1984 Canadian Wildlife Service inventory. A few isolated plants were noted in the 2012 inventory of the Edward property and more were noted in the 2015 wetland inventory. No control programs have been implemented.

Loosestrife displaces wildlife by replacing native food sources and eliminating nesting sites for marsh birds and wildlife. *Galareculla calmeriensis*, a beetle native to Eurasia has been bred and released as a biocontrol agent in several regional parks. The beetle has proven to be very effective in wet fields and non-tidal wetlands. It has had limited success as a biocontrol in tidal wetlands.

Yellow flag iris is present in small isolated patches along wetland channels. Yellow flag-iris reproduces quickly through seed dispersal and horizontal root systems. In infested areas, up to several hundred flowering plants may be connected under the water, and fragments can form new plants when they break off and drift downstream. Specially adapted floating seeds are dispersed by water. Tides and currents carry seeds up and down stream to infest new areas adjacent to water courses. Unless the small patches are removed, they are likely to increase in density and spread to new areas. No control programs have been initiated.

Reed canarygrass (*Phalaris arundinacea*) forms dense monotypic stands that exclude most other species. In slow moving streams and ditches, reed canarygrass can impact water quality by reducing water flows leading to increased siltation, nutrient loading and a reduction in dissolved oxygen. There has been considerable debate about the status of reed canarygrass as an exotic species. Reed canarygrass is listed as native in North America by the US Department of Agriculture, and is found across the continent in most states and provinces (e-flora). However, cultivars brought in for erosion control and as pasture grasses have been introduced from Europe and Asia. These hybridize with native populations, producing aggressive offspring. Selective breeding of the grass has resulted in strains that are also drought resistant and extremely aggressive under a wide range of conditions.

Reed canarygrass is very common in Widgeon Slough, in the marshes and along stream edges. It is the dominant species in wet meadows, the tidal marshes and on Siwash Island. Treating reed canarygrass in this environment would be extremely difficult, if not impossible.

Bog loosestrife (*Lysimachia terrestris*) was introduced from eastern North America. Although uncommon in British Columbia, this wetland plant is prevalent in swamp horsetail marshes, sedge marshes and some bluejoint reedgrass marshes throughout Widgeon Slough. Along with reed canarygrass, it is one of the most wide spread invasive plants in Widgeon Marsh. There is little information available about this plant's invasive potential and/or control methods. Other species of *Lysimachia*, notably *Lysimachia vulgaris*, are known to be extremely invasive.

Southern wild rice (*Zizania aquatica* var. *aquatic*) is an annual cereal plant native to eastern North America. One of three species of wild rice native to North America, southern wild rice is found primarily on the East Coast in brackish water, along tidal rivers and in shallow inland lakes. The widgeon population represents one of only five recorded occurrences of southern wild rice in British Columbia. The wild rice was first detected in 2004 by Sears and Saarela who speculated that the rice had been purposely planted and the grains harvested for consumption, possibly by the Katzie Frist Nation. However, when contacted in 2005, the Katzie were unaware of the population (Saarela & Sears, 2006).

Wild rice, particularly northern wild rice (*Zizania palustris*) is an important cultural and economic resource to many First Nations in North America. Northern wild rice is native to the Great lakes Region and wetlands of the Boreal Forest regions of Northern Ontario, Alberta, Saskatchewan, and Manitoba and region of North America, the aquatic areas of the Boreal Forest regions of Northern Ontario, Alberta, Saskatchewan and Manitoba in Canada and Minnesota, Wisconsin and Michigan in the US. It has also been reported from a small number of sites in British Columbia where it was likely purposely planted for consumption (E-flora). Although the two species are closely related, and the species names often used interchangeably, there are key differences between the species. *Z. palustris* has been widely cultivated and seeds are readily available for purchase (Minnesota Natural Resources Conservation Service, 2004). Southern wild rice has smaller grains which shatter readily making harvest more difficult and time consuming. Hitchcock and Cronquist (Flora of the Pacific Northwest, 1973) report that *Z. aquatica* was frequently planted in Washington, Oregon, Idaho and Montana as a lure for waterfowl. A brief internet search reveals several companies selling *Z. aquatica* as a wildlife attractant. Given WMRPR history as a private hunting lodge, it is quite possible that that the seeds were planted by former owners to entice waterfowl and enhance hunting opportunities.

The population appears to be expanding. Saarela and Sears (2006) estimated the population at several hundred plants in 2004, while Page and Schaefer estimate several thousand plants were present in 2015. However, it should be noted that wild rice is an annual grass that dies off each year. Natural variation in seed production can result in a crop that expands and contracts annually according to the previous year's seed production which can vary dramatically (Minnesota Natural Resources Conservation Service, 2004). Wild rice is critical wetland component in its native range. It provides both food and shelter for a variety of wetland animals, and is an especially important seed source for waterfowl. On the other hand, wild rice can form dense monotypic stands that limit access to open water reducing recreational opportunities. Further research and monitoring is required to better understand the plants invasive potential and its risks and benefit to this highly valued ecosystem.

Ecosystems and Species at Risk

Two red-listed ecosystems (Sweet gale-Sitka sedge fen and Western hemlock-red cedar –deer fern) and several blue-listed ecosystems have been identified in inventories at WMRPR. In addition, Page and Schaefer described two new wetlands ecosystems (Sweet gale Shrub swamp and Pacific Crabapple Shrub Swamp) that have not been previously described. After consultation with Del Meidinger, BC's ecosystem classification expert, Page and Schaefer (2015) have proposed an amendment to the wetland classification system and have recommended that the plant communities be considered for red-listing by the Conservation Data Centre.

Red and blue listed ecosystems are defined as:

Red: Includes any ecological community that is Extirpated, Endangered, or Threatened in British Columbia. Extirpated ecological communities no longer exist in British Columbia, but do occur elsewhere. Endangered ecological communities are facing imminent extirpation or elimination. Threatened ecological communities are likely to become endangered if limiting factors are not reversed. Placing ecological communities on these lists flags them as being at risk and requiring investigation.

Blue: Includes any ecological community considered to be of Special Concern (formerly Vulnerable) in British Columbia. Ecological communities of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed ecological communities are at risk, but are not Extirpated, Endangered or Threatened.

In addition, a number of communities that are blue (special concern) and yellow listed (not at risk) are under-represented in the region and have high ecological value. For example, the blue-listed Swamp horsetail – Beaked sedge community is known from the interior of British Columbia and on the outer coast. Its occurrence at WMRPR may be the first known location in Southwestern mainland of BC (Page & Schaefer, 2015). Bogs, while relatively common throughout BC, are rare in Metro Vancouver and are very sensitive to changes in hydrology.

A number of red and blue listed species are known to or are likely to occur at occur at WMRPR. Red-listed Pacific Water Shrew (*Sorex bendirii*), for example, has been confirmed within the Widgeon Valley to the north of WMRPR and at Munroe Creek to the south. Peregrine Falcon (*Falco peregrinus anatum*) have been observed hunting over the marsh and are known to nest in Widgeon Valley area. Blue-listed tailed frogs breed in Stewart Creek and American Bittern are residents of Widgeon Slough and are likely breeding on Siwash Island. Three blue-listed plant species - Mountain sneezewort (*Helenium autumnale* var. *grandiflorum*), false pimpnel (*Lindernia dubia* var. *anagallidea*) and green parrot's-feather (*Myriophyllum pinnatum*) occur at WMRPR. A complete list of red and blue listed species that are known to or are likely to occur at WMRPR is provided in [Appendix E](#).

Habitat Heterogeneity

WMRPR is one of the most ecologically diverse parks in Metro Vancouver, encompassing marshes and shrub fen, bogs, ponds, mountain streams, riparian habitat, forest, open fields and rocky outcrops. While each of these features considered in isolation has distinctive ecological value, the combination of features and habitat types makes WMRPR unique. Some species, such as sandhill crane, tailed frog, American dipper and marsh wren have very specific habitat needs, while others will utilize a range of habitat types over a single day, some over a season. Bears move freely through the park from forest to wetland and open field foraging in all habitat types over the course of a day. Tree frogs, western toads and salamanders migrate to ponds and open water wetlands in spring and early summer to breed, their tadpoles emerge as adults in late summer and disperse to shrub, forests and riparian areas throughout the park. For many birds, WMRPR is a brief stopover, a place to rest and refuel on migration, for other WMRPR and the surrounding wetlands and forests are important winter feeding grounds or summer breeding grounds; still others will spend the entire year utilizing different habitat types for feeding, roosting and nesting.

A list of wildlife species known or likely to occur in the park is provided in [Appendix D](#).

Planning Considerations

Ecosystem Sensitivity

Sensitive ecosystems are defined as ecosystems that are “at risk or ecologically fragile in provincial landscape.” (Ministry of Environment, 2006) In 2011 MV developed a comprehensive system to identify and classify sensitive ecosystems using existing Terrestrial Ecosystem Mapping and provincial standards for ecosystem classification and ranking. (Meidinger, 2011) All forested lands, wetlands, riparian areas and other important ecosystems in Regional Parks were assessed and ranked based on rareness, community structure, size, condition, presence of species at risk and ecological context. Highest points were awarded for large, intact, functioning, red and/or blue listed ecosystems with well-developed community structure, natural species composition and little evidence of disturbance.

Seventy-three percent of lands within WMRPR had a score of 21 or higher, representing the highest sensitivity category in the regional park system ([Appendix A9 map](#)). By comparison, just 36% of all regional parklands fall in this category. Indeed, 58% of lands within Widgeon had a score of 27 or higher. While only 3% of all parklands fall into this category, 77% of those lands are at WMRPR.

The high scores reflect the parks relatively undisturbed natural environment, rare wetland features and ecological context described in this report.

Regional parks that have more than 75% of the land base with a score of 16 or more, have been proposed for classification as Regional Park Preserves. Park management in preserves is focused primarily on protecting important ecological features and ecosystems. Opportunities for nature appreciation and passive recreation may be accommodated through developments in less sensitive areas of the park preserve, where appropriate. Future developments will require careful planning to ensure sensitive ecosystems are protected.

Legal Considerations

WMRPR is made of 18 parcels totalling 383 hectares leased from the Nature Trust of BC, 4 hectares water lot lease and 11 parcels totalling 239 hectares that are owned fee-simple (Map [Appendix A10map](#)). An additional 6 hectares of land that fall within the park boundary are unassigned road allowances; these have not been included in the total park area.

The Nature Trust Lands are governed by a restrictive covenant that ensures the lands are preserved and/or developed as a “site of ecological interest for the use, enjoyment and benefit of the people of British Columbia.” Similarly, the 10.5 hectares purchased in partnership with Ducks Unlimited in 2012 require that land management focus on “protecting, preserving, and keeping lands in their natural state.”

A small section of water, the former site of a dock and boathouse which were removed in 2009, are leased from the Vancouver Fraser Port Authority. Under the *Canada Marine Act*, the Vancouver Fraser Port Authority is responsible for the administration, management and control of land and water within its jurisdiction, which includes the lower Fraser River, the lower Pitt River and all of Widgeon Slough. Under the legislation, the Vancouver Fraser Port Authority administers a permitting process to ensure all developments and activities meet applicable standards. Any changes or developments in on the water lot or elsewhere in the slough such as the replacement of the dock and boathouse, and or dredging will require a review and permit from the Vancouver Fraser Port Authority as described in the *Project and Environmental Review Application Guide* (Port Metro Vancouver, 2015) and in the *Project Environmental Review Categories* (2015).

Built Features and Utilities

A seven kilometer single-lane gravel road runs from the end of Quarry Road through WMRPR, past the residential areas to the northern boundary of the park. From here, the road continues as a rough four-wheel drive route through Pinecone Burke Provincial Park to the provincial campground on Widgeon Creek. The first five kilometers are primarily on MV property, but a small portion of the road crosses private property and cuts into adjacent provincial park lands. The road is closed to the public but is used by BC Parks staff and contractors to access the provincial campground. Road access is governed by a covenant granted by the former owners. Secondary access roads run perpendicular to the main road providing access to the waterfront, residential properties, clearings and amphitheater – a rock-walled clearing on Burke Mountain situated between Stuart and Nathan Creeks at approximately 40 meter elevation (Figure 8). An informal trail connects the amphitheater with the old intake structure below the upper waterfall.

There are a small number of residences and outbuildings in various states of repair. Four houses (figures 9 to 11) are currently rented. Both the entrance area and the mid-park area have electrical service, and septic fields. The power poles, which run parallel to the access road are rated in poor condition. Water is provided to the mid park area via water diversion on Nathan Creek. The Gate house (T Edward property) is served by a well which was drilled in 2014 and the View house (B Edward property) is served by a spring-fed stream north of Quarry Road. There is no water license assigned to the stream for View House intake or the pond.



Figure 8: Amphitheater



Figure 9: Rental properties, duplex (left) Lodge House (right). Pond in foreground



Figure 10: "View house" B. Edward former property



Figure 11: "Gate House" T. Edward former property

Research and Conservation Activities

There are a number of on-going research and conservation projects at WMRPR. Canadian Wildlife Service (CWS) is currently conducting swallow research at Widgeon Marsh to identify areas where breeding productivity is high and to determine habitat factors that contribute to high quality breeding habitat. WMRPR was chosen because it represents excellent quality habitat away from agricultural areas where pesticides are used. The Burke Mountain Naturalists monitor and maintain approximately 50 swallow nest boxes for tree swallows at WMRPR and a small group of volunteers conduct monthly bird counts which are posted on E-bird. The Hummingbird Monitoring Network has maintained a banding station at WMRPR for since 2006 and Fisheries and Oceans Canada conduct yearly sockeye stock assessments in the Widgeon Slough. A bioblitz is planned for summer of 2016.

Recreation Potential

The mix of open space, forested slopes, river and wetland and the proximity to Pinecone-Burke Provincial Park provide exceptional opportunities for nature viewing and passive recreation. However, any recreational activities need to be carefully balanced against protection of sensitive ecosystems.

Tides can have a significant impact on recreational opportunities in WMRPR. Widgeon Creek and Widgeon slough are popular destinations for canoeing and kayaking. A canoe rental facility at Grant

Narrows makes Widgeon Creek and Widgeon Slough easily accessible. The shallow protected waters are especially appealing to novice paddlers and young families. However, during low tides water levels on the north end of Widgeon Slough directly across from Grant Narrows, may be too low to provide access. Similarly, access to the landing near the entrance area through the dredged channel may be restricted at low tides. There are reports of former residents dredging the slough to maintain access (Ron Wood. Personal communication), but this was likely done without permits. Access is still possible from the south end of the slough but winds and strong currents may make it challenging for novice paddlers. An analysis of recreational opportunities and constraints is provided under separate cover.

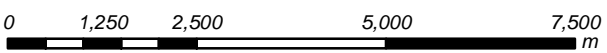
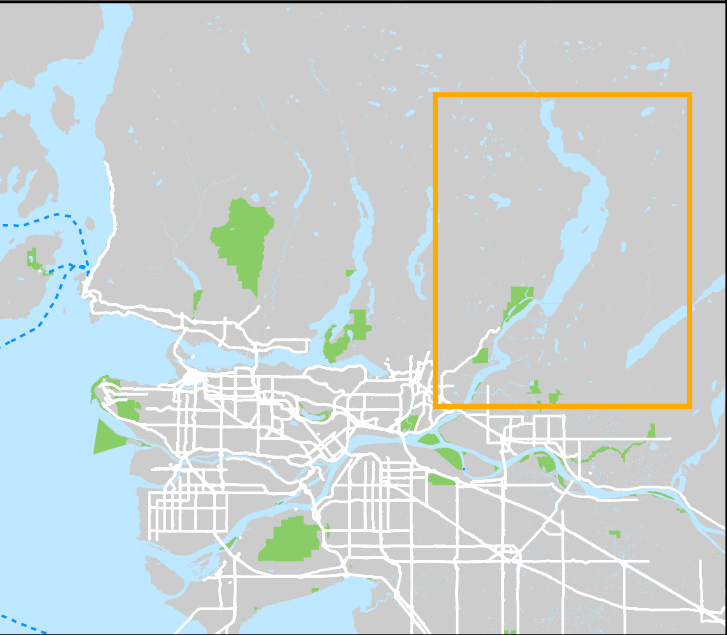
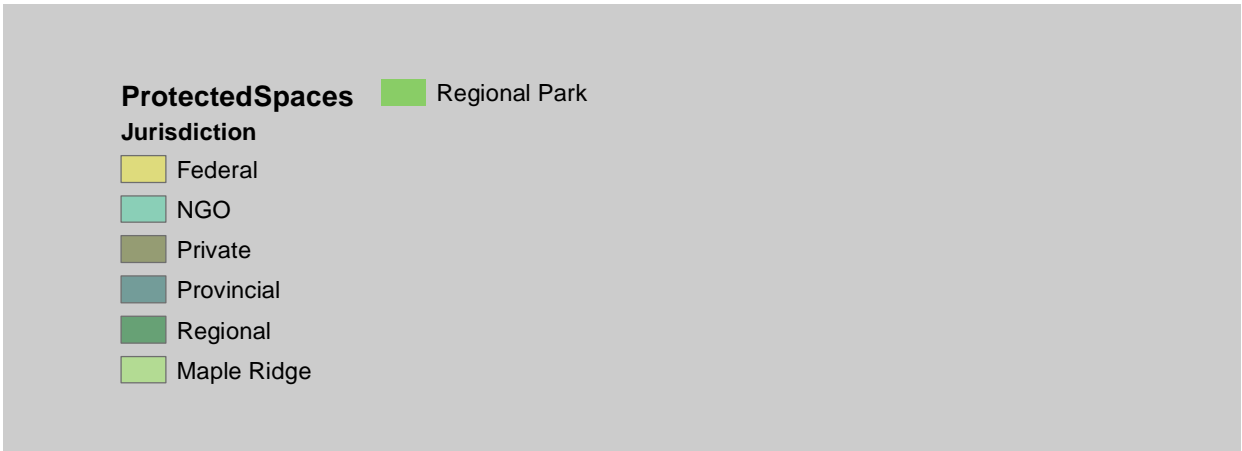
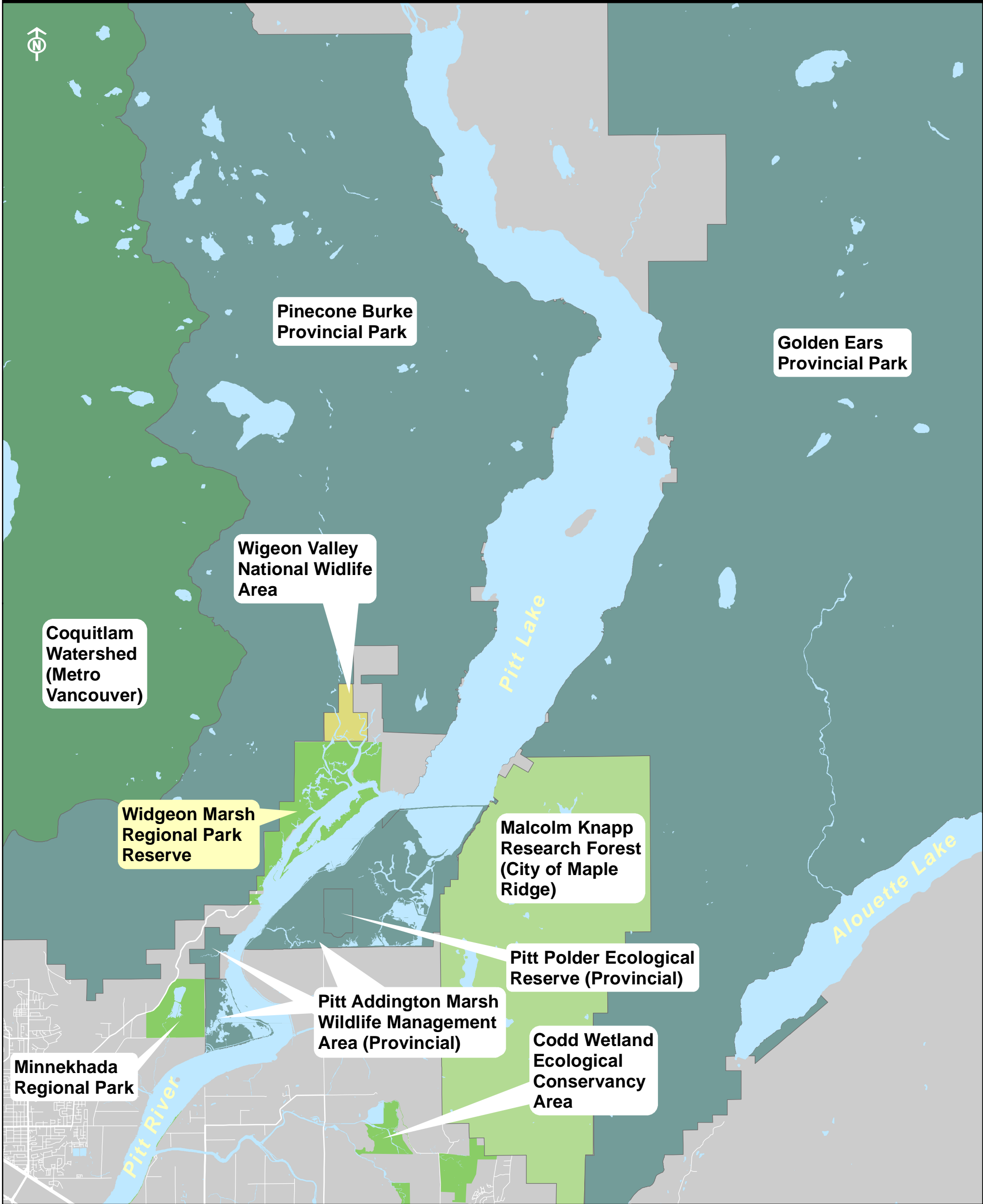


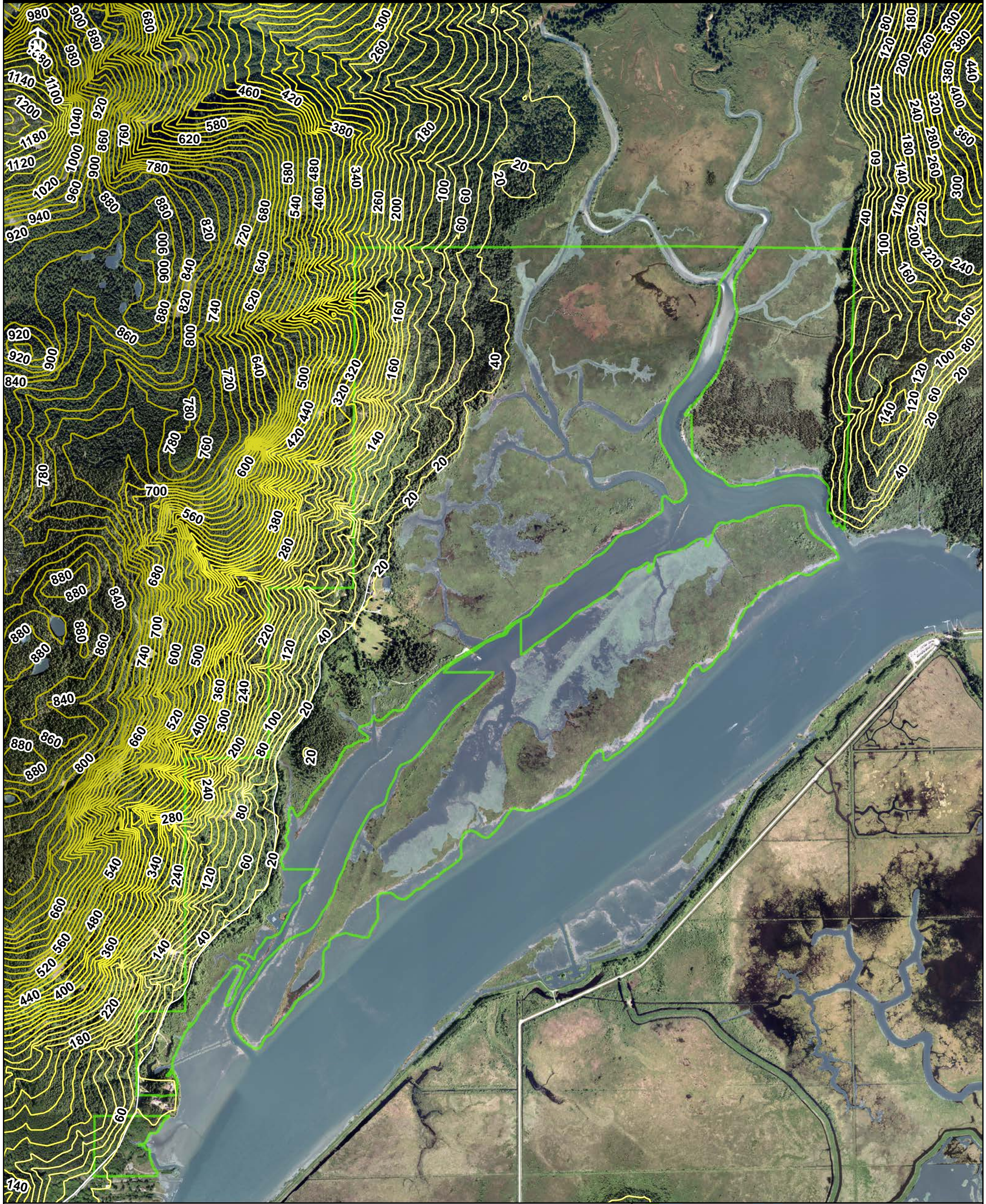
Figure 12: WMRPR viewed from Widgeon slough



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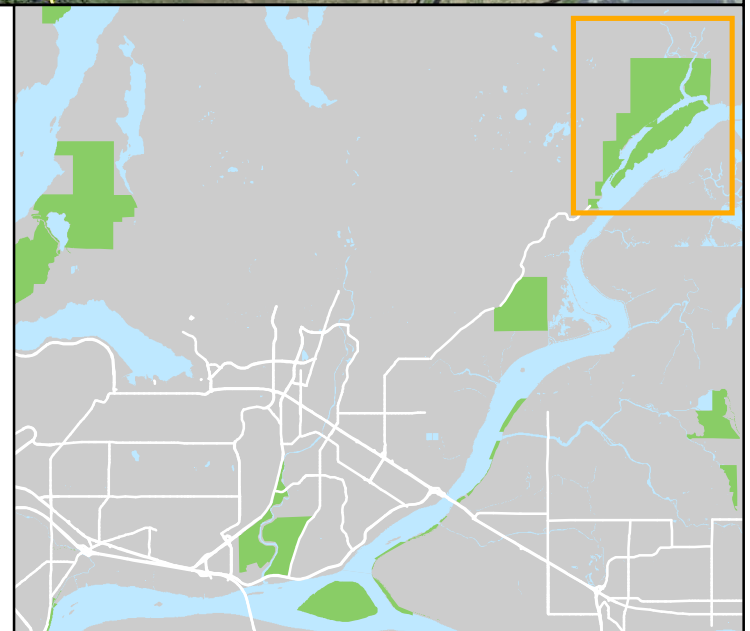
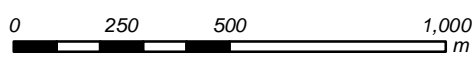
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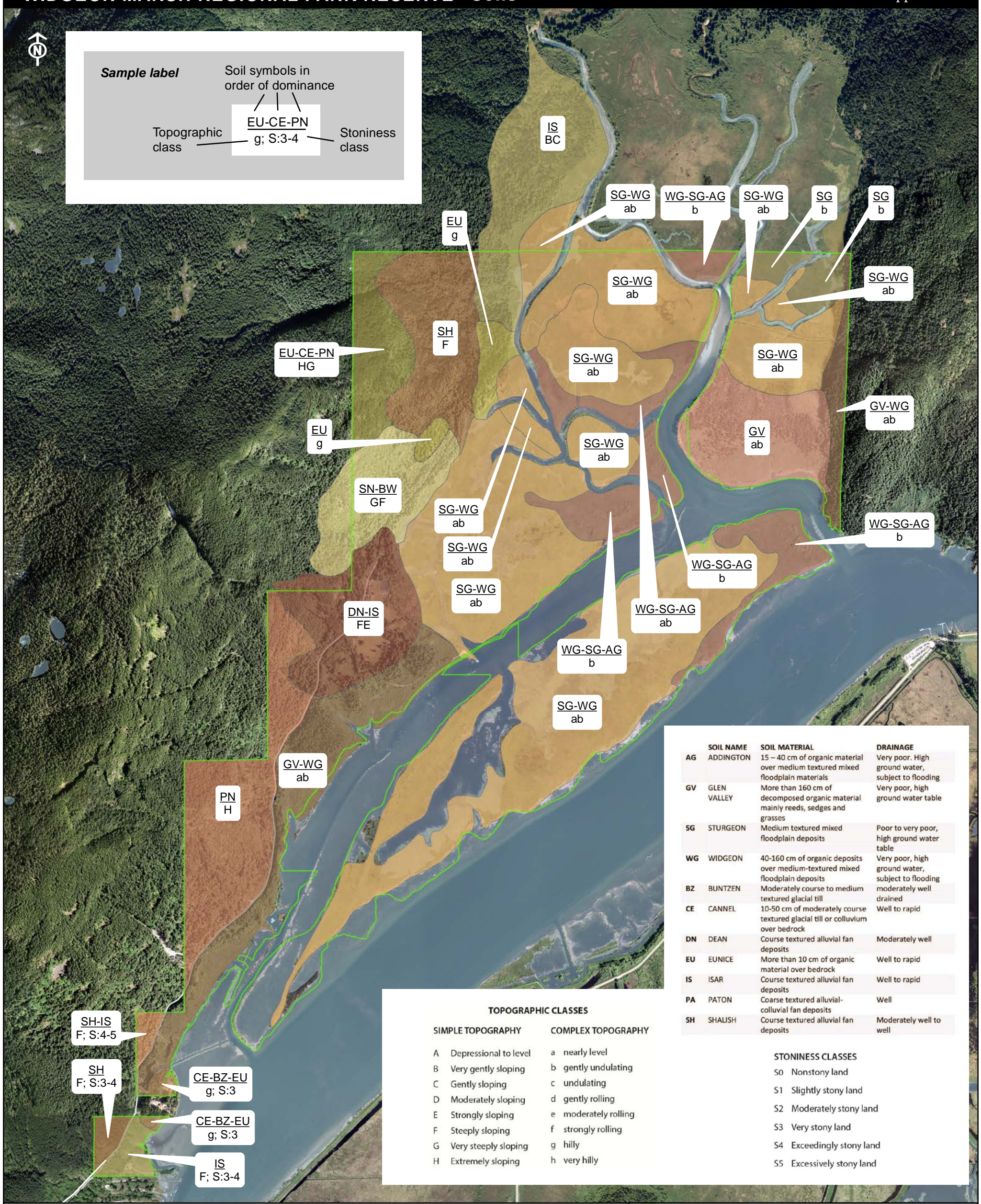
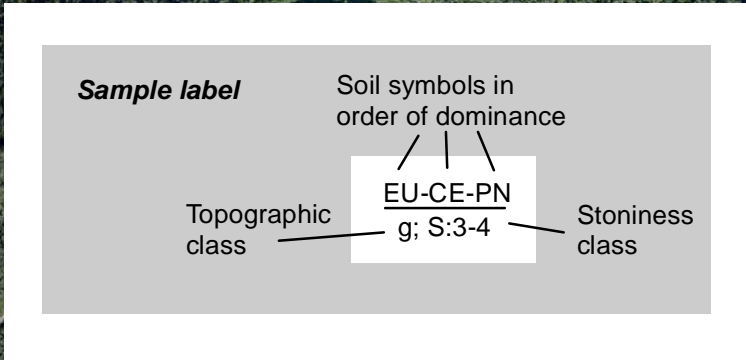




 Park Boundaries
 TRIM 20m Contours

Last modified 2/23/2016





SOIL NAME	SOIL MATERIAL	DRAINAGE
AG ADDINGTON	15 - 40 cm of organic material over medium textured mixed floodplain materials	Very poor. High ground water, subject to flooding
GV GLEN VALLEY	More than 160 cm of decomposed organic material mainly reeds, sedges and grasses	Very poor, high ground water table
SG STURGEON	Medium textured mixed floodplain deposits	Poor to very poor, high ground water table
WG WIDGEON	40-160 cm of organic deposits over medium-textured mixed floodplain deposits	Very poor, high ground water, subject to flooding
BZ BUNTZEN	Moderately coarse to medium textured glacial till	moderately well drained
CE CANNEL	10-50 cm of moderately coarse textured glacial till or colluvium over bedrock	Well to rapid
DN DEAN	Course textured alluvial fan deposits	Moderately well
EU EUNICE	More than 10 cm of organic material over bedrock	Well to rapid
IS ISAR	Course textured alluvial fan deposits	Well to rapid
PA PATON	Coarse textured alluvial-colluvial fan deposits	Well
SH SHALISH	Course textured alluvial fan deposits	Moderately well to well

TOPOGRAPHIC CLASSES

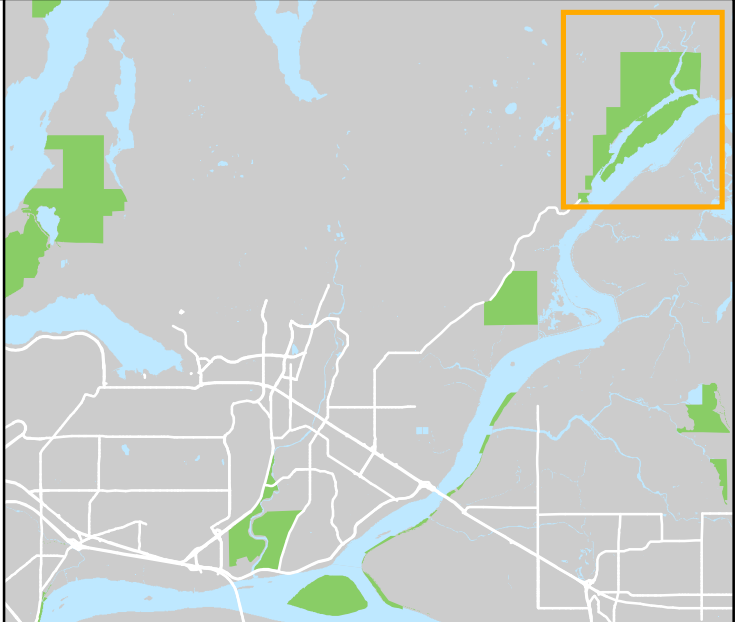
SIMPLE TOPOGRAPHY	COMPLEX TOPOGRAPHY
A Depressional to level	a nearly level
B Very gently sloping	b gently undulating
C Gently sloping	c undulating
D Moderately sloping	d gently rolling
E Strongly sloping	e moderately rolling
F Steeply sloping	f strongly rolling
G Very steeply sloping	g hilly
H Extremely sloping	h very hilly

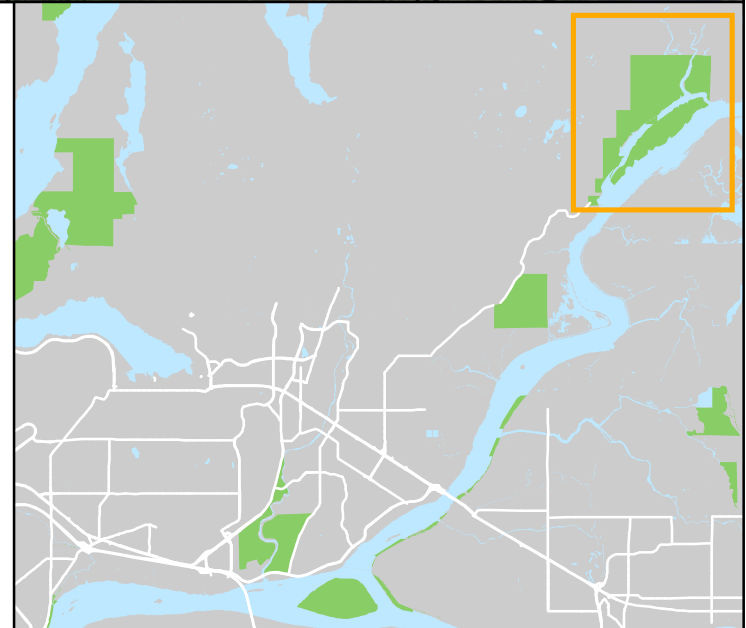
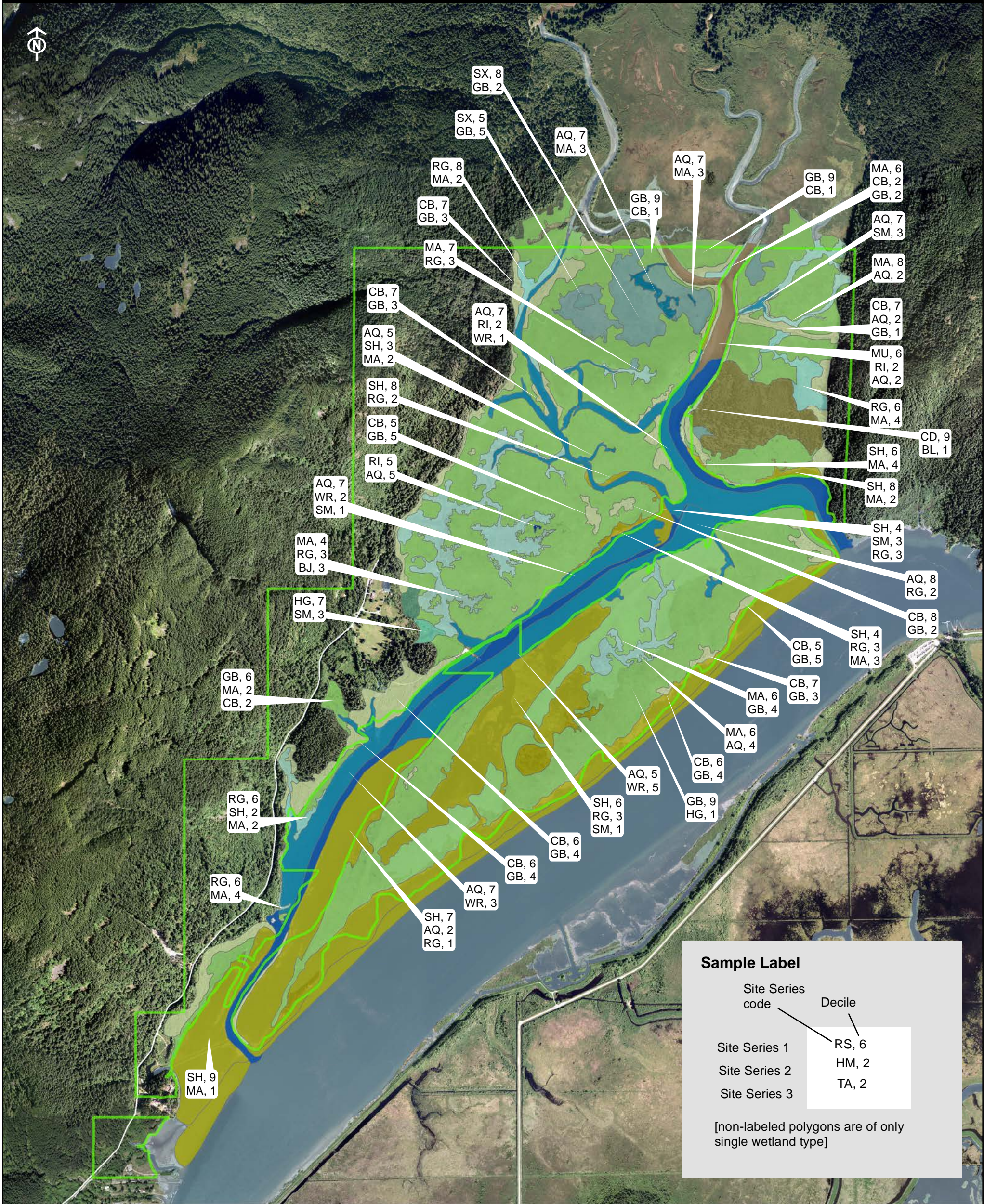
STONINESS CLASSES

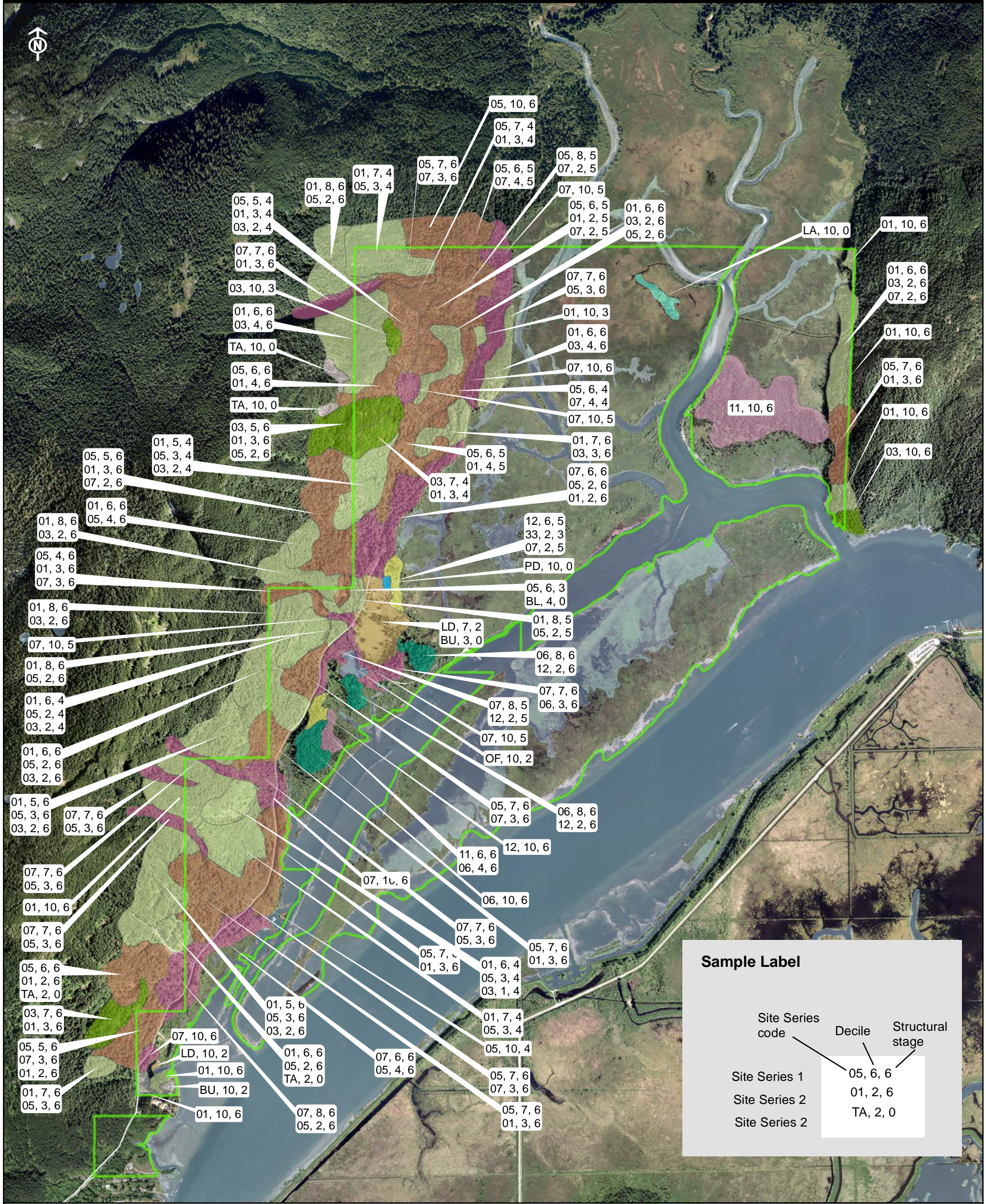
S0 Nonstony land
S1 Slightly stony land
S2 Moderately stony land
S3 Very stony land
S4 Exceedingly stony land
S5 Excessively stony land

Soils

soil_1, Soil_2, Soil_3	IS	Trail - Metro Vancouver
CE, BZ, EU	PN	- - Trail (includes shared)
DN, IS,	SG	— Road
EU	SG, WG	Waterbodies
EU, CE, PN	SH	Park Boundaries
GV	SH, IS	
GV, WG	SN, BW	
	WG, SG, AG	

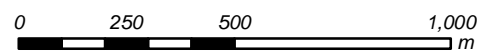




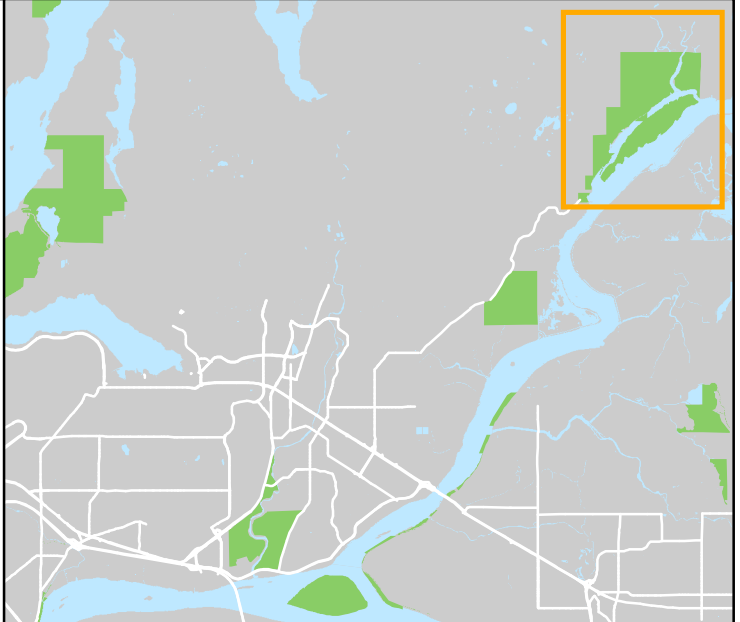


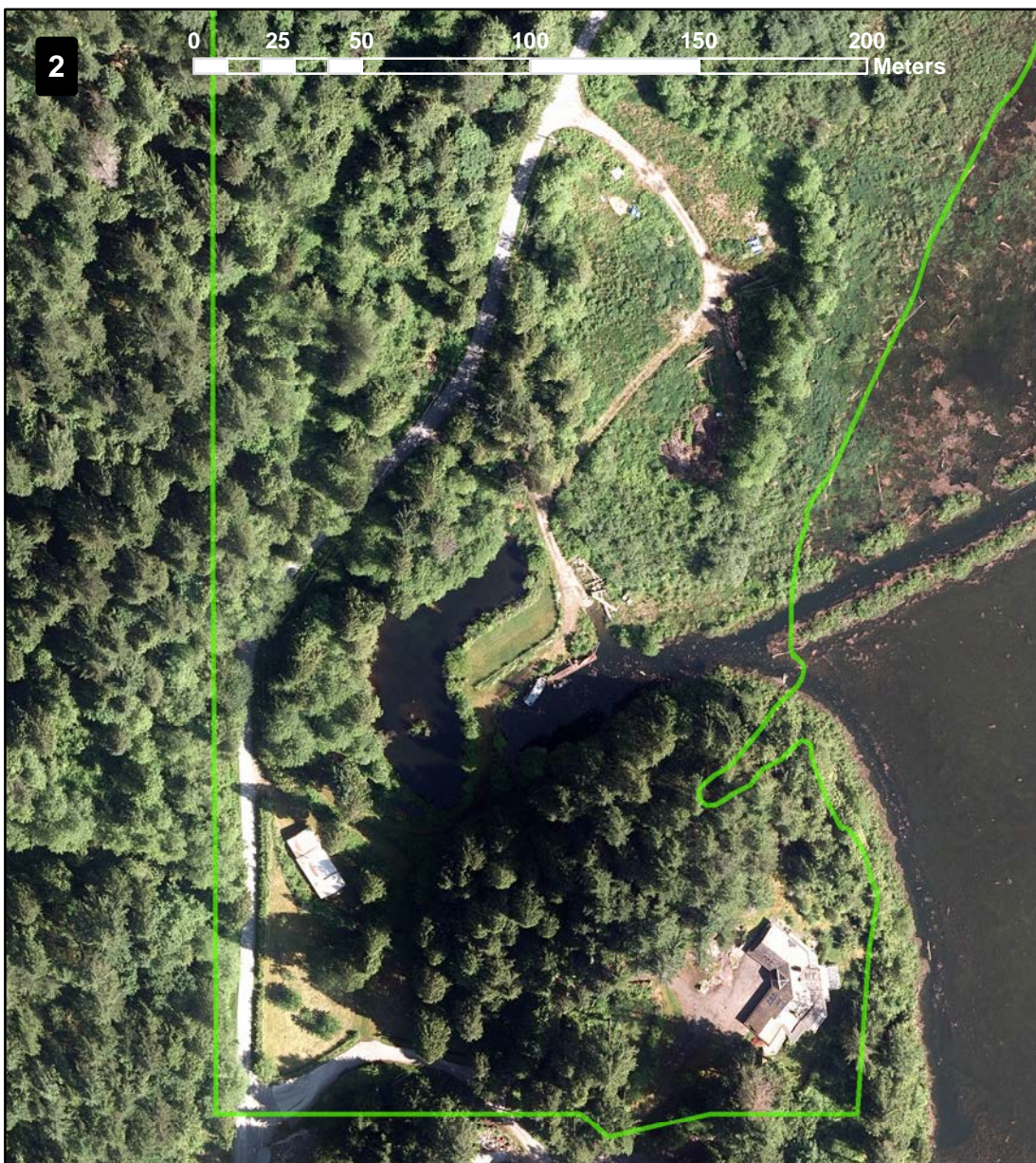
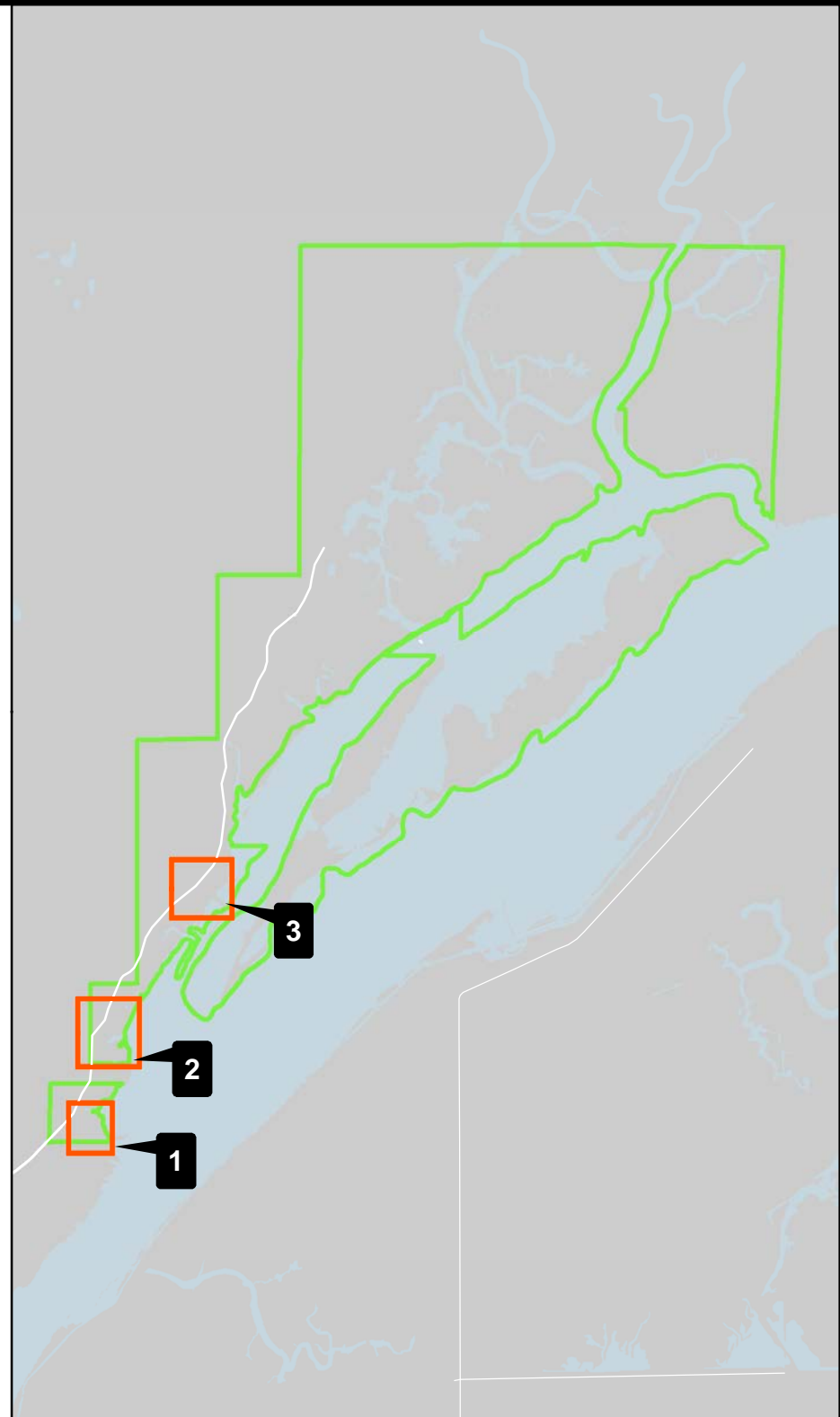
- Terrestrial Ecosystem Mapping**
- 01: Flat moss
 - 03: FdHw - Salal
 - 05: Cw - Sword fern
 - 06: HwCw - Deer fern
 - 07: Cw - foamflower
 - 11: PI - Sphagnum

- 12: CwSs - Skunk cabbage
- BU: Buildings, parking etc.
- LA: Lake or reservoir
- LD: Landscape grass and shrubs
- OF: Old field
- PD: Pond
- TA: Talus



Last modified 3/9/2016




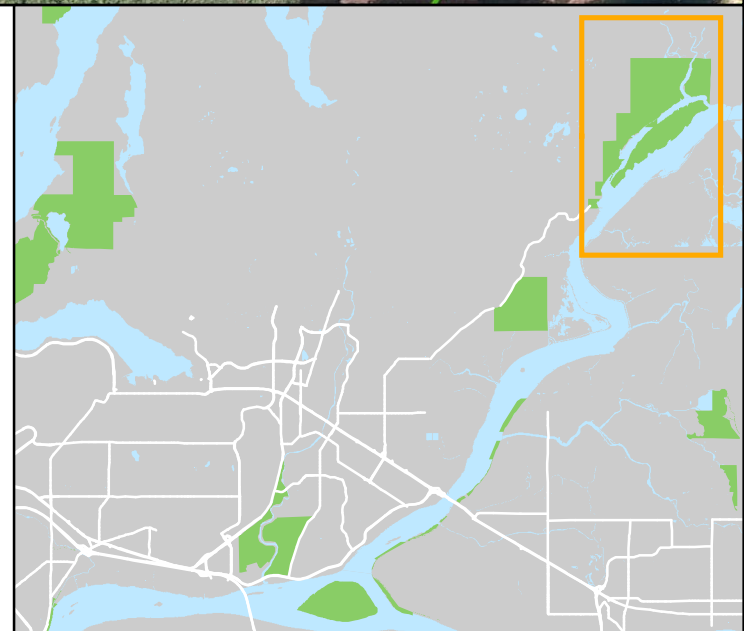


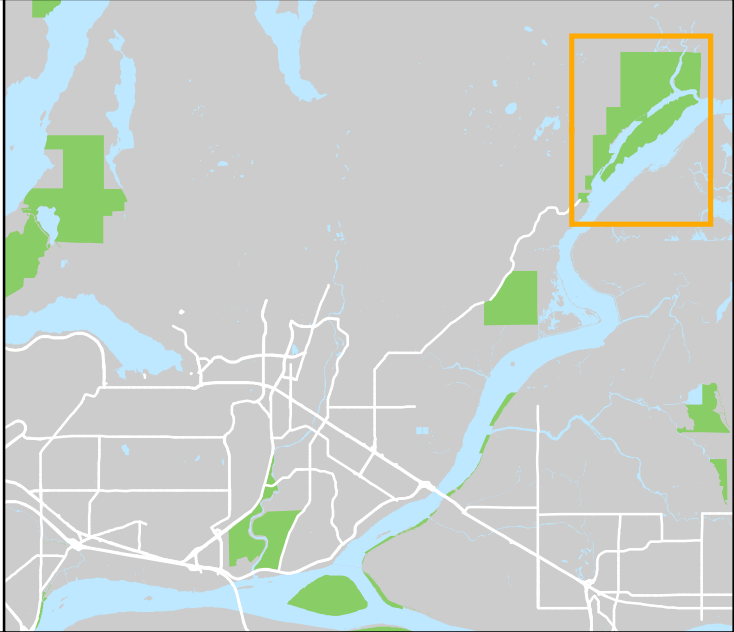
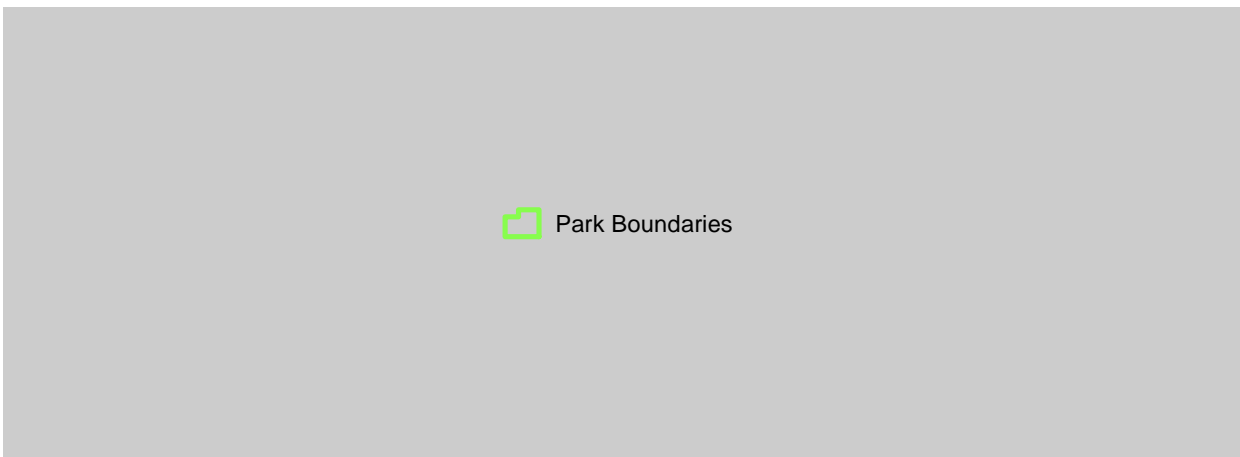
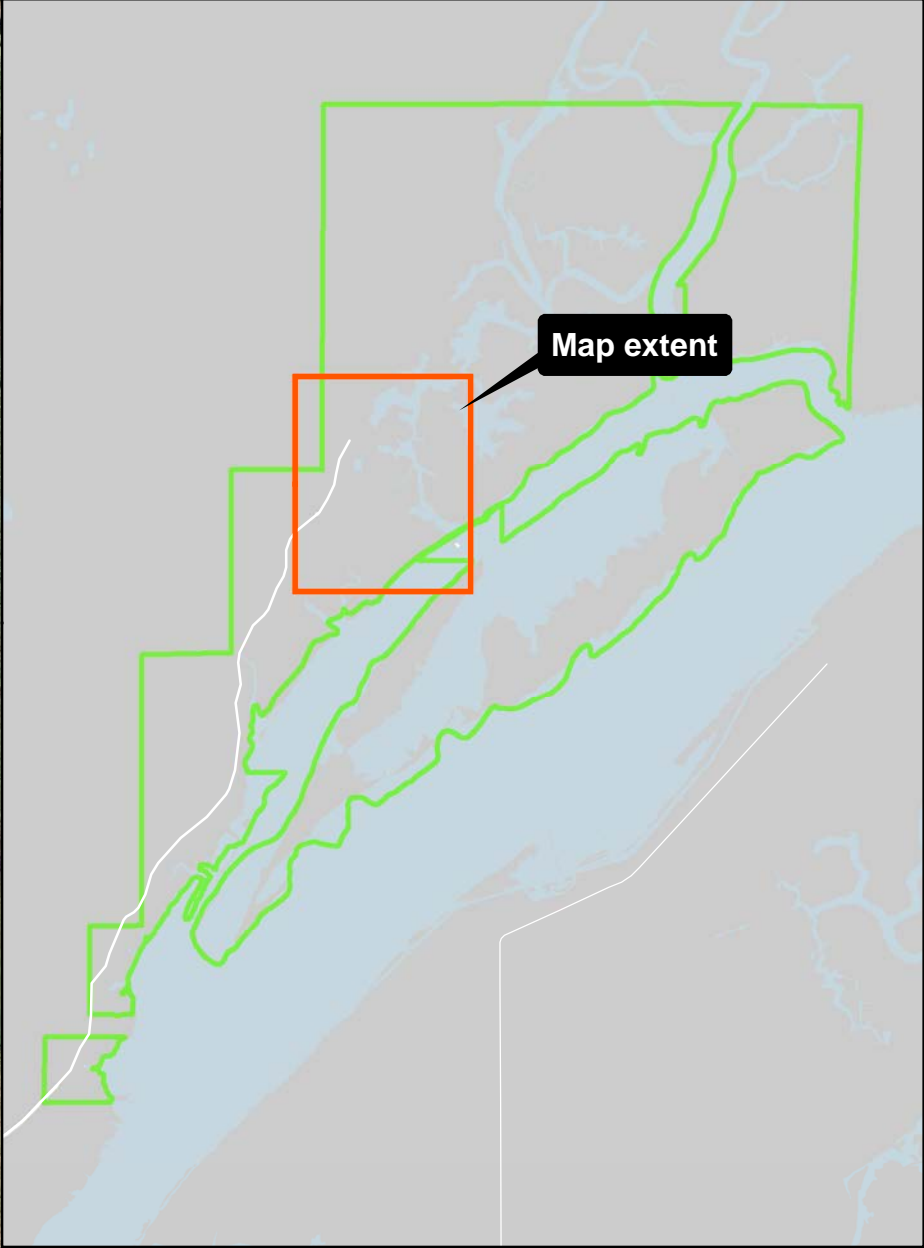
Disturbed area 1: Former residence and logging spit

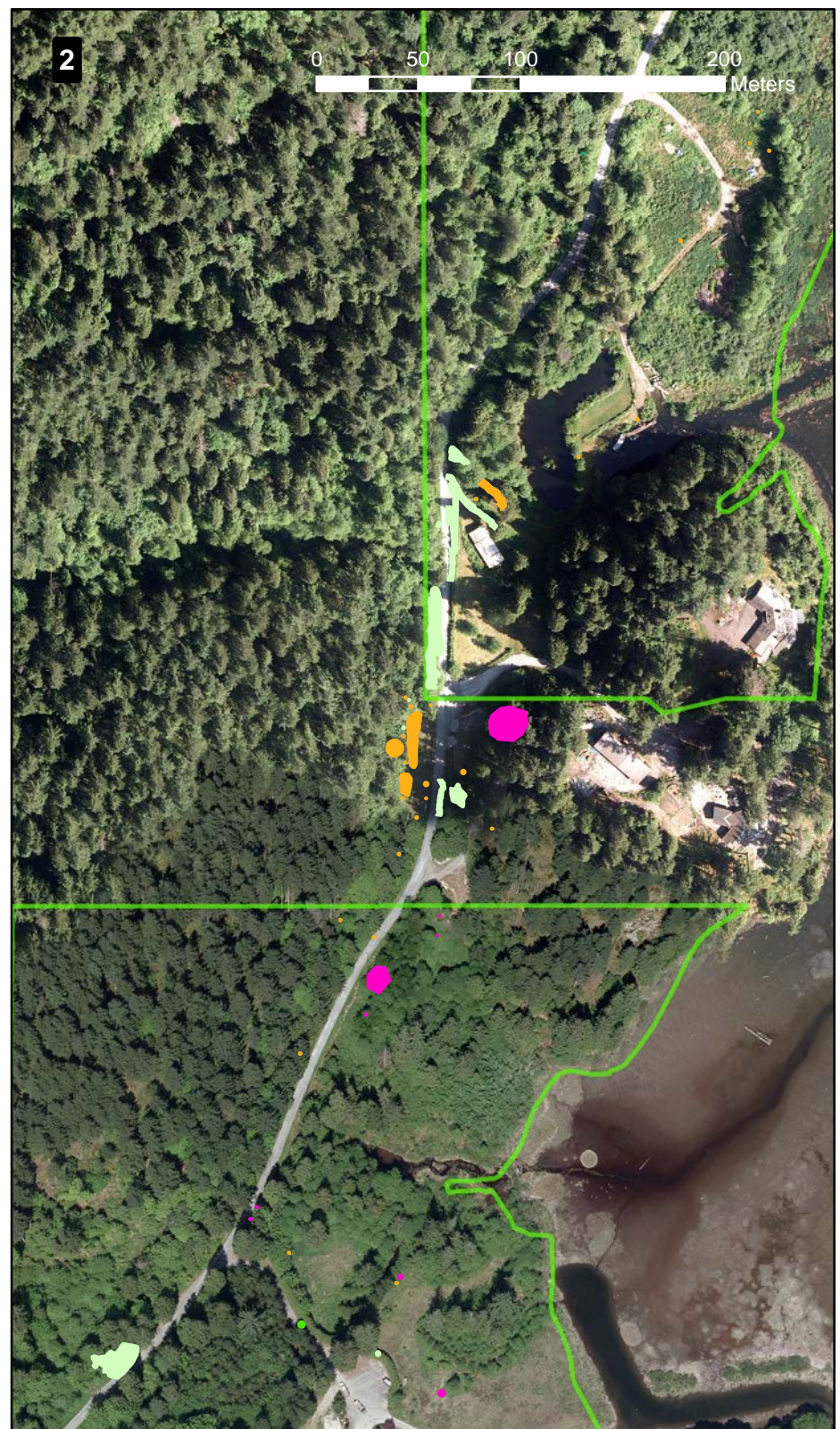
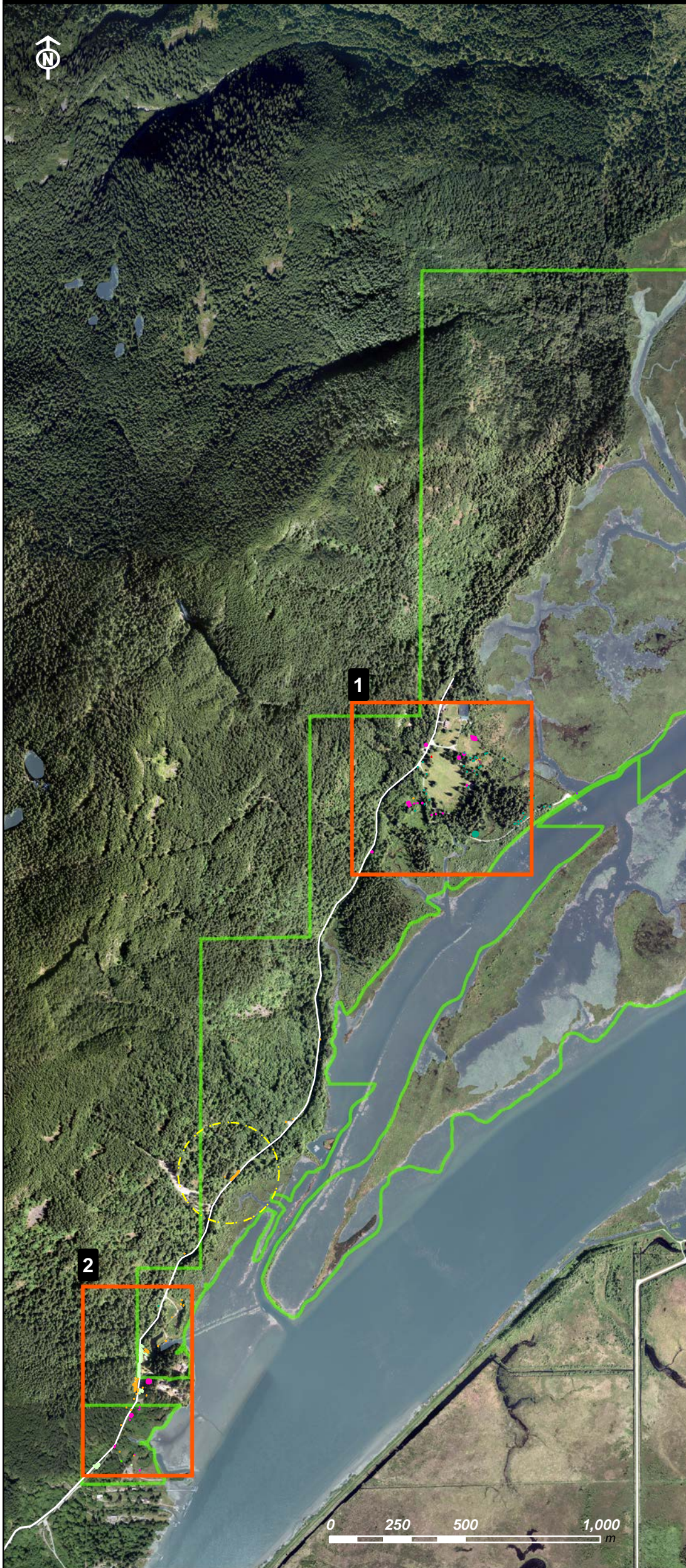
Disturbed area 2: Former residences, log storage area, dredged channel and artificial pond

Disturbed area 3: Access road and former log handling area

 Park Boundaries



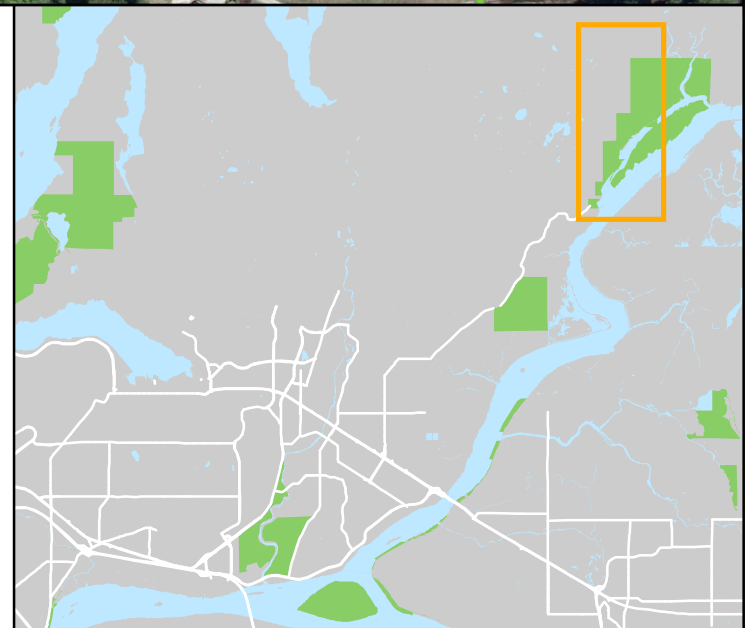




InvasivesData

- Purple Loosestrife
- European Mountain Ash
- Cutleaf Blackberry / Evergreen Blackberry
- English Holly
- English Ivy
- Japanese Knotweed
- Scotch Broom
- Yellow Lamium

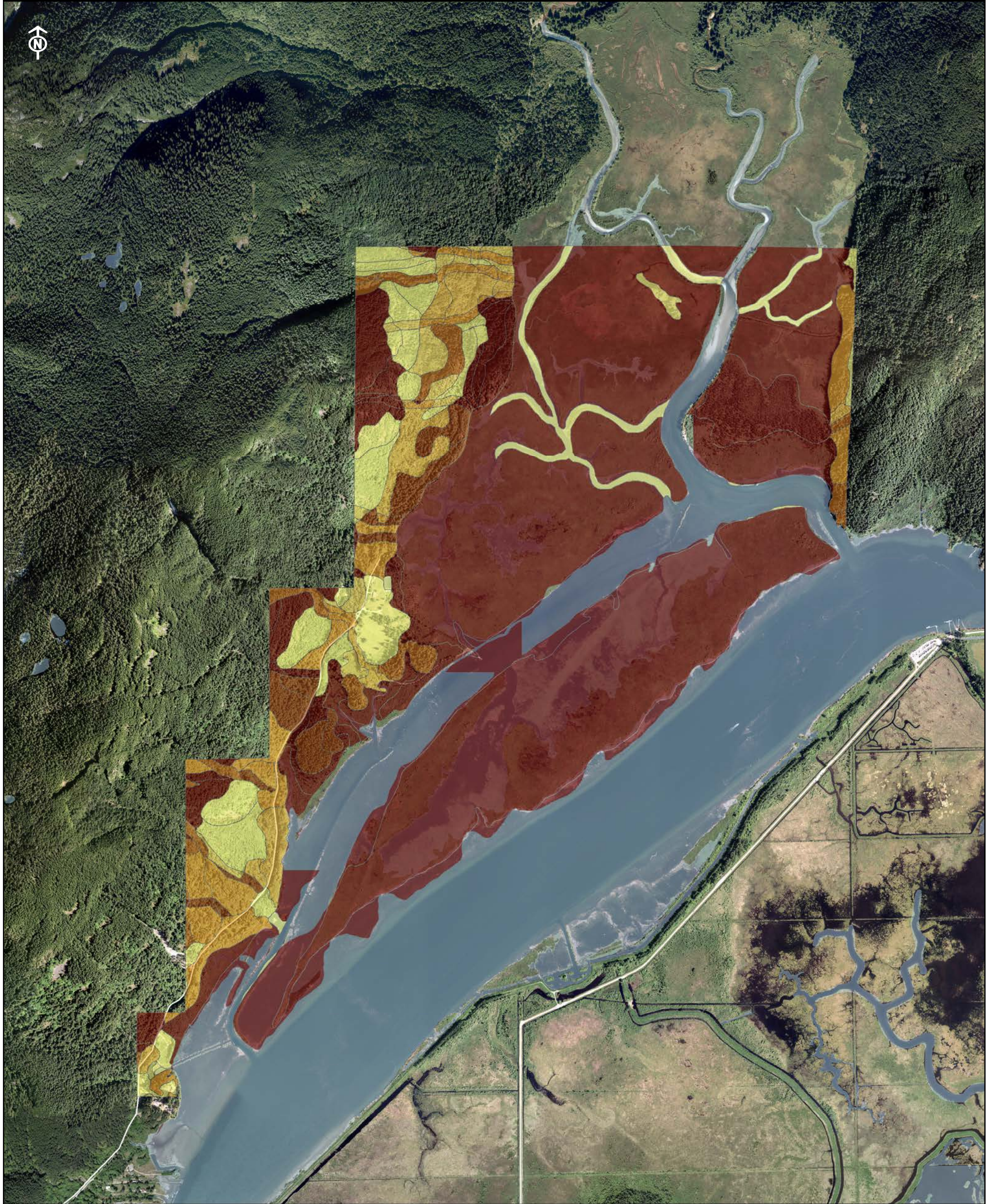
Park Boundaries



Last modified 3/1/2016

Note: no exhaustive inventory of invasive plants present throughout the park has occurred. Invasive plants pictured were target surveyed as candidates for treatment.

WIDGEON MARSH REGIONAL PARK RESERVE - Relative Conservation Value

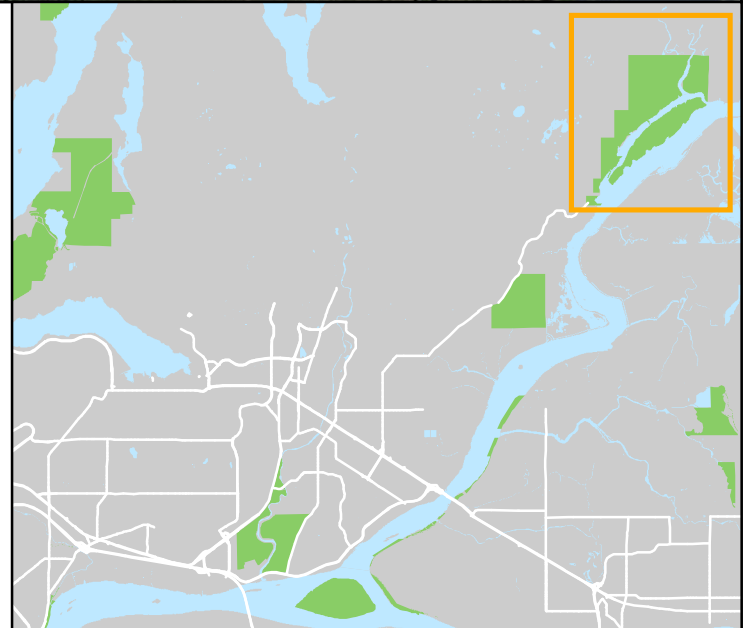


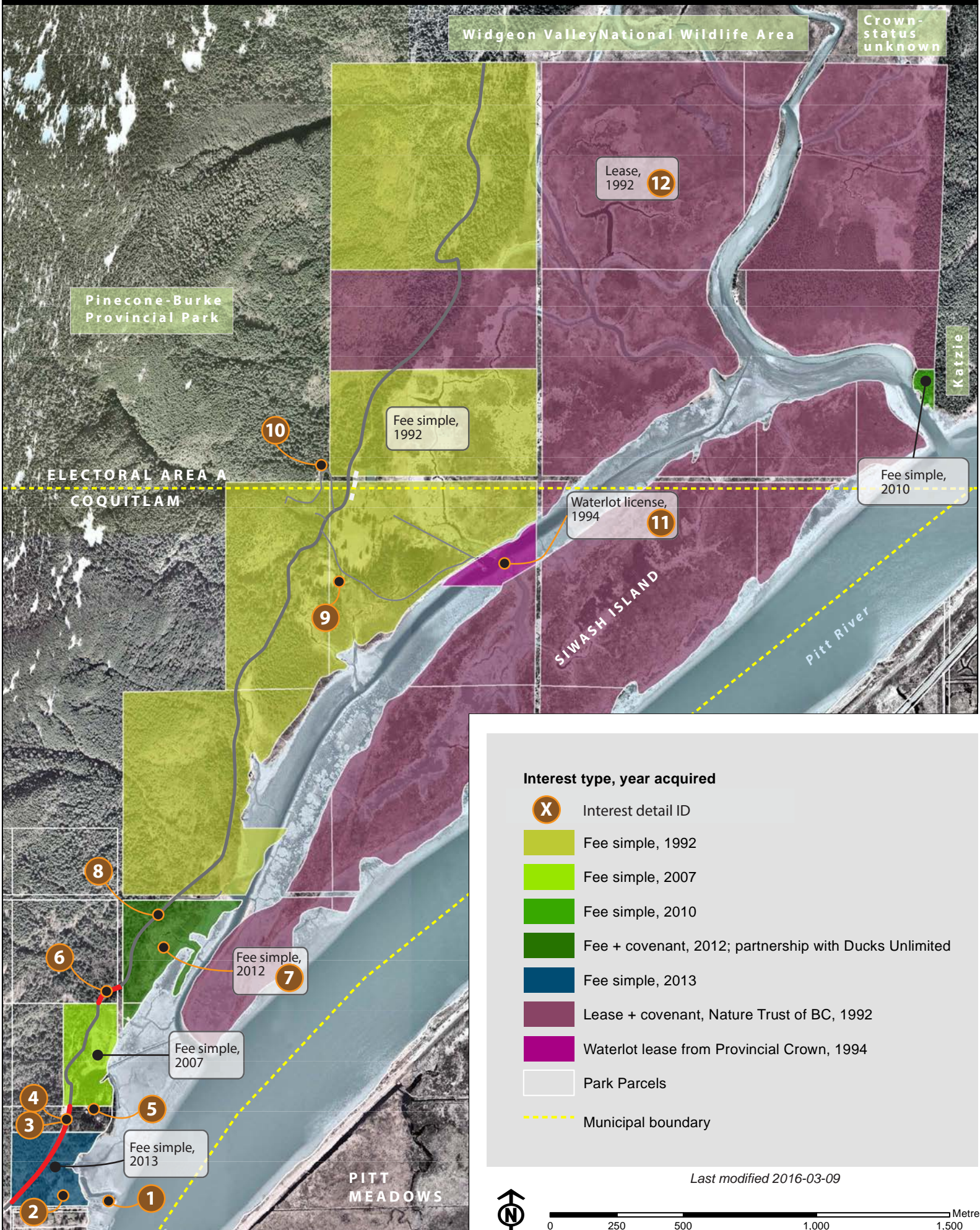
Relative conservation value

- 0-5.9
- 6-7.9
- 8-10.9
- 11-13.9
- 14-15.9
- 16-20.9
- 21+

Last modified 3/9/2016

0 250 500 1,000 m





Appendix B: Widgeon Marsh Regional Park Reserve Plant List

Plants recorded in biophysical inventories of WMRPR to December 2015. This list may be updated through successive inventories and bioblitzes.

Native Conifers

<i>Picea sitchensis</i>	Sitka spruce
<i>Pinus contorta</i> var. <i>contorta</i>	shore pine
<i>Pseudotsuga menziesii</i>	Douglas-fir
<i>Thuja plicata</i>	western red cedar
<i>Tsuga heterophylla</i>	western hemlock

Native Broad-leaved Trees

<i>Acer circinatum</i>	vine maple
<i>Acer macrophyllum</i>	bigleaf maple
<i>Alnus rubra</i>	red alder
<i>Betula papyrifera</i> var. <i>commutata</i>	paper birch
<i>Cornus nutallii</i>	Pacific dogwood
<i>Crataegus douglasii</i>	black hawthorn
<i>Malus fusca</i>	Pacific crab apple
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood
<i>Prunus emarginata</i>	bitter cherry
<i>Rhamnus purshiana</i>	casacara
<i>Salix lucida</i> ssp. <i>lasiandra</i>	Pacific willow
<i>Salix scouleriana</i>	Scouler's willow
<i>Salix sitchensis</i>	Sitka willow

Native Shrubs

<i>Arctostaphalis uva-ursa</i>	kinnikinick
<i>Amelanchier alnifolia</i>	Saskatoon
<i>Cornus stolonifera</i>	red-osier dogwood
<i>Corylus cornuta</i>	beaked hazelnut
<i>Gaultheria shallon</i>	salal
<i>Holodiscus discolor</i>	oceanspray
<i>Kalmia microphylla</i>	Western bog laurel
<i>Ledum greenlanica</i>	Labrador tea
<i>Lonicera involucrata</i>	black twinberry
<i>Menziesia ferruginea</i> ssp. <i>ferruginea</i>	false azalea
<i>Myrica gale</i>	sweet gale
<i>Oemleria cerasiformis</i>	June-plum
<i>Physocarpus capitatus</i>	Pacific ninebark
<i>Ribes lacustre</i>	black gooseberry

<i>Rosa nutkana</i>	Nootka rose
<i>Rubus chamaemorus</i>	cloudberry
<i>Rubus parviflorus</i>	thimbleberry
<i>Rubus spectabilis</i>	salmonberry
<i>Rubus ursinus</i>	trailing blackberry
<i>Salix scouleriana</i>	Scouler's willow
<i>Salix sitchensis</i>	Sitka willow
<i>Sambucus racemosa</i>	coastal red elderberry
<i>Spiraea douglasii</i>	hardhack
<i>Vaccinium corymbosum</i>	highbush huckleberry
<i>Vaccinium ovalifolium</i>	oval-leaved blueberry
<i>Vaccinium oxycoccus</i>	bog cranberry
<i>Vaccinium parvifolium</i>	red huckleberry
<i>Vaccinium uliginosum</i>	bog blueberry
<i>Viburnum edule</i>	highbush cranberry

Fern and Fern-ally

<i>Adiantum aleuticum</i>	northern maiden-hair
<i>Asplenium trichomanes</i>	maidenhair spleenwort
<i>Athyrium filix-femina</i>	lady fern
<i>Blechnum spicant</i>	deer fern
<i>Cryptogramma acrostichoides</i>	parsley fern
<i>Dryopteris expansa</i>	spiny wood fern
<i>Equisetum arvense</i>	common horsetail
<i>Equisetum telmateia</i>	giant horsetail
<i>Equisetum fluviata</i>	swamp horsetail
<i>Polypodium glycyrrhiza</i>	licorice fern
<i>Polystichum munitum</i>	sword fern
<i>Pteridium aquilinum</i>	bracken fern
<i>Selaginella wallacei</i>	Wallace's selaginella

Native sedges, rushes and grasses

<i>Carex obnupta</i>	slough sedge
<i>Carex utriculata</i>	beaked sedge
<i>Carex pauciflora</i>	few-flowered sedge
<i>Carex sitchensis</i>	Sitka sedge
<i>Deschampsia sp.</i>	hairgrass
<i>Dulichium arundinaceum</i>	three-way sedge
<i>Eleocharis obtusa</i>	blunt spike-rush
<i>Glyceria elata</i>	tall mannagrass
<i>Rhynchospora alba</i>	white beaked rush
<i>Scirpus microcarpus</i>	small-flowered bulrush
<i>Juncus acuminatus</i>	Tapered rush

<i>Juncus bufonius</i>	toad rush
<i>Juncus effusus</i>	common rush
<i>Typha latifolia</i>	common cattail
<i>Calamagrostis canadensis</i> var. <i>Canadensis</i>	bluejoint reedgrass
<i>Glyceria elata</i>	tall mannagrass

Native Aquatics

<i>Cassula aquatic</i>	pygmyweed
<i>Myriophyllum hippuroides</i>)	western water-milfoil
<i>Myriophyllum ussuriense</i>	Ussurian water-milfoil
<i>Nuphar polysetum</i>	Rocky Mountain pond-lily
<i>Potamogeton</i> sp	pondweed
<i>Sparganium</i> sp	Bur-reed

Forbs – including wetland plants

<i>Actaea rubra</i>	baneberry
<i>Alisma triviale</i>	American water-plantain
<i>Aruncus dioicus</i>	goatsbeard
<i>Cardamine</i> sp.	bittercress
<i>Claytonia sibirica</i>	Siberian miner's-lettuce
<i>Cicuta douglasii</i>	Douglas water-hemlock
<i>Comarum palustre</i>	marsh cinquefoil
<i>Drosera rotundifolia</i>	Round leaved sundew
<i>Epilobium angustifolium</i>	fireweed
<i>Galium triflorum</i>	sweet-scented bedstraw
<i>Gentiana spectrum</i>	king gentian
<i>Heuchera micrantha</i>	small-flowered alumroot
<i>Hypericum anagalloides</i>	Bog St. John's wort
<i>Lysichiton americanum</i>	Skunk cabbage
<i>Maianthemum dilatatum</i>	false lily-of-the-valley
<i>Menyanthes trifoliata</i>	buckbean
<i>Montia parvifolia</i>	small-leaved montia
<i>Oenanthe sarementosa</i>	Pacific water parsley
<i>Prosartes hookeri</i> var. <i>oregana</i>	Hooker's fairybells
<i>Prunella vulgaris</i>	self-heal
<i>Sagittaria latifolia</i>	arrowhead
<i>Scutellaria laterifolia</i>	Blue skullcap
<i>Sium suave</i>	Hemlock water-parsnip
<i>Symphiotrichum subspicatum</i>	Douglas aster
<i>Tellima grandiflora</i>	fringecup
<i>Tiarella trifoliata</i>	three-leaved foamflower
<i>Trientalis latifolia</i>	northern starflower
<i>Urtica dioica</i>	stinging nettle

Veronica beccabunga
Veronica scutellata
Viola sp

American speedwell
Skullcap speedwell
Viola

Mosses

<i>Atrichum undulatum</i>	common smoothcap
<i>Climacium dendroides</i>	tree-moss
<i>Hylocomnium splendens</i>	step-moss
<i>Isoetecium stoloniferum</i>	isothecium moss
<i>Kindbergia oregonum (Eurhynchium oregonum)</i>	Oregon beaked-moss
<i>Kindbergia praelonga (Eurhynchium praelonga)</i>	slender beaked-moss
<i>Plagiothecium undulatum</i>	flatmoss
<i>Pleurozium schreberi</i>	red stemmed feather-moss
<i>Plagiothecium insigne</i>	silk-moss
<i>Plagiothecium undulatum</i>	hart's-tongue thyme moss
<i>Pogonatum urnigerum</i>	grey haircap moss
<i>Polytrichum strictum</i>	bog haircap moss
<i>Polytrichum sp.</i>	haircap moss
<i>Racomitrium canescens (sensu lato)</i>	grey rock-moss
<i>Rhizomnium glabrescens</i>	large leafy moss
<i>Rhytidiadelphus loreus</i>	lanky moss
<i>Rhytidiadelphus triquetrus</i>	electrified cat's-tail moss
<i>Sphagnum capifolium</i>	common red peat-moss
<i>Sphagnum girgensohnii</i>	common green peat-moss
<i>Sphagnum magellanicum</i>	magellenic peat-moss
<i>Sphagnum pacificum</i>	pacific sphagnum
<i>Sphagnum sp.</i>	peat-moss

Lichens

<i>Usnea longissima</i>	Methuselah's beard
<i>Cladina portentosa</i>	Maritime reindeer

Fungi

<i>Coprinus sp</i>	inky caps
<i>Lycoperdon perlatum</i>	puffball

Appendix C: Non Native Plants of WMRPR

Trees and Shrubs and Vines

<i>Buddleja davidii</i>	butterfly-bush
<i>Cytisus scoparius</i>	Scotch broom
<i>Hedera helix</i>	English ivy
<i>Ilex aquifolium</i>	English holly
<i>Rubus armeniacus</i>	Himalayan blackberry
<i>Rubus laciniatus</i>	cutleaf evergreen blackberry
<i>Salix x chrysocoma</i>	weeping willow
<i>Sorbus aucuparia</i>	European mountain-ash

Forbs (including wetland plants)

<i>Cirsium arvense</i>	Canada thistle
<i>Convolvulus sepium</i>	hedge bindweed
<i>Digitalis purpurea</i>	common foxglove
<i>Geranium robertianum</i>	Robert's geranium
<i>Hypericum perforatum</i>	common St. John's-wort
<i>Hypochaeris radicata</i>	hairy cat's-ear
<i>Impatiens parviflora</i>	small touch-me-not
<i>Iris pseudacorus</i>	yellow iris
<i>Lamium galeobdolon</i>	yellow archangel
<i>Lysimachia terrestris</i>	bog loosestrife
<i>Lythrum salicaria</i>	Purple loosestrife
<i>Mentha arvensis</i>	Field mint
<i>Mycelis muralis</i>	wall lettuce
<i>Myosotis sp</i>	Forget me not
<i>Plantago lanceolata</i>	ribwort plantain
<i>Plantago major</i>	common plantain
<i>Polygonum cuspidatum</i>	Japanese knotweed
<i>Ranunculus repens</i>	creeping buttercup
<i>Senecio viscosus</i>	sticky ragwort
<i>Taraxacum officinale</i>	common dandelion
<i>Vicia sativa</i>	common vetch

Sedges, Rushes and Grasses

<i>Agrostis alba</i>	redtop grass
<i>Dactylis glomerata</i>	orchard grass
<i>Eriophorum virginicum</i>	tawny cotton-grass
<i>Holcus lanatus</i>	velvet grass

Juncus bulbosus
Juncus canadensis

bulbous rush
Canada rush

Appendix D: Fauna of Widgeon Marsh Regional Park Reserve

This list contains species reported by staff or identified in inventories. Animals marked with an (I) are introduced. List will be updated through successive inventories and bioblitzes.

Amphibians

<i>Ascaphus truei</i>	coastal tailed frog	MV
<i>Ambystoma gracile</i>	northwestern salamander	Strix
<i>Ensatina eschscholtzii</i>	common ensatina	Strix
<i>Plethodon vehiculum</i>	western red-backed salamander	Strix
<i>Pseudacris regilla</i>	Pacific chorus frog	Strix
<i>Rana aurora</i>	red-legged Frog	Strix
<i>Lithobates catesbeiana</i>	American bullfrog (I)	MV
<i>Lithobates clamitans</i>	green frog (I)	MV
<i>Taricha granulosa</i>	rough-skinned newt	Strix

Reptiles

<i>Elgaria coerulea principis</i>	northern alligator lizard	Strix
<i>Thamnophis sirtalis</i>	common garter snake	Strix

Mammals

<i>Sorex cinereus</i>	Cinereus shrew	Strix
<i>Sorex vagrans</i> ssp. <i>vagrans</i>	vagrant shrew	Strix
<i>Tamiasciurus douglasii</i> ssp. <i>mollipilosu</i>	Douglas' squirrel	Strix
<i>Castor canadensis</i>	beaver	MV
<i>Peromyscus maniculatus</i>	deer mouse	Strix
<i>Glaucomys sabrinus</i>	northern flying squirrel	MV
<i>Neotamias townsendii</i>	Townsend's chipmunk	MV
<i>Lontra canadensis</i>	river otter	MV
<i>Mustela ermine</i>	short tailed weasel	Strix
<i>Eptesicus fuscus</i>	big brown bat	MV
<i>Myotis lucifugus</i>	little brown bat	MV
<i>Odocoileus hemionus</i> ssp. <i>Columbianus</i>	<i>Columbian</i> black-tailed deer	MV
<i>Ursus americanus</i>	black bear	MV
<i>Procyon lotor</i>	raccoon	MV
<i>Lynx rufus</i>	bobcat	MV
<i>Canis latrans</i>	coyote	MV
<i>Puma concolor</i>	cougar	MV

Fish

<i>Lota lota</i>	burbot	FIDQ
<i>Oncorhynchus clarki clarki</i>	coastal cutthroat trout	FIDQ
<i>Oncorhynchus keta</i>	chum	FIDQ
<i>Oncorhynchus kisutch</i>	coho	FIDQ
<i>Oncorhynchus mykiss</i>	rainbow trout	FIDQ
<i>Oncorhynchus nerka</i>	sockeye	FIDQ
<i>Oncorhynchus mykiss</i>	steelhead	FIDQ

Birds

As reported in E-Bird to December 2015

<i>Branta hutchinsii</i>	Cackling Goose	Nov 2015
<i>Branta canadensis</i>	Canada Goose	Nov 2015
<i>Cygnus buccinator</i>	Trumpeter Swan	Nov 2015
<i>Aix sponsa</i>	Wood Duck	Sep 2010
<i>Anas acuta</i>	northern Pintail	
<i>Anas strepera</i>	Gadwall	Jan 2015
<i>Anas penelope</i>	Eurasian Wigeon	Jan 2014
<i>Anas americana</i>	American Wigeon	Nov 2015
<i>Anas platyrhyncho</i>	Mallard s	Nov 2015
<i>Anas crecca</i>	Green-winged Teal	Apr 2015
<i>Aythya collaris</i>	Ring-necked Duck	May 2015
<i>Aythya affinis</i>	Lesser Scaup	Apr 2015
<i>Bucephala albeola</i>	Bufflehead	Nov 2015
<i>Bucephala clangula</i>	Common Goldeneye	Apr 2015
<i>Lophodytes cucullatus</i>	Hooded Merganser	Nov 2015
<i>Mergus merganser</i>	Common Merganser	Nov 2015
<i>Gavia immer</i>	Common loon	July 2014
<i>Dendragapus fuliginosus</i>	Sooty Grouse	May 2015
<i>Podilymbus podiceps</i>	Pied-billed Grebe	Sep 2015
<i>Podiceps auritus</i>	Horned Grebe	Nov 2015
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Feb 2015
<i>Botaurus lentiginosus</i>	American Bittern	Sep 2015
<i>Ardea herodias</i>	Great Blue Heron	Nov 2015
<i>Butorides virescens</i>	Green Heron	May 1970
<i>Cathartes aura</i>	Turkey Vulture	Jul 2015
<i>Pandion haliaetus</i>	Osprey	May 2015
<i>Aquila chrysaetos</i>	Golden Eagle	Nov 2015
<i>Circus cyaneus</i>	Northern Harrier	Nov 2015
<i>Accipiter cooperii</i>	Cooper's Hawk	Sep 2010
<i>Accipiter gentilis</i>	Northern Goshawk	Jan 2015
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Nov 2015
<i>Buteo jamaicensis</i>	Red-tailed Hawk	Feb 2015

<i>Fulica americana</i>	American Coot	Sep 2010
<i>Grus canadensis</i>	Sandhill Crane	Jul 2015
<i>Tringa melanoleuca</i>	Greater Yellowlegs	Apr 2015
<i>Gallinago delicata</i>	Wilson's Snipe	Apr 2015
<i>Larus delawarensis</i>	Ring-billed Gull	Sep 2010
<i>Larus occidentalis</i>	Western Gull	Sep 2015
<i>Larus glaucescens</i>	Glaucous-winged Gull	Nov 2015
<i>Patagioenas fasciata</i>	Band-tailed Pigeon	Jun 2014
<i>Cypseloides niger</i>	Black Swift	Jul 2014
<i>Bubo virginianus</i>	Great Horned Owl	Sep 2010
<i>Glaucidium gnoma</i>	Northern Pygmy-Owl	Feb 2015
<i>Cypseloides niger</i>	Black Swift	Sep 2010
<i>Chaetura vauxi</i>	Vaux's Swift	May 2014
<i>Selasphorus rufus</i>	Rufous Hummingbird	May 2015
<i>Megaceryle alcyon</i>	Belted Kingfisher	Nov 2015
<i>Sphyrapicus ruber</i>	Red-breasted Sapsucker	Jul 2015
<i>Picoides pubescens</i>	Downy Woodpecker	Sep 2010
<i>Picoides villosus</i>	Hairy Woodpecker	May 2011
<i>Colaptes auratus</i>	Northern Flicker	Nov 2015
<i>Falco peregrinus</i>	Peregrine Falcon	Nov 2015
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Jul 2015
<i>Tyrannus tyrannus</i>	Eastern Kingbird	Aug 2015
<i>Empidonax traillii</i>	Willow Flycatcher	Jul 2015
<i>Empidonax hammondi</i>	Hammond's Flycatcher	May 2007
<i>Empidonax difficilis</i>	Pacific-slope Flycatcher	Jul 2015
<i>Vireo gilvus</i>	Warbling Vireo	Jun 2014
<i>Vireo olivaceus</i>	Red-eyed Vireo	Jul 2014
<i>Cyanocitta stelleri</i>	Steller's Jay	Nov 2015
<i>Corvus caurinus</i>	Northwestern Crow	Nov 2015
<i>Corvus corax</i>	Common Raven	Nov 2015
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow	May 1970
<i>Tachycineta bicolor</i>	Tree Swallow	Jul 2015
<i>Tachycineta thalassina</i>	Violet-green Swallow	May 2015
<i>Hirundo rustica</i>	Barn Swallow	Jul 2015
<i>Poecile atricapillus</i>	Black-capped Chickadee	Jul 2015
<i>Poecile rufescens</i>	Chestnut-backed Chickadee	Jan 2015
<i>Psaltriparus minimus</i>	Bushtit	Feb 2015
<i>Sitta canadensis</i>	Red-breasted Nuthatch	Apr 2015
<i>Certhia americana</i>	Brown Creeper	Jan 2015
<i>Troglodytes pacificus</i>	Pacific Wren	Nov 2015
<i>Cistothorus palustris</i>	Marsh Wren	Nov 2015
<i>Cinclus mexicanus</i>	American Dipper	Apr 2015
<i>Regulus satrapa</i>	Golden-crowned Kinglet	Sep 2015

<i>Regulus calendula</i>	Ruby-crowned Kinglet	Apr 2015
<i>Sialia currucoides</i>	Mountain Bluebird	May 1970
<i>Catharus ustulatus</i>	Swainson's Thrush	Jul 2015
<i>Turdus migratorius</i>	American Robin	Sep 2015
<i>Ixoreus naevius</i>	Varied Thrush	Nov 2015
<i>Dumetella carolinensis</i>	Gray Catbird	Jul 2013
<i>Sturnus vulgaris</i>	European Starling	Apr 2015
<i>Bombycilla cedrorum</i>	Cedar Waxwing	Sep 2015
<i>Oreothlypis celata</i>	Orange-crowned Warbler	Sep 2010
<i>Geothlypis tolmiei</i>	MacGillivray's Warbler	May 1970
<i>Geothlypis trichas</i>	Common Yellowthroat	Jul 2015
<i>Setophaga petechial</i>	Yellow Warbler	Jun 2014
<i>Setophaga coronata</i>	Yellow-rumped Warbler	May 2015
<i>Setophaga nigrescens</i>	Black-throated Gray Warbler	Sep 2010
<i>Selophaga twosendii</i>	Townsend's Warbler	Jun 2015
<i>Cardellina pusilla</i>	Wilson's Warbler	May 2015
<i>Junco hyemalis</i>	Dark-eyed Junco	May 2015
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	Sep 2015
<i>Zonotrichia atricapilla</i>	Golden-crowned Sparrow	May 2015
<i>Passerculus sandwichensis</i>	Savannah Sparrow	Sep 2010
<i>Melospiza melodia</i>	Song Sparrow	Nov 2015
<i>Melospiza lincolnii</i>	Lincoln's Sparrow	Sep 2010
<i>Pipilo maculatus</i>	Spotted Towhee	Sep 2015
<i>Piranga ludoviciana</i>	Western Tanager	Jul 2015
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak	May 2015
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	May 2015
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	May 1970
<i>Molothrus ater</i>	Brown-headed Cowbird	May 2014
<i>Icterus bullockii</i>	Bullock's Oriole	May 2007
<i>Haemorhous purpureus</i>	Purple Finch	May 2015
<i>Spinus pinus</i>	Pine Siskin	Feb 2015
<i>Spinus tristis</i>	American Goldfinch	Jul 2015
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	May 2007

Appendix E: Widgeon Marsh Regional Park Reserve Species at Risk

Red and blue listed species recorded in biophysical inventories of WMRPR to December 2015 and species that have been confirmed in similar habitat nearby.

Species confirmed in biophysical inventories to 2015

Species	Common name	Status	Source
Plants			
<i>Helenium autumnale</i> var. <i>grandiflorum</i>	mountain sneezewort	blue	RAE, 2015
<i>Lindernia dubia</i> var. <i>anagallidea</i>	false pimpernel	blue	RAE, 2015
<i>Myriophyllum pinnatum</i>	green parrot's-feather	blue	RAE, 2015
Amphibians			
<i>Dicamptodon tenebrosus</i>	Coastal tailed frog	blue	MV, 2000
<i>Rana aurorared</i>	red-legged frog	blue	Strix, 2007
Birds			
<i>Ardea herodias fannini</i>	great blue heron, fannini	blue	MV
<i>Butorides virescens</i>	green heron	blue	Strix, 2007
<i>Botaurus lentiginosus</i>	American bittern	blue	MV
<i>Contopus cooperi</i>	olive-sided flycatcher	blue	MV, 2015
<i>Cypseloides niger</i>	black swift	blue	E-bird
<i>Falco peregrinus anatum</i>	Peregrine falcon, anatum	blue	MV. 2015
<i>Hirundo rustica</i>	barn swallow	blue	MV
<i>Megascops kennicottii kennicottii</i>	western screech owl, kennicottii	blue	Strix, 2007
<i>Patagioenas fasciata</i>	Band-tailed pigeon	blue	MV
Fish			
<u><i>Oncorhynchus clarkii clarkii</i></u>	Coastal cutthroat trout	blue	FISQ

Species Identified in similar habitats nearby - may occur at WMRPR

Plants

<i>Bidens amplissima</i>	Vancouver Island beggarticks	blue	CDC, 2008
<i>Callitriche heterophylla</i> var. <i>heterophylla</i>	two-edged water starwort	blue	CDC, 1978
<i>Carex scoparia</i>	pointed broom-sedge	blue	CDC, 1986
<i>Eleocharis rostellata</i>	beaked spikerush	blue	CDC, 1978
<i>Elodea nuttallii</i>	Nuttall's waterweed	blue	CDC, 1980
<i>Juncus oxymiris</i>	pointed rush	blue	CDC, 1973
<i>Lilaea scilloides</i>	flowering quilwort	blue	CDC, 1978

Amphibians

<i>Anaxyrus boreas</i>	western toad	blue	MV
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Fish

<i>Thaleichthys pacificus</i>	white sturgeon	red	FISQ
<i>Spirinchus thaleichthys</i>	pygmy longfin smelt	red	FISQ
<i>Hybognathus hankinsoni</i>	brassy minnow	blue	FISQ

Source: RAE – Raincoast Applied Ecology (Page & Schaefer, 2015); Strix (Strix Environmental Consulting, 2007); CDC (BC Conservation Data Centre); MV – Metro Vancouver staff, FISQ (Fisheries Inventory Data Query (FISQ))

Red: Includes any indigenous species or subspecies that have, or are candidates for, Extirpated, Endangered, or Threatened status in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Not all Red-listed taxa will necessarily become formally designated. Placing taxa on these lists flags them as being at risk and requiring investigation.

Blue: Includes any indigenous species or subspecies considered to be of Special Concern (formerly Vulnerable) in British Columbia. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.

(BC Conservation Data Centre, 2013)