REPORT

BIO-INVENTORY OF DISTRICT LOT 471 AND DISTRICT LOT 95, KITIMAT, BC.

IN SUPPORT OF PHASE I OF THE MINETTE BAY WEST CONCEPT PLAN

Submitted to:
Urban Systems
550 – 1090 Homer Street
Vancouver, British Columbia, V6B 2W9



Reference: 1618-001

Distribution:
Urban Systems - 2 hard copies and 1 e-copy
District of Kitimat - 1 e-copy
Silverwood Consulting Inc. 1 e-copy

SILVERWOOD
NATURAL RESOURCE CONSULTANTS

ACKNOWLEDGEMENTS

The authors of this report would like to acknowledge the contribution of local and site specific knowledge by the District of Kitimat, Haisla Nation, Urban Systems, Kleanza Consulting Inc., Archipelago Marine Research, Murdoch de Greeff Inc., LM Forest Resource Solutions, Ruth Mills, the Kitimat Valley Naturalists, and other citizens that are passionate about Minette Bay and the surrounding Kitimat Valley.

DISCLAIMER

This report was prepared for the exclusive use of Urban Systems and the District of Kitimat. Any use, reliance, or decisions made by third parties on the basis of this report are the responsibility of such third parties.

The information in this report represents observations, results, and recommendations of the authors, and likewise errors or omissions are the responsibility of the authors. Additional information or review comments are welcome. For more information about this report and the Minette Bay West Concept Plan contact the District of Kitimat at tel 250-632-8900 or visit the District of Kitimat website at www.kitimat.ca.

EXECUTIVE SUMMARY

This bio-inventory of District Lot 471 and District Lot 95 (DL 471 and DL 95) was commissioned by the District of Kitimat as part of the Minette Bay West Concept Plan. It contains reconnaissance level information on Environmentally Valuable Resources (such as terrestrial and estuarine ecosystems, and species at risk) as baseline data for the planning process. The methodology used for describing the terrestrial (floodplain forested) ecosystems, the coastal zone ecosystems, and the terrestrial wildlife (and regionally significant species) included a desktop study of historic aerial photographs and background documents, searches of key web-based databases for listed terrestrial species and ecosystems, and a preliminary site survey of DL 471 and DL 95.

The study area occurs on a floodplain between the Kitimat River and Minette Bay and includes intertidal portions of Minette Bay, estuarine / wetland associations, and upland floodplain forests. Minette Bay is part of the Kitimat River estuary and consists of several coastal zone ecosystems. The Kitimat River estuary is rated as a class 1 estuary (Ryder *et al* 2007). Five distinct forest ecosystems were observed and identified during the preliminary site survey. These include three provincially listed ecological communities: CWHvm1-09 (red-listed) Young seral alder dominated high fluvial bench floodplain; CWHvm1–14 (blue-listed) Young seral western hemlock (Hw) dominated low-lying forest; and, CWHvm1–14/05 (blue-listed) Old climax western redcedar, Sitka spruce and western hemlock (Cw/Ss Hw) dominated low-lying forest. Six coastal zone ecosystems were observed and identified during the preliminary site survey, these include both red- and blue-listed estuarine communities: CWHvm1/Em01 (red-listed) Widgeon-grass; CWHvm1/Em05/Em06 (Em05 red-listed, Em06 blue-listed) Estuarine marsh-Lyngbye's sedge / Lyngbye's sedge - Douglas' water hemlock; CWHvm1/Ed01/Ed02 (blue-listed) Estuarine Meadow- Tufted hairgrass – Meadow barley / Tufted hairgrass – Douglas' aster; and, CWHvm1/Ws50/Ws06/Wf52/Fl50 (Ws06 – blue-listed) Transitional shrub complex.

The Minette Bay estuary provides both year-round and migratory habitat for a significant number of bird species. Observational and anecdotal evidence suggests that there is high use of the study area (including Minette Bay) by bear, moose, deer, birds, and juvenile salmon species. Of interest to the Concept Plan development is the potential for wildlife / human conflicts, especially as they pertain to Grizzly bear use of the study area.

Controlling factors identified for development of the study area included sensitive soils in both the forested and estuarine environments, numerous streams, provincially listed plant communities, and possible wildlife impacts. To support the District of Kitimat in the development of the Minette Bay Concept Plan, a number of recommendations are provided in the report. Notable recommendations include:

- Protection of estuarine and listed communities;
- Engagement of specialists in wildlife and hydrology in the development and use of walking trails;
- Discouragement of foot traffic on estuarine areas and the use of elevated trails and observation structures to control where people travel;
- Use of pre-existing access and pre-existing structures as the first choice for approach or connection to the coastal zone;
- Consideration of Green Shores designation and practices for development in the coastal zone (or in the low fluvial terrestrial area) for sea level rise and storm surges due to climate change;

- Appropriate construction environmental management plans for larger land development options if they result from the final Concept Plan; and,
- Best Management Practices (BMPs) including guidance form District of Kitimat plans or bylaws and/or Develop with Care (BC MOE 2014).

Several community engagement events are planned in the near future to share preliminary environmental and archaeological information and to seek public input on the Minette Bay Concept Plan.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS I

DISCLAIMER II

EXECUTIVE SUMMARY III

1 INTRODUCTION 1

2 METHODOLOGY 1

3 ENVIRONMENTALLY VALUABLE RESOURCES 4

3.1 Desktop Review 4

3.2 Preliminary Site Survey Results 9

3.2.1 Terrestrial Ecosystems 10

3.2.2 Coastal Zone Ecosystems 14

3.2.3 Aquatic and Riparian Ecosystems 15

3.2.4 Terrestrial Wildlife and Species at Risk, and Regionally Significant Species 16

3.3 Discussion and Recommendations 17

3.4 Potential Rehabilitation and Restoration Opportunities 20

4 CLOSURE 21

5 REFERENCES 22

APPENDIX I - PHOTOGRAPHS 24

APPENDIX II – BC SPECIES AND ECOSYSTEMS EXPLORER SEARCH RESULTS 32

TABLES

Table 1. Terrestrial Plant (and) Species at Risk Potentially Found in Study Area 5

Table 2 Terrestrial Wildlife Species at Risk Potentially Found in the Study Area 7

Table 3 Terrestrial Ecological Communities in the Study Area 11

Table 4 Coastal Zone Dominant Ecological Communities in the Study Area 14

FIGURES

Figure 1. Project Location 2

Figure 2. District Lots 95 and 471 – the study area 3

Figure 3. DL 471 Terrestrial and Coastal Zone Ecological Communities 12

Figure 4. DL 95 Terrestrial and Coastal Zone Ecological Communities 13

Figure 5. BC Species and Ecosystem Explorer Results for Estuarine Ecological Communities (BC CDC 2016). 32

Figure 6. BC Species and Ecosystem Explorer Results for Terrestrial Ecological Communities (BC CDC 2016). 33

Figure 6. continued 34

1 INTRODUCTION

District Lot 471 and District Lot 95 are located within the District of Kitimat, BC (Figure 1). The bio-inventory of District Lot 471 and District Lot 95 (DL 471 and DL 95), the study area, and this subsequent report, were commissioned by the District of Kitimat as part of the Minette Bay West Concept Plan. The collaborative planning process, which will culminate in the development of a Concept Plan for Minette Bay west is being led by Urban Systems on behalf of the District of Kitimat. The idea of the Concept Plan and the collaborative process to develop the Plan stems from the 2008 Kitimat *Official Community Plan* where, during consultation, residents expressed a strong interest in having greater public access to the coastline. The District of Kitimat Council Strategic Plan for 2015-2018 includes similar priorities.

The bio-inventory is part of Phase I of the Concept Plan (three phased approach). It contains reconnaissance level information on Environmentally Valuable Resources (such as terrestrial ecosystems and species at risk) as baseline data for the planning process. It is the goal of the District of Kitimat to collect sound information to ensure that ecological communities and wildlife habitats are maintained in order to preserve, and potentially restore, the bio-diversity in the Minette Bay west area.

2 METHODOLOGY

The main Environmentally Valuable Resources (EVRs) for discussion in the bio-inventory report for Minette Bay DL 471 and DL 95 include:

- Terrestrial Ecosystems (sections 3.1, 3.2.1, and 3.3),
- Coastal Zone Ecosystems (section 3.1, 3.2.2, 3.3),
- Aquatic and Riparian Ecosystems (section 3.1, 3.2.3, and 3.3),
- Terrestrial Wildlife and Species at Risk, and Regionally Significant Species (section 3.1, 3.2.4, and 3.3), and
- Potential Rehabilitation or Restoration Opportunities (section 3.4).

The choice of EVRs was informed by the guidance given in *Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia* (2014). "Develop with Care" is a document prepared by the provincial government for use by local governments, the development community, landowners and environmental organizations as a comprehensive guide to maintaining environmental values during the development of urban and rural lands (BC MOE 2014). Throughout the discussion of EVRs general consideration was also given to the requirements for designation under the *Green Shores for Coastal Development Credits and Ratings Guide: A Reference to Help Minimize the Environmental Impact of Waterfront Properties and Development* (SCBC 2010).

A low level aerial orthophoto mosaic produced specifically for the purpose of supporting the Minette Bay West Concept Plan was used for preliminary identification of land form and terrestrial features of interest for both the terrestrial ecosystems and the coastal zone ecosystems (Figure 2). Review of the aerial orthophoto mosaic guided the reconnaissance level preliminary site survey (field survey).

The methodology used for describing the terrestrial (floodplain forested) ecosystems, the coastal zone ecosystems, and the terrestrial wildlife (and regionally significant species) included a desktop study of historic aerial photographs and background documents, searches of key web-based databases for listed

terrestrial species and ecosystems, and a preliminary site survey of DL 471 and DL 95. Terrestrial ecosystems were described according to the *Field Manual for Describing Terrestrial Ecosystems, Land*

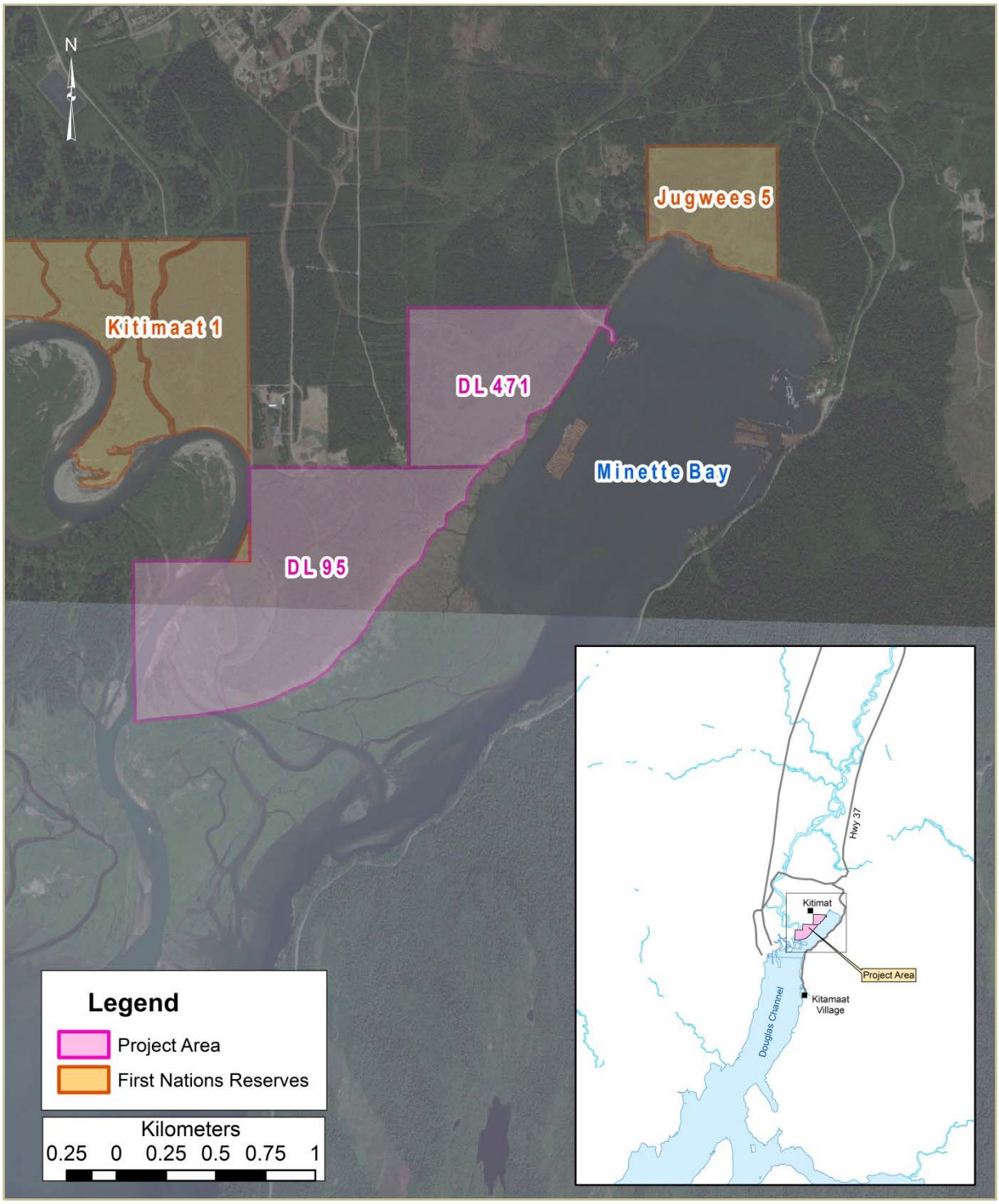


Figure 1. Project Location

Management Handbook 25 (Banner et. al. 1993), *A Field Guide to Site Identification and Interpretation for the Prince Rupert Forest Region, Land Management Handbook 26* (BC Ministry of Forests and Range and BC Ministry of Environment) , and the *Wetlands of British Columbia: A Guide to Identification* (MacKenzie and Moran 2004). Interpretation of field observations with potential relevance to the Minette Bay West Concept Plan is included in the discussion.

To help inform the methodology used to characterize the coastal zone ecosystems along the shore line of DL 471 and DL 95, the *British Columbia Biological Shore-Zone Mapping System* (RIC March 1995) and the *British Columbia Physical Shore-Zone Mapping System* (RIC March 1994) were referenced. The preliminary site survey of the shore zone of DL 471 and DL 95 was at the reconnaissance level and included walking a transect line of the shore line collecting species identification data and photographs. The coastal zones were then classified and mapped based on the estuarine associations described in *Wetlands of British Columbia: A Guide to Identification* (MacKenzie and Moran 2004).

To further the discussion of EVRs in the study area, a desktop study was conducted to determine the potential for wildlife species at risk and regionally significant species to occupy the area. Anecdotal evidence from local residents was also used to describe wildlife use of DL 471 and DL 95. During the preliminary site survey, observations of areas of significant wildlife use were noted.

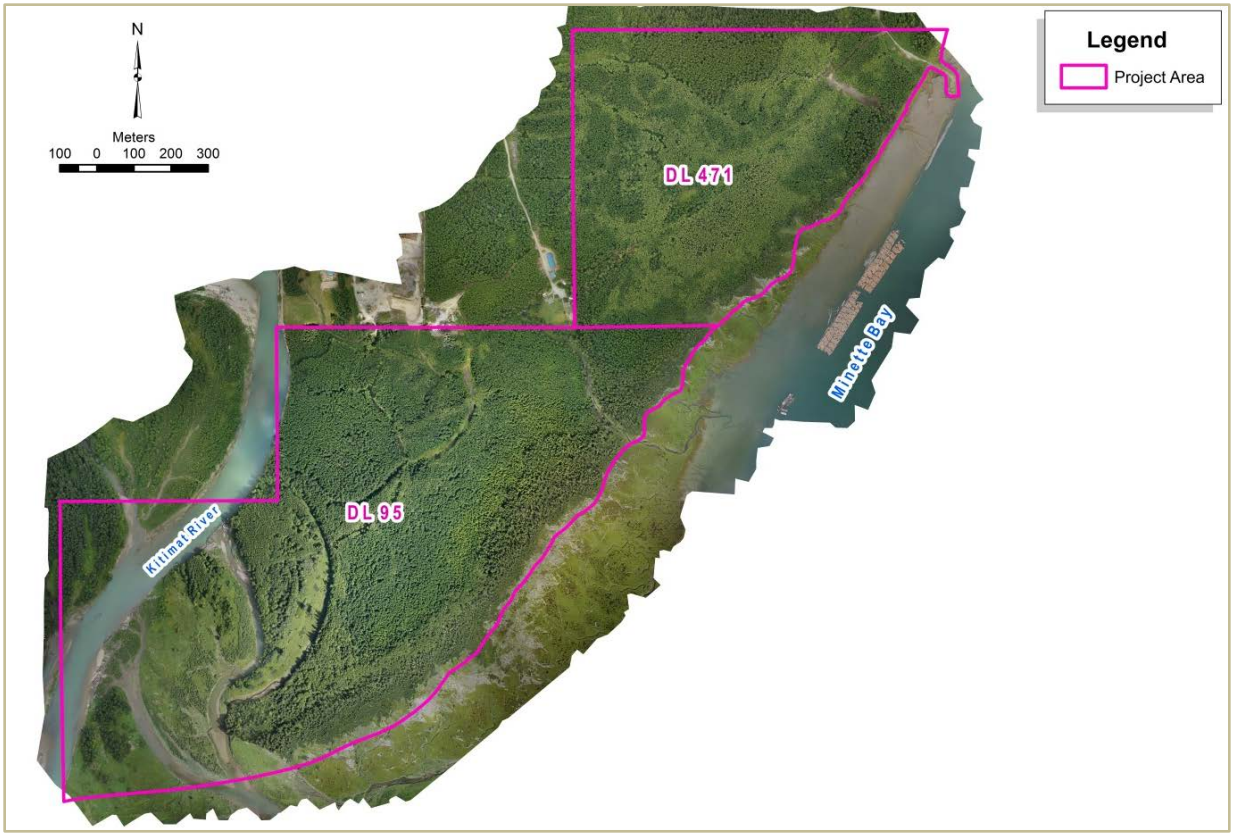


Figure 2. District Lots 95 and 471 – the study area
Source: LM Forest Resource Solutions Ltd, 2016

3 ENVIRONMENTALLY VALUABLE RESOURCES

3.1 Desktop Review

Terrestrial Ecosystems and Coastal Zone Ecosystems

As both the terrestrial ecosystems (upland) and the coastal zone ecosystems (foreshore) are integrated units in the study area, the contemplation of the desktop review results are presented here together.

In general, the importance of terrestrial ecosystems lies in their inherent value to wildlife for food, refuge and travel or migratory routes. Also of importance is that many high value habitats and their supporting ecosystems are becoming increasingly rare and therefore may be required to be considered in the context of conservation.

Several previous studies have been carried out that include consideration of Minette Bay. A 1975 Minette Bay study conducted by the District of Kitimat Planning department includes information about the history of timber harvesting. Both DL 471 and DL95 were significantly harvested. In 1966 the northwest corner of DL 95 representing perhaps 40 percent of the lot was clear cut harvested. The remainder of DL 95 does not appear to have been harvested within the last 100 years. DL 471 includes: (a) a small area of old growth forest with no evidence of harvesting that is located east of the old MacMillan Bloedel log dump; (b) an area of late maturing seral forest along the north boundary that regenerated from logging more than 60 years ago; and (c) the remaining forested area of young seral forest that regenerated following timber harvesting in 1971. The land status at the time of the 1975 study is captured in an aerial photograph included as Photo 1.

Minette Bay is part of the Kitimat River estuary and consists of several coastal zone ecosystems. The estuary has such a connection to freshwater (the Kitimat River) that salinity levels are considerably reduced, and there are significant influences to the area from sediment input and tidal fluctuations. As noted in the *Wetlands of British Columbia, A Guide to Identification* by William H. MacKenzie and Jennifer R. Moran:

> Estuaries provide critical habitat for many wildlife species but comprise much less than 1% of the coastal landscape. These ecosystems have very high values for waterfowl and shorebirds, which use estuaries to maintain fat stores during migration to the nesting grounds. In addition, estuarine ecosystems are critical for coastal bear populations, providing early-season and mid-season forage, and cover while fishing during the salmon run.
> Estuaries are critically important fish habitat. Freshwater inputs of nutrients and organic debris into the marine environment fuel highly productive ecosystems. Many saltwater, freshwater, and anadromous fish will selectively use estuaries during some portion of their lifecycle, particularly for juvenile rearing (pg. 157).

In *An Integrated Biophysical Assessment of Estuarine Habitats in British Columbia to Assist Regional Conservation Planning*, the Kitimat River estuary is rated as a class 1 estuary (Ryder *et al* 2007). The class 1 rating is achieved because of the estuary's high relative "biological importance score". The biological importance score was calculated through an assessment of estuary attribute features such as estuary size, habitat rarity, water fowl use, herring spawn occurrence, and intertidal species rarity (Ryder *et al* 2007). A Class 1 estuary would rate high in the key estuary attribute features.

A *Biological Assessment of the Kitimat River Estuary* (Howard Paish and Associates 1974), which included discussion of Minette Bay, presents historic information on vegetation, fish and wildlife resources. This information was used to complete a list of potential species that have previously been

observed in the Kitimat River Estuary area to compare with the species that are currently present. A review of more recent documents relevant to the bio-inventory included the publicly-available *LNG Canada Environmental Assessment Application* and supporting technical reports (LNG Canada 2014). The Vegetation Resources section of the Application included detailed site survey information that was beyond the scope of this Concept Plan bio-inventory. Although the Terrestrial Ecosystem Mapping (TEM) for the LNG Canada assessment of vegetation resources only included a small portion of DL 95 (and none of DL 471), the assessment results provided a useful comparison for the bio-inventory site survey results in the study area.

Web-based database searches for ecosystems and species at risk were made using the BC Species and Ecosystems Explorer and the Conservation Data Centre (CDC) web application iMap (BC CDC 2016) (BC CDC iMap 2016). Search results identified nineteen terrestrial ecosystems and eleven estuarine ecosystems that are either red or blue listed that have the potential to occur in the study area (see Appendix II – BC Species and Ecosystems Explorer Search Results for search criteria and results). The search criteria for estuarine ecosystems do not allow for qualification to the biogeoclimatic sub-zone level; therefore, the BC listings of estuarine ecosystem at risk are not regionally specific. Consideration of the listed terrestrial and coastal zone ecosystems found in the study area (as observed during the preliminary site survey) is presented in section 3.2.1 and section 3.2.2 below.

Six plant species, one fungus species and one lichen species listed at risk were identified as potentially present in the study area during the database search and from other sources (Table 1) (LNG Canada 2014). A detailed rare plant species survey was not conducted as part of the Phase I Bio-inventory. Based on the desk top review and professional judgment, the likelihood of the listed species presence in the study area has been presented in Table 1.

Table 1. Terrestrial Plant (and) Species at Risk Potentially Found in Study Area

Common Name	Scientific Name	Provincial Status	SARA Status	Comment	Likelihood of Occurrence in Study Area
White adder's-mouth orchid	*Malaxis brachypoda*	blue	not listed	CDC occurrence location NW of DL 471	Medium likelihood
Bog adder's-mouth orchid	*Malaxis paludosa*	blue	not listed	CDC occurrence location noted within DL 471 and DL 95 last observed 1972	Medium likelihood
Oldgrowth specklebelly (fungus)	*Pseudocyphellaria rainierensis*	blue	Schedule 1, Special Concern	CDC occurrence location NE of DL 471 at higher elevation	Low likelihood
Whitebark pine	*Pinus albicaulis*	blue	Schedule 1, Endangered	Not likely to be found at sea level in the Kitimat area	Low likelihood
Cryptic paw lichen*	*Nephroma occultum*		Schedule 1, Special Concern	Noted in desktop study from LNG Canada EA Application (LNG Canada 2014)	Medium likelihood
Eminent bluegrass	*Poa eminens*	blue	not listed	Noted as observed in the region from LNG Canada EA Application (LNG Canada 2014)	Medium likelihood
Rock sandwort	*Minuartia stricta*	blue	not listed	Noted as observed in the region from LNG Canada EA Application (LNG Canada 2014)	Low likelihood
Long-leaved aster	*Symphyotrichum ascendens*	Red	not listed	Noted as observed in the region from LNG Canada EA Application (LNG Canada 2014)	Low likelihood

In BC, species and ecological communities are assigned to one of three lists, based on their provincial Conservation Status Rank. Red-listed species and ecological communities are, or are candidates for, Extirpated, Endangered, or Threatened status in BC. Blue-listed species and ecological communities are of Special Concern (formerly Vulnerable); they have characteristics that are considered sensitive and therefore can be negatively influenced by human activities or natural events. Yellow-listed species and ecological communities are secure in BC and not at risk (BC CDC 2016).

Aquatic and Riparian Ecosystems

Aquatic and riparian ecosystems are extremely productive, they offer significant bio-diversity, and provide critical habitat for numerous amphibians, fish, birds and plants species. Their existing ecological features and functions are what define their integrity. For example, vegetation cover adjacent to streams will help to moderate water temperature, provide nutrients, stabilize soils and stream banks and buffer sediment and pollution. These functions all help provide optimal conditions for fish and amphibians within the ecosystem. Other functions include providing valuable nesting sites for migrating songbirds birds and providing habitat for an abundance of insects which are an important food source for birds, fish, amphibians and small mammals. Currently there are 95 species (plants and animals) listed as Threatened or Endangered provincially and 40 of these species require wetlands as part of important life cycle activities (BC MOE 2014).

In the desktop review, the HabitatWizard mapping tool was consulted. The results included the identification of 2 fish and fish habitat features within or immediately adjacent to the study area. The first is the entire coastline of DL 95 and portion of the southern section of DL 471 which is identified as a wetland (Waterbody Identifier 00467KITR) and the second is fish observation data at a point in proximity to the coastline in the southern portion of DL 471. The fish data included observations of staghorn sculpin (*Leptocuttus armatus*), threespine stickleback (*Gasterosteus aculeatus*), coho salmon fry (*Oncorhynchus kisutch*), chum salmon (*Oncorhynchus* keta), and chinook (*Oncorhynchus tshawytscha*) salmon juveniles (MOE 2016).

In review of relevant literature the following information regarding fish species and their use of the study area and surrounding Kitimat estuary is presented.

Humphries and Webb, 1971 recorded heavy spawn of herring in Minette Bay on March 24, 1971.

The Kitimat River system supports numerous fish species, including all five anadromous pacific salmon species. In May through July 1974, Howard Paish and Associates conducted fish sampling surveys in the Kitimat estuary, including Minette Bay. During the sampling period, in Minette Bay, they captured and recorded consistent numbers of chum, chinook, and coho juvenile salmon (Paish 1974). Conclusions in the report included validation that juvenile salmon will inhabit the inner estuary for periods of 2-3 months after spending their initial 2-3 months in their natal stream, and will potentially remain in the estuary up to a year while they feed and grow (Paish 1974).

Juvenile fish surveys were also conducted by the Department of Fisheries and Oceans (currently Fisheries and Oceans Canada) (DFO) in Minette Bay during the years of 1980, 1984 and 1985. Both juvenile chum and chinook salmon were captured and recorded during those surveys. A recommendation from the report was for no development to be permitted in Minette Bay because of its "physical and biological features" (Orr 1985). Of particular concern were projects "requiring dredging and/or filling below the high water line" (Orr 1985). It was also recommended that "log handling operations should not be expanded beyond current levels" and that there should be a "long term reduction and relocation of log handling operations outside of Minette Bay" (Orr 1985).

More recently in a response to DFO associated with the LNG Canada Environmental Assessment Application, LNG Canada summarizes historic fish species and their distribution and use of the Kitimat River estuary. LNG Canada presents fish sampling results from surveys conducted in 2009 (prepared for Rio Tinto Alcan). Although not site specific to Minette Bay, the results of the 2009 surveys included capture of juvenile chum (highest number captured), chinook (second highest number captured), coho, pink and sockeye (low numbers captured) (in catch per unit effort, CPUE) (LNG Canada n.d.).

Located outside of the study area, but relative for fisheries information, are Pine Creek and Cordella Creek. These two creeks are known to support pink (*Oncorhynchus gorbuscha*) and coho salmon spawning.

As the literature suggested, Minette Bay and the surrounding watercourses historically represented and likely continue to represent important rearing habitat for juvenile fish.

Terrestrial Wildlife and Species at Risk and Regionally Significant Species

As discussed for the terrestrial plant species above, wildlife species in BC are assigned to one of three lists (red, blue or yellow), based on their provincial Conservation Status Rank. Under federal legislation species can also be listed under the *Species at Risk Act* (SARA) Schedule 1. Species that are listed under SARA are legally protected and federally listed as; Extirpated, Endangered, Threatened or of Special Concern. SARA requires that recovery strategies and action plans are developed for Endangered, Threatened and Extirpated species and requires that management plans are developed for species of Special Concern for conservation efforts. All species are initially assessed by The Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This is an independent group of experts who assess the health of species populations that are considered at risk of extinction. All species that become legally protected under the SARA are first identified, assessed and reported on by COSEWIC.

A BC Species and Ecosystems Explorer search revealed the following terrestrial species at risk potentially present in the study area:

Table 2 Terrestrial Wildlife Species at Risk Potentially Found in the Study Area

Common Name	Scientific Name	Provincial Status	SARA Status	COSEWIC	Likelihood of Occurrence in the Study Area*
Coastal tailed frog	*Ascapthus truei*	Blue	Schedule 1, Special Concern	Special Concern	Low likelihood
Western toad	*Anaxyrus boreas*	Blue	Schedule 1, Special Concern	Special Concern	High likelihood
Ancient murrelet	*Synliboramphus antiquus*	Blue	Schedule 1, Special Concern	Special Concern	Medium likelihood
Barn swallow	*Hirundo rustica*	Blue	Not listed	Threatened	Low likelihood
Band-tailed pigeon	*Patagioenas fasciata*	Blue	Schedule 1, Special Concern	Special Concern	Low likelihood
Common nighthawk	*Chordeiles minor*	Yellow	Schedule 1, Threatened	Threatened	Low likelihood
Great blue heron, *fannini* subspecies **	*Ardea herodias fannini*	Blue	Schedule 1, Special Concern	Special Concern	Medium likelihood

Common Name	Scientific Name	Provincial Status	SARA Status	COSEWIC	Likelihood of Occurrence in the Study Area*
Marbled murrelet	*Brachyramphus marmoratus*	Blue	Schedule 1, Threatened	Threatened	Medium likelihood
Northern goshawk	*Accipiter gentills laingi*	Red	Schedule 1, Threatened	Threatened	Low likelihood
Olive-sided flycatcher	*Contopus cooperi*	Blue	Schedule 1, Threatened	Threatened	Medium likelihood
Rusty blackbird	*Euphagus carolinus*	Blue	Schedule 1, Special Concern	Special Concern	Low likelihood
Western-screech owl	*Megascops kennicottii kennicottii*	Blue	Schedule 1, Threatened	Special Concern	High likelihood
Fisher	*Pekania pennant*	Blue	Not listed	Not listed	Low likelihood
Grizzly bear	*Ursus arctos*	Blue	Not listed	Special Concern	High likelihood
Little brown myotis	*Myotis lucifugus*	Yellow	Not Listed	Special Concern	Medium likelihood
Mountain goat	*Oreamnos americanus*	Blue	Not listed	Not listed	Low likelihood
Wolverine, *luscus* subspecies	*Gulo gulo luscus*	Blue	Not listed	Special Concern	Low likelihood

* Likelihood of occurrence is not a reflection of habitat use or habitat suitability (e.g. for breeding, nesting, denning, or feeding), rather the likelihood of that species being present in the study area (likelihood inference made with support from LNG Canada EA Application Wildlife Resources Technical Report, Appendix B and Kitimat Valley Naturalists BC Christmas Bird Count Data, and professional judgment).

**Great blue heron did not appear in the results for the BC Species and Ecosystem Explorer database search using the Kalum Forest District search limit, but it is understood that this species frequents the estuary area of Minette Bay.

It was noted in the *LNG Canada Environmental Assessment Application*, Wildlife Resources section that observations of breeding western toad were made along the Kitimat River in close proximity to the southwestern edge of DL 95 (LNG Canada 2014); therefore, there is a high likelihood that western toad is present in the study area.

Of these listed species (and of regional significance and cultural importance) grizzly bears are likely a key species for consideration throughout the planning and implementation of the Minette Bay Concept Plan because of the high potential for human / wildlife conflicts. Kitimat land use planning falls under the Kitimat Official Community Plan, but for a more general understanding of land and resource management on crown land in the vicinity of Kitimat, the Kalum Land and Resource Management Plan (LRMP) provides useful information developed through stakeholder and provincial representative consensus. The Kalum LRMP is a sub-regional plan that directs the management of public lands and resources for the Kalum Timber Supply Area (TSA), and Tree Farm Licenses 1 and 41. Grizzly bear management and conservation is addressed in the Kalum LRMP. According to the LRMP, the primary human influence on grizzly bears and their habitat are roads and road use. Roads increase the likelihood of bear and human conflicts, and can fragment grizzly bear home ranges such that they could be potentially displaced from critical habitat. Industrial or recreational development may also be detrimental to important patches of grizzly bear habitat. However, the LRMP also states that grizzly habitat in close proximity to human settlement will not be subject to the strategies within the plan. There is an opportunity to consider if a more specific land management plan for the estuary area could specifically guide key activities that directly impact the grizzlies that frequent the area.

There are no identified goat winter ranges and no primary or secondary moose winter ranges noted in the Kalum LRMP for the Kitimat area.

Anecdotal evidence suggests that there is significant use of the study area by grizzly bear, wolf, and coyote, and that grizzly bears have been encountered during winter months in the study area over the past several years (J. Dennill, pers. comm., 26 October 2016).

In the *Kitimat River Estuary Status of Environmental Knowledge to 1976* the Kitimat estuary is noted "as being an important migration and/or wintering area for waterfowl, but not important for waterfowl production" (Bell and Kallman 1976). Dabbling ducks and geese species use Minette Bay extensively during spring migration and over winter because freshwater feeding habitat may remain frozen and/or snow covered thus making the Bay an important food source (Bell and Kallman 1976).

There are many wildlife species that may not be identified as at risk, but are important species to local ecological systems as indicators of the health of those systems and/or as regionally or culturally significant species. Examples of species that are important ecological indicators include amphibians such as salamanders and frogs. Other species of ecological importance include small mammal species such as bats and rodents because they effectively control insects (considered pests to humans) and are food sources for other wildlife species. There are also wildlife species which are considered regionally significant species because of reasons such as limited ranges and abundance and/or significance to human management, for example moose and wolf. Wildlife species of cultural importance (use, or spiritual importance) include, but are not limited to, duck, goose, black bear, moose, deer, mountain goat, wolf, wolverine, grizzly bear and lynx (LNG Canada 2014). Of those species noted as culturally important duck, goose, black bear, wolf, moose, and grizzly bear are the most likely to be found in the study area.

3.2 Preliminary Site Survey Results

The study area occurs on a floodplain between the Kitimat River and Minette Bay. Proceeding from the intertidal portion of Minette Bay, through estuarine / wetland associations to the upland floodplain forest, the following is a high level summary of those associations including the observed dominant plant species.

The high intertidal zone of Minette Bay is dominated by rockweed (*Fucus* sp.). In the northern portion of the study area there is a distinct transition to low level estuarine marsh associations which are dominated by sedges (*Carex* sp.) whereas in the southern portion of the study area the estuarine marsh and meadow associations are more blended. Moving upland from the estuarine marsh and/or meadow associations there is a transitional shrub complex association which includes species such as sweet gale (*Myrcia gale*), *Rosa* sp., *Aster* sp. and grass families such as Aveneae and Agrostideae in the northern portion of the study area, and in the southern portion of the study area these transitional shrub complex associations include *Spirea* sp., young Sitka spruce (*Picea sitchensis*), *Aster* sp., *Salix* sp. along the higher estuarine meadow zone near the treeline in DL 95. Moving inland the general characterization is of floodplain forest which includes species such as western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), red alder (*Alnus rubra*), *Vaccinium* sp., ferns, and skunk cabbage (*Lysichiton americanum*). Inventory abbreviations for these tree species used in the Biogeoclimatic Ecosystem Classification (BEC) for British Columbia are: western hemlock (Hw), Sitka spruce (Ss), western red cedar (Cw), Amabilis fir (Ba) and red alder (Dr).

3.2.1 Terrestrial Ecosystems

Field surveys were used to assess identified features of interest and describe forested ecosystems at the site series level according to Banner et.al. (1993) and wetland site associations according to Mackenzie and Moran (2004). Using the aerial orthophoto and results of the field surveys, polygons were delineated using the orthophoto as a base (Figure 3 and Figure 4). Neither a detailed rare plant survey nor an invasive species survey was completed at this time.

Five distinct forest ecosystems were observed and identified during the preliminary site survey. These include three provincially listed ecological communities and are described below and summarized in Table 3. The map in Figure 3 and Figure 4 delineates the extent of the forest ecosystems in the study area.

CWHvm1-01 Dense young seral western hemlock (Hw) dominated forest (Map Id. 1)

These young seral forests are generally densely stocked with predominantly western hemlock that is in the process of being naturally thinned through inter-tree competition for site resources (light, moisture, nutrients). Self-regulated thinning will continue for several decades as a result of shading of suppressed trees in the stand succumbing to low light conditions. The resulting forest has dead stems falling out of the overstory into the understory where they impede access into and through the forest. There is very little in the way of understory vegetation in this forest type (Photo 2).

CWHvm1-01 Maturing seral western hemlock (Hw) dominated forest (Map Id. 1A)

This maturing seral forest is predominantly western hemlock that is approximately 70-80 years old and the result of natural regeneration following harvesting in 1940-50. There is good visibility through the stand even though there is 80-90% crown closure, and the forest understory has light cover of western hemlock regeneration, blueberries, and false azalea. Visibility is moderate to good throughout the area and the soil conditions are moderately well drained (Photo 3).

CWHvm1-09 Young seral alder dominated high fluvial bench floodplain forest (Map Id. 2)

Identified as provincially red-listed ecosystems, these young pioneer/seral forests with high deciduous components and low levels of dispersed conifer stocking are the result of aggressive regeneration of mixed shrub species and poor natural conifer regeneration success following timber harvesting between 1966-71. Well-developed mixed shrub complexes continue to impede conifer seedling establishment. The resulting forest cover is an overstory dominated by red alder with minor components of Sitka spruce, western hemlock and western red cedar growing in an intermediate position within or above the dense shrub layer (Photo 4).

CWHvm1–14 Young seral western hemlock (Hw) dominated low-lying forest (Map Id. 3)

Identified as provincially blue-listed ecosystems, these swamp forests are considered nutrient-rich, but too wet to support productive forest stands. Western red cedar, western hemlock, Sitka spruce and red alder tend to establish on elevated mounds in this site series. Very high cover of skunk cabbage distinguishes this site from other units (Banner, 1993). The resulting ecosystems in the study area are examples of a blue-listed plant community that has effectively regenerated and is developing naturally back into the CWHvm1 site series 14 following disturbance associated with timber harvesting. These stands are located primarily in the interior forest conditions of the study area (Photo 5).

CWHvm1–14/05 Old climax western redcedar, Sitka spruce and western hemlock (Cw/Ss Hw) dominated low-lying forest (Map Id. 4)

Identified as provincially blue-listed ecosystems, these climax swamp forests are considered nutrient-rich, but too wet to support productive forest stands. Western red cedar, western hemlock, Sitka spruce and red alder tend to establish on elevated mounds in this site series. Very high cover of skunk cabbage distinguishes this site from other units (Banner, 1993). The resulting ecosystems in the study area are primarily located along the coastline in areas that have not been harvested (Photo 6).

Table 3 Terrestrial Ecological Communities in the Study Area

Site Series / Complex	Ecosystem Name	Successional Class/Structural Stage in the Study Area	Location	BC Status	Map Id.	Area (ha)*
CWHvm1-01	HwBa – Blueberry Western hemlock / amablis fir / blueberry	Dense young seral Hw dominated conifer forest	Interior of the study area primarily not along coastline	none	1	4.35
CWHvm1-01	HwBa – Blueberry Western hemlock / amablis fir / blueberry	Maturing seral Hw dominated conifer forest	Northern portion of DL 471	none	1A	1.29
CWHvm1/09	SS – Salmonberry *Picea sitchensis / Rubus spectabilis*	Young seral alder dominated high fluvial bench floodplain forest (includes alder/conifer complex stands with potential to develop toward a Sitka spruce salmon berry climax forest as the red alder is succeeded by the spruce)	Interior and along coastline areas of the study area	red	2	17.98
CWHvm1/14	CwSs – Skunk cabbage *Thuja plicata - Picea sitchensis / Lysichiton americanus*	Young seral Hw dominated low-lying forest approaching estuary (includes a blue-listed plant community that is developing back toward a CWHvm1 site series 14.	Interior of the study area adjacent to similar sites represented by old climax forest	blue	3	40.33
CWHvm1/14/05	CwSs – Skunk cabbage *Thuja plicata - Picea sitchensis / Lysichiton americanus*	Old climax Cw/Ss dominated forest in low-lying depression approaching estuary	Coastline of the study area sometimes adjacent similar sites represented by young seral forests	blue	4	23.44

*Estimated area calculations are based on mapped polygons in Figures 3 and 4.

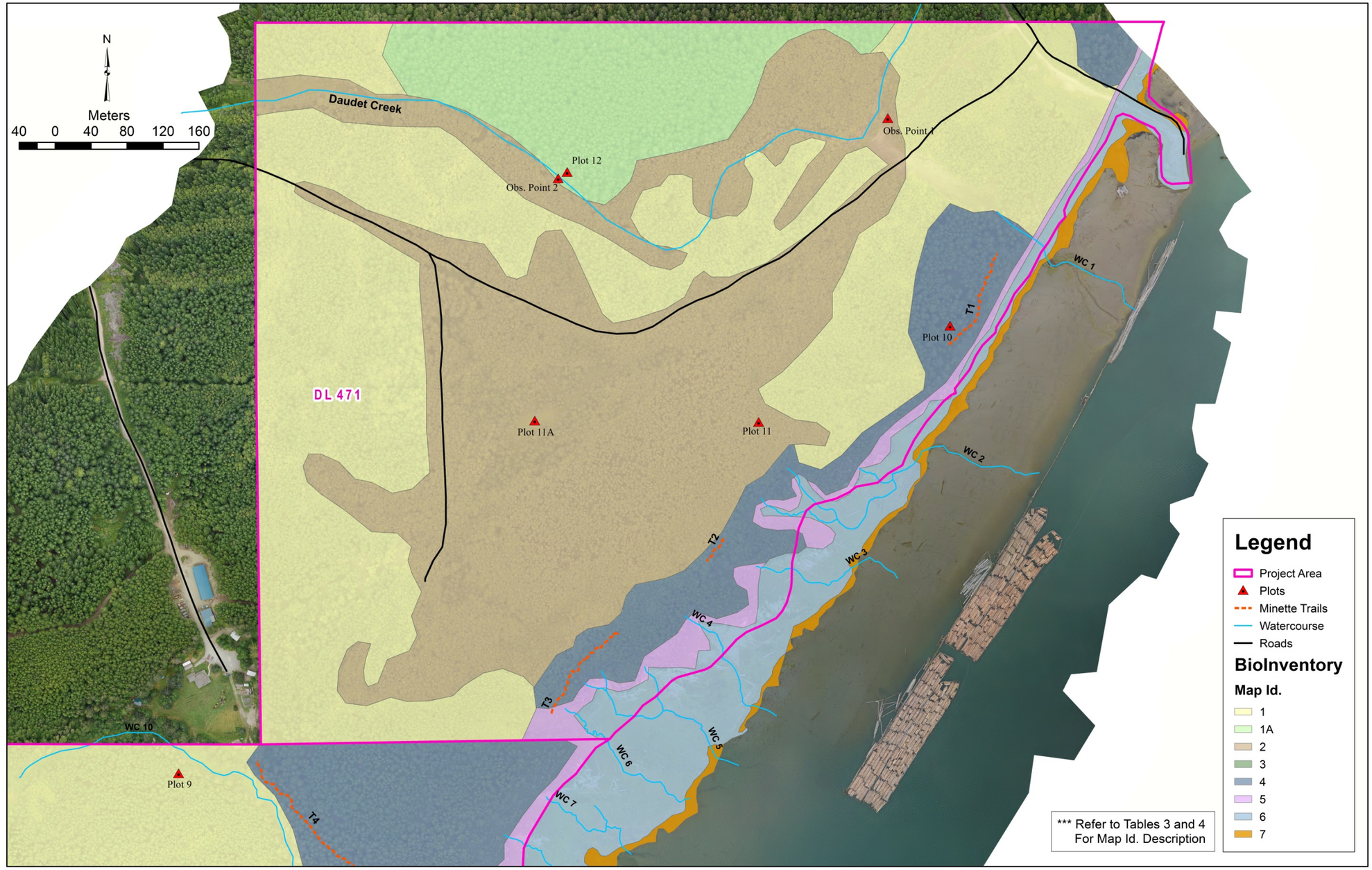


Figure 3. DL 471 Terrestrial and Coastal Zone Ecological Communities

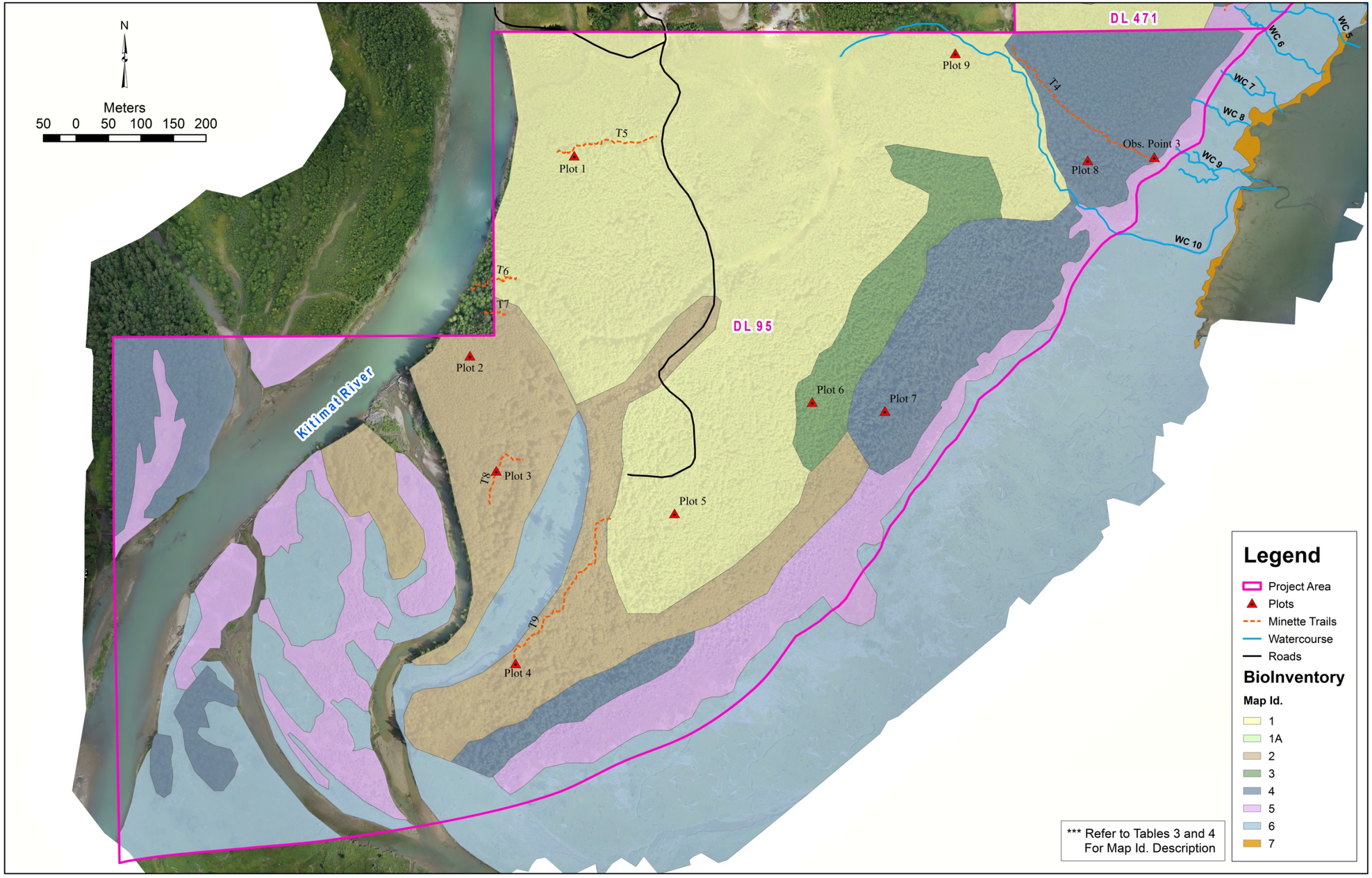


Figure 4. DL 95 Terrestrial and Coastal Zone Ecological Communities

3.2.2 Coastal Zone Ecosystems

Six coastal zone ecosystems were observed and identified during the preliminary site survey; these include both red- and blue-listed estuarine communities and are described below and summarized in Table 4. In Figure 3 and Figure 4, Polygons 5 through 7 delineate the coastal zone ecosystems. For simplicity and because there is a relative blending of estuarine site / species associations, the site / species associations listed in Table 4 have been assigned into three zones: the high intertidal zone (Photo 7, photo far left); the mid estuarine marsh / meadow zone (Photo 7, mid photo); and, the transitional zone (to the upland terrestrial ecosystems) (Photo 8 and Photo 9).

Table 4 Coastal Zone Dominant Ecological Communities in the Study Area

Site Series /Wetland Code	Ecosystem Name	Indicator Species in the Associations	Location	BC Status	Map Id.	Area (ha)*
	Mud flats		Mid to low intertidal	Not listed		
	Intertidal (*Fucus* sp.)		High intertidal zone generally attached to hard surfaces (rock, logs)	Not listed	7	5.9
CWHvm1/Em01	Widgeon-grass	*Ruppia maritima*	Relative estuary level – low / in study area found in mud bottom pools within the CWHvm1/Em04/Em05/06 zone	red	6	54.6
CWHvm1/Em05/Em06	Estuarine marsh : Lyngbye's sedge / Lyngbye's sedge - Douglas' water hemlock	*Carex lyngbyei* *Carex* sp. *Deschampsia* sp. *Aster* sp. *Potentilla* sp *Angelica* sp.	Relative estuary level – medium / in the northern portion of study area distinct separation of estuarine marsh associations from intertidal and estuarine meadow / upland associations; in the southern portion of study area estuarine marsh, meadow and upland associations relatively blended	Em05 - red Em06 - blue		
CWHvm1/Ed01/Ed02	Estuarine Meadow: Tufted hairgrass – Meadow barley / Tufted hairgrass – Douglas' aster	*Deschampsia* sp. *Carex* sp. *Potentilla* sp. *Aster* sp. *Hordeum* sp. Agrostideae	relative estuary level – high / as an association generally absent from the northern portion of the study area; more apparent in the southern portion of the study area	Ed01 and Ed02 - blue		
CWHvm1/Ws50/Ws06/Wf52/Fl50	Transitional shrub complex	Agrostideae *Spire a* sp, *Aster* sp. *Salix* sp. *Carex* sp.	relative estuary level – high esturary to low fluvial wetland	Ws06 - blue	5	67.1

*Estimated area calculations are based on mapped polygons in Figures 3 and 4. For the coastal zone ecosystems the area is under represented as some area representing the estuarine marsh and meadow, and the high intertidal were not captured in the aerial photo mosaic; therefore, not compiled in the area calculation.

No eelgrass (*Zostera marina* or *japonica*) was observed during the low tide of September 1, 2016 within the northern portion of the mud flat area adjacent to DL 471. Generally the substrate in the mid to low intertidal area of the northern portion of DL 471 consists of mud and silts and little sand; therefore, less suitable for eelgrass growth.

3.2.3 Aquatic and Riparian Ecosystems

From the project generated orthophotography there are no apparent inland wetland areas; therefore, the aquatic features of the study area consists of the Kitimat River, small watercourses or streams (ephemeral and year-round), the coastal marsh areas, and Minette Bay proper. DL 471 and DL 95 are found in a unique geographic location such that they are bound by the significant aquatic and riparian features of the Kitimat River and the estuarine waters of Minette Bay. As an aquatic feature the coastal zone has been considered separately under Section 3.2.2, whereas in this section we will discuss the freshwater influenced aquatic features of the study area.

All the watercourses encountered during the preliminary site survey were considered in the context of potential requirements for pedestrian crossing traffic, with a focus specific to the outer (i.e. coastal zone) area of DL 471 and only the northern portion of DL 95 as this is the area likely to be the focal area for the Concept Plan. For phase I of the Minette Bay Concept Plan no stream classification, or specific fish and fish habitat information was collected. The watercourses encountered are numbered one through ten (WC 1-10) moving from north to south in Figure 3 and Figure 4, except Daudet Creek, labelled as such, as it is an identified waterbody. The list of noted watercourses should not be considered a full inventory of aquatic or riparian features within, or adjacent to, the study area as the site survey was at the reconnaissance level and focused toward the coastal and Kitimat River riparian areas of DL 471 and DL 95. The survey should also not be considered a full inventory because the coastal zone south of Watercourse 10 (WC 10) was not visited during the preliminary site survey as it extends significantly outside the DL 95 boundary and is generally a well wetted (salt) marshland and not suitable for access to the estuary area.

All watercourses numbered in Figure 3 and Figure 4 have distinct channel beds and flowing water during the time of seasonal low water (August 24, 2016 and September 1, 2016 observations) and at tidal low water. In general, the watercourses 1-10 channel beds are composed predominantly of fines and silt, and water depth in the channel beds varies significantly with each tide cycle. For reference, Photo 11 shows the general characteristics of most of the observed watercourses (in proximity to the transition into the upland forest).

Watercourse 1 (WC 1) is the channel bed remaining from the historic diversion of Daudet Creek away from its previous course northeast toward Pine Creek. There was an attempt to close off this diversion (to restore the natural flow to Daudet Creek), but currently there remains water draining from the blocked area (Photo 12). Upstream of the diversion / blockage area, Daudet Creek exhibits fish habitat features such as gravels and cobbles, good riparian cover and woody debris (Figure 3, Observation (Obs) point 2) (Photo 13). Associated with Daudet Creek, a secondary issue has arisen at the western end of the blockage area (in Daudet Creek) where there has been beaver activity, thus the water level is high and flow is low (Figure 3, Obs point 1) (Photo 14). It is undetermined whether the beaver(s) are still occupying the area as there is no clear dam structure at this location.

3.2.4 Terrestrial Wildlife and Species at Risk, and Regionally Significant Species

Significant Habitat Features

The study area is not within any approved Ungulate Winter Ranges, although there were signs of use (droppings, tracks, and bedding areas) by ungulates such as moose and deer in the study area.

During the preliminary site survey several wildlife trees were observed. Wildlife trees are mature trees that tend to be standing dead (snags) which supply food (insects) and habitat for cavity nesters (both mammalian and avian). Examples of species which would use wildlife trees are sapsuckers, woodpeckers, owls, and squirrels. In general, wildlife trees were found in the areas of Map Id.1A, 3 and especially 4.

There is timber within and adjacent to the study area that is at the appropriate stage of maturity to support nesting habitat for several species at risk and regionally significant species such as marbled murrelet, bald eagle, and osprey (especially the areas of Map Id. 4).

Areas of Significant Use by Wildlife

During the preliminary site survey several wildlife trails were observed and recorded as trails (T1 – T9) in Figure 3 and Figure 4. Trail 4 (T4) is a historic corduroy trail developed using on-site salvaged timber, and has been listed here for reference only (Figure 4 at Obs point 3) (Photo 15). A discussion of the trail and its significance can be found in the *Archaeological Overview Assessment* associated with the Minette Bay West Concept Plan. It would appear that, in general, the wildlife trails were concentrated in the Kitimat River riparian area in DL 95 and along the near coastal, eastern edge of DL 471 and DL 95. This observation should be tempered with the knowledge that the level of intensity of field observations were also concentrated within the coastal / riparian areas of DL 471 and DL 95. For bear species it is likely that high use areas for feeding are associated with the Kitimat River and with small streams such as Pine Creek (vegetation in the riparian areas and fish during spawning season). Bears may also utilize skunk cabbage sites, particularly in the spring as the skunk cabbage first emerges.

Moose tracks and droppings were observed more frequently in the forest on the coastal side of DL 471 and DL 95 (regardless of vegetation type). Deer tracks were also observed in the same area as moose tracks, but less frequently. Grizzly bear tracks and fish offal were observed in DL 95 at the western edge in proximity to the Kitimat River. A bear skull was observed in DL 95 within the area of Map Id.1. Beaver activity was noted in DL 471 at the intersection of Daudet Creek and the area of historic diversion blockage (Figure 3, Obs point 1).

The Minette Bay estuary provides both year-round and migratory habitats for a significant number of bird species (including waterfowl, shore birds, birds of prey and passerines or songbirds). Bird use of the estuary is noted by the Kitimat Valley Naturalists as significant (Kitimat Valley Naturalists 2011), and the group continues to participate in several regional annual bird counts which supply important data on the abundance and distribution of birds and their use of the area. Several of the observed species noted in the Kitimat Valley Naturalists bird counts include at risk species such as great blue heron, olive-sided flycatcher, and marbled murrelet (LNG Canada 2014). No detailed bird surveys were conducted during the preliminary site survey, but incidental species observations (visual or auditory) during the early fall site visit included red-breasted sapsucker, gulls, sandpipers, pine siskin, and brown creeper. During a site visit, it was noted by Ruth Mills, owner of the Minette Bay Lodge, that over the years there have been both osprey and bald eagle nests in the Minette Bay area.

3.3 Discussion and Recommendations

Terrestrial and Coastal Zone Ecosystems

As the coastal zone ecosystems and the upland terrestrial ecosystems are intricately linked, the discussion of these systems and the recommended protection measures are presented together to ensure environmental degradation of these systems is avoided or minimized.

The upland forest zone of the study area includes a variety of forest conditions including densely stocked areas, young seral, mature seral, and old growth climax forests. Several of these conditions are provincially red- or blue-listed ecological communities. There are no significant land features in the study area as the land is generally low- lying, flat with smooth to slightly hummocked and channeled microtopography. The elevation is consistently less than 10 m above sea level across the study area.

Densely stocked young seral hemlock forests (CWHvm1-01 site series – Map Id. 1) and impenetrable shrub dominated red alder stands (early seral CWHvm1/09 /red-listed – Map Id. 2) provide valuable cover for wildlife. The soil in red alder stands area would tolerate walking trails, but visibility is generally poor as a result of dense tree / shrub growth in the understory. Without intervention to open up the visibility through these areas (by thinning out shrubs and trees) the low visibility condition may be expected to persist for several decades. In terms of human/wildlife interactions this has both positive and potentially negative consequences. On the positive side, dense cover would offer immediate hiding cover in many parts of the study area in the event of encounters between humans and wildlife (e.g. if walking trails were established). On the negative side, opening up these densely vegetated areas with trails would most certainly result in the use of the trails by wildlife and this could increase the likelihood of human/wildlife encounters.

In the northern part of DL 471 there is a mature forested area dominated by conifers (western hemlock, Sitka spruce, western red cedar, and Amabilis fir) up to 30 m tall that are spaced to provide a park-like setting (CWHvm1-01 site series – Map Id. 1A, Photo 3). The soil in this area will tolerate walking trails well and there is good visibility with full crown closure limiting light and shrub growth in the understory. This condition is expected to persist for many decades without intervention and would only be expected to change if the overstory was to be opened up through wind throw, fire, or other natural disturbance.

The remaining forested areas consist of the blue listed ecological community CWHvm1-14 site series. Map Id. 4 includes a climax forest stand and dispersed remnants of old growth along the Minette Bay coastline in areas that have not been harvested. Map Id. 3 is characterized by the same CWHvm1-14 site series, but the forest condition is early seral, dominated by moderately stocked western hemlock overstory and a moderately well-developed shrub layer. The soil in this area will be less tolerant to walking trails due to high water tables. Tree stability in the area is moderate to poor in swampy depressions where rooting is restricted to 20 – 35 cm depth. There is evidence of windthrow in the climax forest stand now that has resulted from uprooted trees in these shallower rooted areas and this condition is expected to persist indefinitely which will maintain a fairly open forest condition with moderate light and consequent moderate shrub development in the understory. Visibility is moderate-to-good in both situations and is expected to remain so or improve as trees continue to die or fall out of the overstory through natural disturbance. Should trail development through these blue-listed ecological communities become part of the Concept Plan they would best served by developing elevated trails with lateral drains to minimize disturbance to the hydrology of the site. These sites would provide valuable opportunities for observing the CHWvm1-14 blue-listed ecosystem in both the climax and the young seral regenerated condition.

The coastal zone of Minette Bay is considered high value habitat and potentially critical habitat to some wildlife species because of the low abundance coast wide of undisturbed estuary areas and because several of the ecological communities within the Minette Bay coastal zone are provincially red- or blue-listed. It is suggested that development not occur in the coastal zone of DL 471 (map Id. 6 and 7, and into the intertidal mud flats) short of use of existing structures such as the breakwater at the northern end of DL 471. Historic information suggests that fluvial sediment continues to infiltrate Minette Bay and change the connectivity of the Bay to Douglas Channel (this is also apparent in that the breakwater at DL 471 no longer accesses water at low tide). In the future, changes to Minette Bay may be influenced both by increases to river sediments (flooding) and/or sea level rise due to climate change. Consideration of these issues is warranted should the use ofthe northern portion of DL 471 as access to the water for motorized boat traffic become part of the Concept Plan. It is suggested that a fluvial geomorphologist (with an eye to climate change considerations) be consulted in order to ascertain the likelihood of these future events should there be sustained interest in boat access to Minette Bay.

In order to ensure that impacts to the ecosystems and species in and adjacent to the Minette Bay west area are avoided or minimized, the following are initial project recommendations for consideration:

- in development and use of trails throughout the terrestrial ecosystem, care should be taken to avoid those areas with provincially listed communities, or, if the areas of listed communities cannot be avoided due to connectivity of the trail system, then site specific environmental protection measures should be developed in collaboration with a qualified professional (with knowledge of the site specific biological and hydrological features of the upland area of DL 471 and DL 95);
- should development of trails through sensitive ecological communities occur (i.e. blue-listed, areas of trees with shallow root systems), consideration should be given to elevating the trails and installing sufficient drainage aids to ensure that surface water hydrodynamics, underground hydrology (particularly in the swamp forests) and connectivity are maintained, thus conserving the current forest attributes;
- development in the estuarine marsh/meadow and intertidal coastal zones adjacent to DL 471 and DL 95 should be avoided. Should development of structures or trails within in the coastal zone become part of the Concept Plan the trails and/or structures should be elevated, confined in space and limited to foot traffic only, and no foot traffic should not occur in the intertidal mud flat areas;
- if development within the coastal zone is to occur, site specific environmental protection measures should be developed in collaboration with a qualified professional (with knowledge of the site specific biological and hydrological features of Minette Bay) to ensure degradation of the coastal zone is minimized and the integrity the coastal zone is maintained;
- pre-existing access and pre-existing structures should be used as the first choice for approach or connection to the coastal zone (e.g. the breakwater at north end of DL 471);
- in context of Green Shores designation and if structures and/or trails are developed in the coastal zone (or in the low fluvial terrestrial area) consideration to sea level rise and storm surges due to climate change will be required;
- should larger land development options become part of the Concept Plan (e.g. camp ground) specific management plan, such as a stormwater management plan and a construction environmental management plan, should be developed and implemented through construction and/or operation; and,
- during all stages of planning and development Best Management Practices (BMPs), such as, but not limited to, the guidance presented in District of Kitimat plans or bylaws and/or Develop with Care (BC MOE 2014) should be used.

Consideration of potential restoration project within the terrestrial and/or coastal zone ecosystems is discussed in Section 3.4.

Aquatic and Riparian Ecosystems

A more detailed field study should be conducted to confirm fish habitat types and fish use of identified watercourses should watercourse crossings in the coastal zone of the study area (or in any portion of DL 471 and DL 95) become part of the Concept Plan. Upon determination of fish bearing status and completion of a development plan, there may be legislated requirements for a permit and/or an authorization to make changes in and about a stream under the provincial *Water Act* and/or for serious harm to fish under the federal *Fisheries Act* (both for stream works and for works below the highwater mark in the estuary).

In order to ensure that impacts to the aquatic and riparian ecosystems in and adjacent to the Minette Bay west area are avoided or minimized, the following are initial project recommendations for consideration:

- avoid or minimize development in riparian zones around watercourses, especially within the riparian management areas of the Kitimat River, Minette Bay, and Daudet Creek;
- where development and/or development activities are deemed necessary within the riparian management area of the above noted watercourses, development and implementation of site specific environmental management plans (which will include site specific environmental protection measures to ensure the integrity of those riparian zones is maintained) should occur;
- should a trail system become part of the Concept Plan in close proximity to the Coastal Zone and necessitate the crossing of the watercourses, site specific environmental management plans will likely be required as part of any in water works associated permits or authorizations; and,
- should a trail system become part of the Concept Plan and those trails come in proximity to aquatic features and their riparian areas, consideration should be given to trails passing through those features at right angles (rather than parallel along them) whenever possible.

Further considerations for restoration potential within the aquatic and riparian ecosystems are discussed below in Section 3.4.

Terrestrial Wildlife Species at Risk and Regionally Significant Species

As also noted above in the discussion of terrestrial and coastal zone ecosystems there is a significant portion of the study area which is considered high value habitat for numerous different species (e.g. coastal zone ecosystems, and fish bearing river and creek systems and their supporting riparian areas).

More detailed wildlife surveys will likely be required once Concept Plan options have been determined in order to confirm habitat use by species at risk and regionally significant species such as marbled murrelet, grizzly bear and moose. The wildlife surveys should be conducted in a collaborative manner such that Haisla Nation, local stakeholders and the public are active participants. This would include assessing the study area for habitat suitability for denning, nesting, overwintering, and as migratory corridors.

In order to ensure that impacts to the wildlife species that frequent the Minette Bay west area are avoided or minimized, the following are initial project recommendations for consideration:

- Section 34 of the provincial *Wildlife Act* prohibits the possession, injury, molestation, or destruction of any bird, egg, or nest while a nest is occupied (certain nests are protected under the *Act* regardless of the occupation by a bird, e.g. eagle, osprey and heron); therefore, should development activities include the falling of trees between April 15 and August 10 (to include the outer ranges of the primary nesting period for the study area under all habitat types) (ECCC

2016) a nesting bird survey should be conducted by a qualified professional (with bird behaviour knowledge) prior to falling, and regardless of date of falling activities an aerial survey (or equivalent survey technique) should be conducted by a qualified professional to confirm the absence of raptor stick nests in the trees to be felled;

- should the falling of trees become part of the development activities, consideration should be given to avoiding the falling of mature timber and wildlife trees (unless they pose a risk to human health as a danger tree, as designated by a certified arborist);
- as noted above in the recommendations for the terrestrial and coastal zone ecosystems, siting consideration for the development of trail systems should include, but not be limited to, line of sight and avoidance of high use wildlife areas in order to avoid or minimize human / wildlife conflicts;
- the management objectives set forth in the Kalum LRMP for wildlife species may be considered during the development of the Minette Bay Concept Plan; and,
- further understanding of habitat suitability and use by large carnivores and ungulate species in the study area is required prior to finalizing the Concept Plan. It is recommended that, at minimum, a specialist in bear behaviour, with knowledge of bear distribution and wildlife conflict solutions in north coast BC, should be consulted.

Further considerations for restoration potential for wildlife species is discussed below in Section 3.4.

3.4 Potential Rehabilitation and Restoration Opportunities

In this section consideration was given to potential opportunities to rehabilitate or restore terrestrial, coastal, aquatic or riparian ecosystems, or enhance wildlife use of DL 471 and DL 95.

Though not specifically targeted in the terrestrial ecosystem field surveys, anecdotal evidence suggests that there are invasive species within DL 471 and DL 95 and as such restoration effort could be directed at removal of these species and replacement with native species and/or important traditional use species. Another opportunity to enhance the terrestrial ecosystems lies in forest management. Manual spacing of high density (high stems/hectare) forest, such as those found in Map Id. 1, would speed the development of that ecosystem toward climax conditions.

In the coastal zone consideration could be given to the removal of derelict vessels stranded in the upper shore zone (barge and camper, ship). Discussion may be required to examine the potential for detrimental environmental effects from the removal (e.g. release of contaminants or destruction of habitat during removal process) and to examine the innate value of leaving the vessel “in situ” because of its aesthetics and history to local residents prior to any removal activities.

Another opportunity for restoration lies in mending the historic diversion channel at Daudet Creek to close drainage to Minette Bay, and focusing on restoring the stream habitat such that important fish species may return to the Daudet Creek system for spawning. This would include removal of beaver dams / cut logs (and potential relocation of the beaver(s)) in order to return water flow downstream.

On a more species specific level, introduction of bat boxes may encourage use of the area by species such as little brown myotis. Encouragement of local involvement in species abundance counts such as the amphibian boards placement and counts under the BC Frogwatch Program and the yearly bird counts for long term data and record of wildlife species use of the area.

4 CLOSURE

We trust that this bio-inventory report provides you with sufficient information for your current needs. Please do not hesitate to contact Nicole Wallace or Paul Hanna at 250-635-0766 should you have any questions or comments.

SILVERWOOD CONSULTING INC.





Nicole Wallace, R.P.Bio.
Operations Manager

Paul Hanna, RPF.
Owner and Principal

5 REFERENCES

Banner, A., *et al*. 1993. *A Field Guide to Site Identification and Interpretation for the Prince Rupert Forest Region* (Land Management Handbook, ISSN 0229-1622; no. 26). Ministry of Forests Research Branch.

B.C. Conservation Data Centre: CDC iMap [web application]. 2016. Victoria, British Columbia, Canada. Available: http://maps.gov.bc.ca/ess/sv/cdc/ . (date accessed September 12, 2016).

B.C. Conservation Data Centre. 2016. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/. (accessed Aug 24, 2016).

BC Ministry of Environment (BC MOE). 2014. *Develop with Care 2014:Environmental Guidelines for Urban and Rural Land Development in British Columbia*. Available at http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/ . Accessed September 2016.

BC Ministry of Environment (BC MOE). 2016. HabitatWizard. Available at: http://maps.gov.bc.ca/ess/sv/habwiz/. Accessed September

BC Ministry of Forests and Range and BC Ministry of Environment. *Field Manual for Describing Terrestrial Ecosystems* - 2nd Edition. (Land Management Handbook 0229-1622 ; 25, ISBN 978-0-7726-6356-6).

Bell, Leonard M., and Kallman, Ronald, J. 1976. *The Kitimat River Estuary Status of Environmental Knowledge to 1976, Report of the Estuary Working Group Department of the Environment Regional Board, Pacific Region*. Special Estuary Series No. 6. Fisheries and Marine Service, Pacific Environment Institute, West Vancouver BC.

British Columbia. 2001. *Kalum Land and Resource Management Plan*. National Library of Canada Cataloguing in Publication Data. Available at: https://www.for.gov.bc.ca/tasb/slrp/lrmp/smithers/kalum_south/docs/April%20%202006%20Cabinet%20Approved%20Kalum%20LRMP%20_amended_.pdf

Dennill, Jody. Personal communication. 26 October 2016.

District of Kitimat. 1975. *Minette Bay Study*, District of Kitimat, Kitimat Planning. Pages 1-5.

Environment and Climate Change Canada (ECCC). 2016. General Nesting Periods of Migratory Birds in Canada. Available at: http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4f39a78f-1#_04. Accessed September 2016.

Howard Paish and Associates. November 1974. *A Biological Assessment of the Kitimat River Estuary*. Prepared for the District of Kitimat.

Howes, D.E., J.R. Harper, and E.H. Owens. 1994. *Physical shore-zone mapping system for British Columbia*. Technical Report by Coastal and Ocean Resources, Inc., Sidney, BC for the Coastal Task Force of the Resource Inventory Committee (RIC), Victoria, BC: RIC Secretariat.

Humphreys, R. D. and Webb, L. A. 1971. *The Abundance of Herring Spawn in the Coastal Waters of British Columbia*. Environment Canada, Fisheries Service.

Kitimat Valley Naturalists. 2011. *Kitimat Valley Naturalists Review of Enbridge Project Documents: Marine Birds, Mammals and Kitimat Estuary*. Available at http://www.ceaa-acee.gc.ca/050/documents/54521/54521E.pdf.

LNG Canada. September 2014. *Environmental Assessment Certificate Application*, Part B Vegetation Resources and Wildlife Resources, and supporting technical reports. Available at: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_398.html. Accessed September 2016.

LNG Canada. No date (n.d.). Comment ID #1120: Marine and Estuarine Fish Use and Habitat Dependency (Rev 1). Available at: http://a100.gov.bc.ca/appsdata/epic/documents/p398/d38461/1425488997082_xKSgJ37QzQXfzk70B6gqLPV71rQw1yfgJVZ2pSxCD7YKNn3t6XQj!1378338455!1425488800538.pdf

MacKenzie, W.H. and J.R.Moran. 2004. *Wetlands of British Columbia: a guide to identification*. Research Branch BC Min. Forests, Victoria, BC. Land Management Handbook No. 52.

Orr, U. N. 1985. *A Survey of Fish Distributions and Recommendations for Habitat Management of Kitimat Estuary British Columbia, draft report.* Department of Fisheries and Oceans, Northern Operations Habitat Management, Prince Rupert, BC.

Ryder, John L., J. K. Kenyon, D. Buffet, K. Moore, M. Ceh and K. Stipec. 2007. *An Integrated Biophysical Assessment of Estuarine Habitats in British Columbia to Assist Regional Conservation Planning*. Technical Report Series No. 476. Canadian Wildlife Service, Pacific and Yukon Region, British Columbia.

Searing, G.F. and H.R. Frith. 1995. *British Columbia Biological Shore-zone Mapping System*. Contract report by LGL Limited, Sidney, B.C. for the Coastal Task Force of the Resources Inventory Committee, B.C. Ministry of Environment, Victoria, B.C.

Stewardship Centre for British Columbia (SCBC). 2010 (updated January 2016). *Green Shores for Coastal Development Credits and Ratings Guide: A Reference to Help Minimize the Environmental Impact of Waterfront Properties and Development*.

APPENDIX I - PHOTOGRAPHS

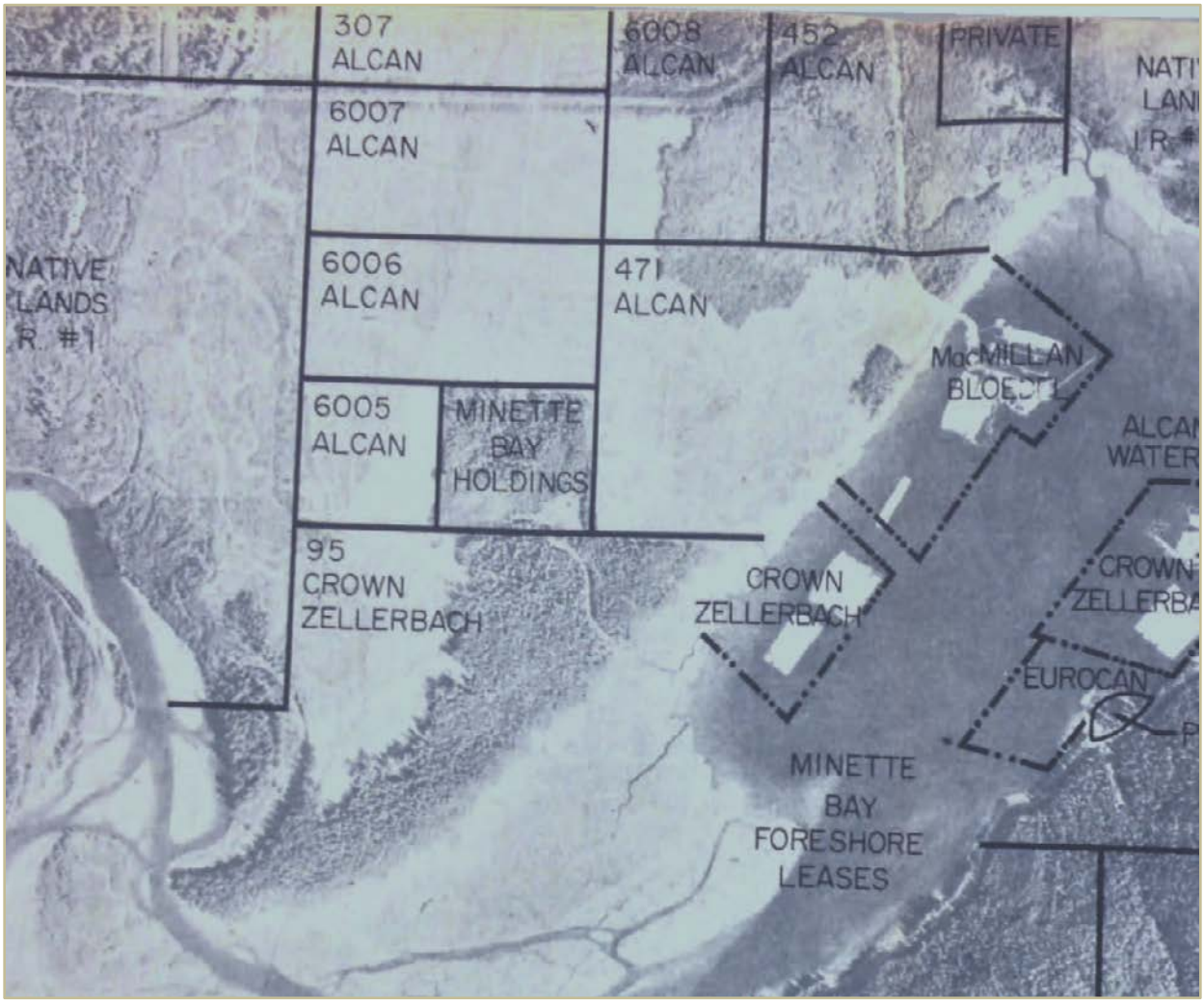


Photo 1. Land clearing (timber harvesting) on DL 95 and DL471 (District of Kitimat 1975)



Photo 2. CWHvm1-01 Dense young seral Hw dominated forest (Map Id. 1)



Photo 3. CWHvm1-01 Maturing seral Hw dominated forest (Map Id. 1A)



Photo 4. CWHvm1-09 Young seral alder dominated high fluvial bench floodplain forest (Map Id. 2)



Photo 5. CWHvm1 – 14 Young seral Hw dominated low-lying forest (Map Id. 3)



Photo 6. CWHvm1 – 14/05 Old climax Cw/Ss Hw dominated low-lying forest (Map Id. 4)



Photo 7. Coastal zone ecological community composition at low tide September 1, 2016 (facing south). (Map Id. 6 and 7)



Photo 8. Transition Zone at northern end of study area. (Map Id. 5)



Photo 9. Transition Zone at southern end of study area. (Map Id. 5)



Photo 10. General characteristics of observed watercourses in proximity to transition into upland forest.



Photo 11. Daudet Creek diversion closing project (SE end) where drainage to Minette Bay is currently occurring.



Photo 12. Daudet Creek at Ob 2 point (Figure 3) observation of fish habitat features.



Photo 13. Observation point 1 (Obs 1, Figure 3), beaver activity on Daudet Creek at area of historic diversion.



Photo 14. Historic corduroy trail (T4, Figure 4) at observation point 3.

APPENDIX II – BC SPECIES AND ECOSYSTEMS EXPLORER SEARCH RESULTS

BC Species and Ecosystems Explorer Search Results

Scientific Name	English Name	Biogeoclimatic Units	Status			Identified Wildlife	Land Use Objectives	CF Priority
			Provincial	BC List	Global			
Carex lyngbyei - Cicuta douglasii	Lyngbye's sedge - Douglas' water-hemlock	CWH/Em06	S3 (2004)	Blue	G4			2
Carex lyngbyei Herbaceous Vegetation	Lyngbye's sedge herbaceous vegetation	CDFmm/Em05 CWH/Em05	S2 (2013)	Red	GNR		Haida Gwaii LUO	2
Deschampsia cespitosa - Sidalcea hendersonii	tufted hairgrass - Henderson's checker-mallow	CWHxm1/00	S1S2 (2004)	Red	G2			1
Deschampsia cespitosa ssp. *beringensis - Hordeum brachyantherum*	tufted hairgrass - meadow barley	CDFmm/Ed01 CWH/Ed01	S2 (2013)	Red	G3		Haida Gwaii LUO	2
Deschampsia cespitosa ssp. beringensis - Symphyotrichum subspicatum	tufted hairgrass - Douglas' aster	CDFmm/Ed02 CWH/Ed02	S2 (2013)	Red	G3		Haida Gwaii LUO	2
Distichlis spicata var. spicata Herbaceous Vegetation	seashore saltgrass Herbaceous Vegetation	CDFmm/Em03 CWHxm1/Em03	S1S2 (2016)	Red	GNR (2008)			2
Juncus arcticus - Plantago macrocarpa	arctic rush - Alaska plantain	CDFmm/Ed03 CWH/Ed03	S1 (2007)	Red	GNR			1
Plantago maritima - Puccinellia pumila	sea plantain - dwarf alkaligrass	CWH/Em04	S2 (2004)	Red	G2			1
Ruppia maritima Herbaceous Vegetation	beaked ditch-grass Herbaceous Vegetation	CDFmm/Em01 CWH/Em01	S2 (2013)	Red	GNR		Haida Gwaii LUO	2
Sarcocornia pacifica - Lysimachia maritima	American glasswort - sea-milkwort	CDFmm/Em02 CWH/Em02	S2 (2013)	Red	G3G4			3
Sidalcea hendersonii Tidal Marsh	Henderson's checker-mallow Tidal Marsh	CWHxm1/00	S1 (2004)	Red	G1			1
Zostera marina Herbaceous Vegetation	common eel-grass Herbaceous Vegetation	CDFmm CWHdm CWHvh1 CWHvh2 CWHvm1 CWHwh1 CWHxm1	SNR	No Status	GNR			

Search Summary

Time Performed Sat Sep 17 14:44:06 PDT 2016

Results 12 records.

Search Criteria Search Type: Ecological Communities
AND Ecosystem Realm-Groups: Estuarine
AND BGC Zone:CWH
Sort Order:Scientific Name Ascending

Notes

1. Citation: B.C. Conservation Data Centre. 2016. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Sep 17, 2016).

2. Biogeoclimatic Site Unit(s): This column indicates the BGC unit(s) on which each ecological community is known to occur (future inventories may indicate range extensions). The two digit number following the slash (01 and up) indicates that the ecological community occurs on a site series that is part of the B.C. Ministry of Forests (MOF) site series classification (see MOF Regional Field Guides to Site Identification and Interpretation for more information). A two digit number of '00' indicates that the ecological community occurs on a site unit that is not part of the MOF site series classification but is recognized from other vegetation and site classifications, and ecosystem mapping projects.

3. The data contained in the Results Export in BCSEE are provided under the Open Government License - BC.

Figure 5. BC Species and Ecosystem Explorer Results for Estuarine Ecological Communities (BC CDC 2016).

BC Species and Ecosystems Explorer Search Results

Scientific Name	English Name	Biogeoclimatic Units	Status			Identified Wildlife	Land Use Objectives	CF Priority
			Provincial	BC List	Global			
Abies amabilis - Picea sitchensis / Oplopanax horridus	amabilis fir - Sitka spruce / devil's club	CWHvm1/08 CWHvm2/08	S3 (2016)	Blue	GNR			2
Abies amabilis - Thuja plicata / Rubus spectabilis Very Wet Maritime	amabilis fir - western redcedar / salmonberry Very Wet Maritime	CWHvm1/07 CWHvm2/07	S4 (2001)	Yellow	GNR			2
Abies amabilis - Thuja plicata / Tiarella trifoliata Very Wet Maritime	amabilis fir - western redcedar / three-leaved foamflower Very Wet Maritime	CWHmm2/05 CWHvm1/05 CWHvm2/05	S3S4 (2008)	Yellow	G3G4			2
Brasenia schreberi - Utricularia spp.	water shield - bladderworts	CDFmm CWHdm CWHmm1 CWHmm2 CWHvh1 CWHvm1 CWHvm2 CWHxm1 CWHxm2	SNR	No Status	GNR			
Carex sitchensis / Sphagnum spp.	Sitka sedge / peat-mosses	CWHvh2/Wf51 CWHvm1/Wf51 CWHvm2/Wf51 CWHwh1/Wf51 CWHwm/Wf51 CWHws2/Wf51 ICHvc/Wf51 ICHwc/Wf51 MHmm1/Wf51	S2 (2014)	Red	G2		Central and North Coast LUO Haida Gwaii LUO South Central Coast LUO	1
Eriophorum angustifolium / Sphagnum spp.	narrow-leaved cotton-grass / peat-mosses	CWHvm1/Wf50 MHmm1/Wf50	S3S4 (2004)	Yellow	G3G4			2
Leymus mollis ssp. *mollis - Lathyrus japonicus*	dune wildrye - beach pea	CDFmm CWHdm CWHds1 CWHms2 CWHvh1 CWHvh2 CWHvm1 CWHwh1 CWHwm CWHws1 CWHxm1 CWHxm2	S1S2 (2008)	Red	GNR		Central and North Coast LUO South Central Coast LUO	1
Picea sitchensis / Rubus spectabilis Very Wet Maritime	Sitka spruce / salmonberry Very Wet Maritime	CWHvm1/09	S2 (2010)	Red	G3		Central and North Coast LUO South Central Coast LUO	2
Pinus contorta / Sphagnum spp.	lodgepole pine / peat-mosses	CWHdm/11 CWHds1/11 CWHds2/11 CWHmm1/11 CWHms1/10 CWHms2/10 CWHvm1/13 CWHwm/10 CWHws1/10	S4S5 (2009)	Yellow	GNR		South Central Coast LUO	4
Populus trichocarpa - Alnus rubra / Rubus spectabilis	black cottonwood - red alder / salmonberry	CDFmm/08 CWHdm/09 CWHds1/09 CWHds2/09 CWHmm1/09 CWHms1/08 CWHms2/08 CWHvm1/10 CWHwm/06 CWHws1/08 CWHws2/08 CWHxm1/09 CWHxm2/09	S3 (2010)	Blue	GNR		South Central Coast LUO	2
Rhododendron groenlandicum / Kalmia microphylla / Sphagnum spp.	Labrador-tea / western bog-laurel / peat-mosses	CDFmm/Wb50 CWHdm/Wb50 CWHvm1/Wb50 CWHxm1/Wb50 CWHxm2/Wb50	S3 (2004)	Blue	G4			4
Salix sitchensis / Carex sitchensis	Sitka willow / Sitka sedge	CWHvm1/Ws06 CWHvm2/Ws06 ICHvk1/Ws06 MSdc1/Ws06 MSdm1/Ws06	S3 (2004)	Blue	G3			2

Figure 6. BC Species and Ecosystem Explorer Results for Terrestrial Ecological Communities (BC CDC 2016).

BC Species and Ecosystems Explorer Search Results (Printer-friendly) Page 2 of 2

		MSmw2/Ws06 SBSvk/Ws06 SBSwk1/Ws06					
Thuja plicata - Picea sitchensis / Lysichiton americanus	western redcedar - Sitka spruce / skunk cabbage	CWHdm/12 CWHds1/12 CWHds2/12 CWHmm1/12 CWHms1/11 CWHms2/11 CWHvh1/13 CWHvh2/13 CWHvm1/14 CWHwh1/12 CWHwh2/06 CWHws1/11 CWHxm1/12 CWHxm2/12	S3? (2004)	Blue	G3?	Central and North Coast LUO South Central Coast LUO	3
Thuja plicata - Tsuga heterophylla / Polystichum munitum	western redcedar - western hemlock / sword fern	CWHmm1/04 CWHmm2/04 CWHvm1/04 CWHvm2/04	S3? (2005)	Blue	GNR	Central and North Coast LUO South Central Coast LUO	1
Thuja plicata - Xanthocyparis nootkatensis / Coptis aspleniifolia	western redcedar - yellow-cedar / spleenwort-leaved goldthread	CWHvh1/11 CWHvh2/11 CWHvm1/12 CWHvm2/09 CWHwh1/10 CWHwh2/05	S4S5 (2005)	Yellow	G4G5		4
Tsuga heterophylla - Abies amabilis / Blechnum spicant	western hemlock - amabilis fir / deer fern	CWHvm1/06 CWHvm2/06	S3 (2010)	Blue	GNR		2
Tsuga heterophylla - Abies amabilis / Vaccinium alaskaense	western hemlock - amabilis fir / Alaskan blueberry	CWHvm1/01 CWHvm2/01	S4? (2001)	Yellow	GNR		2
Tsuga heterophylla - Pinus contorta / Cladina rangiferina	western hemlock - lodgepole pine / grey reindeer	CWHvm1/02 CWHvm2/02	S3S5 (2007)	Yellow	G3G5		2
Tsuga heterophylla - Thuja plicata / Gaultheria shallon Very Wet Maritime	western hemlock - western redcedar / salal Very Wet Maritime	CWHvm1/03 CWHvm2/03	S3 (2006)	Blue	G3 (2005)		2

Search Summary

Time Performed Thu Sep 15 09:11:33 PDT 2016

Results 19 records.

Search Criteria Search Type: Ecological Communities
AND Forest Districts:Kalum Forest District (DKM)
AND MOE Regions:6- Skeena
AND Regional Districts: Kitimat-Stikine (KSRD)
AND BGC Zone, Subzone, Variant, Phase:CWHvm1
Sort Order:Scientific Name Ascending

Notes

1. Citation: B.C. Conservation Data Centre. 2016. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Sep 15, 2016).

2. Biogeoclimatic Site Unit(s): This column indicates the BGC unit(s) on which each ecological community is known to occur (future inventories may indicate range extensions). The two digit number following the slash (01 and up) indicates that the ecological community occurs on a site series that is part of the B.C. Ministry of Forests (MOF) site series classification (see MOF Regional Field Guides to Site Identification and Interpretation for more information). A two digit number of '00' indicates that the ecological community occurs on a site unit that is not part of the MOF site series classification but is recognized from other vegetation and site classifications, and ecosystem mapping projects.

3. The data contained in the Results Export in BCSEE are provided under the Open Government License - BC.

Modify Search | New Search | Results

file:///S:/Contracts%202016/1618%20PFS%20Urban%20Systems%20-%20Minette%20... 17/09/2016

Figure 7. continued.