Ecosystems, Wildlife and Features of Importance to Kwanlin Dün First Nation within the City of Whitehorse

Prepared by: John Meikle and John Grods

Prepared for: Kwanlin Dün First Nation

Heritage, Lands and Resources

Attn: Glenda Koh

April 2024

Cover photo: Long Lake and the forest east of the Yukon River; view to the North

Table of Contents

1 Introduction 4

2 Objectives 4

3 KDFN Citizen Values 5

4 Conservation Considerations 8

5 Legislation, Guidelines and Policy 9

6 Ecocultural Context 13

7 Species, Ecosystems and Features 15

8 Ecosystem Mapping for Whitehorse 50

9 Using this map 58

10 Further work 62

11 References 63

Appendix 1: Legend for Important Ecosystem/Features and Modifiers 66

Appendix 2: Polygon Attribute Table 68

Appendix 3: Ecosites of the Boreal Low Zone - Southern Lakes and Crosswalk to Whitehorse Ecosystems 71

Appendix 4: CDC Methods to Assess Ecological Communities 73

Appendix 5: Listed Ecosystems for Whitehorse, 2000 75

Acknowledgements

Funding for this project in its inception was provided by Ta'an Kwäch'än Council, Kwanlin Dün First Nation and the City of Whitehorse. Mapping was completed by John Grods, with some updates and edits by John Meikle. An early version of this report was prepared by Kirsten Kurjata Funding for bringing the mapping and report to this stage was provided by Kwanlin Dün First Nation, with project management by Glenda Koh.

Executive Summary

Kwanlin Dün is a self-governing First Nation centred in the City of Whitehorse. Through its Land Claim agreement, Kwanlin Dün First Nation has extensive land holdings throughout the City. The majority of these lands were selected for residential use for First Nation citizens and for developments geared towards revenue generation. As a guide to developing a Community Land Plan was prepared in which Kwanlin Dün citizens supported the development mandate, but qualified it with articulating a desire to maintain cultural and ecological values within city limits. Kwanlin Dün also has a voice in shaping the City on non-settlement land through participation in municipal planning and project reviews. To support this interest in wise development, a map of ecosystems found within the city is required.

Mapping was undertaken using the most up-to-date large scale mapping available for Whitehorse, known as CanVec . The water layer from CanVec was use as the anchor for mapping. Polygons developed were directly mapped at a scale of 1:10,000, with reference to a combination of previously mapped vegetation, surficial geology and important ecosystems. The ecosystem polygons reflect areas of uniform vegetation, terrain, land use, and habitat characteristics. The attribute tables were completed following the polygon delineation.

1 Introduction

Whitehorse is an isolated city set in a mountainous natural landscape. It has sparse agricultural and residential developments within its periphery. Yet the dominant characteristic is relatively unroaded boreal lowlands and mountains. It is not surrounded by transformative land uses, such as forestry, agriculture, fossil fuel extraction or adjacent urban areas. The large municipal boundary is not evident from above through quick land use transition. Rather, the river, lowland forests and mountains extend uninterrupted into the city area. Kwanlin Dün First Nation citizens expressed their valuation of wildlife, plants and specific cherished areas within the city and in the context of this continuum with the broader setting. Likewise, the City of Whitehorse has long billed itself as the Wilderness City. The extensive lands, coupled with the natural regional setting, presents opportunity to plan for and enjoy species, ecosystems and natural spaces within the City that are linked to the regional landscape.

This project was initiated by the Kwanlin Dün First Nation, Ta'an Kwäch'än First Nation and City of Whitehorse to further refine and better understand the ecosystems of the City of Whitehorse, in order to assist with current land use planning and management strategies within the city. The goal of the project is to identify ecosystems considered sensitive to disturbance, ecosystems which contain rare species, and species identified by government and valued by First Nations for aesthetic, medicinal or other reasons, to represent natural spaces and ecosystems that require recognition and stewardship within Whitehorse city limits.

The city boundaries encompass a large proportion of diverse natural spaces which provide some of the most scenic views in all of Canada. Whitehorse is located along the Yukon River, nestled between Grey Mountain, Haeckel Hill and Golden Horn Mountain and includes numerous streams, small lakes, ponds and wetlands. There are five regional parks located in Whitehorse, and together they make up 30% of the city area (City of Whitehorse, 2018). Whitehorse sits on small discontinuous patches of permafrost, adding to the patchwork mosaic of the natural environment, adding to the diversity of natural spaces within the city.

The study area covers the City of Whitehorse, approximately 416.5km^2, and includes private lands, parks, crown lands, and First Nations settlement lands. The area lies in the Southern Lakes Ecoregion, and ranges from the Boreal Low Southern Lakes Bioclimate subzone (BOLsl) below about 900 meters elevation (Environment Yukon 2017), through the Boreal High (BOH) to the subalpine (BOS) zone over about 1,300 meters (Flynn et al. 2017). The city has a dry sub-arctic climate, however temperatures can reach +30° C in the summer and below -30° C in the winter. Annual precipitation is low, with a 30-year average of 267 millimetres (Government of Yukon, 2018).

2 Objectives

Develop KDFN lands while ensuring that key ecosystem and First Nations values within the City are upheld.

Prepare a values framework and mapping system that can be embraced by partners.

3 KDFN Citizen Values

In the process of preparing a plan for the management, including sound development, of KDFN settlement lands within Whitehorse, citizens identified a wide range of heritage and ecosystem values, species, habitat types and areas. Over 600 specific references were made on maps during workshops, indicating ongoing intimate knowledge of the land. These interests are summarized in the following tables.

Species were organized by the number of times they were referenced in Community Land Planning workshops. The numbers of references were used as proxy for priority. Not surprisingly, eagles have high cultural significance, and were mentioned frequently. Bald Eagles along the river are of particular significance. They are also understood to represent, or be linked to, healthy fish populations in the Yukon River. Grouse species are also important within the City, even though it is recognized that they are not to be hunted within City limits. Notable were observations of Blue Grouse (Dusky Grouse) in higher elevations. Reflective of general ecosystem health, migrant song birds were mentioned frequently. These were subsequently organized into species groups that are specialists within each of the four bioclimate zones. For millennia, the people of the region have relied on Chinook Salmon and Caribou. Fresh water fish, including those that occupy the kettle lakes and are sought out in winter, are also of high value. A wide range of mammal species remain important. Citizens expressed interest in maintaining areas suitable for caribou, moose, predators and small animals, particularly habitats that enable movement through the City.

Group	Order / Family	Common Name	Genus	Species	Workshop References	Workshop notes	Notes
Bird	Raptor	Bald Eagle (4)	Haliaeetus	leucocephalus	25	Bald Eagle along Yukon River (1)	
Bird	Grouse	Dusky Grouse (1)	Dendragapus	obscurus	20		
Bird	Song bird				14		Alpine: HOLA; AMPI; SAVS; BRSP
Bird	Song bird				14		Subalpine: TOSO; WCSP; DUFL; GCSP
Bird	Song bird				14		Upland Deciduous: WAVI; CHSP; BCCH; PUFI; LEFL
Bird	Song bird				14		Upland Coniferous: YRWA; SWTH; BOCH; RBNH; GCKI
Bird	Swan				9		Specially Protected (Tumpeter Swan)
Bird	Waterfowl				7		
Bird	Shorebird				5		
Bird	Dove				1		
Bird	Gull				1		
Fish	Salmon	Chinook Salmon	Oncorhynchus	tshawytscha	27	Salmon camps (1); spawning habitat (1)	
Fish	Fish				16	Winter fishing Long Lake	
Fish	Fish	Northern Pike	Esox	lucius	10		
Fish	Fish	Arctic Char	Salvelinus	alpinus	2	Concern re escapment from fish farm (1)	introduced
Fish	Fish	Whitefish	Coregonus		1		
Mammal	Ungulate	Caribou	Rangifer	tarandus	32		
Mammal	Ungulate	Moose	Alces	alces	29		
Mammal	Ursus	Grizzly bear	Ursus	arctos	25		
Mammal	Ursus	Black bear	Ursus	americanus	23		
Mammal	Lagmorpha	Snowshoe Hare	Lepus	americanus	22		
Mammal	Carnivore	Grey Wolf	Canis	lupus	22	overpopulated (1); into garbage (1)	
Mammal	Rodent	Porcupine	Erethizon	dorsatum	21		
Mammal	Ungulate	Mule deer	Odocoileus	hemionus	20		expanding north
Mammal	Carnivore	Coyote	Canis	latrans	18		
Mammal	Rodent	Arctic Ground Squirrel	Spermophilus	parryii	17		
Mammal	Bovide	Dall sheep	Ovis	dalli	16	on Grey Mountain (1)	obs Grey Mtn, Mt Mac, Haeckel & Fish Lk
Mammal	Rodent	Beaver	Castor	canadensis	14	Beavers overpopulated (1)	
Mammal	Carnivore	Cougar	Felis	concolor	12		expanding north; Specially Protected; could augment with DOE obs record
Mammal	Rodent	Muskrat	Ondatra	zibethicus	11		
Mammal	Mustelid	River Otter	Lutra	canadensis	11		
Mammal	Mustelid	Pine Marten	Martes	americana	10		
Mammal	Carnivore	Red Fox	Vulpes	vulpes	8		
Mammal	Ungulate	Elk	Cervus	canadensis	6		introduced; west of Whitehorse
Mammal	Bovide	Bison	Bison	bison	3		introduced; west of Whitehorse
Mammal	Mustelid	Wolverine	Gulo	gulo	3		obs Long Lk area, Mt Mac, Sumanik Ridge
Mammal	Carnivore	Lynx	Lynx	canadensis	1		
Mammal	Rodent	Hoary Marmot	Marmota	caligata	1	Sumanik Ridge	
Mammal	Rodent	Groundhog	Marmota	monax	1	[obs behind (west) Mt Sima. Locational accurracy? Groundhog or Marmot?] One M. monax obs in Chadburn.	Yukon Rank: S2S3
Plant	Mushrooms				10		
Plant	Trees				9	trees cut down on C-116 (2)	

Figure 1: Kwanlin Dun First Nation citizens noted over 600 habitat areas or species of interest within the City during the preparation of the KDFN Community Lands Plan.

As with species, a wide range of habitat types are also valued. Many of these hold value for being obligatory habitats to species of plants and animals that were and are harvested for foods, medicines and materials. Habitat types mentioned include the higher elevation areas around the City, which support moose, caribou, and occasionally Dall Sheep and wolverine. The corridor function of steams and forested lowlands, along with unbroken forested areas was recognized and remain important values.

General	Specific	Example	Species within	C Land Workshops	References
Alpine / Subalpine	open grass & shrub with escape terrain	Haeckel Hill	Dall Sheep, moose, caribou, wolverine, Townsend's Solitaire	95, 111, 331, 457	KDFN 2010 Ecosystems
Corridor	Large Stream	Yukon River	salmon, bank swallow, moose, freshwater fish,	281, 528	OCP 2010 p37f
Corridor	secondary stream	Croucher Creek	beaver, waterfowl, freshwater fish, salmon spawning & rearing, moose, bear, wolf	85, 282, 285	OCP 2010 p37f
Corridor	terrestrial	game trail east of Croucher Creek	Caribou	524	Chadburn Lake PMP p14
Forest	High boreal	west of Copper Haul Road	grouse; arctic ground squirrel, moose, wolf, porcupine	207, 213, 228, 527	
Forest	lichen rich	Long Lake Road	Caribou	286, 289, 292, 527	Chadburn Lake PMP p14
Forest	Low Boreal, varied	Wolf Creek	Moose	289, 292	
Forest	old growth	small pockets throughout	specialist / indicator sp such as Black-backed woodpecker sp, biodiverse, structure	160, 319, etc (9 refs to 'trees')	City AEM 2000, KDFN 2010 Ecosystems
Grassland	Aspect grassland	Hidden Lakes	sage (ie Artemisia frigida); black bear, Beringian refugial vegetation		City AEM 2000; Chadburn Lake PMP p14; Schroeder 2011
Landscape Feautes	Dunes	northeast	open Pine forest; caribou, grizzly bear, fox	192, 224, 539	
Landscape Feautes	Meltwater Channels	Valerie Lake - Copper Trail	Pacific Slope Flycatcher; Grizzly, muskrat	239, 571	iNaturalist
Landscape Feautes	River Bluffs	Yukon River	Bank Swallow; Bald Eagles	49, 84, 121	SARA
Natural Area'	see KDFN Significant Areas	Mt. Sima area	intact forest ecosystem, moose, coyote, grizzly bear, dall sheep, muskrat	concentrations of points from workshops	C Lands Plan, Proposed OCP p34 - avoid further fragmentation; KDFN 2010 Core Areas
Water	lake	Chadburn Lake	Rednecked Grebe nesting, fish	82, 288, 526	Chadburn Lake PMP p14
Water	ponds	complex west of sewage lagoon	Bufflehead nesting, moose	293	Chadburn Lake PMP p14
Wetland	marsh, fen	Lot 226	waterfowl, beaver, moose, muskrat	283, 425, 427, 429, 440, 488, 489, 518,	OCP 2010 p37f, City AEM 2000

Figure 2: Feature types mentioned through the C Lands Plan process are listed here.

4 Conservation Considerations

4.1 Sensitivity

Wildlife species have a range of responses to various human activities and developments. From displacement and avoidance in highly sensitive species such as caribou to attraction and successful use of species such as Red Fox. Ecosystems are also sensitive to natural and human induced disruption. The response to disruption may differ between ecosystems and the types of change, yet from subalpine shrub to riparian forests and from dry aspect grasslands to wetlands, ecosystems can be altered, hampered from their post fire trajectory, or destroyed.

4.2 Rarity

Some species and ecosystems occur naturally at low densities. This, in and of itself, is not of concern. Conservation interest increases where a species or ecosystem is reduced in numbers or range from its historic normal, is at the edge of range, or is part of a unique ecological phenomena. The latter, in the case of Whitehorse, includes Beringian species that reach their southeastern extent in this area. Given the natural setting of Whitehorse, rarity is less of a concern than it is in municipalities that are surrounded by agriculture, forestry or other landscape altering activities.

4.3 Function

The range of structures of ecosystems, from open grasslands, interspersed wetlands, to closed forests, provide a range of functions. Many species of birds and mammals require open areas for foraging and forests for shelter, for example. Patches of old growth forests can provide seeds, for nearby burns. Wetlands and forests retain water, releasing it much more slowly than developed areas. Ecosystem function can be disrupted through fragmentation, exposure to introduced species and removal of species or ecosystem components.

4.4 Representation

Conservation efforts in municipal settings often focus on rare species and spatially limited ecosystems, sometimes to the detriment of dominant ecosystems. The establishment of Regional Parks in Whitehorse is a major step towards maintaining the full complement of ecosystem types and providing for habitat security for the species that depend on them. This consideration can be extended to planning and development review outside of the parks.

While ecosystem representation is usually applied at a regional scale or provincial and territorial scales, and beyond, there is room for considering it in Whitehorse. The concept of representation in conservation planning was arrived at with the recognition that many protected area systems were

skewed towards recreational areas, mountainous terrain or unique natural features. System planning for jurisdictional protected areas in the 1980s began assessing for the inclusion of all ecosystem types and protected area designs that were aimed at providing for ecological integrity. Again, as the city area is large and includes extensive natural spaces, there is opportunity and responsibility at the municipal level to steward these spaces and ecosystems. Conservation within the city can complement regional conservation objectives.

4.5 Cultural Importance

As Kwanlin Dün citizens expressed in the preparation of the Community Lands Plan, species and ecosystems have important value within an urban context. Opportunity to encounter wildlife, to know that built environment remains habitable and permeable for wildlife is important. The intrinsic value of knowing species occupy shared urban space is important, even if they are not regularly seen. For gathers, places close to home where medicines and berries can be harvested has great value. While much of the world's population becomes urbanized, the isolation from natural spaces, plants and animals is increasingly problematic. Despite not being a large metropolis, it is easy to become isolated from the natural surroundings even in Whitehorse. The people of Kwanlin Dün can set an example by retaining as much of their connection to their culture, which is closely tied to the land, within the city limits.

5 Legislation, Guidelines and Policy

5.1 Canada

5.1.i Species At Risk

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) provides advice about the status of wildlife species in Canada. COSEWIC assesses and classifies the status of wildlife species using the best available information on the biological status of a species and its environment, including scientific knowledge, community knowledge, and Aboriginal traditional knowledge. COSEWIC is the organization responsible for assessing species according to criteria from the *Species at Risk Act* (Government of Canada, 2002) and developing candidate listings to be added to the SARA Registry. This includes information gathered from observation, personal experience and culture, and used to inform about current and/or past population distribution and abundance, habitat use and availability, life history traits, ecological relationships and potential threats to the survival of the species. If accepted by the Government, these species are added to the SARA Public Registry. For species listed in the registry as extirpated, endangered or threatened, activities within the species critical habitat require permits.

For species, or groups of species, of conservation concern, but not considered to be in imminent threat of becoming extinct, Canada partners with local provincial, territorial and First Nation governments to prepare management plans. An example is the "Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada [Proposed], 2011." This proposed plan includes general direction on mapping and managing important habitats across the 36 herds that comprise the Northern Mountain Population ecotype. It does not provide specific direction for the two herds in the Whitehorse area.

The *Species at Risk Act* requires that Recovery Strategies be prepared for species that are listed as threatened, endangered or extirpated. An example that includes Whitehorse, and much of Canada, is the Recovery Strategy for Bank Swallow. With precipitous population declines over the past decades, it is listed as being threatened. Key elements of the Strategy are the definition and delineation of critical habitat, along with population and distribution objectives. Nesting colonies along the banks of the Yukon River in Whitehorse are mapped as critical habitat in the Strategy. Other species known in Whitehorse for which there are recovery stratagies are the Red Knot, Common Nighthawk, Olive-sided Flycatcher, Baikal Sedge and Grizzly Bear. That only five of the 387 Recovery Strategies apply in Whitehorse is testament to the relatively undeveloped city within a still-natural matrix.

The Red Knot (Calidris canutus) is a shorebird with three recognized subspecies. The subspecies Calirris canutus roselaari is considered accidental in Yukon, as it migrates between wintering grounds in northwestern Mexico to breeding grounds in northwest and northern Alaska, Wrangel Island and Russia. With a global population of Roselaari of only 17,000 individuals, it is listed as Threatened in the SARA registry. It has been observed only a few times in Whitehorse, notably at the Sewage Lagoons. It is seen occasionally at Judas Creek and other sites along Marsh Lake.

With a deep dive and buzzy sound from wind over its wing-tips, the Common Nighthawk (Chordeiles minor) is heard more often than seen during its breeding season in the Whitehorse area. The

population of this aerial insectivore is in decline, with factors thought to include habitat loss, climate change, pollution and accidental mortality. With no clear factor contributing to the decline, the precautionary principle guides the recovery strategy. It is listed as Special Concern. It is found most commonly in Whitehorse in the dry forests east of the Yukon River, including the Long Lake area and Chadburn Park.

The Olive-sided Flycatcher has been designated as Threatened. It is not understood whether or not potential issues with breeding habitat are influencing population decline. Most factors are considered to be the non-breeding range, including reduced insect prey, and habitat loss. They are found in open forests and adjacent to waterbodies in the Whitehorse area.

Baikal Sedge (Carex sabulosa) is found in relict open dunes throughout southwestern Yukon. With less than 10 known locations it was considered Threatened in 2005. Subsequent inventory, including participation by Kwanlin Dün Lands and Resources, identified numerous additional populations. It was subsequently reassessed and, as of 2019, it is listed as Special Concern on the SARA Registry. The only known population in Whitehorse is the open sand and silt on the bluff at the north side of Riverdale, locally known as the 'Notch',

5.1.ii Migratory Birds

The Canadian Wildlife Service is responsible for migratory species in Canada. Pursuant to the *Migratory Birds Convention Act*, 1994, Canada has written Bird Conservation Strategies for each of the 14 Bird Conservation Regions of Canada. The region that includes Whitehorse is Region 4: the Northern Interior Forest. It covers the northern cordillera, with an outline similar to the proposed caribou plan mentioned above. Of the 211 bird species that are regularly occurring in the region, 77 are given priority in the plan owing to differing levels of conservation concern. Of particular interest are Common Nighthawk, Olive-sided Flycatcher, Peregrine Falcon, Short-eared Owl and Rusty Blackbird, all of which are known in Whitehorse. Some species covered by the Strategy are listed in the SARA Registry as being of conservation concern. Most of the priority species have lesser levels of conservation concern and are included here such that precautionary habitat measures can be taken to lessen the chance of population declines

5.1.iii Yukon Environmental and Socio-Economic Act

Established by Canada in 2003, the *Yukon Environmental and Socio-Economic Act (YESAA)*, is an obligation of the Yukon First Nation Final Agreements. It replaces the former Canadian Environmental Assessment process in Yukon. This Act provides for comprehensive review of development projects

through Yukon, including projects on First Nation Settlement Land within Whitehorse. These reviews are administered by the Whitehorse Designated Office.

5.2 Yukon

Yukon has delegated authority from Canada to manage land and resources within the Territory. A number of territorial statues contribute to managing for species and ecosystems within Whitehorse. These include, but are not limited to, the *Municipal Act*, which enables Whitehorse to operate, plan and administer land, along with the *Lands Act (Yukon)*, the *Wildlife Act*, *Environment Act*, and the *Parks and Land Certainty Act*. Yukon has developed policy for wetlands, a regional Strategic-level forestry plan, that includes Whitehorse, and manages Wolf Creek Park within the City. There are guidelines for ecosystem classification and mapping, but no policy or legislative requiring their use in project assessment or planning.

The Department of Environment, Yukon, manages the Conservation Data Centre (CDC). Yukon's CDC is part of the international Nature Serve program that is a partner in to the implementation of the Species at Risk Act in Canada. The Yukon CDC currently gathers, maintains and distributes information Yukon species of plants, insects and animals that are of conservation concern. This includes species listed in the SARA Public Registry as well as an extensive 'watch list' of additional species. It is anticipated that the CDC will begin collecting information on ecological communities in the future.

5.3 Whitehorse

The primary policy vehicle for expressing ecological values within the City is the Official Community Plan. It contains high level policy statements and delineation of important areas, particularly the Regional Parks. Neighborhood and Park plans take these policies to a more detailed level and include larger-scale mapping of greenspaces within developed areas.

5.4 Kwanlin Dün First Nation

The First Nation has high-level statements of land value in its Constitution. The Self-Government Agreement and Final Agreement enable the First Nation to enact laws and define its participation in land and water management. A *Lands Act* was passed by Council in 2020. The most relevant policy document is the Kwanlin Dün First Nation Community Lands Plan: A Plan for KDFN Settlement Land in Whitehorse. The land values citizens identified through the preparation of this plan are described elsewhere in this report.

6 Ecocultural Context

Whitehorse is located in the northwestern cordillera of North America. It is within the Teslin Plateau (Matthews, 1986) portion of the Intermontane Morphological Belt, the latter known for relatively subdued terrain comprised of volcanic and sedimentary rocks, both of which are usually slightly metamorphosed (McKenna and Smith, 2004). Bedrock exposures are limited to the mountains east and west of the City, along with a few notable lower elevation sites. These include the largely sedimentary rocks of Grey Mountain, including limestone and dolostone from which it derives its common name. Exposures to the west at Haeckel Hill, Mount McIntyre and Goldenhorn are plutonic. The best known bedrock exposure in the City is the columnar basalt flow bisected by the Yukon River at Kwanlin. The study of groundwater in the City by Gartner Lee, 2003, provides a good summary of bedrock geology for Whitehorse.

The Whitehorse area was subject to glaciation, most recently in the McConnell Glacial event that occurred between approximately 24,000 and 11,000 years ago (Bond, 2004). Glacial till, deglaciation processes and deposits and glacial impoundments that resulted in deep glaciolacustrine sediments filled the Whitehorse Valley. Subsequent movement of deltaic sand from the diminishing Glacial Lake Laberge by wind and downcutting of all sediment types by streams and rivers have resulted in the contemporary landscape. A number of projects describe glacial process and the surficial geology of Whitehorse in detail, the most recent being Lipovsky, 2023.

Distinctive ecosystems form on this diversity of parent materials and landscape types, including bedrock canyons along with fens and shallow water wetlands in the numerous meltwater channels that run parallel to the valley before cutting their way to the Yukon River, dry Lodgepole Pine dominated forests on the eolian dune complex in the northeast, lakes and aspect grasslands in the kettle – kame landscapes, and extensive White Spruce led forests on till and moister glaciofluvial materials.

In the rain shadow of the coastal mountains, the climate is dry, with only 300 to 400 mm of precipitation per year. It is a sub-arctic climate, yet the proximity to the Pacific Ocean modifies the climate, buffering it from the temperature extremes of the continental interior climates experienced further to the east and north in Yukon.

The dominant ecosystem is the northern boreal forest that is subject to periodic rejuvenation through wildfire events. It is led by White Spruce and Lodgepole Pine, with Trembling Aspen, along with pockets of Paper Birch on cool aspects, accompanied by Subalpine Fir at the upper reaches of the forest. In addition to the dominant boreal forest, there are dry forests on dune fields in the northeast, grasslands persist on south facing slopes. At the other end of the moisture spectrum are numerous small lakes, fens, marshes and shallow water wetlands. There are subalpine habitats on the mountains at the margins of the City limits. There is a very limited occurrence of alpine habitat on Golden Horn Mountain. The lower elevation portion of the City's ecosystems are described in *A Field Guide to Ecosite Identification for the Boreal Low Zone of Yukon: The Southern Lakes Subzone,* by Meidinger et. al. 2014. The larger KDFN traditional territory and higher elevation ecosystems are described in a broad

ecosystem mapping project that was undertaken in support of regional land use planning (Meikle et al. 2024).

The glacial retreat was followed by a relative warm spell that persisted for one or two millenia. By roughly 10,000 years ago, small alpine glaciers began to form in the Coastal Mountains. Slightly further toward the interior, seasonal alpine snow patches began to be sustained, resulting in compression and the formation of ice patches. These ice patches were too small to flow like glaciers. Layers within them retained organic material that blew across them in the summers, along with insects, birds, small mammals and bones of bison and caribou. Also preserved are tools used by people to hunt these animals, mostly focused on caribou. The closest of these features to Whitehorse is on Mount Granger to the west. This cultural record extends back 9,000 years; which is to say to the beginning of the formation of the ice patches. Along the major rivers, chinook salmon were plentiful in mid-summer as they returned to spawning grounds. So, there is a material record, supported by oral history, of continuous use of the Whitehorse area by caribou and salmon people since the region greened up following the last glacial event. Climates and ecosystems varied over this time, recently with the cooling during the Little Ice Age from approximately 1450 to 1850. Events like the rapid deposition of volcanic ash from the explosion of Mount Churchill in 852 would have caused major disruption to human life, but were followed by reoccupation of the region.

Of course, the major event in the human story for the region was the exploration by a trickle of western Europeans from the mid-1800s followed by the rapid descent on the area by gold seekers in 1898 and following. As the waters through Kwanlin were not navigable, the productive fish camps along the river downstream were quickly converted into a hub in support of ship building and other commerce in support of the gold rush. Whitehorse continued to grow in subsequent years, replacing Dawson City as the capital of Yukon. World War II saw the Americans grow concerned about the security of Alaska following a Japanese attack on the Aleutian Islands. In order to secure an inland route for moving materials, people and oil, the Canol Pipeline and Alaska Highway, which supported airstrips, including in Whitehorse, were built. Whitehorse was a hub for refining oil, highway construction and other US military operations. This insertion of people and infrastructure precipitated growth that is unabated to this day.

The change in climate following the emergence from the Little Ice Age resulted in effects such as increased areas with habitat suitable to species like moose. This change, which was occurring at a pace that plants, animals and people were able to adjust to, has been greatly accelerated with human caused global warming and with it, impacts on the land such as the melting of permafrost, warmer winters, new species establishing and changing ecosystems.

7 Species, Ecosystems and Features

In order to engage constructively in planning and in development reviews to ensure that species and habitats of interest are maintained, some form of mapped representation of ecosystems and features is required. The following describes the types of ecosystems that are considered important and mappable at the scale required. These descriptions form the categories or classification used in mapping.

7.1 Species

7.1.i Important to Kwanlin Dün

Culturally important plant species are harvested for foods and medicines. This practice continues within and beyond the city limits. There is recognition that hunting and trapping, say of gophers, not permitted within the City. Nevertheless, citizens expressed interest in knowing that the city was permeable to species moving through. Aquatic habitats for freshwater fish and salmon are described as being important, as are terrestrial habitats for large mammals, including moose, caribou, deer and bears. Likewise habitat sufficient to support smaller animals such as pine marten, porcupine and gophers is understood to be important. Citizens value viewing these species and the cognitive value of knowing that they are there, sharing space in the City within and adjacent to residential areas. These values, combined with those of the broader society, including species of conservation concern, for which there are legislated requirements to consider, are reflected in the following table. Habitats for some of these species appear in the attribute table associated with the city ecosystem map; others require expert knowledge to interpret species needs related to the ecosystems described.

Figure 3: KDFN citizens described the importance of seeing wildlife within the City and knowing that wildlife populations were healthy and coexisting with people, despite not hunting or trapping. Of particular note were gophers, such as this one from Mount McIntyre.

Group	Order / Family	Common Name	ALPHA Code	Genus	Species	Conservation Status - Canada	YG Rank	Cdn Rank	Global Rank	Whitehorse Habitat - General	Whitehorse Habitat - Specific
Bird	Falconiformes	Peregrine Falcon	PEFA	Falco	peregrinus	Not at Risk	S3B	N3N4B, N2N, N3N4M	G4	Nest on cliff ledges; hunt shorelines, wetlands	
Bird	Passeriformes	Barn Swallow	BARS	Hirundo	rusitca	Special Concern	S2B	N3N4B, N3N4M	G5	bridges, buildings	
Bird	Podicipediformes	Horned Grebe	HOGR	Podiceps	auritus	Special Concern (2009)				ponds, small lakes w marshy margins	
Bird	Charadriiformes	Red-necked Phalarope	RNPH	Phalaropus	lobatus	Special Concern (2014)				wetlands during migration	
Bird	Passeriformes	Rusty Blackbird	RUBL	Euphagus	carolinus	Special Concern (2017)	S4B	N4B, NUN, N4M	G4	wetlands	
Bird	Passeriformes	Olive-sided Flycatcher	OSFL	Contopus	cooperi	Special Concern (2018)				open forests	
Bird	Caprimulgiformes	Common Nighthawk	CONI	Chordeiles	minor	Special Concern (2018)	S3B	N4B, N3M	G5	Open forest	Long lake road; Chadburn Park
Bird	Charadriiformes	Buff-breasted Sandpiper	BBSA	Tryngites	subruficollis	Special Concern (2018)	S1B	N2N4B, N4N5M	G4	open fields	
Bird	Strigiformes	Short-eared Owl	SEOW	Asio	flammeus	Threatened (2008)	S3B	N4B, N3N, N4M	G5	varied: grasslands, marshes, open forest	
Bird	Passeriformes	Bank Swallow	BANS	Riparia	riparia	Threatened (2013)	S4B	N5B, N5M	G5	vertical riverbanks	
Bird	Charadriiformes	Hudsonian Godwit	HUGO			Threatened (2019, awaiting listing)					
Bird	Charadriiformes	Red Knot	REKN	Calidris	canutus rufa	Threatened (2020)					incidental in SW Yukon
Bird	Charadriiformes	Lesser Yellowlegs	LEYE			Threatened (2020, awaiting listing)					
Insect	Apidae	Gypsy Cuckoo Bumble Bee		Bombus	bohemicus	Endangered (2014)	S2	N1	G3G5	open areas w Flowers	
Insect	Diptera	Dune Tachinid Fly		Germaria	angustata	Special Concern (2011)	S3	N3	G4G5	open dunes, with scattered sedges	
Insect	Apidae	Western Bumble Bee, McKay subspeci		Bombus	occidentalis mc	Special Concern (2014)				mixed forest to alpine meadows	
Insect	Coleoptera	Transverse Lady Beetle		Coccinella	transversogutta	Special Concern (2016)				generalist	
Insect	Coleoptera	Variable Tiger Beetle		Parvindela	terricola		S2S3	N4N5	G5		
Insect	Odonata	Muskeg Emerald		Somatochlora	septentrionalis		S3	N5	G5		
Mammal	Chiroptera	Little Brown Myotis		Motis	lucifugus	Endangered (2013)	S3B	N2N4B, NNRN, NNRM	G3	buildings, rock crevices, tree cavities, under tree bark	
Mammal	Lagamorpha	Collared Pika		Ochotona	collaris	Special Concern (2011)	S3S4	N3	G5		
Mammal	Carnivora	Grizzly Bear		Ursos	arctos	Special Concern (2012)				generalist	
Mammal	Bovidae	Wood Bison		Bison	bison athabasc	Special Concern (2013)				to west of City	
Mammal	Carnivora	Wolverine		Gulo	gulo	Special Concern (2014)				boreal forest to alpine	
Mammal	Cervidae	Woodland Caribou (Northern Mountai		Rangifer	tarandus caribo	Special Concern (2014)				Winter: Lichen rich forest; Summer: Alpine	
Mammal	Rodentia	Woodchuk		Marmota	monaz		S2S3	N5	G5		19 records in Yukon, including one in Chadburn Park. One KDFN record behind Mt Sima.
Plant	Cyperaceae	Baikal Sedge		Carex	sabulosa	Special Concern (2016)	S3	N3	G5	open sand	Riverdale - bluff
Plant	Cyperaceae	Inland Sedge		Carex	interior		S2S3	N5	G5		
Plant	Cyperaceae	Many-headed Sedge		Carex	sychnocephala		S2	N5?	G5		
Plant	Asteraceae	Leafy Thistle		Cirsium	foliosum		S1S2	N4N5	G4		
Plant	Amaranthaceae	Saline Saltbush		Atriplex	dioica		S2S3	N5	G5		
Plant	Asteraceae	Rayless Alkali Aster		Symphyotrich	ciliatum		S1	N5	G5		
Plant	Brassicaceae	Water Awlwort		Subularia	aquatica		S3	N5	G5		

Figure 4: Species of conservation concern that occur within Whitehorse, as described by COSEWIC and others are listed here.

7.2 Ecosystems

Ecosystems can be represented at spatial scales from global to site-level and beyond. Mapping of ecosystems in this project is appropriate for the map scale of 1:20,000 and for an interpretation that did not include an extensive field component. The primary ecosystems mapped are lakes, rivers, wetlands, riparian areas, mature forests, old growth forests, mixed forests, grasslands, shrublands, sparsely vegetated areas, geological features and anthropogenically altered areas. Some of these primary ecosystems have modifiers, described below. Site-level ecosystems have been described for the Whitehorse area (Meidinger. et al. 2014). For understanding the range of site-level ecosystems within each ecosystem mapped here, a crosswalk to the ecosites of the Southern Lakes Boreal Low Subzone is provided in the appendices. Most ecosites have further delineation by Vegetation Associations. These are not recorded here, but are well described in section two of the Southern Lakes Boreal Low Subzone Field Guide (Meidinger. et al. 2014).

7.2.i Lakes (LA)

While Whitehorse is within the Yukon Southern Lakes Ecoregion and is situated on the Yukon River between Marsh and Laberge lakes, there are few lakes within the municipal limits. The largest is Chadburn Lake at 1.87 km2, followed by Chadden and Hidden lakes. These are kettle lakes, created by the deposition of outwash deposits around blocks of stranded ice. This complex extends north to the area between the sewage lagoon and the Yukon River and includes Long Lake and the smaller pothole

lakes in the complex. None of these lakes have surface water outflows, but they are connected by groundwater to the Yukon River (Gartner Lee Limited. 2003).

West of the Yukon River a number of small lakes are mapped. With few exceptions these are small lakes occupying meltwater channels cut through bedrock and glacial till. Most of these lakes are hydrologically connected by surface streams. The largest of these is Mary Lake at 22ha, with smaller lakes, such as Valerie Lake further north.

7.2.i.1 Why are Lake Ecosystems Important?

Rarity: Many species or plant communities listed as sensitive or potentially sensitive can be often found in and around lake ecosystems.

Biodiversity: Various wildlife will use lakes throughout the year for activities such as foraging and feeding, and healthy lake environments are critical to the health and maintenance of fish populations. Specialized habitat: submergent, emergent, and shoreline vegetation in lakes is essential reproduction habitat for amphibian, insect, and fish species.

Socio-environmental considerations: Lakes are valued fishing, some of which, such as Chadburn Lake, were known as sure food sources when late winter food supplies were low. Lakes are still known for fishing value, along with recreational, spiritual, and aesthetic values.

Ecological Function: The ability of lakes to store large amounts of water allows them to contribute to flood mitigation. Lakes work to replenish groundwater, positively influence water quality of downstream watercourses, and preserve the biodiversity and habitat of the area.

Modifiers Possible: CDC species (s); fisheries (f); ecological function (e); biodiversity (b)

7.2.ii Rivers (RI)

The main stem of the Yukon River is the only element in this category. Given the significant flow, Schwatka Lake is included here. The Yukon River is the major hydrological feature within the City, and beyond. It has well documented value as a Chinook Salmon river, with much of the population that migrates through Whitehorse spawning upstream at Michie Creek.

7.2.ii.1 Why are River and Stream Ecosystems Important?

Sensitivity: Rivers and streams feed waterbodies, large and small. As arteries to waterbodies, any impacts to rivers and streams result in impacts to the receiving waterbody. Also, more likely to suffer cumulative impacts due to various uses of the Yukon River--stormwater, dam, sewage water discharge.

Specialized habitat: Watercourses are highly valued fish spawning habitat. Changes to flow, organic debris, and bed material all impact the ability of successful spawning.

Socio-environmental considerations: Watercourses are valued for their recreational, cultural, and aesthetic value.

Ecological Function: Rivers and streams connect bodies of water and serve in water volume regulation during times of flood and drought. They are important in nutrient regulation and are a key source of primary production in the ecological food chain.

Modifiers Possible: CDC species (s); fisheries (f); ecological function (e); biodiversity (b)

7.2.iii Wetlands (WN)

Wetlands are defined as areas that are saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment. Wetlands are of five classes, bogs, fens, swamps, marshes and shallow water (National Wetlands Working Group. 1997). Many of the wetlands within the municipal boundary are part of stream systems. Where the wetland is the dominant ecosystem, it is mapped as such, but needs to be understood to be part of a riparian complex.

Bogs (B)

Bogs are peat landforms characterized by a surface raised above the surrounding terrain, receiving water from precipitation but virtually unaffected by any groundwater flow. The pH of the soil and soil water is low, usually less than pH 4.8. The surface of the bogs is usually drier than other wetlands.

Bogs occur rarely in the City of Whitehorse. They are generally part of larger wetland complexes and those found are generally too small to be mapped at a map scale as large as 1:10,000. The peaty bog soils are usually frozen. Bogs in the city are usually characterized by stunted white spruce, with a *Sphagnum fuscum* moss and sedge groundcover. Shrubs typically include willow (*Salix sp*), Labrador tea (*Rhododendron groenlandicum*), cloudberry (*Rubus chamaemorus*), crowberry (*Empetrum nigrum*) and low bush cranberry (*Vaccinium vitis idaea*).

Fens (F)

Fens are peatlands influenced by minerotrophic groundwater, rich in dissolved minerals, and therefore have a higher pH and are more productive than bogs. Slow groundwater movement and sometimes surface water flow are characteristic. The water table is usually at or just below the surface, and peat is composed of moderately decomposed sedge or brown moss peat. Fens can range from rich fens, dominated by herbaceous vegetation, to poor fens, with lower pH and nutrients and with many vegetation species in common with bogs.

Fens in the City of Whitehorse occur in some of the abandoned glacial meltwater channels on the slopes of Mt McIntyre, Golden Horn and Grey Mountain. The depth of peat in the fens varies from about 20 cm to more than 2 meters. The soil pH is typically in the range of 5.5 to 7. Treed fens, shrub fens and sedge fens are all found within the city. The ground vegetation of fens is typically dominated by sedge and brown moss communities.

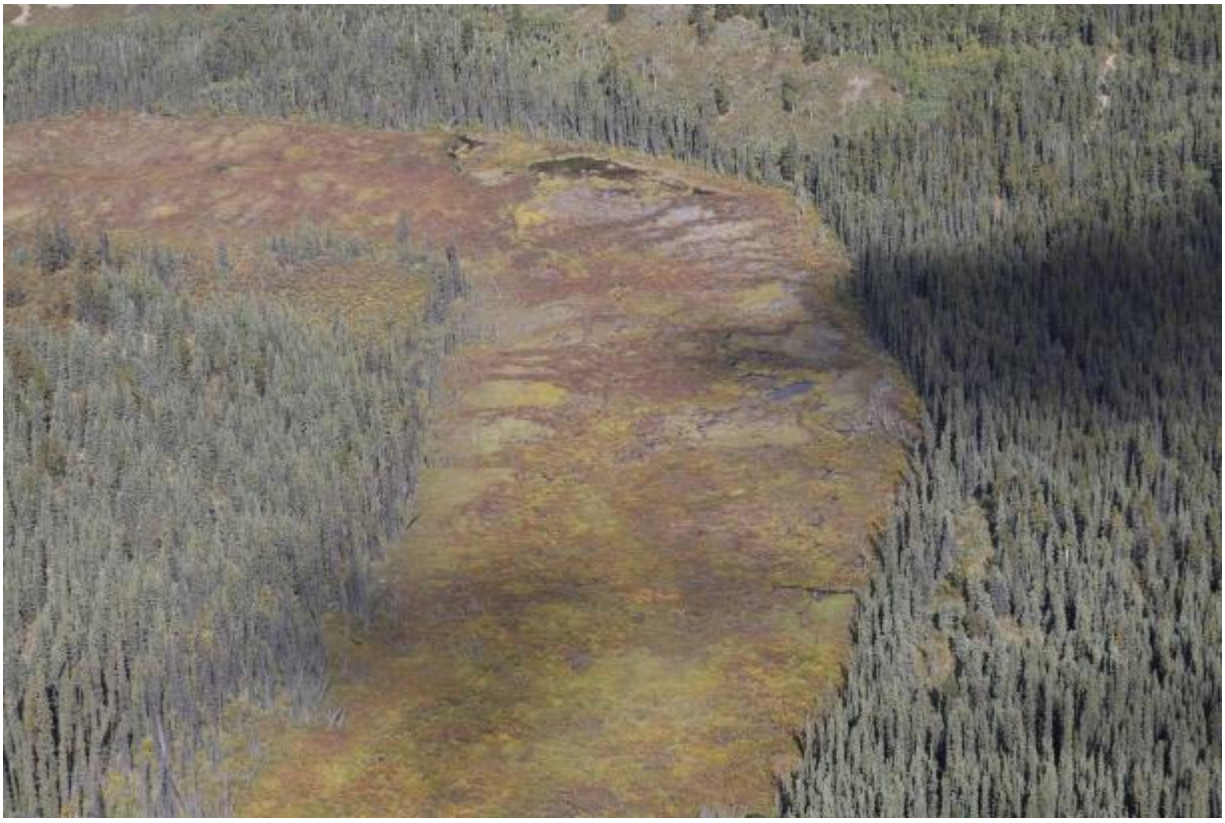

Figure 5: Fens are common in meltwater channels left during deglaciation on either side of the Yukon River valley in Whitehorse. This ribbed fen is within the McIntyre Creek system.

Swamps (S)

A swamp is a tall shrub or tree dominated wetland (usually >25% cover of woody species) that is influenced by minerotrophic groundwater. Swamps are characterized by well decomposed woody peat and can be either peatlands or non-peatlands. They typically have a fluctuating water table.

Swamps are a common wetland classes in Whitehorse. There are some willow and alder shrub swamps adjacent to the Yukon River that are frequently inundated by flood water. Swamps also occupy old glacial meltwater channels common on the slopes of Grey Mountain, Mt McIntyre and Golden Horn and along smaller tributary creeks. These are usually willow shrub or treed white spruce willow swamps with a sedge (*Carex aquatilis*), bluejoint reed grass (*Calamagrostis canadensis*) and brown moss understory.

Marshes (M)

A marsh is a minerotrophic wetland with a near-surface water table that fluctuates daily, seasonally or annually. Water levels may vary from year to year. Marshes are characterized by mineral soils with > 25% herbaceous sedge, grass and or forb vegetation.

Marshes are not widespread in the City of Whitehorse but small marshes do occur at the margins of lakes, ponds, creeks and along the Yukon River. Due to the calcareous parent material, soils surrounding lakes and ponds are often calcareous. Sedges dominated by water or beaked sedge *(Carex aquatilis, C. utriculata)*, and grasses such as foxtail barley (*Hordeum jubatum*), Kentucky bluegrass (*Poa pratensis*) and tufted haigrass (*Deschampsia cespitosa*), rushes (*Juncus* sp.) and water horsetail (*Equisetum fluviatile*) are typical dominant species in these marshes.

Figure 6: Small marshes occur throughout the City, including confluences of streams and the Yukon River. They host a wide range of migratory waterfowl and shorebirds. This Lesser Yellowlegs was observed during a feeding stopover at the mouth of McRae Creek. Along with birds less commonly observed in Whitehorse, such as, the Short-eared Owl, the Lesser Yellowlegs is listed as Threatened in Canada.

Shallow Water (W)

Shallow water wetlands are permanent open water bodies, generally less than 2 meters deep.

Aquatic submergents, such as pondweeds (*Stukenia sp., Potamogeton sp*.) and muskgrass (*Chara* sp) characterize the vegetation.

7.2.iii.1 Why are Wetlands Important?

Rarity: Many species or plant communities sensitive or potentially sensitive, can be found in and around wetland areas (**Error! Reference source not found.**). In some areas, wetlands have been filled in to create lands for development or agriculture, making natural wetland features potentially rare in an environment.

High biodiversity: Often wetlands are focal points for wildlife because of their high productivity, diversity and infrequent occurrence in this landscape. Wetlands provide wildlife and biodiversity values that are

disproportionate to the area they occupy on the land base. Wetland vegetation provides food, shelter, breeding habitat, and cover for many species of amphibians, reptiles, mammals, birds, and insects. Wetland vegetation provides food for many aquatic organisms. Shallow open water bodies are important watering sites for many species and provide habitat for sensitive species. Wetlands are also sources of insects that provide food to birds and bats (Iverson & Cadrin, 2003).

Vulnerability: Wetlands are subject to a range of direct human disturbances such as vegetation removal, peat removal, draining, grazing, and infilling. Indirect changes including small changes in hydrology such as reduced flows or lowered water tables, and urban run-off and other sources of nutrients including fertilizers and livestock manure, can change or reduce the diversity of wetland communities (Iverson & Cadrin, 2003). Wetlands are important because:

- They play a role in the maintenance of water quality as well as quantity: Properly functioning wetlands store and filter water, thus maintain water quality. They reduce the levels of sediment, nutrients, and toxic chemicals in outflow water (Iverson & Cadrin, 2003).

Socio-environmental considerations: Wetlands provide opportunities for education, bird watching, and aesthetic enjoyment. The green space that wetlands provide can add to real estate values in adjacent areas and can draw tourists into the area (Iverson & Cadrin, 2003).

Ecological Function: Wetlands are water storage power-houses. They trap and slow runoff in rain events and are used as natural water purification systems. Wetlands are also important habitats for many species groups, link aquatic habitats and sequester carbon.

7.2.iv Riparian Areas

Riparian areas are the transition zones between water and land, and generally border streams, rivers, and lakes. They support critical ecosystem functions important to fish and fish habitat, and other wildlife habitat and they are often highly productive ecosystems due to water availability, and site diversity. This project defines riparian areas as the floodplain associated with rivers, streams and lakes and springs and seepages. All of the non-wetland riparian components of tributary streams to the Yukon River and islands and elevated benches along the Yukon River are mapped as Riparian. Floodplain systems are typically described in terms of low, middle and high benches reflected in frequency and duration of annual flooding events as seen in several classification systems across North America.

Low bench (rl)

Low bench areas lie along a water course and are subject to flooding and fluctuating groundwater tables maintain the form of channels and provide protection of important aquatic habitat. These are usually shrub ecosystems. Due to their location, they are major contributors to small and large organic matter which provides nutrients and structure to the aquatic ecosystem (MacKenzie & Moran, 2004)

Middle bench (rm)

Middle bench areas occur on sites briefly flooded, about 10-25days, during freshet. These conditions allow for tree growth but limit tree species to flood-tolerant broadleaf species (MacKenzie & Moran, 2004). These benches are typically balsam poplar forests.

High bench (rh)

High bench areas occur where river flooding produces lengthy subsurface flow, though periodic flooding may occur. Forests are typically coniferous dominated but the understory vegetation reflects periods of ground saturation.

Springs (rs)

Springs are naturally occurring groundwater discharges from bedrock or Holocene deposits. Some springs in Whitehorse are used to support fish hatcheries and bottled water with operating licences from the Yukon Territorial Water Board (Gartner Lee Limited, 2003). These include Yukon Springs downslope of KDFN C-176 across from Crestview, Arctic Ova adjacent to KDFN C175 in Kulan Subdivision, the former McIntyre Creek Fish Hatchery across Mountain View Drive from KDFN C-15 and Icy Waters on the Fish Lake Road which flows through KDFN R-75.

Seepage/toe slope sites (re)

Seepage areas are groundwater discharge areas, usually located at the base of slopes with subsurface seepage and water flows less than a spring. Numerous ephemeral seepages are known in the City, including KDFN Lot 226 below Crow Street and the slope further south west of Mountain View Drive.

Figure 7: The diversity of riparian habitats is evident on the Yukon River at the confluence with Wolf Creek. Included here are seasonally flooded marshes on low benches, high benches, cool seepage areas and dry steep bluffs.

7.2.v Why are Riparian Areas Important?

Rarity: Many plant communities found in riparian areas are listed as rare or sensitive by the conservation data center.

- Groundwater springs often support rare plant species and communities which are adapted to the specific temperature and mineral conditions around the springs (Meidinger, McKenna, Kennedy, & Flynn, 2014).

High biodiversity: Riparian ecosystems support disproportionately high numbers of species relative to the area they occupy. These areas provide wildlife with water, cover, breeding habitat, and food. The wide diversity of plants, invertebrate organisms, and structural complexity of these ecosystems provide many habitat niches. Riparian vegetation provides food for many aquatic organisms (Iverson & Cadrin, 2003).

Fragility: Riparian ecosystems are strongly influenced by adjacent water bodies and their associated water levels, thus are sensitive to any changes or disturbance in flow regimes.

- Riparian areas protect aquatic areas from nearby land-based disturbance and maintain water quality through filtering of water. Vegetation and root systems stabilize soils and they increase infiltration to reduce erosion and flooding.

Specialized habitats: Wildlife corridors are an important use of riparian habitats. These areas provide cover as wildlife moves along watercourses and between lowland waterbodies and wetlands to drier upland regions.

- In streams such as McIntyre Creek , deep underlying gravel that does not freeze provides for nutrient rich winter and relatively warm waterflow that is critical for salmon spawning habitat.

Ecological Function: Riparian areas help to slow overland flow during rain events and act as sponges when water levels are high, to prevent flooding.

7.2.vi Grasslands

Grasslands are typically herbaceous habitats dominated by perennial grasses and forbs and generally lacking shrubs or trees. These environments are generally less than 10% treed and less than 25% shrub. Herbs, grasses, mosses and/or lichens compose greater than 10%. Grasslands of the Whitehorse region are typically found on steep south-facing slopes and alkaline lacustrine depressions.

7.2.vi.1 Why are Grasslands Important?

Rarity: Grasslands of the region are rare due to their location on the landscape. Areas in which they are found are infrequent around the landscape.

Fragility: Recovery of grasslands from disturbance can take decades, due to their location in the landscape. Species which grow in these areas generally do not rapidly regenerate, and many of these areas are small micro-habitats, uncommon in the landscape.

Biodiversity: High levels of biodiversity are found within the litter and soil profile layers of grasslands because of decomposition. They contain a disproportionately high number of plant, microorganism and insect species compared to other ecosystems. High numbers of birds and mammals also use grasslands.

Specialized habitats: Grasslands are key habitats for species such as grazers, burrowers, and ground-nesters. They also attract predators as they provide good visibility.

Other Ecological Function: Grasslands are important to the carbon cycle, as they are a major storage area for carbon in the organic rich soils created by decomposition of grass roots and forbs.

Modifiers Possible: CDC species (s); Cultural (c); wildlife (w); Alpine (a); ecological function (e); biodiversity (b)

Table 1: Sensitive or Rare Species which use Grasslands

Species	COSEWIC Status	SARA Status	Yukon Status
Common Nighthawk *(Chordeiles minor)*	Threatened	Threatened	Imperiled

Figure 8: Grasslands in Whitehorse area found on steep warm slopes of eskers, pothole lakes and some riverbanks. These dry areas are often juxtaposed by wetlands and waterbodies. These sensitive sites host plant and insect species not common in the boreal forest. Mixed stands of White Spruce and Trembling Aspen can be seen mid-photo. This photo is of Hidden Lake with a view southeast to Grey Mountain.

7.2.vii Forests

7.2.vii.1 Old Growth Forests

Old Growth Forests (OF)

Old growth forests are defined as “Old” forest (120-160yr), “Very Old” (160-250yr), or “Relict” forest (>250yr) (Applied Ecosystem Management, 2000); however, fire is prevalent in the Yukon, forests recover slowly, and decomposition is slow making it difficult to find old forests that do not have some sort of fire evidence. Aging trees becomes difficult as trees over 100 years are at a decayed state (Tauzer, 2018). Old forests can be distinguished by their age, as well as the density of large (>1.0m^3) snags and logs, stand basal area and volume (Burton, Kneeshaw, & Coates, 1999). Tree size is often the most important indicator of old growth (Lee, Hanus, & Grover, 2000).

The oldest growth forests in the City of Whitehorse are usually found along gullies and smaller creeks which are sometimes skipped over by forest fires.

Coniferous (co)

Areas are classified as coniferous when trees cover a minimum of 10% of the total polygon area by crown cover, and coniferous trees are 75% or more of the total tree basal area. (Government of British Columbia, 2002).

Mixed (mx)

Mixed stands are composed of conifer and broadleaf trees, each representing between 25% and 75% of the cover; Trembling aspen and White spruce mixed wood forests are common (Environment Yukon, 2016).

Broadleaf (bd)

This environment is classified as broadleaf when trees cover a minimum of 10% of the total polygon area by crown cover, and broadleaf trees (aspen, balsam poplar or Alaska birch) are 75% or more of the total tree basal area. (Government of British Columbia, 2002).

7.2.vii.2 Why are Old Growth Forests Important?

Rarity: Many plant species and community associations found with old growth forests are rare due to the age and lack of disturbance of the area.

High biodiversity: Old forests provide habitat for a wide variety of wildlife, plant, and invertebrate species, and have many unique and important structural attributes (Iverson & Cadrin, 2003). The undisturbed nature of these areas provides a medium for growth, allowing species to reach maturity levels uncommon to many environments.

Specialized habitats: Old forests provide large, old trees for cavity nester species, as well as snags and woody debris used as critical habitats for many species.

Socio-environmental considerations: Old growth forests provide passive recreational and educational opportunities and provide an enhanced aesthetic to local areas. In riparian settings and adjacent uplands, these forests contribute to moderating flood events and aid in erosion control.

Ecological Function: Old growth forest provide habitat for a variety of plant, animal, and bird species. They are used by many migratory bird or raptor species during the nesting season. They can also be a seed source for some species.

Modifiers Possible: CDC species (s); lichen (l); Permafrost (p); Cultural (c); wildlife (w); ecological function (e); biodiversity (b)

Table 2: Sensitive or Rare Species which use Old Growth Forests

Species	COSEWIC Status	SARA Status	Yukon Status
Olive-sided Flycatcher *(Contopus cooperi)*	Threatened		Imperiled

Figure 9: Olive-sided Flycatchers are known in Whitehorse from wetlands adjacent to older forests, such as this one observed at Hidden Lakes.

7.2.vii.3 Woodlands (WD)

Woodlands are open stands, of trees with between 10 and 20% tree cover. They can be coniferous, mixed or broadleaf. This ecosystem is defined as "a vegetation community characterized by tree species >5m tall, with an open canopy, resulting from climate, shallow soils, soil droughtiness, or excess water. (Environment Yukon, 2016).

Coniferous Woodlands (co)

Treed-coniferous woodlands in the city of Whitehorse consist mostly of Pine and White Spruce with some Subalpine Fir at higher elevations. Areas are classified as coniferous when coniferous trees are 75% or more of the total tree basal area.

Mixed Woodlands (mx)

These stands are composed of conifers and angiosperms, each representing between 25% and 75% of the cover; Trembling aspen and White spruce mixed wood forests are common within the City of Whitehorse.

Broadleaf Woodlands (bd)

Broadleaf woodlands contain species commonly referred to as deciduous or hardwoods. This environment is classified as broadleaf when broadleaf trees are 75% or more of the total tree basal area.

7.2.vii.4 Why are Woodlands Important?

High Biodiversity: Woodland ecosystems are diverse and support a rich assemblage of species.

- Broadleaf woodland ecosystems have diverse plant communities that support a rich assemblage of species. Deciduous litter fall results in organically enriched upper layer of soil (Iverson & Cadrin, 2003).

Sensitivity: These woodland systems may have shallow or wetland soils that are sensitive to disturbance.

Specialized Habitats: Scattered large, older trees with cracks and crevices in ecosystems with exposed bedrock provide a range of habitat niches. Cavity nesters will often use Aspen trees during the nesting season.

Socio-environmental considerations: Woodlands are often used for recreational activities such as hiking, biking, and bird-watching.

Ecological Function: These areas often function as ecological buffers and/or corridors for wildlife. These areas also provide shelter, protection, and food and for many plant and animal species. Many migratory birds and raptors use these forests to nest and rear young. Woodlands provide ecosystem services such as carbon storage, maintenance of biodiversity and timber production.

Modifiers Possible: CDC species (s); lichen (l); Permafrost (p); Cultural (c); wildlife (w); Clearing/logging (g) ; ecological function (e); biodiversity (b)

7.2.vii.5 Mature Forest

Mature forests generally can be classed as greater than 80 years but less than 140 years. The trees have matured, with some secondary tree growth, and the understory is well developed. They consist of medium to large patches of forest (6.4 hectares plus) (McPhee, Ward, & et. al, 2000) dominated by mature trees, where structure of the stand ncludes some heterogeneity.

Coniferous Mature Forests (co)

Treed-coniferous woodlands in the city of Whitehorse consist mostly of lodgepole pine and white spruce with some subalpine fir at higher elevations. Areas are classified as coniferous when trees cover a minimum of 10% of the total polygon area by crown cover, and coniferous trees are 75% or more of the total tree basal area. (Government of British Columbia, 2002).

Mixed Mature Forests (mx)

These stands are composed of conifers and angiosperms, each representing between 25% and 75% of the cover; Trembling aspen and White spruce mixed wood forests are common (Environment Yukon, 2016).

Figure 10: Mixed mature forests surround Long Lake on the rolling kettle-kame terrain.

Broadleaf Mature Forests (bd)

Treed – broadleaf Mature forests contain species commonly referred to as deciduous or hardwoods. This environment is classified as broadleaf when trees cover a minimum of 10% of the total polygon area by crown cover, and broadleaf trees are 75% or more of the total tree basal area. (Government of British Columbia, 2002).

7.2.vii.6 Why are Mature Forest Ecosystems Important?

Rarity: Similar to woodlands mature forests may host species and community associations which are considered sensitive or rare.

Socio-environmental considerations: Mature forests are used for recreational activities such as hiking, biking, and bird-watching.

Modifiers Possible: CDC species (s); lichen (l); Permafrost (p); Cultural (c); wildlife (w); Clearing/logging (g); ecological function (e); biodiversity (b)

7.2.vii.7 Shrublands (SH)

Shrublands are defined as “vegetation communities characterized by shrub species >10cm tall (Environment Yukon, 2016). These environments generally have ≥ 20% of the canopy cover being shrub or >33% of total vegetation as shrub (Forest Managment Branch, 2005).

- A dwarf shrubland is characterized by shrubs which have prostate growth form and are <10cm tall (Environment Yukon, 2016).

7.2.vii.8 Why are Shrublands Important?

Fragility: Plant which grow in shrublands may be more susceptible to small changes in site conditions as their root systems may be shallower due to shallow depths to bedrock, permafrost or late persisting frostcompared to treed environments.

Modifiers Possible: CDC species (s); Cultural (c); wildlife (w); Alpine (a)

7.2.vii.9 Sparsely Vegetated (SV)

Sparsely vegetated ecosystems are areas that have less than 10% cover of vascular vegetation. They can include sand dunes, talus, cliffs, rock outcrop, eroded slopes, or active floodplains.

Sand Dunes (sd)

Sand was deposited in the delta of Glacial Lake Laberge over glaciolacustrine deposits in what is now the northern portion of the City of Whitehorse. During a dry warm spell following the major deglaciation event southerly winds created parabolic sand dunes. These are thought to have stabilized 9000 to 10000 years ago as boreal forests took hold owing to increasing moisture and cooler climatic conditions (Wolfe, et al, 2011). While there are open dunes in the region, notably along the Takhini River downstream of Kusawa Lake and at Carcross, there are none within Whitehorse. A small sandy area that caps the glaciolacustrine material on the bluff north of Riverdale Subdivision is kept open by wind and recreational use. It contains some of the species of plants associated with the regional dunes. Additional wind blown, or eolian, materials occur as thin deposits north of Mountainview Cemetery, at Whistle Bend Subdivision and around the sewage lagoons south of the dune complex.

Figure 11: The largest dune complex in Whitehorse is located in the northeast. The dunes support open Lodgepole pine forests with lichen-rich floors, ideal winter habitat for caribou.

Talus (ta)

Colluvium is material that has eroded from bedrock by physical or chemical processes and has been deposited gravitationally at the base of source slopes. It ranges in size from fine material to large blocks. Talus is a term that is often used to describe the deposit of colluvial material. Owing to the extensive glacial, lacustrine and alluvial deposits in Whitehorse, the extent of talus or colluvium is limited. The most significant expression is adjacent to bedrock outcrops east of the City from Haeckel Hill, along the McIntrye Ridge to Golden Horn Mountain. Smaller occurrences are found at the base of bedrock canyons along the Copper Haul Road.

Rock Outcrop (ro)

These are areas of exposed bedrock with less than 10% vegetation cover. The most pronounced expression of rock outcropping is on Grey Mountain. This outcropping has the appearance of being alpine, but is within the Subalpine Bioclimate Zone where steepness and erosion over the carbonate rocks has limited soil development.

Eroded Slopes (es)

Eroded slopes are steep, non-vegetated or sparsely vegetated slopes, generally in excess of 30% composed of erodible unconsolidated material subject to erosion (Gartner Lee Limited, 2004).

7.2.vii.10 Why are Sparsely Vegetated Ecosystems Important?

Rarity: Many sparsely vegetated areas are home to species and communities that have been recommended as rare or sensitive by the CDC.

Specialized habitats: A wide variety of specialized habitats are found in sparsely vegetated ecosystems

- Deep crevasses or talus slopes used as hibernacula or shelter.
- Deep crevasses located in these environments may be home to species such as bats or insects.
- Cliffs provide perch points or roots for raptor species.
- Species found in dune areas are considered to be well adapted to reproducing in actively moving sand (Meidinger, McKenna, Kennedy, & Flynn, 2014).

Sensitivity: Sparsely vegetated sites may be sensitive to disturbance. If sensitive or rare species are removed or disturbed, they can take very long periods of time to recover.

Modifiers Possible: CDC species (s); Cultural (c); wildlife (w); Nest (n); ecological function (e); biodiversity (b)

7.2.vii.11 Geological Features (GF)

Geological Features (or GeoFeatures) identified here are rock or physical features formed by geologic processes which create important ecosystems.

Some important geologic features in Whitehorse include Miles Canyon on the Yukon River which consists of cliffs and crevices in Tertiary volcanic rock; a narrow river reach with boils, whirlpools and eddies; and glacial meltwater channels bounded by cliffs or steep rock faces and occupied by numerous fen and swamp wetland ecosystems. Mountain ridgetops, sand dunes, eskers, permafrost and silt bluffs are other geological features which create important ecosystems and complexes.

7.2.vii.12 Why are Geological Features Important?

Fragility: Geological Features take hundreds or thousands of years to develop. Impacts to these features are most likely permanent, thus changing the feature forever. Some of these features create a complex of ecosystems which together form ecosystems which are more important because of their close association. For example, a meltwater channel bounded by cliffs may provide nesting for raptors adjacent to prime waterfowl nesting in the wetland. The cliffs and wetlands also provide recreation and viewing opportunities. Eroding silt bluffs along the Yukon River provide nesting for swallows, perching for raptors, viewing for people, and control the river channel.

Figure 12: Bedrock canyons cut by glacial meltwater offer unique steep rock walls, moist forest floors, such as this example near Valerie Lake. Species such as the Western Flycatcher have only been observed in these habitats in Whitehorse.

Anthropogenic (NS)

This category encompasses lands that have been altered by human activity. The extent of alteration varies widely, including mine tailings, roads, urban and rural residential subdivisions, the ski hill, and sewage lagoons. The map scale of this project does not allow the considerable ecological value and interest within this category to be evident. There are forest stands, neighbourhood parks, semi-natural habitat corridors and linkages, and small wetland areas within this unit. Disturbed and revegetated areas such as golf courses, sports fields and backyards have habitat value. The sewage lagoons are important bird staging habitats. Some land uses, such as the soil and gravel quarries are temporary and can be recontoured and vegetated. Many of the First Nation settlement land parcels are within this category as they are lots within developments that existed at the time of treaty negotiations. KDFN citizens described many ecological interests within and adjacent to this category. The value of green spaces, trails to parks and other natural places beyond subdivisions and other ecological values within neighbourhoods is regularly expressed by Whitehorse citizens during OCP and neighbourhood-level

planning. Subsequent large-scale City-wide mapping or mapping for development projects would be required to describe ecological and conservation interests within this category. An example of this larger scale consideration and mapping is the ecological network mapping for by the City of Edmonton (Natural Connections. 2007).

Figure 13: Neighbourhoods, such as Riverdale, while mapped as Anthropogenic, retain considerable habitat value and semi-natural spaces that are cherished by residents. Larger scale mapping for planning and development assessments is required for decision making at these scales.

7.3 Important Areas

Over time, a number of areas have been described as having particular importance ecologically within the City. Whitehorse OCPs, inventories, and the Kwanlin Dün C Lands Plan have all identified areas that have importance as natural areas, of concentrated habitat importance and of importance for wildlife viewing, berry picking and recreating in largely natural settings.

KDFN Community Lands Plan

In addition to describing general plant, wildlife and habitat values, KDFN citizens identified areas of importance during the preparation of the KDFN C Lands Plan. A number of these interests overlap areas expressed through other plans and reports. These include important water features, such as the Yukon River, lakes such as the Chadburn, Chadden and Hidden lakes area, and tributary streams to the Yukon River, notably Croucher, Wolf and McIntyre creeks. Unique to the KDFN areas, though with some overlap with WKAs, is the value given to higher elevation areas, particularly all of the high hills and mountains along the western boundary of the City. Importance was also expressed for the accessible 'back yard' to the McIntyre Subdivision as a place to observe wildlife, despite some measure of development and recreational use.

Area	KDFN Citizen Values (subset)	KDFN Citizen comments	Bioclimate Zones	Notes
Yukon River	Salmon; freshwater fish (pike); beaver; raptor (Bald Eagle); muskrat; swan; waterfowl;		BOL	
McIntyre Creek / Fish Lake Road area	Salmon; swan; coyote; wolf; beaver; dove; hare; raptor; grizzly bear; porcupine; freshwater fish; mule deer; cougar; river otter;	C-15B wetlands protection, interpretation, preservation, tourism, cultural; Wildlife corridor (bear, deer, wolf cross through the city); Eagles, ptarmigan, moose, wolf; songbird	BOL, BOH	
Croucher Creek	river otter; moose; coyote; wolverine; grizzly bear; wolf; black bear;		BOL	
Wolf Creek	salmon spawning; marten; waterfowl; arctic ground squirrel; mule deer; mushrooms; muskrat		BOL, BOH, BSA	
Long Lake Road area	freshwater fish; grouse; hare; raptor; black bear; porcupine; marten; hare; moose; caribou	significant area for wildlife; disturbed by human activity	BOL	
Chadburn Lake area	Mushrooms; grouse; mule deer; fox; caribou; raptor; porcupine; moose; muskrat; cougar; black bear; hare; wolf; freshwater fish; river otter; songbird;	C-188: wetlands protection; interpretation; preservation; tourism, cultural	BOL	
Yukon / Takhini Confluence	Salmon; moose; swan; beaver		BOL	Subset of Yukon River Corridor
McIntyre Subdivison and Forest behind	arctic ground squirrel; grouse; moose; hare; black bear; coyote; wolf; cougar; river otter; porcupine; mushrooms; fox; grizzly bear		BOL	many observations within the subdivision
Mt. McIntyre area	wolverine; grouse; hare; moose; caribou; raptor; arctic ground squirrel; wolf; coyote; dall sheep; grizzly bear	wildlife; berries; recreation	BOH, BSA	
Grey Mountain area	wolf; dall sheep; porcupine; mule deer; caribou; cougar		BOH, BSA	
Mt Sima area	moose; groundhog; wolf; dall sheep	moose, sheep and caribou; berries, moose, caribou winter in area;	BOL, BOH, BSA	
Golden Horn area	wolf; caribou; moose; marten; grizzly bear; songbird; porcupine; black bear; grouse; muskrat		BOH, BSA	most points outside municipal boundary
Haeckel Hill area	raptor; wolf; hare; grouse; caribou; dall sheep; porcupine; moose		BOL, BOH, BSA	

Figure 14: Areas of the City described as having particularly eco-cultural importance by KDFN citizens.

KDFN Whitehorse Conservation Design (2010)

As part of its submission to the City for the first OCP review following the Final Agreement, KDFN included ideas for focusing development, while maintaining ecological health of ecosystems and species. High elevation habitats, which were stressed again in during C Lands Planning, along with river corridors, wetlands and intact forests, were mapped as having high ecological value within the City. Some of these areas were included within the 2010 OCP regional parks network.

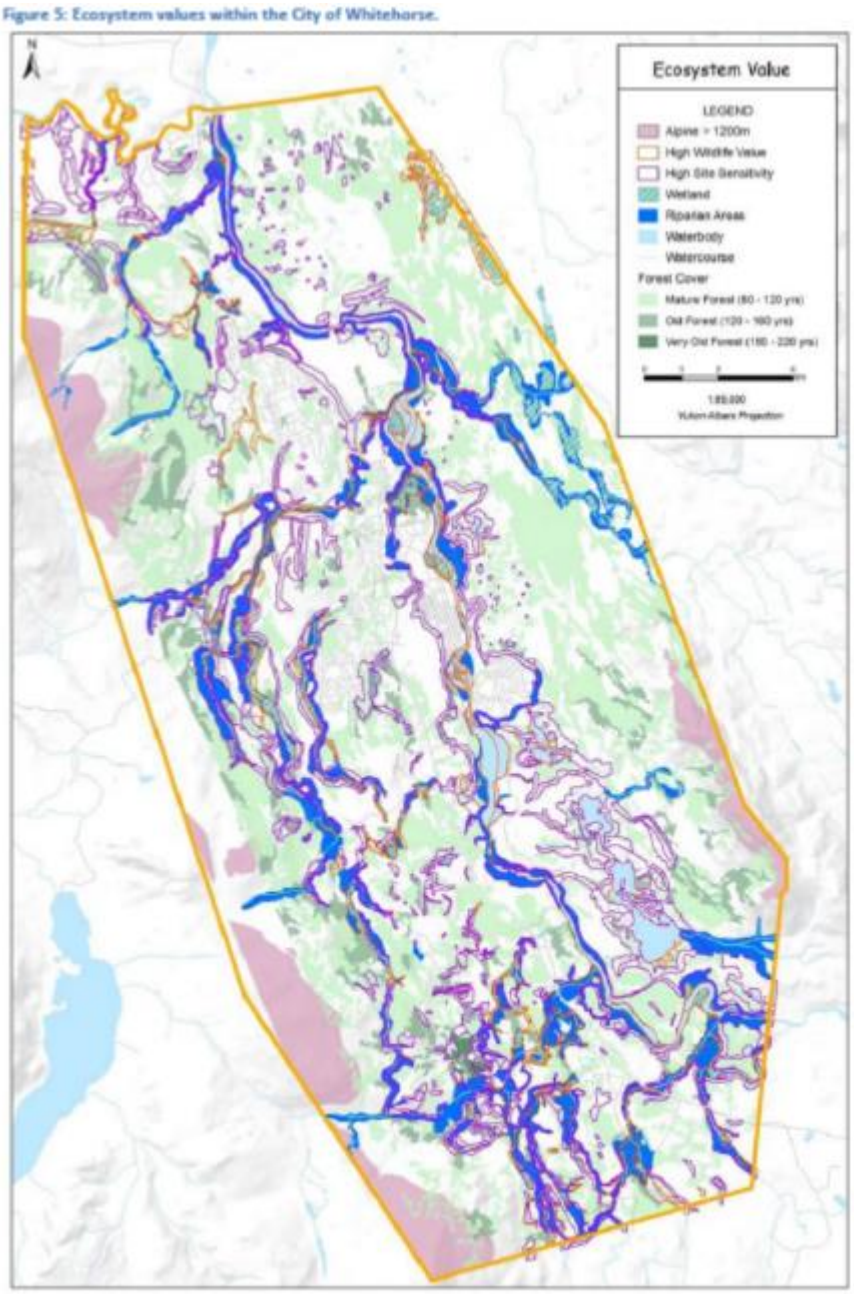

Figure 15: Important ecosystems mapped by KDFN lands in support of the 2010 OCP.

City of Whitehorse Significant Wildlife areas (AEM 2000)

In this report for the City, 17 'Significant Wildlife Areas' are described. Areas were selected for inclusion based largely on recognition from the Wildlife Viewing Program of Yukon Environment. Contributions to descriptions were provided by biologists and terrain scientists. Much of the focus is on waterbodies, stream corridors, including the Yukon River shoreline and associated wetlands. The areas comprise approximately seven percent of the City area. This document was prepared prior to the conclusion of Final Agreements for Ta'an Kwachin Council and Kwanlin Dün First Nation. It does not appear either FN was involved in preparing the report. A number of the proposed Significant Wildlife Areas now contain Site Specific settlement lands, including important places, such as the Old Village. Some of the areas proposed have been incorporated into Regional Parks, beginning with the 2010 Whitehorse OCP.

Yukon Environment Wildlife Key Areas Program

The Wildlife Key Areas Program is managed by the Habitat Section of Yukon Environment. Areas that contain habitats considered to be of central importance to a season or life phase of birds, mammals and fish are delineated. In the Whitehorse area, this includes upper elevation areas important for raptors, lowland moose habitat in the wetlands and mixed forest in the northeast of the City and Dall's Sheep habitats on Mount McIntyre and Grey Mountain.

City of Whitehorse Official Community Plan: Regional Parks (2010, 2020)

A significant milestone of the 2010 Whitehorse OCP was the inclusion of a system of parks. These include a modified Chadburn Lake Park, extended north east, while the portion west of the Yukon River was dropped; and new parks for Wolf Creek, including the Cowley Creek wetland, McLean Lake, Paddy's Pond/Ice Lake and McIntyre Creek. To date management planning has been concluded for Chadburn Lake Park only.

The table below summarizes areas that have been identified by these various initiatives. Descriptions provided in source documents, particularly the Significant Wildlife Areas report, are not repeated here. The discussion below aims to organize the areas according to their feature type, and includes notes on the primary interest and management status.

Reference Number	General Area	Management Status	KDFN C Lands 2020	KDFN Cons Design 2010	OCP 2010 2022	City Wildlife Area 2000	WKA
1a	Yukon River	Corridor Plan 1999	y	y		y	
1b	Yukon Takhini confluence		y				
1c	Schwatka Lake	Mgt Plan			y	y	
2	McIntyre Creek	City Park	y	y	y	y	
3	Croucher Creek		y	y		y	y
4	Wolf Creek	City Park	y	y	y	y	
5	Little Takhini Creek					y	
6	Chadburn Lake area	City Park	y	y	y	y	
7	McLean Lake	City Park			y	y	
8	Paddy's Pond	City Park		y	y		
9	Crestview Ponds			y		y	
10	Stinky Lake			y			
11	Versleuce Meadows and Hidden Lk			y			
12	Haeckel Hill area		y	y			
13	Mt McIntyre area		y	y			y
14	Mt Sima area		y				
15	Golden Horn area		y				y
16	Grey Mountain area		y				y
17	Livingston Trail			y			
18	Long Lake Road area		y	y		y	
19	Copper Haul Road South			y			
20	McIntyre Subd Area behind		y				y

Stream Corridors and Confluences

1) Yukon River.

The Yukon River Corridor in Whitehorse has long been listed as a central feature for heritage, habitat, recreation and aesthetic values. A plan was prepared for the Corridor in 1999, based on citizen input, supported by geophysical, ecological, heritage and recreational use studies. Reaches of the river, along with associated stream confluences, were identified as Significant Wildlife Areas in 2000. These were highlighted in a KDFN and TKC submission to the City during the preparation of the 2010 Official Community Plan and again in the KDFN Community Lands Plan in 2020. Despite this continued attention to the values of the Corridor, no specific land use designations have been made by the City or other governments. The minor exception is Wolf Creek Campground that includes approximately 300 m of its boundary on the bluff above the Yukon River at the lookout.

Confluences between the Yukon River and other streams have been identified as important for Chinook Salmon spawning and rearing habitats, freshwater fish habitats. They have varied wetland and terrestrial habitats, including old growth riparian forests. These habitats support migratory and breeding birds, and provide feeding and movement corridor functions to mammal species. The largest of the confluences is, of course, that of the Takhini River flowing into the Yukon River at the northern limit of the City. Secondary confluences include Croucher, McIntyre and Wolf creeks, along with smaller streams, such as Little Takhini, Crestview, Porter Creek and McRae creeks.

Additional ecological values and natural features along the Yukon River Corridor include open water areas in winter, grayling spawning and rearing, salmon spawning reds and rearing amoung the islands and upstream of the dam, proglacial lake sediments, now host to Bank Swallow nesting colonies, the basalt canyon, wetlands and riparian habitats.

Adjacent habitats have been described in the Whitehorse Sensitive Wildlife Areas including the confluence with Wolf and Cowley creeks, Schwatka Lake and the adjacent Ear Lake, Yukon River Flats in Riverdale, the Quartz Road Wetland, the Old Village Wetlands (Lot 226), and the McIntyre, Croucher, Porter Creek and Little Takhini creek confluences. Despite the relative business of the site, the Quartz Road Marsh is one of the best birding sites in the City, with over 154 species observed.

Schwatka Lake, an impounded portion of the Yukon River, like many reservoirs, has a range of ecological values. To date, 138 bird species have been observed on or near the lake. Bird habitat functions supported include migratory stop over for waterfowl in spring and fall, shoreline nesting for gulls, grebes and waterfowl, and adjacent forest habitats for resident and migratory birds.

A management plan, approved by the City in 2015, covers the western shoreline and adjacent areas of land and water.

Figure 16: The Yukon River cuts through glacial lake sediment at the north edge of town, creating bluffs perfect for Bank Swallow colonies.

2) McIntyre Creek

After the Yukon River Corridor, McIntyre Creek has received the most attention as an important riparian habitat. Wetlands, including a mix of shallow open water, marshes and fens, in its upper reaches occupy meltwater channels. These are important waterfowl staging habitats, along with rich nesting and early summer habitat for waterfowl, songbirds, raptors and others. Till adjacent to the stream and the deep sedimentary deposits in the upper channel provide relatively warm and nutrient rich winter water to salmon spawning habitats downsteam. McIntyre Creek is also recognized as an important wildlife corridor between the river and the uplands to the west.

It is listed as the second largest of the City's parks. There are active multi-party discussions about formal protection and management of the area..

Threats to McIntyre Creek include road crossings, roadways in the riparian zone, introduced fish species and redirection of Fish and Porter creeks for hydroeclectric generation.

3) Croucher Creek

Croucher Creek flows into the Yukon River just across and downstream of McIntyre Creek, forming a mirror wildlife and riparian corridor to the east. Its headwaters extend up the side of Cap Ridge east of Cantlie Lake. They also follow meltwater channels, support numerous wetlands enroute to the Yukon

River. This area is less developed than McIntyre Creek, so is understood to support more intact habitats for moose and other boreal wildlife, and is the only area within the City to include functional winter habitat for disturbance-sensitive caribou.

Croucher Creek has experienced considerable fuelwood harvest and trail development; most of the woodcutting trails are becoming revegetated. Current threats include the road crossing, hydro line transmission clearing, recreational trails, invasive species, such as Rainbow Trout, some residential development and recreational trails. A portion of the watershed is within the proposed future expansion area to the City's Urban Containment Boundary.

4) Wolf Creek

Closely following the Mary Lake – Wolf Creek Significant Wildlife Area, along with the portion of Cowley Creek (Wolf Creek/Cowley Creek –Yukon River Significant Wildlife Area) downstream of the Alaska Highway, Wolf Creek Park was first delineated in the 2010 OCP. This area includes waterfowl habitat, particularly in the wetland at the outflow of Mary Lake, along with the typical boreal wetland and riparian warblers and sparrows. The large riparian forest behind Wolf Creek Subdivision and through the campground supports a rich assemblage of boreal plants, provides a corridor for terrestrial wildlife. The lower stream supports Chinook Salmon spawning habitat.

This conservation area is constricted along the steam course east of Wolf Creek Subdivision, has a major road crossing, and sees considerable recreation on trails in the upper reach to the campground. As with other Regional Parks, it has no formal designation or regulation, except the portion within the Yukon Government campground.

5) Little Takhini Creek

This small area includes a small, deeply-incised riparian area with Chinook Salmon spawning habitat. It most likely had a traditional fish camp at the confluence with the Yukon River. While the Little Takhini Creek Significant Wildlife Area is described downstream of the Alaska Highway and North Klondike Highway intersection, the riparian area extends to the south and west, draining the eastern slopes of Haeckel Hill.

This small area has residential lots, Cousins Airstrip, is crossed by the Alaska Highway and has potential for residential development by TKC and KDFN. The upstream portion includes the Haeckel Hill road and soil and gravel extraction areas.

Waterbodies

6) Chadburn Lake and Area

Depressions formed as glacial outwash material was deposited around decaying blocks of ice are now occupied by Chadburn, Chadden and Hidden lakes and smaller ponds. The lakes support whitefish, which were harvested traditionally, while Hidden, Chadden and Long lakes have been stocked with rainbow trout, kokanee and Arctic char. The Three-spined Stickleback has been introduced inadvertently to Long Lake in the 1970s. These lakes were used by First Nations people, particularly in late winter when other food supplies ran low (pers. Com. Ann Smith). The water table has been elevated by the Schwatka reservoir, enlarging the lakes and creating new wetland areas. Numerous species of waterfowl use the lakes for migratory staging and nesting. Dry, Lodgepole Pine dominated forests occupy much of the upland areas and include examples of First Nation food use of pine on Culturally Modified Trees. Warm aspect slopes support grassland communities that include the southeasterly extent of Beringian species such as Easter Daisy (Townsendia hookeri) and Clustered Broom-rape (Aphyllon fasciculatum) which is rare in south-central Yukon and disjunct from the main North American range. These aspect grasslands are sensitive to disturbance.

Despite the long history of being a park reserve, and now being a feature park in the City's regional parks system, Chadburn Lake Park has no other formal designation.

The following small waterbodies have been described in various plans and reports as having value within the context of their local neighbourhoods. The share local ecological and recreation, mostly hiking, values. Of these, McLean Lake and Paddy's Pond have been recognized in the 2023 OCP as part of the Regional Parks System within the City. The first four include open water habitats, important to waterfowl surrounded by upland forests that support boreal forest bird habitats.

7) McLean Lake

This small lake is a headwater contributor to the ephemeral stream and series of wetlands that feed Ear Lake. It supports waterfowl species, hosts mature riparian forests and wetlands, and includes adjacent south facing grasslands. It receives relatively light recreational and naturalist use.

The McLean Lake Park was recognized in the 2023 OCP as part of the Regional Parks System. It lies within the gravel deposits adjacent to the Copper Haul Road, with significant lease and extraction pits in the vicinity. Connection to Ear Lake and the Yukon River is compromised by the Alaska Highway, unplanned residential lots and additional gravel extraction areas east of the highway.

8) Paddy's Pond

The smallest of the parks included in the 2010 OCP, Paddy's Pond and the nearby Ice Lake are small waterbodies with associated wetlands that have trail systems well used by the nearby residents of Hillcrest and Granger neigbourhoods. The ponds support waterfowl and nesting habitat for a variety of shoreline and forest nesters.

9) Crestview Ponds

Small ponds with important bird habitats, a calcareous fen, and headwaters to Crestview Creek, with Chinook Salmon spawning and traditional camps at the confluence with the Yukon River. The area contains a trail network regularly used by nearby residents.

While not assigned a formal designation, the area is just outside of the Urban Containment Boundary. There is gravel at the northern portion that is subject to extraction interests.

10) Stinky Lake

A small isolated pond, 1.1 ha in size, that is supported by spring water sits above McIntyre Creek. Stinky Lake is surrounded by a diversity of ecosystem types including the marly wetland to the south, aspect grasslands and a range of boreal ecosystems from dry aspen to pine dominated forests. It is the central feature in a trail network used by residents of Porter Creek Subdivision.

While the site itself is likely not developable, increased recreational use, should further residential development occur, could have an impact. The lake sits at the northeast corner of a titled parcel.

11) Versleuce Meadows and Hidden Lake

The pond in the meadows supports numerous migratory waterfowl and is nesting habitat for waterfowl, such as Ruddy Duck, and wetland species, such as Sora and Red-winged Blackbird. Water levels in Hidden Lake can fluctuate dramatically from year to year. Trails in the forest around the lake and in the meadow are well used by the local community, birders, and the adjacent school.

Private residential titles occupy much of the meadow where conversion to drier lawns has reduced the size of the wetland. The stream connecting to Hidden Lake has been channelized. The feature is bisected by Holly Street and includes numerous large residential lots. Most of Porter Creek has been diverted into McIntyre Creek above the upper generating station. Flows into Versleuce Meadows and Hidden Lake have been reduced.

Figure 17: The pond in Versleuce Meadows is a nesting site for Redwinged Blackbirds, Sora, various warblers and Ruddy Ducks, pictured here.

Upper Elevation Areas

Kwanlin Dün citizens identified all of the high country around the city, particularly on the west side, as having high value for wildlife. Habitat for caribou, moose and sheep were mentioned, along with knowledge of use by smaller mammals, such as gopher, and birds, such as grouse and ptarmigan. These areas occupy the transition between developed rural areas and more natural country beyond, and are valued for the opportunity to view wildlife as well as for the intrinsic value of knowing that wildlife may be there. Plant harvest, particularly berries, are important to KDFN citizens in these areas.

12) Haeckel Hill area

Haeckel Hill, has a Southern Tutchone name and is connected to an important traditional story. [reference them here ?] Sitting just at the western limit of the City, Haeckel Hill is connected to a ridge system of alpine and subalpine habitats that run to west to the Ibex Valley. It supports habitats for moose, gopher, pika and groundhog (Hoary Marmot); and important food and medicinal plants, including blueberry, cranberry, caribou horn lichen and balsam.

The tower road will be maintained in support of the increased wind power generating investements. There is the possibility of this activity being extended to the Sumanik Ridge to the northwest. The road provides access to recreational hikers and the clearing at the tower has a paragliding launch.

13) Mt McIntyre area

This area is adjacent to the route between the Yukon River valley and Fish Lake, and in the 20th century was well used as a route between Whitehorse and Fish Lake. It is also an important traditional harvest area for plants and gophers. It is connected to the upland basin and peaks, bounded to the west by Mount Granger, home to sheep, caribou, moose, gopher, groundhog and other species traditionally harvested.

Roads to the communication tower are maintained and well used by for recreational backcountry vehicle use, mountain biking, cross country skiing and hiking. In the fall the subalpine is targeted by cranberry harvesters. Commercial tourism, including horseback and winter dog team travel, generate trails used for these activities and provide access to many others.

Figure 18: The subalpine habitat of Mount McIntyre is rich in cranberries in the early fall, and is home to gopher (Arctic Ground Squirrel), with occasional groundhog (Hoary Marmot) observations.

14) Mt Sima area

This subalpine area has relatively old growth spruce forests on the lower slopes and adjacent valley, with extensive balsam (subalpine fir) forests on the upper portion. The area of interest described by KDFN citizens extended to the upper boreal forests adjacent to Mt Sima, and is described as good habitat for moose, in the mixed habitat of small ponds and forests, grouse and medicinal plants, particularly balsam.

This area has been subject to mining activity up to the 1980s, and is still of interest. The ski hill development attracts users in winter and summer. The Copper Haul Road is maintained to the south, and is recently the focus of wildfire mitigation in the southwest of the City.

15) Golden Horn area

Anchoring the southeast corner of the Granger upland area, Golden Horn Mountain, at 1,710 m a.s.l. is the highest point in the City and the only area of true alpine. In addition to alpine plants, such as Moss Campion and Woolly Lousewort, the area is home to Collared Pika and Rock Ptarmigan. South of the mountain Coal Lake is drained by Wolf Creek, running east to the before wrapping around Golden Horn and entering the City on its southerly boundary. Long-term meteorological, water and vegetation monitory has taken place since 1993 as part of the Wolf Creek Research Basin. It is a multi-agency initiative supported by the Changing Cold Regions Network (CCRN).

Roads developed for accessing coal deposits are now well used by off-road vehicles to access the plateau and the country further west.

Figure 19: Anchoring the southwest corner of the City boundary, Golden Horn Mountain supports an array of alpine plants, such as Wooly Lousewort, has a colony of Collared Pika, and is listed in Wildlife Key Areas as being important for Golden Eagles.

16) Grey Mountain area

The highest point on the eastern side of Whitehorse, Grey Mountain is comprised of carbonate rocks, part of a complex along the east side of the Yukon Trough, also exposed on the east shores of Lake Laberge and Coghlan Lake further north. This subalpine area includes a variety of important food and medicinal plants, particularly on cool aspects, including blueberry and balsam, along with Dusky (Blue) Grouse, Rock Ptarmigan and gopher. With little soil development on the high ridge, alpine-like conditions and vegetation occur, including Mountain Avens and Net-leaved Willow.

The road is maintained for the communication equipment, providing two-wheel vehicle access enabling the ridge to be frequented by recreational hikers. An extensive network of mountain bike trails is being developed on the west and northwest slopes.

Lowland Areas

17) Livingston Trail

The portion of the Livingston Trail north of the 'Long Lake Road' segment, is within a forested dune complex sitting on Glacial Lake Laberge sediment. To the east are pothole ponds and wetland complexes that are part of the Laberge Creek watershed, while pothole ponds west of the sewage lagoon feed the Yukon River through groundwater. This is the primary area of remaining functional winter habitat for caribou.

The largest disturbance in this area is the sewage lagoon, which, somewhat ironically, has become one of the top bird viewing sites in the City, with 150 bird species observed. The road and powerline cut through, while fuelwood cutting trails are regrowing. Much of the area is within TKC settlement land.

18) Long Lake Road area

The road area south of Croucher Creek is in a kettle – kame feature, containing depressions and steep slopes. Northward, the terrain is gentler, comprised of windblown sediment over glaciolacustrine deposits comprised of silt, sand and clay. The forest cover is relatively even aged, with patches along Croucher Creek and in depressions that were protected from the most recent fire. Mule deer are commonly observed here on the aspect grasslands and open deciduous forests, while ponds and wetlands support beaver and muskrat and waterfowl and songbird nesting.

An area north of Long Lake and west of KDFN C-116 has been applied [transferred to City ? 2023-1320] for as a land reservation for future residential development.

Figure 20: This shallow water wetland, part of Croucher Creek, is within the Long Lake Road area. It remains relatively natural, with only the road, a few residences, powerline, sewage lagoons and some trail development. The coniferous and mixed wooded area in the bottom left of the frame is part of KDFN C-116, within the proposed eastern development areas. The creek and wetland are within Chadburn Park.

19) Copper Haul Road area

The lowland east of Golden Horn Mountain contains the mid-reaches of Wolf and McCrae creeks. Terrain complexity, along with ponds, wetlands and riparian areas, has created one of the most diverse forests found in the City. Moist soils and fire breaks have resulted in some of the oldest forests occurring here. This area is habitat to moose and beaver, while black and grizzly bears are observed occasionally.

This area is bounded on the east by rural residential subdivisions and the railway, is bisected by the Copper Haul Road, includes quarries and tailings, and is now has the forest conversion project occurring as a fire abatement effort. Much of the area is subject to mineral tenures.

20) Area north and west of McIntyre Subdivision

The forested trails adjacent to the McIntyre Subdivision were identified by KDFN citizens as an important area for wildlife habitat, viewing wildlife, berry picking and recreation. The area is part of the of the Whitehorse Ski Club land licence and the McIntyre Creek Park reservation.

8 Ecosystem Mapping for Whitehorse

Since the 1970s, various initiatives have been undertaken to classify and map ecosystems in Yukon. This has been consolidated in the past decade in the Yukon Ecological Land Classification (ELC) Program. Informal standardization of site-based classification and regional, top-down classifications is underway. There are no formally approved guidelines or standards for either classification or mapping. Mapping of regional ecosystems for Yukon were completed in 1995, updated in 2013, and are recognized as part of Canada's National Ecological Framework. A parallel system of bioclimate zones has been modelled for Yukon, (Flynn. 20xx). The most developed site-level classification for the Boreal Low Bioclimate Zone in the Yukon Southern Lakes area. In time, it is anticipated that formalization of classification and associated mapping will take place. At such time, it will be possible for the Yukon CDC to identify ecosystems that are rare, threatened, or of other conservation concern. A classification has been generated for the Boreal Low Bioclimate Zone for the Yukon Southern Lakes ecoregion. This includes the majority of the lowland areas within Whitehorse where both development and recreation occur and where the majority of the conservation interests are found, as expressed, for example, by the City's Regional Parks network.

8.1 Surficial Geology

A number of initiatives related to the Alaska Highway, potential pipeline development, determining aggregate resources and other resource interests mapped surficial geology in the Whitehorse region. These were done at a range of map scales from 1:250,000 to 1:100,000 with the first maps being completed in 1982. A large-scale product, that makes use of the detail provided by Lidar imagery, has been completed recently by the Yukon Geological Survey (Lipovsky, 2023). This updated surficial product aligns with the updated map base for Whitehorse.

8.2 Soils

Foundational to subsequent ecosystem products for Whitehorse is the soil, terrain and wetland survey by Charlotte Mougeot with Scott Smith of Agriculture and Agri-Food Canada and Catherine Kennedy of Yukon Renewable Resources (Mougeot GeoAnalysis and Agriculture and Agri-Food Canada. 1997).

8.3 Forestry Mapping

In Yukon, the Forest Resources Branch, within the Yukon Department of Energy, Mines and Resources is responsible for conducting inventories of forests. Mapping attributes focus on tree species, tree height, density and age, along with a limited number of abiotic values, such as moisture. These attributes are designed to facilitate forestry management, largely through enabling calculations of available volumes for harvest permitting. As there are few landscape attributes, the process is referred to as the Yukon Vegetation Inventory (YVI) rather than ecosystem mapping.

8.3.i Southern Lakes Vegetation Inventory 2015

A regional 1:250,000 product prepared by DIAND in the 1980s was upgraded for the Whitehorse region in 2014 by Timberline (Forest Management Branch. 2014). The new product is mapped at a scale of 1:40,000, and is derived from interpretations of digitized aerial photography using softcopy software. This new product, which places Whitehorse forests in a regional context, conforms to CanVec 1:50,000 spatial data and includes more interpretations of non-forested sites than previous inventories.

8.3.ii Whitehorse Area Vegetation Inventory

A large map scale vegetation inventory was completed for the City of Whitehorse by Rob Legare in 2005 (Forest Management Branch. 2005). With a nominal scale between 1:5,000 and 1:10,000, this product is one of the primary inputs to the current ecosystem map. It was completed after the first iteration of ecosystem mapping for Whitehorse (Applied Ecosystem Management. 2000a). The Whitehorse YVI is based on the 1 :50,000 National Topographic Data Base (NTDB). Canada, with Yukon, has updated this linework in a new product known as CanVec. Additionally, new imagery, and Lidar-derived contours, provide for a more accurate map base. So, the 2005 YVI, provides a useful visual guide for the updated ecosystem map, but it does not align with the current base.

8.4 Ecosystem Mapping

8.4.i Regional Ecosystem Products

Terrain-focussed mapping of Yukon-wide ecosystems began with the publication of the Ecoregions of Yukon in 1977 (Oswald and Senyk). In this stratification, Whitehorse was placed within the Lake Laberge Ecoregion. This top-down approach to ecosystem delineation was continued through a contribution by Yukon scientists to the National Ecological Framework (Ecological Stratification Working Group, 1995), who then completed a second Yukon Ecoregion report (Smith, et al., 2004). The Lake Laberge Ecoregion was modified slightly and named more appropriately the Yukon Southern Lakes Ecoregion. A mapping

project was undertaken for the Yukon Southern Lakes and Pelly Mountains ecoregions that gave better definition to Ecodistricts, the next level below Ecoregions, in the National Ecological Framework. This project also included the first attempt to model bioclimate zones in Yukon (EBA, 2004). Yukon-wide ecoregion mapping was refined in concept and scale in 2014 (McKenna, Meikle, Flynn, 2014). This refinement extended the Yukon Southern Lakes Ecoregion into British Columbia, encompassing Tagish and Atlin lakes, and aligning with the northwestern portion of British Columbia's Boreal Mountains and Plateaus Ecoregion (Demarchi, 2011).

Approaches to mapping regional ecosystems with a focus on climate have complemented these more landform-based interpretations. These include the Ecoclimatic Regions of Canada, 1989, and the recent and ongoing publication of Bioclimate Zone models by Yukon. For a more complete history of ecosystem classification and mapping in Yukon see Jones et al. (2007).

Larger scale mapping, with a nominal scale of 1:100,000, of ecosystems for the Southern Lakes area, including Whitehorse, was completed in 1983, supported through a resource development agreement between Canada and Yukon. (Davies, Kennedy, McKenna. 1983). In support of regional land use planning, a regional predictive ecosystem model has been prepared (Meikle et al. 2024). It is a raster-based product and has had been utilized as a base for habitat models for wildlife and bird species.

8.4.ii Whitehorse Ecosystem Products

The regional interpretations provide ecological context for Whitehorse. At a scale suitable for supporting Official Community Plans, along with neighbourhood and regional park plans the City commissioned an Ecosystem Map for the developable portion of the municipal area. This product was prepared for use no larger than a map scale of 1:20,000 (Applied Ecosystem Management. 2000a). The mapping approach incorporated terrain attributes, linking them to contemporary vegetative expressions to produce an ecosystem classification and map. The classification was organized around ecosystem response to disturbance, mostly wildfire, so included information on the trajectory, or seral stages, of ecosystems in post-burn settings. This product was based on a 1:20,000 base map that was derived from the 1:50,000 NTDB.

8.5 Updated Ecosystem Map

8.6 Data inputs

Six primary inputs were used in the delineation of ecosystems for this updated stratification. First is the new CanVec base mapping at 1:50,000 that has replaced NTDB. The CanVec data has been spatially corrected using satellite imager such that it has considerably less laterally displacement or error than was contained within NTDB. Secondly, this base was augmented by the high resolution Lidar data that was obtained by Whitehorse in ____. In addition to providing for a very large-scale digital base, Lidar facilitated improved visual interpretation of ecosystem types and transitions between types. The other

inputs were the soils mapping, surficial geology, the 2000 Ecosystem Map and the City YVI, which are described above. The final input was the Important Ecosystems Map created by KDFN in 2010. The update to surficial geology (Lipovsky, 2023) for the City became available after the linework for this project was completed.

In areas with digital landcover interpretations and terrain models, for example, modelling can assist in mapping ecosystems. This was not the case for the City of Whitehorse at the map scale required. A modelled set of Broad Ecosystem Units are a for the southern lakes area, including Whitehorse. This regional product, and its derivative habitat interpretations, are useful in providing context for Whitehorse, but are too coarse to be used in planning and project review within the City.

Mapping was undertaken using CanVec water as the foundation. Polygons developed were directly mapped, using prior data and thematic maps from the various sources listed above. Polygons were delineated at 1:10,000 from aerial imagery, with the use of multiple data overlays. Ecosystems reflect areas of uniform vegetation, terrain, land use, and habitat characteristics. The attribute tables were completed following the polygon delineation.

8.7 Development of a Legend

Prior to initiating mapping, a list of important ecosystems was developed, based on the environment and landscape of the region. This project uses twelve broad ecosystem/feature classes to represent the overall ecosystems or features found in the City of Whitehorse. Sub-classes, or “Types” of each class were developed to further refine the broad units. Where existing B.C. SEI class or type do not reflect that of the Whitehorse environment, new classes and types for the Whitehorse area were developed, based on various data sources, as listed in the following section. The legend can be found in Appendix 2.

8.7.i Modifiers

Further to classes and types, a modifier was developed to be added to the units to further discern specifics applicable to the ecosystem or feature (Appendix 2). Ecosystem modifiers are additional characteristics that an ecosystem, feature or polygon may present in certain landscapes or general locations. Some modifiers such as permafrost conditions may refer to the entire polygon, Other modifiers such as Yukon CDC element occurrences may indicate a known occurrence within a polygon requiring further consideration prior to development.

It is expected that the list of modifier will evolve over the course of future work.

8.7.ii Non-Spatial Data

Standards for the non-spatial data were based on the B.C. Terrestrial Ecosystem Mapping (1998) and the Standards for Mapping Ecosystems at Risk in British Columbia (2006). Descriptions of ecosystems and features can be found in Section 5 - Important Ecosystem are described in the following chapter. Digital data was captured and presented in the following attributes.

8.7.iii Project Attributes

This information is applicable to the entire project and is recorded once. Appendix x provides details for data requirements.

8.7.iv Core Polygon Attributes

Core attributes are required for Important Ecosystems and Features mapping (Table 3). Full table can be found in Appendix X

Table 3: Core polygon attributes required for Important Ecosystems and Features mapping

FORMAL NAME	DESCRIPTION
Project Name	The common name of the project.
Project Year	Year project was completed. Ex. 2018
Organization Name	Organization or Consultant responsible for mapping project
Client	The client (public or private organization) for whom the project was completed.
Mapsheet Identification	The Mapsheet Identification of the map with the largest area of the polygon falling within it.
Polygon Number	Unique polygon number
Ecodistrict Number	A component of the National Ecological Framework for Canada. Input Ecodistrict Number
Bioclimate Zone Code	Bioclimate Zone - Yukon Ecological and Landscape Classification unit. Ex. BOL (Boreal Low)
Bioclimate Subzone Code	Bioclimate subzone - Yukon Ecological and Landscape Classification unit. Ex. Sl (Southern Lakes)
SEF Class - Component 1	Sensitive Ecosystem and Feature Class designation for Component 1.
SEF Class - Component 2	Sensitive Ecosystem and Feature Class designation for Component 2.
SEF Class - Component 3	Sensitive Ecosystem and Feature Class designation for Component 3.

8.7.v Optional or Recommended Attributes

Table 4 shows the optional attributes which may be used for the project as necessary.

Table 4: Optional or recommended attributes for Important Ecosystems and Features mapping

FORMAL NAME	DESCRIPTION
Geographical Location	The geographic location of the mapping project. This is a gazetted name taken from published map; for example, a town, lake, or watershed.
Map Scale	The source scale on which the ecosystem polygons were captured. Ex. 20000 not 1:20000
Map Datum	Map datum project was completed. Ex. Yukon Albers
Data Source	Source of the data used to determine polygon units. (Plot or Interpreted)
Plot Number or Identifier	Plot number/identifier established in polygon
Unit decile - Component 1	The proportion of polygon covered by component 1, in deciles. Ex. 1 (10%), or 8 (80%). Note all deciles must add up to 100%, or 10 for polygon.
SEF Type - Component 1	Sensitive Ecosystem and Feature Type designation for Component 1.
SEF Modifier - Component 1	Sensitive Ecosystem and Feature Modifier designation for Component 1.
Landscape Context - Component 1	Landscape Context considers the surrounding geographic area for Component 1. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
Condition Assessment for Component 1	Condition Assessment looks at Composition, Structure and Function of ecological community. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
Viability - Component 1	numeric representation of how viable the ecosystem unit is - considers condition, size and defensibility parameters
Unit decile Component 2	The proportion of polygon covered by component 2, in deciles. Ex. 1 (10%), or 8 (80%). Note all deciles must add up to 100%, or 10 for polygon.
SEF Type - Component 2	Sensitive Ecosystem and Feature Type designation for Component 2.
SEF Modifier - Component	Sensitive Ecosystem and Feature Modifier designation for Component 2.
Landscape Context - Component 2	Landscape Context considers the surrounding geographic area for Component 2. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
Condition Assessment for Component 2	Condition Assessment looks at Composition, Structure and Function of ecological community. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)

Viability - Component 2	numeric representation of how viable the ecosystem unit is - considers condition, size and defensibility parameters
Unit decile - Component 3	The proportion of polygon covered by component 3, in deciles. Ex. 1 (10%), or 8 (80%). Note all deciles must add up to 100%, or 10 for polygon.
SEF Type - Component 3	Sensitive Ecosystem and Feature Type designation for Component 3.
SEF Modifier - Component 3	Sensitive Ecosystem and Feature Modifier designation for Component3.
Landscape Context - Component 3	Landscape Context considers the surrounding geographic area for Component 3. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
Condition Assessment for Component 3	Condition Assessment looks at Composition, Structure and Function of ecological community. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
Viability - Component 3	numeric representation of how viable the ecosystem unit is - considers condition, size and defensibility parameters
Fragmentation	Degree of fragmentation of surrounding landscape in context for polygon. %

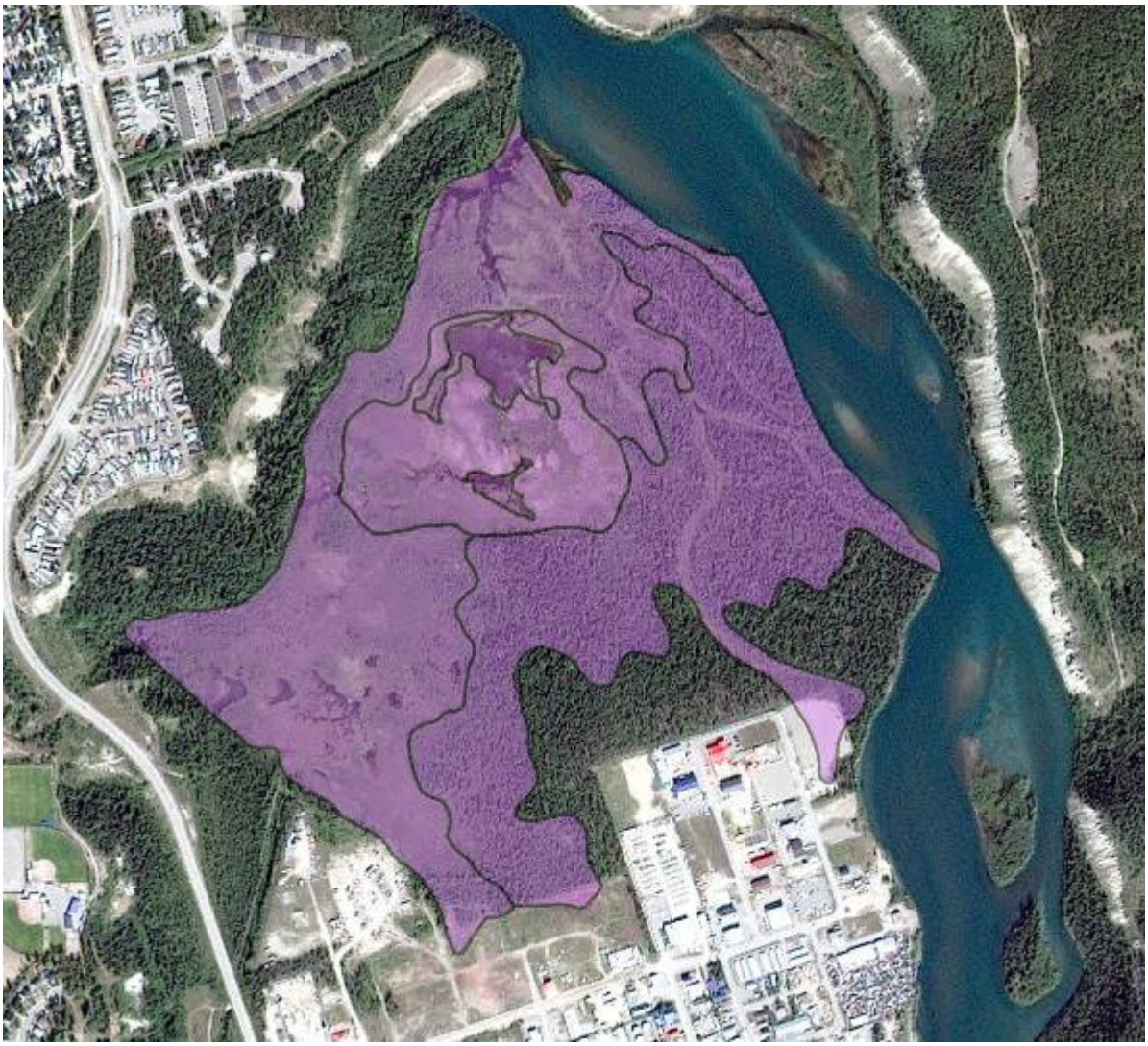

Figure 21: The wetland complex at the north of Lot 226 includes open water, surrounded by a fen. Water moving through the open forest area is mapped as a marsh, while the wet White Spruce forest to the south is a bog. Groundwater discharge often occurs from the bluff to the north and a small stream from a spring along the bluff to the west feeds the wetland from the southwest.

9 Using this map

9.1 Management considerations

9.1.i Protect features and ecosystems

The City contains a rich array of geologic features and ecosystems. These include meltwater carved canyons with rocky walls, ponds and wetlands on the canyon floors, forests that have been missed by successive fires in the lowland, subalpine shrub and edaphic alpine, wetlands, pothole lakes, silty river bluffs and aspect grasslands. Each of these provide habitat to unique suites of species, some common, others rare or threatened. Protecting this range of features and ecosystems is one way of ensuring that the full complement of interests stated by the community during the Community Land Plan development are protected.

9.1.ii Protect important areas.

Given the large area the City boundary encompasses, many natural areas remain that Kwanlin Dün citizens and other City residents have expressed interest in. A strategy for managing these areas is required. Some lend themselves to being incorporated into the City's Regional Parks system. Others have a larger degree of development or uses and can be managed through appropriate zones. Some may even have their attributes maintained when incorporated thoughtfully into more highly developed areas of the City. Examples of the three in order may be Chadburn Lake area, Mount McIntyre area and Versleuce Meadows.

9.1.iii Maintain functional habitat.

The majority of the land within the City is not developed. While some areas are being considered for future development, one objective for the remaining lands should be the maintenance of habitat functionality. Managing for functionality can be different than managing for aesthetic values. Many ecosystem functions can be maintained and species use ensured in concert with various human uses. Review of potential impacts on species and ecosystems of proposed activities and developments should be undertaken and incorporated into plans and development permits. This can include trail development, noise mitigation, recreation type and intensity, fuelwood cutting, wildland fire mitigation and rural residential development. A suite of specific species and ecosystems should be decided upon, with traditional knowledge and science-based understanding of needs and tolerances.

9.1.iv Buffer

Policies are in use by the City for buffering developments from streams. The objective of these buffers is not well articulated. Additional buffering policies are required for a range of ecosystems, including waterbodies, wetlands, riparian habitats, old growth forests and grasslands.

9.1.v Connect

Habitat connections include river corridors, hydrologically linked wetlands and waterbodies and continuous alpine or subalpine habitats. Less obvious are the connections through relatively unbroken lowland forests for species like caribou. Inevitably, development fragments ecosystems and creates barriers to species movements. Planning and development policies around consolidation of urban land uses, design that facilitates permeability to target species, and design that includes habitat for appropriate species should be developed.

Figure 22: Croucher Creek is primary riparian corridor east of the Yukon River. Less obvious as a corridor is the undisturbed forest that provides a connection for caribou from the mountains along Cap Ridge to the winter habitat in the northeast of the City.

9.1.vi Consider watersheds

While there is a plan for the Yukon River Corridor, there is little planning done that considers the tributary watersheds. The primary exception is McIntyre Creek, a salmon stream and habitat corridor with extensive fens. More formal recognition of the remaining watersheds and policy for their management is required. Many of these streams supported traditional salmon fishing camps at their confluences, have secondary riparian forest to wetland habitats and remain wildlife corridors. Croucher and Laberge creeks remain relatively natural, with only one road crossing each, the sewage lagoons and limited fuelwood cutting. Pressure on these watersheds east of the Yukon River is likely to increase through development of First Nation settlement lands, increased recreational trail development, and, in the longer term, urban residential development. On the west, Little Takhini Creek watershed in the north, upstream to Cowley Creek watershed, and all those in between, are bisected by the Alaska Highway and have residential, light industrial and commercial developments. First Nation elders and other citizens routinely speak of the value of water and respect for streams and watersheds. These ought to be considered in the development of settlement land and review of other city developments west of the Yukon River. A detailed listing and map of watersheds in Whitehorse is provided in the Preliminary Groundwater Inventory of the City of Whitehorse by Gartner Lee Limited, 2003.

9.2 Reference or Flagging tool

Planning

Many of the values identified by the Kwanlin Dün community, and through previous City assessments and plans, are best addressed through city-wide to neighbourhood to parcel specific plans. The ecosystem map can aid in providing spatial representation to many of the value that can then be maintained through appropriate mechanisms in plans at these three scales.

Project Review

The renewed ecosystem map has a nominal map scale of approximately 1:50,000. Values within each polygon are not necessarily expressed uniformly across entire polygons. As such, this map is most appropriately viewed a reference or flagging tool. Where a development proposal is received, the map may indicate a number of ecological values that could be impacted. This should contribute to a statement of work for more detailed analysis. This could include larger-scale mapping, field inventory and consultation with domain experts. For understanding the range of site-level ecosystems within each ecosystem category here, a crosswalk to the ecosites of the Southern Lakes Boreal Low Subzone is provided in the appendices. Note that, unlike most Forestry Ecosite Guides, this classification does not provide management direction for each site.

See West Kelowna Development Permit Areas. Have Terrestrial and Aquatic permits. Use this sort of mapping to flag interests and determine site-level assessment and project accommodation.

9.3 Referrals to experts

As described briefly above, a number of agencies in the national and territorial governments have legislated conservation mandates and expert staff that administer the mandates. Kwanlin Dün First Nation cannot be expected to replicate this expertise in-house. A structure for referral to these experts, should be drafted for planning settlement land and for project review on settlement land and beyond. This can take the form of engaging Canadian Wildlife Service biologists on appropriate habitat management for migratory birds; the Yukon Conservation Data Centre for advice on potential impacts on occurrence records; Yukon Environment Habitat Section on grassland management; Yukon Forest Resources on location and management of old growth forests; etc.

10 Further work

Areas of ecological and cultural value have been mapped by previous initiatives, such as the Kwanlin Dün Community Lands Plan, the KDFN Whitehorse Conservation Design, the Yukon River Corridor Plan, and the Defining Ecologically-Based Significant Wildlife Areas for the City of Whitehorse. Each of these projects used a map framework that predates the linework in the current ecosystem map. It would be worthwhile to attribute the current map, as closely as possible, with the important area concepts from these previous initiatives.

As required, additional species could be linked to habitat types and attributed in the table associated with this map.

Policy development around particular features and ecosystems should be developed. These can be reflected in the mapping. This could include specific policy guidance for treatment of specific ecosystem types, such as old growth forests and grasslands, along with linework, rather than arbitrary buffers for setbacks from riparian areas, wetlands and waterbodies.

11 References

Applied Ecosystem Management. 2000a. *A Users Guide to City of Whitehorse Ecosystem Mapping (ver. 2c).* Whitehorse. Prepared for City of Whitehorse Planning Department.

Applied Ecosystem Management Ltd. 2000b. *Defining Ecologically-Based Significant Wildlife Areas for the City of Whitehorse.* Prepared for City of Whitehorse Planning Department and Yukon Department of Renewable Resources, Wildlife Viewing Program.

Bond, J. 2004. Late Wisconsinan McConnell glaciation of the Whitehorse map area (105D), Yukon. In Yukon Exploration and Geology 2003, D.S. Emond and L.L. Lewis (eds.), Yukon Geological Survey, p. 73-88.

Davies D., Kennedy, C.E. and McKenna K. 1983. Resource Inventory - Southern Lakes. Land Planning Branch, Department of Renewable Resources, Government of Yukon.

Demarchi, D.A. 2011. An Introduction to the Ecoregions of British Columbia, Third Edition March, 2011. Ecosystem Information Section, Ministry of Environment, Victoria, British Columbia.

Department of Indian Affairs and Northern Development. 2004. Kwanlin Dün First Nation Final Agreement. Department of Indian Affairs and Northern Development. Ottawa, ON, Canada. 550 pp.

Environment Canada. 2011 Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada [Proposed]. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. vii + 80 pp.

Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 4 in Canada : Northwest Interior Forest.

Enrivonment and Climate Change Canada. 2022. Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. Ix + 125 pp.

Environment Yukon. 2016. Flynn, N. and Francis. S. editors. Yukon Ecological and Landscape Classification and Mapping Guidelines. Version 1.0. Whitehorse (YT): Department of Environment, Government of Yukon.

Environment Yukon. 2017. Southern Lakes Boreal Low Subzone (BOLsl): A Field Guide to Ecosite Identification. Boreal Low Zone Series. Department of Environment, Government of Yukon.

Flynn bioclimate zones Yukon

Forest Management Branch. 2005. Whitehorse Area Vegetation Inventory Manual: Vegetation Classification. Department of Energy, Mines and Resources. Government of Yukon. 27 pp.

Forest Management Branch. 2014. South-Central Yukon Vegetation Inventory. 1:40,000 scale map. Prepared by Timberline

Gartner Lee Limited. 1999. Yukon River Corridor Plan. Prepared for City of Whitehorse.

Gartner Lee Limited. 2003. Preliminary groundwater inventory of the City of Whitehorse. Prepared for: Community Development Branch, Department of Community Services, Government of Yukon. 56p + 8 X 1 :50,000 scale maps.

Government of Canada. 2002. *Species At Risk Act.* Minister of Justice.

Iverson, K., & Cadrin, C. 2003. *Sensitive Ecosystem Inventory: Central Okanagan 2000-2001. Volume 1 : Methodology, Ecological Descriptions, Results and Conservation Tools.* Pacific and Yukon Region, British Columbia: Canadian Wildlife Service.

Jones, C.F., R.C. Albricht, R. Rosie & K. McKenna. 2007. Yukon Ecological Land Classification and Mapping Program: Concepts Towards a Strategic Plan. Yukon Department of Environment and Department of Energy, Mines and Resources. Government of Yukon.

Kwanlin Dün First Nation. 2017. Traditional Territory Land Vision. Kwanlin Dün First Nation, Land and Resources Department. Whitehorse. Yukon.

Kwanlin Dün First Nation. 2020. Kwanlin Dün First Nation Community Lands Plan : A Plan for KDFN Settlement Land in Whitehorse. Kwanlin Dün First Nation, Land and Resources Department. Whitehorse. Yukon.

Kwanlin Dün First Nation. 2020. Nan kay shawthan Dak'anuta ch'e. We look after our Land. *Lands Act*. OIC-2020-09. Statutes of the Kanlin Dun First Nation.

Lipovsky, P.S. 2023. Surficial geology and geohazards of the greater Whitehorse area. Yukon Geological Survey. OpenFile 2023-1, 67p. plus appendices.

Matthews, W.H. 1986. Physiography of the Canadian Cordillera. Map 1701A. Ottawa: Geological Survey of Canada.

McKenna, K., and Smith, C.A.S. 2004. Physiography in Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes. Smith, C.A.S., J.C. Meikle, and C.F. Roots (editors). Agriculture and Agri-Food Canada, PARC Technical Bulletin No.04-01, Summerland, British Columbia. p. 8-10.

Meidinger, D., McKenna, K., Kennedy, C., & Flynn, N. (2014). *A Field Guide to Ecosite Identification for the Boreal Low Zone of Yukon: The Southern Lakes Subzone.* Whitehorse: Governmet of Yukon.

Meikle, J., Wilson, L., and Lapointe. S. 2010. Whitehorse Heritage and Ecosystem Design Proposal. Kwanlin Dün First Nation, Heritage, Lands and Resources Department, with Ta'an Kwach'an Council, Lands and GIS Section. 17 pp.

Meikle, J., Grods, J., McKenna, K. and Rosie, R. 2024. Predictive Ecosystem Mapping for the Yukon River Headwaters. Prepared for Kwanlin Dün First Nation, Taan Kwachan Council and Carcross/Tagish First Nation and the How We Walk with the Land and Water initiative.

Ministry of Environment. (2006). Standards for Mapping Ecosystems at Risk in British Columbia: an approach to mapping ecosystems at risk and other sensitive ecosystems. Government of British Columbia. Terrestrial Ecosystems Task Force Resources Information Standards Committee.

Mougeot Geoanalysis and Agriculture and Agri-Food Canada. 1997. Soil, Terrain and Wetland Survey of the City of Whitehorse. Draft Report with Maps at 1 :20,000 scale. Prepared for Planning Services, City of Whitehorse.

National Wetlands Working Group. 1997. The Canadian Wetland Classification System. 2nd ed. Wetlands Research Centre, University of Waterloo, Waterloo, Ont., 68 pp.

Natural Connections. 2007. City of Edmonton Integrated Natural Areas Conservation Plan. 48 pp.

Oswald, E.T. and J.P. Senyk. 1977. Ecoregions of the Yukon. Canadian Forestry Service, Pacific Forestry Centre, Victoria, B.C. Information Report BC-X-164.

Schroeder, L. 2011. Preliminary Investigation of Southern Yukon Grassland Classification and Vegetation Associations. Unpublished manuscript. Yukon College.

Smith, C.A.S., J.C. Meikle, and C.F. Roots (editors), 2004. Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes. Agriculture and Agri-Food Canada, PARC Technical Bulletin No.04-01, Summerland, British Columbia.

Wolfe, S., Bond, J., and Lamtohe, M., 2011. Dune stabilization in central and southern Yukon in relation to early Holocene environmental change, northwestern North America. Quaternary Science Reviews, vol. 30, p. 324-334.

Complete/update references for :

Yukon CDC. (2017). *Rare species database*. (Yukon Conservation Data Centre)

B.C. Terrestrial Ecosystem Mapping (1998)

Standards for Mapping Ecosystems at Risk in British Columbia (2006).

SARA Recovery Plans (BANS, CONI, OSFL, REKN, Carix sabulosa)

Appendix 1: Legend for Important Ecosystem/Features and Modifiers

Important Ecosystems and Features

ECOSYSTEM/FEATURE	TYPES	SEF Class	SEF Types
LAKES		**LA**	
RIVER/STREAM	RIVER	**RI**	
WETLAND		**WN**	
	FEN		**wf**
	BOG		**wb**
	MARSH		**wm**
	SWAMP		**ws**
	SHALLOW OPEN WATER		**ww**
	SALINE MEADOW		**wa**
	SHRUB CARR		**sc**
RIPARIAN		**RR**	
	LOW BENCH		**rl**
	MIDDLE BENCH		**rm**
	HIGH BENCH		**rh**
	SPRINGS		**rs**
OLD GROWTH FOREST		**OF**	
	CONIFEROUS		**co**
	MIXED		**mx**
	BROADLEAF		**bd**
MATURE FOREST		**MF**	
	CONIFEROUS		**co**
	MIXED		**mx**
	BROADLEAF		**bd**
WOODLANDS		**WD**	
	CONIFEROUS		**co**
	MIXED		**mx**
	BROADLEAF		**bd**

ECOSYSTEM/FEATURE	TYPES	SEF Class	SEF Types
GRASSLANDS		**GR**	
SHRUBLANDS		**SH**	
SPARSELY VEGETATED		**SV**	
	SAND DUNES		**sd**
	TALUS		**ta**
	CLIFFS		**cl**
	ROCK OUTCROP		**ro**
	ERODABLE SLOPE		**es**
GEOLOGICAL FEATURES		**GF**	
ANTHROPOGENIC/ NON-SENSITIVE		**NS**	

Modifiers:

Modifier	Modifier code	Description
Lichen	l	Associated with Pine Lichen stands (Caribou habitat)
Permafrost	p	Permafrost condition (continuous or discontinuous)
CDC species	s	CDC/SARA species known location - Protected - Contact CDC for further information
Nest	n	known nest, den, lek, etc… of CDC/SARA feature
Cultural	c	cultural and/or historical significant feature
Beringia	b	Beringia conditions and/or species
Wildlife	w	Known wildlife feature
Fisheries	f	Known fisheries feature
Alpine	a	Alpine condition for ecosystem and/or feature.
Tailings	t	Tailings pond, Reservoir, Sewage Lagoon, Golf Course Ponds, or other artificial water surfaces
Clearing/Logging	g	Natural areas disturbed through logging or clearing (SV or SH)
Forest Fire	x	Recent burn areas at young regen stages (SH)

Appendix 2: Polygon Attribute Table

Core Polygon Attributes

FIELD NAME	FORMAL NAME	DESCRIPTION
PROJ_NAME	Project Name	The common name of the project.
PROJ_YEAR	Project Year	Year project was completed. Ex. 2018
ORG_NAME	Organization Name	Organization or Consultant responsible for mapping project
CLIENT	Client	The client (public or private organization) for whom the project was completed.
MAPSHEET	Mapsheet Identification	The Mapsheet Identification of the map with the largest area of the polygon falling within it.
POLY	Polygon Number	Unique polygon number
ECO_DIST	Ecodistrict Number	A component of the National Ecological Framework for Canada. Input Ecodistrict Number
BIOCL_ZONE	Bioclimate Zone Code	Bioclimate Zone - Yukon Ecological and Landscape Classification unit. Ex. BOL (Boreal Low)
BIOCL_SUB	Bioclimate Subzone Code	Bioclimate subzone - Yukon Ecological and Landscape Classification unit. Ex. Sl (Southern Lakes)
SEFCL_1	SEF Class - Component 1	Sensitive Ecosystem and Feature Class designation for Component 1.
SEFCL_2	SEF Class - Component 2	Sensitive Ecosystem and Feature Class designation for Component 2.
SEFCL_3	SEF Class - Component 3	Sensitive Ecosystem and Feature Class designation for Component 3.

Optional or Recommended Attributes

FIELD NAME	FORMAL NAME	DESCRIPTION
GEOG_LOC	Geographical Location	The geographic location of the mapping project. This is a gazetted name taken from published map; for example, a town, lake, or watershed.
MAP_SCALE	Map Scale	The source scale on which the ecosystem polygons were captured. Ex. 20000 not 1:20000
DATUM	Map Datum	Map datum project was completed. Ex. Yukon Albers
SOURCE	Data Source	Source of the data used to determine polygon units. (Plot or Interpreted)
PLOT	Plot Number or Identifier	Plot number/identifier established in polygon

FIELD NAME	FORMAL NAME	DESCRIPTION
DEC_1	Unit decile - Component 1	The proportion of polygon covered by component 1, in deciles. Ex. 1 (10%), or 8 (80%). Note all deciles must add up to 100%, or 10 for polygon.
SEFTY_1	SEF Type - Component 1	Sensitive Ecosystem and Feature Type designation for Component 1.
SEFMOD_1	SEF Modifier - Component 1	Sensitive Ecosystem and Feature Modifier designation for Component 1.
CONT_1	Landscape Context - Component 1	Landscape Context considers the surrounding geographic area for Component 1. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
COND_1	Condition Assessment for Component 1	Condition Assessment looks at Composition, Structure and Function of ecological community. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
VIAB_1	Viability - Component 1	numeric representation of how viable the ecosystem unit is - considers condition, size and defensibility parameters
DEC_2	Unit decile Component 2	The proportion of polygon covered by component 2, in deciles. Ex. 1 (10%), or 8 (80%). Note all deciles must add up to 100%, or 10 for polygon.
SEFTY_2	SEF Type - Component 2	Sensitive Ecosystem and Feature Type designation for Component 2.
SEFMOD_2	SEF Modifier - Component	Sensitive Ecosystem and Feature Modifier designation for Component 2.
CONT_2	Landscape Context - Component 2	Landscape Context considers the surrounding geographic area for Component 2. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
COND_2	Condition Assessment for Component 2	Condition Assessment looks at Composition, Structure and Function of ecological community. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
VIAB_2	Viability - Component 2	numeric representation of how viable the ecosystem unit is - considers condition, size and defensibility parameters
DEC_3	Unit decile - Component 3	The proportion of polygon covered by component 3, in deciles. Ex. 1 (10%), or 8 (80%). Note all deciles must add up to 100%, or 10 for polygon.
SEFTY_3	SEF Type - Component 3	Sensitive Ecosystem and Feature Type designation for Component 3.
SEFMOD_3	SEF Modifier - Component 3	Sensitive Ecosystem and Feature Modifier designation for Component3.
CONT_3	Landscape Context - Component 3	Landscape Context considers the surrounding geographic area for Component 3. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)

FIELD NAME	FORMAL NAME	DESCRIPTION
COND_3	Condition Assessment for Component 3	Condition Assessment looks at Composition, Structure and Function of ecological community. A four point ranking. Excellent (4); Good (3); Fair (2); Poor (1)
VIAB_3	Viability - Component 3	numeric representation of how viable the ecosystem unit is - considers condition, size and defensibility parameters
FRAG	Fragmentation	Degree of fragmentation of surrounding landscape in context for polygon. %

Appendix 3: Ecosites of the Boreal Low Zone - Southern Lakes and Crosswalk to Whitehorse Ecosystems

Names and Codes for ecosites of the Boreal Low Bioclimate Zone: Southern Lakes, including Whitehorse follow (Meidinger et al. 2014).

10	PSw – Kinnikinnick – Lichen
11	BA – Rocky Mountain fescue
20	Pasture sage – Purple reedgrass
21	A – Purple reedgrass – Kinnikinnick
01	SwAP – Soapberry – Twinflower
30	Sw – Labrador tea – Feathermoss
31	Sw – Willow – Red bearberry
32	(Sw) – Shrub birch – Willow
33	Sw – Willow – Horsetail
40	Sw – Horsetail
41	B – Horsetail
50	Saline meadows
Wb1	SbSw – Labrador-tea – Peat moss
Wf1	Water sedge – Beaked sedge
Wf2	Shrub birch – Willow – Water sedge
Wf3	Willow – Water sedge
Ws1	Willow – Blue-joint reedgrass
Ws2	River alder – Willow
Ws3	Willow – Water sedge – Marsh cinquefoil
Ws4	Sw – Willow – Water sedge
Ws5	Willow – Horsetail
Wm	Marshes
Ww	Shallow open water

Ecosystem		Modifier		Southern Lakes Boreal Low Subzone
code	**name**	**code**	**name**	BOLsl Ecosites.
LA	Lake			
RI	River & Stream			
WN	Wetland	b	Bog	B01
		f	Fen	F01 to F04
		s	Swamp	S01 to S04
		m	Marsh	M01 to M07
		w	Shallow Water	W01 to W06
RR	Riparian	rl	Low Bench	M01 to M02; S01 to S04
		rm	Middle Bench	40
		rh	High Bench	41
		rs	Springs	
		re	Seepage/ toe slopes	
OF	Old Growth Forest	co	Coniferous Forest	See all Dry to Mesic and Mesic to Moist ecosites and vegetation associations
WD	Woodland	mx	Mixed Mature Forest	
MF	Mature Forest	bd	Broadleaf Mature Forest	
GR	Grassland			20
SH	Shrubland			
SV	Sparsely Vegetated	sd	Sand Dunes	11
		ta	Talus	
		ro	Rock Outcrop	
		es	Eroded Slopes	
GF	Geological Feature			
NS	Anthropogenic			

Appendix 4: CDC Methods to Assess Ecological Communities

The CDC methodologies and assessments to rank at risk ecological communities are based on the *NatureServe®* methodologies. Two types of assessments are conducted under the CDC, the Ecological Community Element Conservation Status Rank, and the Ecological Community Element Occurrence Rank (Ministry of Environment, 2006). The status rank assesses the current state of the ecological community in an area, whereas the occurrence rank is used to evaluate the state of a specific ecological community occurrence.

Ecological Community Element Conservation Status Rank

The Element Conservation Status Rank for an ecological community (**Error! Reference source not found.**) listed by the CDC is a combination of community rarity (**Error! Reference source not found.**), threats and trends (**Error! Reference source not found.**) (Ministry of Environment, 2006), similar to that of the *NatureServe* methodology (**Error! Reference source not found.**).

Conservation Data Centre Status Assessment Definitions for Ecological Communities

Critically Imperiled	Because of extreme rarity (5 or fewer extant occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation or extinction
Imperiled	Because of rarity (typically 6-20 extant occurrences or few remaining individuals) or because of some factor(s) making it vulnerable to extirpation or extinction
Rare or Uncommon	Typically 21-100 occurrences; maybe be susceptible to large-scale disturbances (ie)may have lots of extensive peripheral populations
Frequent to common	Greater than 100 occurrences; apparently secure but may have a restricted distribution or there may be perceived future threats
Common to very common	Demonstrably secure

Rarity Status Assessment Factors for Ecological Communities

Status Factor	**Description**
Number of Occurrences	Estimated, inferred, or suspected number of occurrences believed extant for the ecological community
Number of Occurrences with Good Variability	The number of occurrences believed extant that have excellent or good viability
Range Extent	Estimated current range of the ecological community
Area of Occupancy	Estimated current area of occupancy

Risk Status Assessment Factors for Ecological Communities

Number of Protected and Managed Occurrences	The number of occurrences that are appropriately protected and managed for the long-term persistence of the element
Long-term Trends	The observed, estimated, inferred, or suspected degree of change over the long term (ie)200yrs
Short-term Trends	The observed, estimated, inferred, or suspected degree of change over the long term (ie)10-100yrs
Threats	The degree to which the ecological community is observed, inferred, or suspected to be directly or indirectly threatened, including: scope, severity, and immediacy
Intrinsic Vulnerability	The likelihood of regeneration or recolonization; consider characteristics that make it vulnerable or resilient to natural or anthropogenic stresses or catastrophes
Environmental Specificity	The resilience of the ecological community due to degree of specificity of site requirements or site restrictions (ie)sand dunes
Other Considerations	Any other information that should be considered in the assignment of a conservation status.

Ecological Community Element Occurrence Rank

The Element Occurrence Rank is an assessment of ecological community viability[1], or ecological integrity. To assess and rank occurrences of ecological communities at risk, three criteria can be; Size, Landscape Context, and Condition. In British Columba, an equation is then applied, and the relationship expressed as: Ecological Integrity = ∑ Landscape Context, Size, Condition (Ministry of Environment, 2006).

Factor	Components
Size	Area of occupancy
Condition	Development/Maturity
	Species composition and biological structure (richness, evenness, presence of exotics)
	Ecological processes (degree of disturbance)
	Abiotic physical/chemical factors
Landscape Context	Landscape structure and extent (pattern, connectivity)
	Condition of surrounding landscape (species composition, structure, development, ecological processes, abiotic physical/chemical factors)

Appendix 5: Listed Ecosystems for Whitehorse, 2000

Ecosystems identified in the first ecosystem map for the City of Whitehorse are found below (Applied Ecosystem Management, 2000a).

AN	Anthropogenic Disturbance	Gravel pits, mine tailings, ect
CF	Cultivated Fields	Active agriculture
UR	Urban	Developed areas
BOREAL UPLAND FORESTED		
AB	Trembling Aspen - Bearberry	Generally occur on south-facing slopes and ridges, but can be found in a variety of positions. Lichen and moss cover are low with a near carpet of bearberry (*Arctostaphylus uva-ursi*) forming ground cover. Sporadic soapberry (*Shepherdia canadensis*) is common. Steep slopes are often associated with GS (grass-sage). Aspen (*Populus tremuloides*) grovesmay also be locally-prominent on a range of conditions and are often considered "early successional" forest types.
PB	Pine/Bearberry	Lodgepole pine-dominated stands on morainal or transitional upland sites with limited shrub understory development. Bearberry (*Arctostaphylus uva-ursi*) forms the dominant groundcover. Soapberry (*Shepherdia canadensis*) and willow cover sporadic, aspen and spruce may be intermixed in canopy and moss cover is generally low. Terrestrial lichens may be locally abundant. Labrador tea (*Ledum groelandicum*)/dwarf birch shrubs (*Betula glandulosa*) and mossberry (*Empetrum nigrum*) may be important on moist sites and in the lower subalpine. This community generally occurs on dry, poor sites, however.
PC	Lodgepole Pine – Canoe (Paper) Birch	Open canopy lodgepole pine stands occurring on gently sloping, shallow soil ecosystems with rock outcrops. Rock outcrops may contain a high cover of terrestrial lichens. Moist depressions contain thick blankets of feathermoss with Paper Birch (*Betula paperifera*), alder (*Alnus crispa*) and Labrador Tea (*Ledum groenlandicum*). This community has only been described on one site within the City of Whitehorse, near Mount Sima. To the knowledge of the mapping team, this ecosystem unit has not been described elsewhere within the Southern Lakes Region.
PG	Lodgepole Pine -Grass	Open, mesic stands with low shrub cover, abundant grass cover and a variable moss layer. Soapberry and Mooseberry (*Viburnum edule*) is often present in moderate amounts with large, sporadic willows growing in canopy openings. This unit has received limited description and field sampling.
PL	Pine-Lichen	Dry, open canopy lodgepole pine (*Pinus contorta*) forests with abundant terrestrial lichen cover (*Cladina* and *Cladonia* spp.) growing on coarse textured soils. Flat benches and complex

		terrain are the dominant terrain features. Rapidly drained, poor sites. Usually associated with glaciofluvial parent materials (glaciofluvial sites generally have the highest abundance of terrestrial lichens). Complex fire history is common. PL is commonly associated with PB ecosystems.
RB	Recent Burn	Recent burn (<10 years old) with limited vegetation recovery. A recent burn in a previously-forested area would receive the designation of Forested, Recent Burn. This would be differentiated from Non-forested areas by the presence of standing and downed snags, indicating forested conditions.
SF	White Spruce - Feathermoss	A closed canopy, white spruce (*Picea glauca*) dominated forest community occurring on both level conditions and cool aspects. The shrub understory is usually sparse and ground cover is dominated by a thick layer of feathermoss. Pine may be interspersed throughout the canopy. Old stands may contain juniper; moist sites may contain mossberry and Labrador tea.
SL	White Spruce - Lichen - Grass	Open canopy white spruce stands growing on level medium textured soils with rapid drainage. Mixed spruce and pine canopy with predominantly lichen, grass and dwarf shrub groundcover. Lichen is not as dominant as the PL ecosystem unit. Willow or shrub birch may be interspersed throughout.
ST	White/Black Spruce – Labrador Tea	Acidic, cool (possibly permafrost), moist to wet soils for portions of the year. Tree cover can be white or black (*Picea mariana*) spruce. Forest canopy is usually sparse and a thick layer of moss and Labrador tea in the understory. Limited shrub cover. Poor sites often in association with depressions and seepage areas. ST usually forms on mineral soils with peaty surface horizons.
SW	White Spruce - Willow	Open canopy white spruce forests growing on a variety of sites but tending towards mesic, with moderate-high moss cover and a prominent shrub layer. Both willow and shrub brush may be present. Moss cover is variable. Depressions may contain Labrador Tea and mossberry.
BOREAL LOWLAND FORESTED		
RB	Recent Burn	Recent burn (<10 years old) with limited vegetation recovery. A recent burn in a previously-forested area would receive the designation of Forested, Recent Burn. This would be differentiated from Non-forested areas by the presence of standing and downed snags, indicating forested conditions.
SB	Spruce Bog	Acidic, partially saturated soils for portions of year. Partially forested with variable cover of willow and shrub birch. Bogs are rare in southern Yukon due to the dry climate.
SF	White Spruce - Feathermoss	Spruce-feathermoss forests that occur in riparian zones and on alluvial terraces can have variable but usually

		limited development of shrub understory. Moist sites may have extensive horsetail (*Equisetum* spp.) cover on rich, organic soils. They are generally not influenced by active flooding and deposition. These sites contain some of the most productive forests in southern Yukon.
SP	White Spruce - Balsam Poplar Riparian	Generally limited to lowland riparian areas with rich organic soils. Are periodically influenced by flooding and similar low intensity disturbances. They tend to be structurally complex and are affected by fire to a lesser degree than upland stands.
ST	White/Black Spruce – Labrador Tea	Acidic, cool (possibly permafrost), moist to wet soils for portions of the year. Tree cover can be white or black (*Picea mariana*) spruce. Forest canopy is usually sparse and a thick layer of moss and Labrador tea in the understory. Limited shrub cover. Poor sites often in association with depressions and seepage areas. ST usually forms on mineral soils with peaty surface horizons.
SW	White Spruce - Willow	Wettest of the spruce-willow communities. Well developed herbaceous and graminoid cover is common.
BOREAL VEGETATED NON-FORESTED		
BG	Sphagnum Bog	Acidic, sphagnum moss dominated wetlands where scattered spruce, willows and shrub birch may be present. They are not connected to local watertables.
FE	Sedge Fen	Productive, sedge dominated wetlands occurring in alkaline conditions where standing water is common. Thick growth of sedge (*Carex* spp.) is common. Fens are connected to local hydrologic flows.
ME	Meadow	Herbaceous growth (sedge, grass) with fluctuating water table. Many meadows remain dry for large periods of the year.
MR	Marsh	Non-forested, saturated mineral soils. Open, shallow water is usually present with emergent sedge and grass cover.
RB	Recent Burn	Recent burn (<10 years old) with limited vegetation recovery. A recent burn in a shrub (disclimax) area would receive the designation of Non-Forested, Recent Burn.
WA	Willow - Alder	Non-forested shrub communities (willow and alder) generally limited to riparian areas. Often in association with SP, SW and SF units.
WB	Willow - Shrub Birch	Non-forested willow and shrub birch meadows occur throughout the boreal and subalpine areas of the Southern Lakes ecoregion. A variable cover of grass, sedge, or lichen may be present, depending on site moisture regimes.
BOREAL NON-VEGETATED/SPARSELY VEGETATED		
CL	Cliff	Steep rock cliffs
ES	Erodible Slope, steep	Steep, non-vegetated or sparsely vegetated erodible slopes.
GS	Grass – Sage	Grass and sage communities limited to dry, steep warm

		aspect slopes. Often associated with the AB ecosystem unit.
GB	Gravel/Sand Bar	Gravel and sand bars in river or edgewater environments
LL	Lake, Large	Deep lake, no emergent vegetation, >60 ha
LS	Lake, Small	Shallow lake with limited emergent vegetation, <60 ha
OW	Open Shallow Water	Shallow water body with possible seasonal depth fluctuations and variable emergent vegetation.
RI	River	Large flowing water feature
RO	Rock Outcrop	Rock Outcrop