

2020

Dawson Planning Region Resource Assessment Report



**Dawson Regional
Planning Commission**

On The Land We Walk Together • Nän kāk ndä tr'ädäl

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Sincerely,

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Dawson Planning Region Resource Assessment Report **Executive Summary**

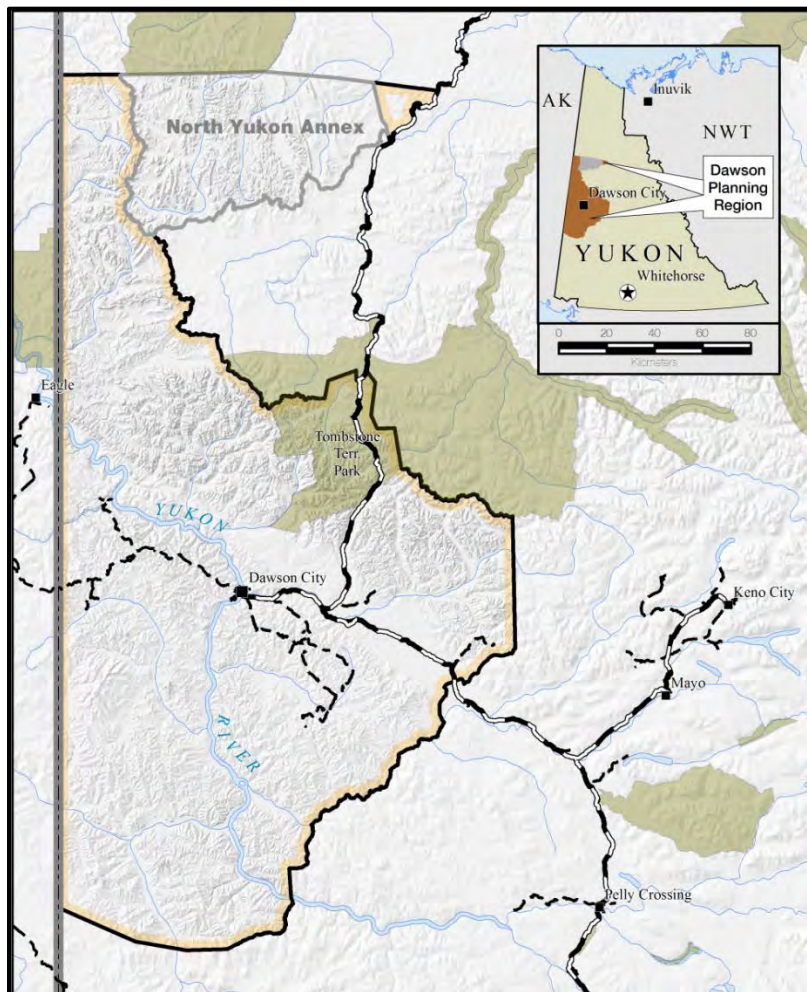


Executive Summary

Overview

The Resource Assessment Report (RAR) is intended to describe the natural, human, and economic resources in the Dawson Planning Region. This report is one of the key foundational planning products outlined in the Commission's Terms of Reference (TOR). The document is not an exhaustive description of every resource and their associated values, but rather it is intended to be a snapshot of the current state of knowledge – both scientific and traditional. The RAR is an informational document and does not attempt to assess land use conflicts or offer specific management strategies for the region.

The original RAR was developed and approved by the previous Commission in October 2013 and recently updated by the Parties (Tr'ondëk Hwëch'in and Government of Yukon) and the Yukon Land Use Planning Council (YLUPC).



Dawson Planning Region Boundary

Objectives of the Resource Assessment Report

The RAR has the following objectives:

- To document and describe the natural, human and economic resources of the region;
- To describe the historical, current and potential future land uses and land use patterns; and
- To describe the potential issues relating to current and future land uses.

The RAR is a reference document that provides information to support the development of a draft regional land use plan for the Dawson Region. It is important to note that the RAR is not intended to be the only source of information for the Commission. The report is a comprehensive, but not complete, compilation of existing data and information informed by the Parties, plan partners, and with input from the public. It is not an exhaustive description of every resource and their associated values, but rather it is intended to be a snapshot of the current state of knowledge – both scientific and traditional. The RAR is one of many sources of information (i.e. technical reports, government policy and studies, public submissions etc.) to support the Commission's decisions in writing the Draft Regional Land Use Plan.

How this Report Was Updated

This edition of the RAR has been updated from the original 2013 version with the assistance of the Commission's Technical Working Group (TWG). The mandate of TWG is to provide coordinated technical information and support to the Commission. TWG is composed of technical experts from YG, TH and YLUPC that provide input and advice to the Commission regarding relevant information, issues, policies and initiatives from both governments.

In 2018, the Parties and select federal departments were asked to submit comments and updates to the RAR, including any new or updated spatial data. With technical assistance from TWG, YLUPC updated the RAR to reflect the submitted comments and best available data. Every effort has been made to validate the accuracy of information and interpretations with contributing partners. The Commission is expected to review, modify if required, and adopt the report in accordance with the Commission's TOR.

In summary, resource assessments are dynamic and change over time in response to new research, information and understanding. For example, land use and land status change over time. Natural disturbances such as wildfire can also radically alter landscapes and habitats. In addition, climate change may alter existing land use conditions. Since the RAR is a snapshot in time, it is known that further information may be necessary to consider as the Commission's work on planning issues advances. While this report will not be continuously updated as part of this planning process, information sharing between the

Commission and the Parties will be ongoing to ensure that the Commission is incorporating the most contemporary and relevant information into the planning process.

Report Format

This report is organized into four major sections:

- **Section 1 – Framework and Regional Context**
An overview of the region from the perspective of relevant legislations and policies, socioeconomic landscape (e.g. economy, population), biophysical attributes (e.g. geological history, climate) and current land status.
- **Section 2 - Regional Resource and Land Use Descriptions**
Regional resources are identified and described in terms of their value (traditional, socio-cultural, economic and environmental), resource management (legislation and policy), and the risks and uncertainty associated with them.
- **Section 3 – Resource Summary Maps**
Twenty-seven resource summary maps were prepared to reflect the abundance, diversity and distribution of resource values across the regional landscape.
- **Appendices**
Key technical documents are included as appendices to this report.

Section 1

Chapter 2 - Vision Statement

Our Vision...

For the Region

The Dawson Region encompasses a unique landscape that enables our community to build a diverse economy while maintaining a rich cultural legacy and a healthy environment.

For the Process

Shared and respectful use of natural resources is guided by the principles of sustainable development, respect for heritage and culture, and conservation of fish and wildlife habitats. Ongoing community stewardship, based on consensus building, will achieve significant and lasting social, economic, and ecological benefits for all Yukoners.

For the Plan

Our regional plan will be crafted to reflect community values and will guide the integrated use and management of land, water, and resources.

Vision Statement ratified by the Dawson Regional Planning Commission on September 25, 2019

Chapter 3 - Relevant Legislation and Policies

In the Yukon, regional land use planning originates from the land claims and is established under Chapter 11 (Land Use Planning) of the Final Agreements, which specifies how land use planning shall be carried out. The Umbrella Final Agreement (UFA) and First Nation Final Agreements (FAs) between the Government of Canada, Government of Yukon (YG), and Yukon First Nations (YFNs) establish a policy framework and objectives for regional land use planning in the Yukon.

Resource sectors relevant to land use planning are administered and regulated, in some cases jointly, by the Federal, Yukon and First Nations governments. Regional land use plans must have regard for the regulatory environment while providing guidance on land and resource management in the planning region.

In this chapter of the report, a comprehensive list of relevant Federal, Territorial, and Tr'ondëk Hwëch'in legislation is highlighted and briefly described. The chapter also provides a listing of relevant policies, management plans, and best management practices (BMPs) that are in place or in development that pertain to regional planning and land use activities in the region.

Chapter 4 - People, Settlement and Economy

This chapter presents an overview of settlement patterns and the economy of the region. In addition, a description is provided of the historic and contemporary presence of the three self-governing First Nations (Tr'ondëk Hwëch'in, Vuntut Gwitchin and Na-cho Nyak Dun) whose Traditional Territories, as defined in the Final Agreements, are located within the region and an overview of historic and contemporary settlement patterns.

In summary, the Dawson region has a relatively small population that has seen a gradual increase of 22.4% over 10 years, with most residents residing in and immediately around Dawson City. As of September 2019, there was an estimated population of 2,350 people residing in Dawson and the immediate surrounding area, representing about 6% of the Yukon population

Chapter 5 - Biophysical Setting

This chapter provides a landscape scale description of physiography, geology, climate, glacial history, landscape types and natural disturbance regimes in the planning region. The details in this chapter also set the foundation for understanding the resource chapters in Section 2 of the report. In summary, key points in this chapter include:

Geology: The planning region is characterized by a diverse geology and is transected by the Tintina Trench. Geology is the foundation for the region's energy, mineral and water resources and also influences planning issues such as climate change and natural hazards.

Glacial History: As part of a greater ice-free landscape known as Beringia, most of the Klondike Plateau and the North Ogilvie Mountains remained ice-free for much of the last three million years. This extended unglaciated period has had a major influence on the landforms and ecology of the region.

Climate: The climate of the planning region is continental (i.e. little temperature moderation by oceans) with long, cold winters and relatively warm summers.

Ecozones and Ecoregions: The two ecozones (Taiga Cordillera and Boreal Cordillera) located in the planning area include six distinct ecoregions: Eagle Plains, Mackenzie Mountains, North Ogilvie Mountains, Yukon Plateau – Central, McQuesten Highlands and the Klondike Plateau.

Hydrology: The Yukon River is the largest river in the planning region and its significant tributaries include the White River, Stewart River and Klondike River. Wetlands also form an important part of the regional ecosystem covering about 10% of the planning region.

Climate Change: Average annual temperatures are increasing in the planning region and are predicted to increase by 4.7°C to 5.3°C by the end of 2100. Geographically varying increases in annual precipitation from +3cm in flatter terrain to +36cm in more mountainous areas are also expected by the end of this century.

Chapter 6 - Land Status

This chapter summarizes the current use and designation of land within the planning region. The chapter describes the Traditional Territories, Settlement Lands, protected areas and land use activities found in the region. In addition, the existing land use footprint is discussed including the potential implications of these disturbances on the landscape. In summary, key points in this chapter include:

- Tr'ondëk Hwëch'in has 135 parcels of settlement land within the region totaling 2,550.85km². This count does not include settlement land within community boundaries (e.g. Tr'ochëk).
- Protected areas in the planning region include nationally designated lands (e.g. Discovery Claim National Historic Site), lands designated by territorial legislation or Final Agreement (e.g. Tombstone Territorial Park) and lands designated by an adjacent planning process (i.e. the Peel Watershed and North Yukon planning regions) and adjacent international jurisdictions (e.g. Yukon-Charley Rivers National Preserve in Alaska).
- The disposition of Crown land in the planning region may occur by way of fee simple title, leasehold interest, resource use concession (e.g. trapping, outfitting) and/or land use permit.
- Key human activities contributing to the existing land use footprint in the region include linear features (e.g. roads), developed areas (e.g. settlements) and resource development (e.g. gravel pits, quartz exploration and mining, placer mining). These activities have the potential to create cumulative effects on ecological, cultural and socioeconomic values in the planning region.

Section 2

Chapter 7 - Resource Values

A key objective of Chapter 11 (Land Use Planning) in FN Final Agreements is “to ensure that social, cultural, economic and environmental policies are applied to the management, protection and use of land, water and resources in an integrated and coordinated manner so as to ensure Sustainable Development”. In addition, the FN Final Agreements state that the land use planning process must take into account First Nation traditional values. Accordingly, this chapter defines how resources in the planning region are described in the RAR in terms of their contribution to, and impact on, natural, traditional, socio-cultural and economic values.

The five values identified and defined in this chapter have been used to provide context to each resource described in the report:

**Natural Value | Traditional Value | Socio-Cultural Value | Traditional Economy
| Economic Value**

These five values relate to each other and the intention is not to hold them separate but rather create a holistic picture of each resource to assist the Commission when considering land use decisions that ensure for sustainable development.

Chapter 8 - Heritage

Due to its history and unique geological landscape, the region is rich in heritage resources including, but not limited to, historical, archaeological, and paleontological records. This section describes the inventory of heritage resources that are found in the Dawson Planning Region, and identifies areas of heritage artifact potential in the region that remain undisturbed. This section also highlights the interpretation of heritage from a First Nations’ perspective, broadening the definition to include an understanding of heritage as a way of life that is rooted by a strong relationship with the land.

Heritage resources are defined and interpreted differently by the Government of Yukon and the First Nations governments of the region. Key points in this chapter include:

- First Nations in the region have a broader interpretation of heritage resources than what is defined in Government of Yukon legislation.
- First Nations view their traditional territory as a holistic cultural landscape, with land at the center of culture. Heritage is understood as a way of life that is alive and changing.

- Tr'ondëk Hwëch'in have traditionally occupied, travelled or harvested in virtually every corner of the planning region. Traditional use sites, spiritual and story locales, harvest areas, as well as long ago sites all contribute to the cultural fabric of the TH landscape.
- The region holds the highest concentration of historic sites in the territory, relating to gold mining from the late 19th century to the 1960s, First Nations' history and early fur trade in the region.
- Prehistoric and archaeological sites in the planning region span the period from the end of the last Ice Age to historic times.
- Placer mining activity has been one of the principal discovery mechanisms of ice age fossil remains with exceptional preservation. Virtually every creek with intact frozen silts and gravels in the unglaciated parts of the planning region has potential for paleontological resources.
- Heritage resources are an important attraction for the region and provide substantial economic benefits through heritage tourism.
- Large areas of the planning region have not been surveyed for heritage resources. Increasing land access and human activities, particularly land clearing and disturbance of sediments, has the potential to create adverse impacts on resources. Heritage resource assessments and the use of best management practices can help in mitigating potential impacts.
- YG has identified specific areas that are expected to have high concentrations of heritage resources that are at risk of loss due to increased demand for land access and human activities.
- The proposed Tr'ondëk—Klondike World Heritage Site region is on Canada's shortlist to be nominated as a UNESCO World Heritage Site. The proposed property submitted to UNESCO in January 2017 comprised 38,251.26 hectares of lands and water, including the Bonanza Creek valley and parts of the Klondike and Yukon River Valleys. In 2018, the nomination was withdrawn by Canada for reassessment, to be resubmitted for UNESCO's consideration in the future.
- The effects of climate change have the potential to impact heritage resources through thawing of permafrost, rising water levels, accelerated erosion and sedimentation, and more frequent storms and wildfires.

Chapter 9 - Water

Water resources in the region (e.g., rivers, lakes and wetlands) are highly valued for their role in supporting economic development; providing important fish and wildlife habitat, food, and drinking water; and facilitating transportation connections. In addition, water has spiritual and aesthetic values and provides opportunities for traditional economic activities. However, relatively little is known about the region's water resources. This chapter characterizes water resources in the region, identifies gaps in knowledge and provides an understanding of the regulatory processes concerning its use. The chapter also emphasizes the importance of water to the health and productivity of region's ecosystems, people and economy. Key points in this chapter include:

- Water's location and availability is never static and each phase of the hydrologic cycle plays an important role in supporting ecosystems.
- The Yukon River is a major contributor of water and solutes to the Bering Sea and Arctic Ocean ecosystems. Changes in the Yukon River, to either flow or water quality, could also influence these ecosystems.
- Few lakes or large open water wetlands exist in the region and all are significant to waterfowl.
- Water resources of the region are highly valued for habitat, sustenance, transportation, economic activity, recreation and spiritual qualities.
- Limited data on water resources exists in the planning region. As of January 2019, the region has two active hydrometric stations, three active snow survey courses, one long term water quality monitoring station and three long-term groundwater monitoring stations. These facilities are managed by the Water Resources Branch.
- Break-up of the Yukon River at Dawson has advanced by a week in the last 30 years.
- Stresses on watersheds from increased development pressure and climate change can compromise the health and productivity of aquatic and terrestrial ecosystems and affect their ability to provide ecosystem services.
- Future industrial demand for water is expected to increase.
- A large number of industries in the region utilize water, rely on the availability of water for their operations and have the potential to impact water resources.
- Placer mining dominates the allowable licensed use by a substantial margin, accounting for 93% of the gross allowable water use.
- Water use and protection are considered during assessment and regulatory processes. Water licenses contain operating conditions, discharge standards and requirements for monitoring, sampling and reporting.

- Tr'ondëk Hwëch'in Elders and community members have identified water as of utmost importance, essential for the health of every part of the land and for every aspect of survival.
- The Government of Yukon is developing a wetland policy for the territory and, depending on timing, could be used to help guide the land use planning process in the Dawson Region.
- Potential impacts to water resources associated with climate change include changes to soil moisture and runoff regimes, shifts in vegetation, changing drainage from permafrost loss and altered fire cycles.

Chapter 10 - Forests

The region's forested areas are important from environmental, economic and sociocultural perspectives. The forested areas in the planning region are an extension of the boreal forest zone that spans the continent from Yukon to the Atlantic coast in Labrador. Of the 26,223 km² of the planning region that lies within the Boreal ecozone, approximately 75% is covered by either coniferous (60%) or mixed (15%) forest. Most of the planning region north of the Ogilvie Mountains lies within the un-forested Taiga Cordillera ecozone.

Many connections can be made in this chapter to other resource values discussed in the RAR, such as transportation and access, wildlife habitat, and tourism and recreation. Key points in this chapter include:

- The forested areas of the region are part of a large circumpolar boreal region and these forest ecosystems are complex and dynamic.
- The boreal forest provides essential habitat for many of the region's flora and fauna, including moose and caribou. It also helps mitigate climate change as the boreal forest processes and stores carbon.
- Wildfire is an important driver of diversity in forest type, seral stage and age class, which in turn provides a variety of habitats for birds and wildlife, cultural landscapes and harvest opportunities.
- Forests boast a number of important values including:
 - Environmental: Ecosystem services such as fresh water, carbon storage, and erosion control; fish and wildlife habitat.
 - Economic: Timber and other harvested forest products, tourism opportunities, trapping and hunting, and traditional economic activities.
 - Social and Cultural: Cultural and historic resources, traditional arts, outdoor recreation opportunities, and natural beauty.

- The *Forest Resources Act* provides a comprehensive planning, tenure, compliance and enforcement regime to support the sustainable use and management of forests in the region.
- As per Chapter 17 of the THFA, forest management in the region is guided by the Dawson Regional Forest Resources Management Plan which was developed in partnership between Government of Yukon and Tr'ondëk Hwëch'in.
- Government of Yukon and Tr'ondëk Hwëch'in have recently established a monitoring program with indicators to assist forest managers in making informed decisions about best management practices.
- During the first Dawson Regional planning process, Land Management Units identified in the Plan Alternatives package were generally based on the Dawson Forest Land Use Zones.
- The Dawson Forest Resources Management Plan must be consistent with the Dawson Region Land Use Plan in accordance with the THFA.
- There are currently 12 Timber Harvest Plans (THP) that have been developed in the Dawson Region and there is interest in developing a THP for the gold fields area.

Chapter 11 - Fish and Wildlife Habitat

Relative to other parts of Canada, the planning region is remote and largely undeveloped. The region supports a variety of wildlife species including moose, caribou, sheep, furbearers, freshwater fish and salmon. This chapter focuses on fish and wildlife habitat in the region with emphasis on focal species and their habitat requirements. Wildlife and habitat information for focal species, fish and birds in the planning region was taken from a variety of research and local knowledge sources. In addition, more recent species information was provided by Tr'ondëk Hwëch'in and Government of Yukon through review of this report. Key points in this chapter include:

- Focal Species are identified at a landscape scale due to the fact that they are widely dispersed and their habitat requirements also encompass many other species' habitats. For example, a healthy grizzly bear habitat not only benefits the grizzly bear, but many other species that live within the same landscape.
- There are many species that occur in the region that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and subsequently listed on *Schedule 1* of the Species at Risk Act (SARA), including grizzly bear, wolverine and caribou.
- There are 46 mammal species in the planning region and mammalian biodiversity is higher in the southern portions of planning region.

- Moose populations appear stable within the TH traditional territory, however there are a few 'Game Management Sub-Zones' that are experiencing over-hunting pressures likely due to the ease of access.
- Key areas for waterfowl include wetlands, riparian areas adjacent to rivers and creeks and the flyway along the Tintina Trench.
- Due to the migratory habits of salmon and caribou, there are additional transboundary management considerations both nationally and internationally.
- Mineral licks, lakes and wetlands, riparian zones, grassland slopes, unglaciated mountains, springs, old growth forest and rare plants all represent important habitat requirements for the animals of the region.
- Wetlands are considered ecological hotspots and are considered to have a high threat magnitude in the region.
- For most species, late winter habitat is most critical for survival although it may not be used every year.
- The Tintina Trench is a major migration route within the planning region, and the diversity of habitats within it sustains a wide range of birds.
- Fish and wildlife habitat are a valued resource in the region both for direct (e.g. hunting, trapping) and indirect (e.g. wildlife viewing, tourism) use values.
- It is largely recognized that reducing habitat fragmentation and maintaining landscape and habitat connectivity is an important consideration for regional planning.

Chapter 12 - Protected Areas and Conservation Opportunities

Within Yukon, regional land use planning under Chapter 11 of the Final Agreements is one of the primary tools used to identify new protected and conserved areas. These areas can serve to protect fish and wildlife habitats, areas of cultural and historic significance and the traditional economy. This chapter describes the site selection elements and site/network design elements of conservation planning. It also highlights differences in approaches between the indigenous and western perspectives in conservation planning. Key points in this chapter include:

- When planning for protected and conserved areas, key considerations include an understanding of ecological representation, areas important for biodiversity and focal species.
- Landscape connectivity is integral to healthy, sustainable, and resilient ecosystems.
- The Dawson planning region includes one existing protected area (Tombstone Territorial Park) and three directly adjacent protected areas (Kit Range / North Cache Creek SMA, Yukon-Charley National Preserve and Fishing Branch Habitat Protection Area).

- Land use planning in the north should plan for the impacts of a changing climate. For example, changes in vegetation, shifting wildlife habitats and an increase in disturbance regimes (e.g. fire).
- Areas of broad conservation interest in the planning region include intact subwatersheds, river corridors, wetlands and the Tintina Trench flyway.
- Protected area planning must equally consider western science and traditional/community knowledge and interests, while respecting indigenous values and perspectives.
- The Tr'ondëk Hwëch'in are currently working on a Land Stewardship Framework (LSF) that will help inform the regional planning process. The overall purpose for the LSF is to enable TH to take strong stewardship actions over the lands and waters in TH Traditional Territory.

Chapter 13 - Minerals

For over a century, economic development in the planning region has been closely linked to its mineral deposits. This chapter discusses various aspects of placer and quartz (hard rock) potential, mineral exploration and production activities and regulations that apply to the mining industry. Key points in this chapter include:

- Hard rock (quartz) mining and placer mining are distinct and different land use activities; each has its own unique pattern of exploration, development, production and reclamation.
- As of September 2019, there are 39,466 active quartz claims in the planning region covering an area of 7,778.9 km², or 19.5% of the region.
- Hard rock mineral exploration is a significant economic activity within the planning region. In 2018, exploration expenditures in the region reached a record high of \$147 million.
- As of July 2019, there are 14 active mineral exploration projects in the planning region being undertaken by nine companies (or individuals). These projects employ over 400 workers (both full-time and temporary) of which 13% are First Nations people and 11% live in the Dawson area.
- The Coffee Gold Project is a proposed open-pit gold mine that is expected to be in operation for 8-10 years with potential for expansion. The mine is expected to contribute \$251.1 million to the Yukon economy annually during production and contribute \$427.5 million to government revenues, in the form of taxes and royalties, over its lifetime.
- In 2017, placer gold production in the Yukon was an estimated value of \$120 million.
- The Dawson Placer Mining District is by far the most productive placer mining district in the territory.

- As of December 2018, there are 18,291 active and pending placer claims in the planning region covering an area of 2,556 or 5.6% of the region. Claims are primarily located within the watersheds of the Klondike, Indian, west Yukon (Fortymile, Sixtymile and Moosehorn Range rivers) and lower Stewart rivers.
- Mineral claim and lease staking can impact ecological and cultural values.
- Mineral exploration is an extensive activity with potential for adverse cumulative effects on ecological and cultural resource values.
- Hard rock mine development occurs on a very small footprint, but with potentially significant and enduring environmental and socio-economic impacts.

Chapter 14 - Energy

Economic and population growth in the region is increasing the demands for energy. With a growing population and increasing resource development, governments and industries are actively seeking new sources of energy, including potential new sites for hydroelectric and other projects. Continued development in the mining sector is placing additional pressure to identify adequate and cost-effective local sources of energy production. Key points in this chapter include:

- Transportation, commercial, residential, and industrial are the major sectors for energy consumption in the Yukon.
- The northern section of the planning region includes portions of two sedimentary basins with identified potential for oil and natural gas resources: the Eagle Plain and Kandik basins.
- Government of Yukon is not proceeding with the development or regulation of unconventional hydrocarbons (i.e. extracted by means of hydraulic fracturing) at this time.
- Hydrocarbons continue to be a major source of energy.
- Demand on existing hydroelectric infrastructure continues to rise with new construction and major mining projects.
- Exploration of a hydro generation facility is underway for the North Fork area.
- Biomass energy (fuelwood) is an important resource for heating in the region and there will likely be increased demand for wood energy over the short and long term.
- Solar energy for heating and electricity is a viable seasonal option.
- There has been limited assessment of sources and options for wind and geothermal energy in the region.
- There are potential negative impacts to the natural value of the region associated with development of renewable and non-renewable energy resources.

- Future energy requirements in the planning region will depend on population trends, energy efficiency of municipal and territorial infrastructure, and the level and type of economic development activities.

Chapter 15 - Agriculture

The Dawson Planning Region contains some of the most productive agricultural land in the Yukon. High quality agriculture soils are associated with the flood plains and lower terraces of major river valleys. In this region, there are extensive suitable agricultural areas along the Yukon (both upstream and downstream of Dawson), the lower Stewart River as well as along the Indian River and the Klondike River. This chapter summarizes agricultural potential in the region including soil capability; climate; water considerations; existing and future potential production; and strategic planning considerations. Key points in this chapter include:

- The areas of West Dawson, Sunnydale, Henderson's Corner, and the Klondike Valley contain large areas of suitable agricultural land.
- As of 2018, there are approximately 40 titled lots derived from agriculture land programs (i.e. Spot Land Program). However, spot land applications for agriculture have caused land use conflicts with YFN and individuals who apply in the region.
- TH has noted several Settlement Land parcels that are suitable for agriculture in the region.
- Current agricultural production in the Dawson region is geared towards the local market with an emphasis on direct sales, either at the farm gate or at the weekly farmers' market in the summer. The majority of sales are for fresh vegetables and eggs, although bedding plants, dairy, and meats are increasing.
- Agricultural development may impact traditional activities and disturb heritage resources.
- Improper management practices can result in adverse impact to wetlands and wildlife habitat.
- Yukon's agriculture policy states that no significant loss of key wildlife habitat will occur as a result of new agricultural land development.
- Some activities on agricultural land are assessed by the Yukon Environmental and Socio-Economic Assessment Board (YESAB).
- The Tr'ondëk Hwëch'in Teaching and Working Farm is a valued cultural and economic resource.

Chapter 16 - Tourism and Recreation

The Dawson region is an important destination for visitors to the Yukon. Well-known historical and cultural attractions, along with wilderness destinations such as the Yukon River and Tombstone Territorial Park and road-accessible tundra landscapes, continue to attract visitors. People visit the region to explore history, cruise and paddle historic and wild rivers, hike through sub-arctic landscapes, and learn about the cultural heritage of the Tr'ondëk Hwëch'in. Dawson City is a critical component of the region's tourism sector with its well-established tourism opportunities. This chapter highlights tourism and recreation infrastructure within the region, discusses the current state of the tourism industry and presents potential opportunities for the future. Key points in this chapter include:

- Scenery, wildlife viewing, Klondike gold rush history, and historical attractions are identified as key tourism attributes of the region.
- Historic resources and attractions tied to gold rush history are concentrated in and around Dawson City.
- Linear heritage features, particularly the Ridge Road Trail and Yukon Ditch are popular for motorized and non-motorized recreational use.
- Tourism provides seasonal and year-round jobs for local residents, as well as seasonal jobs for transient summer workers.
- Dawson residents are primary users of the recreation resources in the region.
- Opportunities for growth include winter activities, lodge-based tourism, First Nation cultural interpretation tours, and ecotourism.
- Areas with high potential for new and expanded recreation activities include the Yukon River Corridor and Forty Mile area; Ogilvie Mountains and Dempster Highway Corridor; the Yukon Ditch trail network; and the Top of the World Highway.
- The Regional Economic Development Plan for the Tr'ondëk Hwëch'in Traditional Territory identifies opportunities for growth including FN cultural heritage sites (e.g. Tr'ochëk) and Tombstone Territorial Park (including the Dempster Highway).
- Another major tourism opportunity for the region is the potential Tr'ondëk-Klondike UNESCO World Heritage Site. The bid for this designation is currently on hold but may be resubmitted in the future by the project partners.
- Visitation data shows significant increases in visitor numbers and tourist spending. New attractions such as the Inuvik to Tuktoyaktuk highway may continue to contribute to this rise in the region.
- Tourism operators note that land use and access are potential barriers to business growth. There is limited access to land for infrastructure and uncertainty about land tenure.

- Increased resident and visitor use of popular routes and destinations may impact environmental and cultural values and resources in the region.
- Best management practices and cross-industry cooperation are key to maintaining a quality wilderness and/or cultural tourism experience.

Chapter 17 - Transportation and Access

Regional access and transportation networks are vital for the movement of people, food, freight, construction materials, fuel, and other goods and supplies. Transportation networks and infrastructure also have a major influence on land use patterns and economic development. This chapter provides an overview of land, water and air-based access in the planning region. Aggregates are also included in this chapter because their primary purpose is as a key resource vital for construction and maintenance of transportation networks. Key points in this chapter include:

- Major transportation assets of the region that allow for economic, traditional and recreational activities include: three highways, a community airport and airstrips, an international border crossing, the Yukon River Corridor, a traditional trail system, and numerous secondary roads and trails.
- The Yukon River is the major navigable waterway in the region and one of the most valuable resources to TH and many others. It is a key transportation corridor and essential to traditional economic activities.
- Shared corridors provide economic and ecological advantages. However, route selection for new all-season corridors is difficult without full cost accounting and consideration of potential environmental, social and cultural impacts.
- Increased access in the region can have positive and negative effects on traditional, socio-cultural and economic values. However, the impact of increased access on natural values of the region is generally negative.
- The impact of access on ecological integrity and wildlife varies with:
 - size and extent of access features,
 - level of activity associated with those features, and
 - success of mitigation measures designed to minimize these impacts.
- Limits to access affect the ability of resource users to pursue economic, recreational or cultural activities.
- Aggregate resources are limited in the Dawson Region and their availability must be taken into consideration when planning large infrastructure projects and access routes.
- Yukon Government is currently developing a Resource Road Regulation and an Off-Road Vehicle Regulation which will guide access decisions in the territory.

- The proposed Northern Access Route (NAR) involves upgrading existing roads and will require a total of approximately 20% (37km) of new road construction to connect existing portions, along with various upgrades to existing road and stream crossings, starting from the Klondike Highway near Dawson City and extending south to the proposed Coffee Mine project.
 - Climate change presents risk to the stability of transportation infrastructure and uncertainty in route planning to avoid permafrost areas.
-

Section 3

Resource Summary Maps

Twenty-seven resource maps were created to accompany the Resource Assessment Report. For online access of **Section 3: Resource Maps**, please visit <https://dawson.planyukon.ca/index.php/the-dawson-region>

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List of Acronyms

CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
DR	Dawson Region
DRLUP	Dawson Regional Land Use Plan
DRPC	Dawson Regional Planning Commission
EMR	Department of Energy Mines and Resources
FN	First Nations
IPCC	Intergovernmental Panel on Climate Change
KATTS	Klondike Active Transport and Trails Society
KPMA	Klondike Placer Miners Association
KVA	Klondike Visitors Association
LMU	Land Management Unit
NEF	National Ecological Framework
NND	First Nation of Na-cho Nyak Dun
NWT	North West Territory
NYA	North Yukon Annex
PCMB	Porcupine Caribou Management Board
SARA	Species at Risk Act
TH	Tr'ondëk Hwëch'in
THFA	Tr'ondëk Hwëch'in Final Agreement
TOR	Terms of Reference
TT	Traditional Territory
UFA	Umbrella Final Agreement
UNESCO	United Nations Educational, Scientific and Cultural Organization
VGFN	Vuntut Gwitchin First Nation
WRFN	White River First Nation
YBEC	Yukon Bioclimate Ecosystem Classification
YCM	Yukon Chamber of Mines
YESAA	Yukon Environmental and Socio-Economic Assessment Act
YESAB	Yukon Environmental and Socio-Economic Assessment Board
YFN	Yukon First Nations
YG	Government of Yukon
YGS	Yukon Geological Survey
YLUPC	Yukon Land Use Planning Council
YPS	Yukon Placer Secretariat

Section 3 - List of Resource Summary Maps

Map

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APPENDIX A: Dawson Land Use Planning Mineral Potential Assessment

2013. W.E. Kilby. Yukon Geological Survey, Miscellaneous Report 8. Whitehorse, Yukon, Canada.

APPENDIX B: Dawson Forest Resources Management Plan

2013. Dawson Forest Management Planning Team. Yukon, Canada.

APPENDIX C: Tombstone Territorial Park Management Plan,

2009. Government of Yukon, Department of Environment. Whitehorse, Yukon, Canada.

APPENDIX D: We are Dënezhu. The People of this land.

2019. Tr'ondëk Hwëch'in. Dawson, Yukon, Canada.

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Section 1



Framework and Regional Context

1 INTRODUCTION

1.1 Background

The Dawson Regional Planning Commission (herein referred to as “DRPC” or “the Commission”) was initially established in August 2010, with a mandate to recommend a regional land use plan for the Dawson planning region to the Yukon Government (YG), Tr’ondëk Hwëch’in (TH) and Vuntut Gwitchin First Nation (VGFN), as described in Terms of Reference for the planning process (YLUPC, 2009).

The key task of the Commission, as described in the Terms of Reference, was to “create a vision of future land use, including identifying conservation and development areas, and providing land use decision makers with guidance and direction.” During the planning process, the Commission was required to:

- Identify regional issues and interests;
- Identify areas where regional land use conflicts are occurring or may occur;
- Summarize the valued resources of the region;
- Establish plan goals and objectives;
- Provide regional management direction; and
- Apply a land designation system, including priority areas for conservation and land development.

In December 2014, the Parties (YG, TH, VGFN) agreed to temporarily suspend the Dawson regional land use planning process until litigation related to the Peel Watershed Regional Land Use Plan was resolved. The work that was done by the Commission was preserved for reference once the planning process resumed.

Following the Supreme Court of Canada ruling in late 2017, the DRLUP process resumed in 2018 with a new Terms of Reference that included the following key changes:

- 1 The process would continue under the guidance of a newly appointed Commission, the members of which were appointed in early 2019.
- 2 The planning boundary for the region was revised to reflect an agreement between VGFN and the TH with respect to overlapping traditional territories.
- 3 The Approval Parties for the regional land use plan will be TH and YG as both governments own and administer land within the Dawson planning region (Tr’ondëk Hwëch’in and Yukon Government, 2018).

- 4 The newly established Commission is tasked to produce a number of planning products to fulfill its planning and public engagement responsibilities, as outlined in the updated Terms of Reference, including a recommended land use plan for the Dawson Planning Region (Tr'ondëk Hwëch'in and Yukon Government, 2019).

1.2 Understanding the Resource Assessment Report

1.2.1 Overview

This report is one of the key foundational planning products outlined in the Commission's TOR (Tr'ondëk Hwëch'in and Yukon Government 2019). The Resource Assessment Report (RAR) is intended to describe the natural, human, and economic resources in the Dawson Planning Region. The document is not an exhaustive description of every resource and their associated values, but rather it is intended to be a snapshot of the current state of knowledge – both scientific and traditional. The RAR is an informational document and does not attempt to assess land use conflicts or offer management strategies for the region.

The original RAR was developed and approved by the previous Commission in October 2013 and recently updated by the Parties and YLUPC. In accordance with the Commission's TOR, the Commission is encouraged to review, modify if required and adopt the RAR.

1.2.2 Objectives of the Resource Assessment Report

The Dawson Planning Region RAR has the following objectives:

- To document and describe the natural, human and economic resources of the region;
- To describe the historical, current and potential future land uses and land use patterns; and
- To describe the potential issues relating to current and future land uses.

The RAR provides information to support the production of a draft regional land use plan for the Dawson Region. Readers are encouraged to refer to the referenced documents for greater detail.

It is important to note that the RAR is not intended to be the only source of information for the Commission. The report is a comprehensive, but not complete, compilation of existing data and information from the Parties, with input from the public. The RAR is one tool of

many in the planning toolbox to assist the Commission in the production of the regional land use plan.

1.2.3 How this Report Was Updated

This edition of the RAR has been updated from the original version with the assistance of the Commission's Technical Working Group (TWG). The mandate of TWG is to provide coordinated technical information and support to the Commission. TWG is composed of technical experts from YG, TH and YLUPC that provide input and advice to the Commission regarding relevant information, issues, policies and initiatives from both governments.

In 2018, the Parties and select federal departments were asked to submit comments and updates to the RAR, including any new or updated spatial data. With technical assistance from TWG, YLUPC updated the RAR to reflect the submitted comments and best available data. Every effort has been made to validate the accuracy of information and interpretations with contributing partners. The Commission is expected to review, modify if required, and adopt the report in accordance with the TOR (TH & YG, 2019).

In summary, resource assessments are dynamic and change over time in response to new research, information and understanding. For example, land use and land status change over time. Natural disturbances such as wildfire can also radically alter landscapes and habitats. In addition, climate change may alter existing land use conditions. Since the RAR is a snapshot in time, it is anticipated that further information may be necessary to consider as the Commission's work on planning issues advances. While this report will not be continuously updated as part of this planning process, information sharing between the Commission and the Parties will be ongoing to ensure that the Commission is incorporating the most contemporary and relevant information into the planning process.

1.2.4 Data Sources and Maps

All spatial data used in the 2013 edition of the RAR was inventoried and revised, if updates were available from the Yukon Government's GeoYukon data portal, TH or other YG departments. For data where updates were not available from the Parties, information was further assessed to determine if it should be included in the revised RAR. As a result, some data from the 2013 edition was used again in this report. However, some data was removed from this report if it was no longer current. Spatial data sets regarding sensitive cultural or ecological resources are not included with the report but will be considered in the future work of the Commission.

1.2.5 Report Format

This report is organized into four major sections:

- **Section 1 – Framework and Regional Context**
An overview of the region from the perspective of relevant legislations and policies, socioeconomic landscape (economy, population etc.), biophysical attributes (geological history, climate, etc.), and current land status.
- **Section 2 - Regional Resource and Land Use Descriptions**
Ten (10) regional resources are identified and described in terms of their value (socio-cultural, economic and environmental), resource management (legislation and policy), and the risks and uncertainty associated with them.
- **Section 3 – Resource Summary Maps**
Twenty-seven (27) resource summary maps were prepared to reflect the abundance, diversity and distribution of resource values across the regional landscape.
- **Appendices**
Key technical documents are included as appendices to this report.

1.3 Regional Interests and Issues

In accordance with the TOR, one of the planning products the Commission must prepare is an Issues and Interests Report. This report provides a summary of regional interests and planning issues and ultimately frames what the land use plan will try to achieve. The RAR is a supporting document to assist the Commission in achieving their goals related to the themes identified in the Issues and Interests Report.

In the spring of 2011, the Commission held community consultations and solicited written submissions to identify issues and interests in the planning region. Subsequently, the Commission released an Interests and Issues Report in December 2011, summarizing stakeholder input (DRPC, 2011). In 2018, the Issues and Interest Report (I&I) was re-circulated to the parties to review and update as necessary to reflect any changes to the core issues that have surfaced since the original document was created in 2011.

1.3.1 Interests and Issues: 2011

Management of cumulative effects, promotion of economic diversity and maintenance of ecological integrity were common concerns from a wide range of perspectives. Access was clearly identified as a significant management concern, as an opportunity for realizing economic potential, and as a threat to sensitive areas and vulnerable wildlife populations.

The Commission recognized that the diverse ecological, cultural and economic interests all share a common resource base. Four main themes for a land use plan were identified in the 2011 Interests and Issues Report from public consultation and written submissions:

- 1 Mineral Exploration and Mining**
- 2 Conservation of Fish and Wildlife Habitat**
- 3 Defining a “Workable Balance” for Sustainable Development**
- 4 Land Use Conflict within the Yukon River Corridor**

For more complete discussion of issues in the 2011 report, please refer to the original document which is available on the Commission’s website (DRPC, 2011).

1.3.2 Interests and Issues 2019

When the planning process resumed in 2018, the Parties were asked to review their submissions for the Issues and Interests Report (2011) and amend as necessary to reflect their current interests and issues in the planning region. In accordance with the TOR, the Commission is encouraged to review, modify if required, and adopt the Issues and Interests Report once the report has been updated by the Parties and YLUPC. (TH&YG, 2019).

1.4 Context for Regional Land Use Planning in Yukon

Regional planning in the Yukon is rooted in the Umbrella Final Agreement (1993) and enshrined in the Constitution of Canada. The Tr’ondëk Hwëch’in Final Agreement (1998) establishes the goals and objectives for planning in the region.

Chapter 11 of Yukon First Nation Final Agreements (FAs), Land Use Planning, sets out the following objectives for a common planning process outside community boundaries (NND – DIAND 1993, VGFN – DIAND 1993, TH – DIAND 1998):

11.1.1	The objectives of this chapter are as follows:
11.1.1.1	to encourage the development of a common Yukon land use planning process outside community boundaries;
11.1.1.2	to minimize actual or potential land use conflicts both within Settlement Land and Non-Settlement Land and between Settlement Land and Non-Settlement Land;
11.1.1.3	to recognize and promote the cultural values of Yukon Indian People;
11.1.1.4	to utilize the knowledge and experience of Yukon Indian People in order to achieve effective land use planning;
11.1.1.5	to recognize Yukon First Nations' responsibilities pursuant to Settlement Agreements for the use and management of Settlement Land; and
11.1.1.6	to ensure that social, cultural, economic and environmental policies are applied to the management, protection and use of land, water and resources in an integrated and coordinated manner so as to ensure Sustainable Development.

Section 11.4.5 of the FAs establishes the mandate for a Regional Land Use Planning Commission:

11.4.5	In developing a regional land use plan, a Regional Land Use Planning Commission:
11.4.5.1	within its approved budget, may engage and contract technical or special experts for assistance and may establish a secretariat to assist it in carrying out its functions under this chapter;
11.4.5.2	may provide precise terms of reference and detailed instructions necessary for identifying regional land use planning issues, for conducting data collection, for performing analyses, for the production of maps and other materials, and for preparing the draft and final land use plan documents;
11.4.5.3	shall ensure adequate opportunity for public participation;
11.4.5.4	shall recommend measures to minimize actual and potential land use conflicts throughout the planning region;
11.4.5.5	shall use the knowledge and traditional experience of Yukon Indian People, and the knowledge and experience of other residents of the planning region;
11.4.5.6	shall take into account oral forms of communication and traditional land management practices of Yukon Indian People;
11.4.5.7	shall promote the well-being of Yukon Indian People, other residents of the planning region, the communities, and the Yukon as a whole, while having regard to the interests of other Canadians;

11.4.5.8	shall take into account that the management of land, water and resources, including Fish, Wildlife and their habitats, is to be integrated;
11.4.5.9	shall promote Sustainable Development; and
11.4.5.10	may monitor the implementation of the approved regional land use plan, in order to monitor compliance with the plan and to assess the need for amendment of the plan.

These objectives have been further refined by the YLUPC, in conjunction with YG and affected Yukon First Nations, into general terms of reference for planning commissions.

1.5 The Dawson Planning Region

The Dawson planning region (herein referred to as “the planning region”) is located in the west central part of Yukon, encompassing 39,854 km² or about 10 per cent of the territory (Figure 1-1 and Table 1-1). In general, the boundary of the planning region extends:

- North to the contiguous boundary agreed to by TH and VGFN to resolve the overlap between their traditional territories;
- Southeast to the northwestern most extent of the Selkirk First Nation Traditional Territory;
- Southwest to the northern boundary of the Kluane First Nation Traditional Territory;
- East to the boundaries associated with the Peel Watershed planning region and the overlap agreement between the First Nation of Na-cho Nyak Dun (NND) and TH; and
- West to the Yukon/Alaska border (TH&YG, 2018).

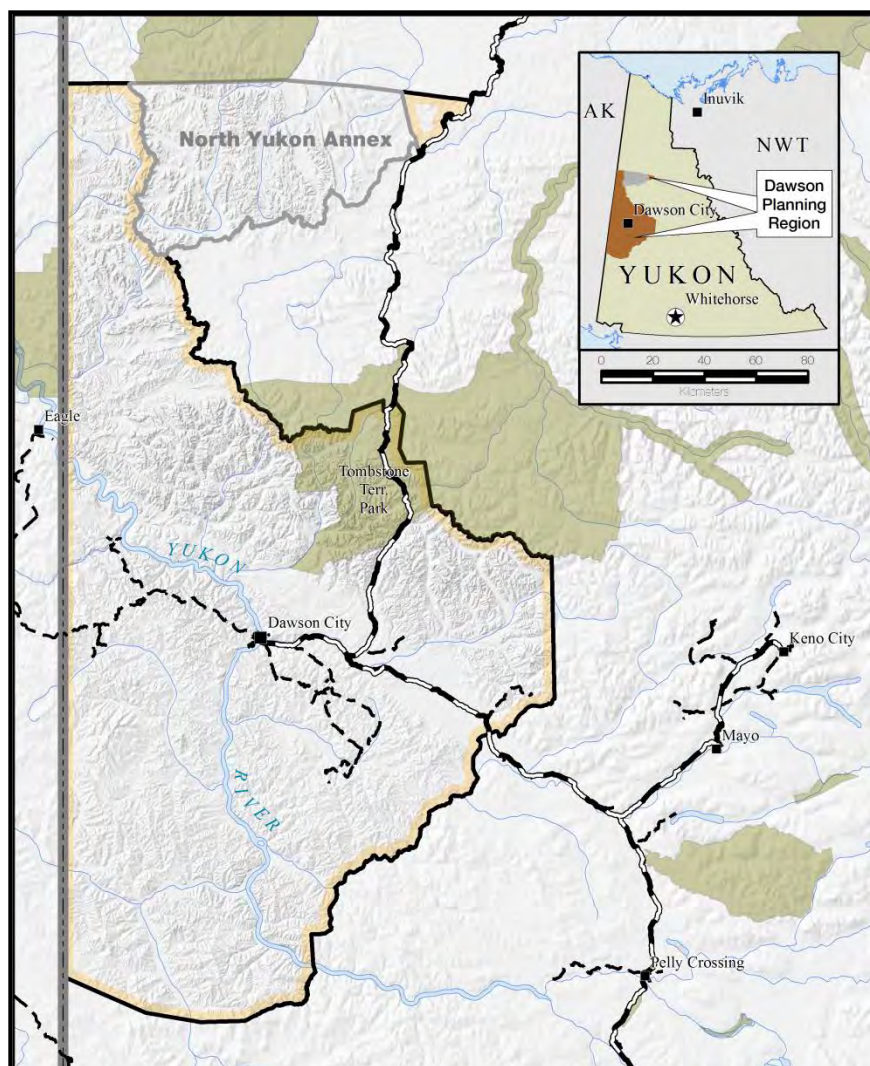


Figure 1-1 Dawson Planning Region Boundary

Update: One of the most notable changes to this iteration of the DRLUP process is the change of the region's boundary. A section of the northern portion of the planning region will be absorbed into the North Yukon Regional Plan as per overlap agreements among the VGFN and TH. This section is referred to as the ***North Yukon Annex*** in this document, as this decision was made after the planning process was suspended in 2014. This document contains information for land use decision making in both the North Yukon Annex and the revised Dawson Planning Region. However, plans and other documents from the DRLUP process will pertain only to the latter.

Table 1-1 Total area (km²) of Dawson Land Use Planning Region and North Yukon Annex

Planning Region	Area (km²)
Dawson	39,854
North Yukon Annex	5,386
Total	45,240

See also Section 3 – Map #1: Regional Overview

In addition, the regional land use plan will not apply to:

- Land within the City of Dawson and areas subject to subdivision planning or local area planning outside of a municipal boundary (e.g. West Dawson, Sunnyside) (City of Dawson, 2012);
- The Klondike National Historic Sites; and
- Tombstone Territorial Park (TH & YG, 2019).

Settlement Lands adjacent to the planning region, while outside the boundary of the regional land use planning area, may still be affected by land use decisions made through the DRLUP process, and therefore should also receive consideration. Other lands adjacent to the planning region that warrant consideration include, but are not limited to:

- Yukon-Charley Rivers National Preserve (Alaska);
- Fishing Branch Wilderness Preserve and Habitat Protection Area (North Yukon); and
- Oil and gas basins that cross into adjacent planning regions, such as the Kandik or Eagle Plain basins.

1.6 Chapter References

City of Dawson. 2012. The City of Dawson Official Community Plan Bylaw No. 12-23, 2012. Dawson, Yukon, Canada

Dawson Regional Planning Commission (DRPC). 2011. Interests and Issues Report. Dawson, Yukon, Canada

NND – DIAND. 1993. First Nation of Na-Cho Nyak Dun Final Agreement Department of Indian Affairs and Northern Development. Ottawa, Ontario, Canada.

TH – DIAND. 1998. The Tr'ondëk Hwëch'in Final Agreement. Department of Indian Affairs and " Northern Development. Ottawa, Ontario, Canada.

Tr'ondëk Hwëch'in and Yukon Government (TH & YG). 2019. Dawson Regional Planning Commission: Terms of Reference 2018, Updated 2019. Whitehorse, Yukon, Canada.

VGFN – DIAND. 1993. Vuntut Gwitchin First Nation Final Agreement. Department of Indian Affairs and Northern Development. Ottawa, Ontario, Canada.

YLUPC (Yukon Land Use Planning Council). 2009. Terms of Reference for the Dawson Regional Planning Commission. Yukon Land Use Planning Council Recommendation #08-001. Whitehorse, Yukon, Canada.

2 VISION STATEMENT

Our Vision...

For the Region

The Dawson Region encompasses a unique landscape that enables our community to build a diverse economy while maintaining a rich cultural legacy and a healthy environment.

For the Process

Shared and respectful use of natural resources is guided by the principles of sustainable development, respect for heritage and culture, and conservation of fish and wildlife habitats. Ongoing community stewardship, based on consensus building, will achieve significant and lasting social, economic, and ecological benefits for all Yukoners.

For the Plan

Our regional plan will be crafted to reflect community values and will guide the integrated use and management of land, water, and resources.

Vision Statement ratified by the Dawson Regional Planning Commission on September 25, 2019

3 FINAL AGREEMENTS, LEGISLATION and POLICIES

Within the Yukon, regional land use planning is established under Chapter 11 (Land Use Planning) of the Final Agreements, which specifies how land use planning shall be carried out. The Umbrella Final Agreement (UFA) and First Nation Final Agreements (FAs) between the Government of Canada, Government of Yukon (YG), and Yukon First Nations (YFNs) establish a policy framework and objectives for regional land use planning in the Yukon. Chapter 11 of these agreements deals specifically with regional land use planning.

In the Yukon, resource sectors relevant to land use planning are administered and regulated, in some cases jointly, by the Federal, Yukon and First Nations governments. Regional land use plans must have regard for the regulatory environment while providing guidance on land and resource management in the planning region.

Information for this section is taken from a document entitled Overview of Legislation and Policies Pertaining to Regional Land Use Plans in the Yukon, prepared by the Government of Yukon's Department of Energy, Mines and Resources to assist the Commission with the policy and legislative context in which regional land use planning occurs (Government of Yukon, 2011). It has also been updated to include legislation and policies that have been introduced after 2011.

3.1 First Nation Final Agreements

The First Nation Final Agreements are Treaties under Section 35 of The Constitution Act (1982). Provisions of the Final Agreements take precedence over other laws of general application. Final Agreements affecting land and resource management in the planning region are:

- Tr'ondëk Hwëch'in (1998)
- Vuntut Gwitchin First Nation (1995)
- First Nation of Na-Cho Nyak Dun (1995)

Pertinent provisions relating to regional land use planning are found in the following chapters of the FAs:

- Chapter 2 – General Provisions
- Chapter 10 – Special Management Areas
- Chapter 11 – Land Use Planning
- Chapter 12 – Development Assessment

- Chapter 13 – Heritage
- Chapter 14 – Water Management
- Chapter 16 – Fish and Wildlife
- Chapter 17 – Forest Resources
- Chapter 18 – Non-renewable Resources
- Chapter 22 – Economic Development Measure

3.2 Tr'ondëk Hwëch'in Self Government Agreement

In accordance with Chapter 24 of the THFA, the TH Self Government Agreement was signed July 16, 1998 by Canada, Government of Yukon and Tr'ondëk Hwëch'in and came into effect shortly after. The SGA provides TH legal status, law making powers and administrative authority, replacing the Dawson Indian Band previously under the Indian Act. The SGA provides TH the powers to enact its own legislation and manage its own affairs, such as planning, zoning and land development on Settlement Land. The SGA provides compatible land use provisions in respect of certain settlement land parcels and adjacent non-settlement land use. These provisions are to be followed by TH and the YG and/or municipalities depending upon jurisdiction, with opportunities for co-governance arrangements.

3.3 Umbrella Final Agreement Boards

The Yukon Umbrella Final Agreement provides for the appointment of Boards to consider matters relating to implementation of Yukon land claims. The following Boards have land and resource management mandates that are integrated with those of the Commission:

- Yukon Fish and Wildlife Management Board
- Dawson District Renewable Resource Council
- Yukon Salmon Sub-Committee
- Yukon Heritage Resources Board
- Porcupine Caribou Management Board

There are various other related boards listed in Section 2.12.2 of the THFA. Both the YLUPC and the Commission are considered boards under this section of the Final Agreement.

3.4 Legislation

This section briefly describes applicable legislation and regulations with respect to land and resources management in the Yukon.

3.4.1 Federal Legislation

<p><u>Canada Wildlife Act</u> (RC1985, cW-9) Allows for the creation, management and protection of wildlife areas for research activities, or for conservation or interpretation of wildlife.</p>
<p><u>Fisheries Act</u> (RSC 1985, c F-14) Provides the proper management and control of fisheries and the conservation and protection of fish and fish habitat, including by preventing pollution. Revisions from Bill C-68 focus on the protection of all fish and fish habitat.</p>
<p><u>Migratory Birds Convention Act</u> (SC 1994, c 22) This Act and its complementary Regulations ensure the conservation of migratory bird populations by regulating potentially harmful human activities.</p>
<p><u>Navigation Protection Act</u> (Formerly Navigable Waters Protection Act, RSC 1985, c N-22) Regulates and protects the public's right to marine navigation on all navigable waterways in Canada. All construction of works built or placed in, over, through or across navigable waterways must be licensed by the federal Navigable Waters Protection Program. Renamed the Navigation Protection Act under Bill C-45 and restricted in scope to large navigable waterways, such as Yukon River.</p>
<p><u>Yukon Environmental and Socio-Economic Assessment Act</u> (SC 2003, c 7) Establishes a process for review and assessment of a broad range of activities on federal, territorial, First Nation and private land.</p>

3.4.2 Territorial Legislation

<p><u>Area Development Act</u> (RSY 2002, c 10) Regulates the orderly development of land in a 'local development area' including zoning, allocation of land for different uses, public infrastructure, fire protection, and public health and safety. Establishes a local development area.</p>
<p><u>Environment Act</u> (RSY 2002, c 76) Ensures the management of the environment, preservation of biological diversity and promotion of sustainable development; integration of land and resource management. Provides for establishment of a wilderness management area for preserving areas with intrinsic, ecological and economic value. Pesticide Regulation (OIC 1994/125) for handling of waste, application of pesticides and remediation of contaminated sites</p>

<p>Solid Waste Regulation (OIC 2000/11) for operation of dumps and waste disposal facilities</p> <p>Special Waste Regulations (OIC 1995/47) for handling and transporting of special waste</p> <p>Spills Regulations (OIC 1996/193) requires reporting of spills of specified substances</p> <p>Storage Tank Regulations (OIC 1996/194) regulates storage of petroleum and hazardous substances in storage tanks</p> <p>Contaminated Sites Regulation (OIC 2002/171) characterizes contaminated sites and establishes requirements and standards for restoration</p>
<p><u>Forest Resources Act</u></p> <p>(SY 2008, c15)</p> <p>Forest Resources Regulation (OIC 2010/171) to administer disposition and harvesting of timber on public lands.</p>
<p><u>Highways Act</u></p> <p>(RSY 2002, c 108)</p> <p>Highways Regulation (OIC 2002/174) regulate highway use, construction and maintenance, protection of highways, access control, land acquisition and disposal, and safety.</p>
<p><u>Historic Resources Act</u></p> <p>(RSY 2002, c 108)</p> <p>Preservation, development and interpretation of heritage resources in Yukon</p> <p>Establishes regulations for access to, recovery and protection of historic resources, including the Archaeological Sites Regulation (OIC 2003/73)</p>
<p><u>Parks and Lands Certainty Act</u></p> <p>(RSY 2002, c 165)</p> <p>Creation and management of parks in Yukon, including Ní'iinlī Njik - Fishing Branch Ecological Reserve (OIC 2003/31), Ní'iinlī Njik - Fishing Branch Wilderness Preserve (OIC 2003/32), and Tombstone Territorial Park (OIC 2004/203)</p>
<p><u>Placer Mining Act</u></p> <p>(SY 2003, c 13)</p> <p>Administration and control of leasehold interests for the purposes of placer mining.</p> <p>May prohibit entry on certain lands for purpose of locating a claim or prospecting for gold or other precious minerals and stones, such as land withdrawals for Fishing Branch Wilderness Preserve (OIC 2003/48), Fishing Branch Ecological Reserve (OIC 2003/49), Dawson Airport (OIC 2003/102), Tombstone Territorial Park (OIC 2004/204), TH Settlement Lands (OIC 2006/164), Clinton Creek (OIC 2006/173), Forty Mile – Ft. Cudahy/Ft. Constantine (OIC 2008/134), and Tr'ochek (OIC 2008/135)</p> <p>Placer Mining Land Use Regulations (OIC 2003/59) establish a specific threshold for each class of mining activity; environmental standards for all classes of activity on claims and leases; and recording and reporting requirements for archaeological, paleontological, or historic objects and burial sites discovered during placer operations.</p>

Public Health and Safety Act

(RSY 2002, c 176)

Set standards for protection of public health and safety.

Regulations for public campgrounds and campsites (OIC 1974/94), camp sanitation (CO 1961/38), sewage disposal systems (OIC 1999/82) and drinking water (OIC 2007/139).

Quartz Mining Act

(SY 2003, c 14)

Provides for the ability to stake, record and hold claims and the administrative management of that process.

Establishes a right to enter, locate, prospect and mine for minerals on any vacant public lands; may prohibit entry on certain lands for purpose of locating a claim or prospecting for minerals (see lands withdrawn from staking noted under Placer Mining Act).

Quartz Mining Land Use Regulations (OIC 2003/64) establish a specific threshold for each class of mining activity; environmental standards for all classes of activity on claims and leases; and recording and reporting requirements for archaeological, paleontological, or historic objects and burial sites discovered during mining.

Subdivision Act

(RSY 2002, c 209)

Regulates creation of an interest in a parcel of land within a municipality or on public land.

Territorial Lands (Yukon) Act and Lands Act

(SY 2003, c 17 & RSY 2002, c 132)

Orderly administration of Crown land under Yukon jurisdiction, specifically land disposition, use and development; the legislation also applies to land-based activities that occur directly adjacent to water; provisions for withdrawal of land from disposition.

Associated regulations established under the Lands Act include: Lands Regulations (O.I.C. 1983/192); Quarry Regulations (O.I.C. 1983/205).

Associated regulations established under the Territorial Lands (Yukon) Act include: Territorial Lands Regulation (O.I.C. 2003/50); Land Use Regulation (O.I.C. 2003/51); Coal Regulation (O.I.C. 2003/54); Dredging Regulation (O.I.C. 2003/55); Grazing Regulations (O.I.C. 1988/171).

Ní'inlilí Njik (Fishing Branch) Ecological Reserve and Wilderness Preserve withdrawal Disposition Order, No. 1 [O.I.C. 2003/30](#);Lands Withdrawn from Disposal (Tombstone Territorial Park) [O.I.C. 2004/202](#);Order Respecting the Withdrawal from Disposal of Certain Lands in Yukon (Tr'ondëk Hwëch'in First Nation) [O.I.C. 2006/152](#)**Wildlife Act**

(RSY 2002, c 229)

Pertains to the non-subsistence harvesting of wildlife; prohibits hunting and possession of protected wildlife. A Habitat Protection Area can be established if it is deemed necessary to do so because of the sensitivity of the area to disturbance, the likelihood of disturbance and the importance of the area as habitat for any population, species or type of wildlife.

Waters Act

SY 2003, c 19

Establishes the Yukon Water Board. Waters Regulation (OIC 2003/58) regulates surface and ground water use and waste disposal into water for a variety of undertakings including mining, forestry, transportation, agriculture, power generation and conservation.

Wilderness Tourism Licensing Act

(RSY 2002, c 228)

Helps sustain wilderness quality of Yukon lands and waters.

Wilderness Tourism Licensing Regulation (1999/69) establishes standards for safety and guiding skills in commercial wilderness tourism operations.

Yukon Oil and Gas Act

(RSY 2002, c 162)

Regulates and administers the orderly disposition and development of rights for oil and gas lands in a way that is consistent with principles of sustainable development, maintenance of essential ecological processes and preservation of biological diversity. Section 65(1) permits the Commissioner in Executive Council to make regulations for all stages of oil and gas exploration and production, including the transportation of substances by pipeline or other means. Section 69(1), subject to any other Yukon legislation, permits any person to enter on and use the surface of the land for the purposes of exercising rights under a disposition or licence.

Various associated regulations include: Oil and Gas Disposition Regulations (OIC 1999/147); Oil and Gas Geoscience and Exploration Regulations (OIC 2004/156); Oil and Gas Licence Administration Regulations (OIC 2004/157); Oil and Gas Drilling and Production Regulations (OIC 2004/158); Oil and Gas Processing Plant Regulation (OIC 2013/162)

Ministerial orders withdraw certain lands from disposition under the Act:

Tombstone Territorial Park (MO 2004/11);

Ní'ínlíi Njik Ecological Reserve (MO 2003/05); and

Ní'ínlíi Njik Wilderness Preserves (MO 2003/06)

3.4.3 Tr'ondëk Hwëch'in Legislation and Regulations

Tr'ondëk Hwëch'in Fish and Wildlife Act (2009)

Regulates and protects subsistence harvesting rights on TH Settlement Land and within the TH traditional territory. Manages fish and wildlife species and populations in the traditional territory for future generations.

Tr'ondëk Hwëch'in Land and Resources Act (2004, under review)

Regulates access, occupancy and use of TH Settlement Land. Provides for land and resource management of Settlement Lands to provide for the sustainable use of the land, promote healthy lifestyle of TH citizens, and to preserve the peaceful enjoyment of the land by TH Citizens.

Central Tr'ondëk Land Management Area Regulations

The Central Tr'ondëk Land Management Area (CTLMA) was established by TH Council through the Land and Resources Act as the priority area for land use planning and residential, commercial, and institutional development. The CTLMA includes settlement land parcels in and around the City of Dawson. Tr'ondëk Hwëch'in Land and Resources Branch is currently working on a community plan for the CTLMA to inform land development and tenure allocation.

Tr'ondëk Hwëch'in Tenure and Land Use Regulations (2013)

Regulates access of settlement land through the issuance of Access Notice Certificates and Land Use Permits.

Tr'ondëk Hwëch'in Oil and Gas Act (Draft August 2013)

Establishes a requirement for reciprocal consultation prior to granting oil and gas rights on Category A Settlement Land

Tr'ondëk Hwëch'in Heritage Act (2016)

Direction for management of Yukon First Nations heritage and culture in and on Traditional Territory of the Tr'ondëk Hwëch'in. Recognizes the uniqueness of Tr'ondëk Hwëch'in understanding and definition of tangible and intangible heritage.

3.5 Management Plans and Other Policies

This section briefly describes applicable policies and plans governing land and resources management in the Yukon.

Dempster Highway Development Area (1979)

The Dempster Highway Development Area extends for 8km on either side of the Dempster Highway, from km 68 to the border with Northwest Territories. Any development or motorized use of the land (except snow machines) within the corridor requires an Authorization under the Area Development Act.

Klondike Valley District Land Use Plan (1988)

Establish a framework for the use and disposition of public lands in the Klondike Valley to meet short and long-term social, economic and environmental needs of the region. Yukon Community and Transportation Services prepared an implementation strategy for this plan in September 1989. The Plan is implemented by Area Development Regulations (OIC 1992/029).

West Dawson Sunnydale Local Area Plan (2013)

This Local Area Plan guides land use and policy direction for future land management decisions within the West Dawson and Sunnydale area. The Local Area Plan recognizes Tr'ondëk Hwëch'in land claim settlement rights and interests in the area while providing a common framework for the development of both Tr'ondëk Hwëch'in and non-Tr'ondëk Hwëch'in lands.

<u>Fish Habitat Management System for Yukon Placer Mining (2008)</u>
Adaptive Management Framework including protocols for Aquatic Health Monitoring, Water Quality Objectives Monitoring and Economic Health Monitoring.
<u>Mine Reclamation and Closure Policy (2006)</u>
Duty of mine operators to plan, implement and fund mine site reclamation and closure. Reflects Government of Yukon's objectives in the areas of environmental protection, responsible economic development and fiscal responsibility. Does not apply to prospecting, grassroots exploration or advanced exploration on a mineral property.
<u>Tombstone Territorial Park Management Plan (2009)</u>
In developing a land use plan that includes all or part of the Park, a Regional Land Use Planning Commission shall consider the Management Plan (THFA Chapter 10, Schedule A, Clause 13.2)
<u>Forty Mile Caribou Working Group</u>
The Working Group shall review how the Development Assessment Process, land use planning process, existing wildlife management plans, existing programs in respect of habitat protection, and such other programs and plans that may be relevant, could be used to address habitat protection in the area (THFA Chapter 16, Schedule B, Clause 3.1.3)
<u>Forty Mile Caribou Harvest Management Plan 2012-2018 (2012)</u>
Management plan for the harvest and conservation of Forty Mile Caribou Herd.
<u>Forty Mile, Fort Cudahy and Fort Constantine Historic Site Management Plan (2005)</u>
& Forty Mile Cultural Resource Management Plan Vol.1 (2014) Protection and management of the Forty Mile Historic Site as per the requirement of Section 3 Schedule A of the THFA.
<u>North Yukon Regional Land Use Plan (2009)</u>
Land Management Unit and Land Designation System provisions will guide land use management recommendations in the shared Traditional Territory of VGFN and TH.
<u>Moosehide Community Plan and Moosehide Cultural Resources Management Plan (2017)</u>
Provides guidance for activities at Moosehide, including construction of new cabins, and the protection of cultural resources.
<u>Resource Roads Regulation (in progress 2018)</u>
Resource Access Roads Framework (2013) Framework was completed in 2013 outlining the process for development and management of resource access roads, and providing guidance to regulators, industry and the public.
<u>Harvest Management Plan for the Porcupine Caribou Herd in Canada (2010)</u>
Management plan and accompanying implementation strategy coordinates management actions for conservation and responses to ongoing status of herd.

<p><u>Dawson Forest Resources Management Plan (2013)</u></p> <p>Provides the framework for sustainable management of forest-based economy in the Dawson forest planning region. A forest management plan and forest fire management plan shall be consistent with any approved regional land use plans (FNFAs Chapter 17, Section 6.1)</p>
<p><u>Tr'ondëk Hwëch'in Community Plan (in progress 2019)</u></p> <p>The TH Community Plan provides high level designations and policy direction for land management and tenure allocation on Tr'ondëk Hwëch'in Settlement Land parcels.</p>
<p><u>Tr'ondëk Hwëch'in Land Stewardship Framework (2018 – present)</u></p> <p>The Land Stewardship Framework (LSF) is an initiative to re-assert TH's ancestral stewardship responsibility to the land. The LSF is premised on a duty to interact with and use the land "in a good way" and to collectively sustain, guard, maintain, protect and enhance the land and all it entails. The LSF outputs include foundational documents, grounded in TH's cultural and spiritual values, to guide leadership and staff on all decisions, policy development and land use planning directives.</p>
<p><u>Tr'ondëk Hwëch'in Mining Mandate (2011)</u></p> <p>Applies to mining activities on Crown lands within TH Traditional Territory. Describes the matters to be addressed in agreements with proponents of mining and exploration projects.</p>
<p><u>Off-Road Vehicle Regulation (in progress 2018)</u></p> <p>Consultation underway to create regulation and management plans to for Off-Road Vehicle (ORV) use in the Yukon.</p>
<p><u>Yukon Water Strategy and Action Plan (2014)</u></p> <p>Plan outlining six priorities for maintaining the quality, quantity and health of Yukon Water. Provides guidance for comprehensive approach to water management decisions.</p>
<p><u>Land Based Heritage Resources Policy (2011)</u></p> <p>Provides direction on TH's approach to heritage resources on its settlement lands. In addition, it also contains the Stewardship Guide, which provides guidance to Heritage Technicians managing heritage within TH Traditional Territory.</p>
<p><u>Dawson City Climate Change Adaptation Plan (2011)</u></p> <p>Increase adaptive capacity and to respond to challenges and opportunities arising from climate change.</p>
<p><u>Dawson City Official Community Plan</u></p> <p>The main policy document for the City of Dawson (City). It outlines the goals and policies that are used to guide decision making on planning and land use management.</p>
<p><u>Tr'ondëk Hwëch'in and City of Dawson Integrated Community Sustainability Plan (2007)</u></p> <p>Provides direction for the community to realize sustainable objectives in the decades ahead. The environmental, cultural, social, governance and economic dimensions of our identity will be shaped by the principles and guidance proposed in the plan. The plan identifies a community vision, community value statements and sustainable principles which will help the community create a sustainable future.</p>

Yukon Wetland Policy (in progress 2020)
Tr'ondëk Hwëch'in Wetland Reclamation Guidance (in progress 2018)
To provide guidance for wetland protection and reclamation in relation to placer mining.
General policies that guide land use activities throughout the Yukon, not necessarily addressing issues specific to the region. <ul style="list-style-type: none"> • Grazing Policy (2010) • Big Game Outfitting Policy (2013) • Commercial and Industrial Land Application Policy (2013) • Rural Residential Policy (2013) • Trapping Cabin Policy (2013) • Water Lot Lease Policy (2013)

3.6 Best Management Practice Protocols

A “Best Management Practice” (BMP) is a non-regulatory practice or combination of practices that represent best available knowledge about effective and practical methods for preventing or reducing the amount of adverse impact or land-use conflict resulting from a land use activity. BMPs are non-enforceable guidelines that are intended to provide commercial and industrial operators with up-to-date information on best practices to mitigate negative effects on cultural heritage and to minimize environmental damage.

Some BMPs identified for land use activities occurring in the Dawson planning region are listed below. Note that this may not be an exhaustive list as some industry specific best practices may exist. When applicable, RAR chapters will refer to additional BMPs.

- *Flying in Sheep Country: How to minimize disturbance from aircraft.* Government of Yukon. 2006. Revised edition, second printing 2006. Mining Environment Research Group. Whitehorse, Yukon, Canada.
- *Oil and Gas Best Management Practices for Wilderness Tourism.* Government of Yukon. 2006. Department of Energy, Mines and Resources. Whitehorse, Yukon, Canada.
- *Oil and Gas Best Management Practices for Historic Resources.* Government of Yukon. 2006. Department of Energy, Mines and Resources. Whitehorse, Yukon, Canada.
- *Oil and Gas Best Management Practices for Seismic Exploration.* Government of Yukon. 2006. Department of Energy, Mines and Resources. Whitehorse, Yukon, Canada.
- *Flying in Caribou Country: How to minimize disturbance from aircraft.* Government of Yukon. 2010. Revised edition, second printing 2010. Mining Environment Research Group. Whitehorse, Yukon, Canada.

- *Yukon Placer Mining Best Management Practices for Heritage Resources*. Government of Yukon. 2010. Edition 1. Department of Tourism and Culture. Whitehorse, Yukon, Canada.
- *Best Management Practices Bulletin: Fencing to contain horses on Yukon Government grazing agreements*. Government of Yukon. Undated. Whitehorse, Yukon, Canada.
- *Code of Conduct for Operating Wilderness Tours: WTAY Guidelines*. Wilderness Tourism Association of the Yukon. 2002. Whitehorse, Yukon, Canada.
- *Best Environmental Practices on Yukon Rivers: A minimal impact guide for river travellers*. Wilderness Tourism Association of the Yukon. 2013. Whitehorse, Yukon, Canada.
- *Yukon Mineral and Coal Exploration Best Management Practices and Regulatory Guide*. Yukon Chamber of Mines. 2010 Whitehorse, Yukon, Canada.
- *Community Adaptation Project: Dawson Climate Change Adaptation Plan*. Northern Climate ExChange & Yukon College
- *Best Management Practices for Fossils at Yukon Placer Mines*. Government of Yukon. 2014. Whitehorse, Yukon, Canada.
- *Best Management Practices for Burial Sites and Human Remains in Yukon*. Government of Yukon. 2014. Whitehorse, Yukon, Canada.
- *Best Management Practices for Works Affecting Water in Yukon*. Government of Yukon. 2011.
- *Best management Practices for Placer Mining in Yukon Wetlands*. Klondike Placer Miners' Association Yukon. 2015.
- *Guidelines Respecting the Discovery of Human Remains and First Nation Burial Sites*. Government of Yukon. Department of Tourism and Culture. 2014.
- *Guide to Heritage Stewardship for Yukon First Nation Governments*. Yukon First Nation Heritage Group. 2018.

3.7 Chapter References

Government of Yukon. 2011. Overview of Legislation and Policies Pertaining to Regional Land Use Plans in the Yukon. Department of Energy, Mines and Resources. Whitehorse, Yukon, Canada.

The Constitution Act, 1982. Schedule B to the Canada Act 1982 (UK), 1982, c 11, Available at: <http://canlii.ca/t/ldsx>

4 PEOPLE, SETTLEMENT and ECONOMY

This chapter presents a high-level overview of the planning region. More detailed descriptions of natural, cultural and economic resources are contained in **Section 2 – Regional Resource and Land Use Descriptions**.

4.1 People

The Dawson region has a relatively small but stable population, with most residents residing in and immediately around Dawson City (**Figure 4-1**). The region's population fluctuates seasonally due to the nature of the mining and tourism industries.

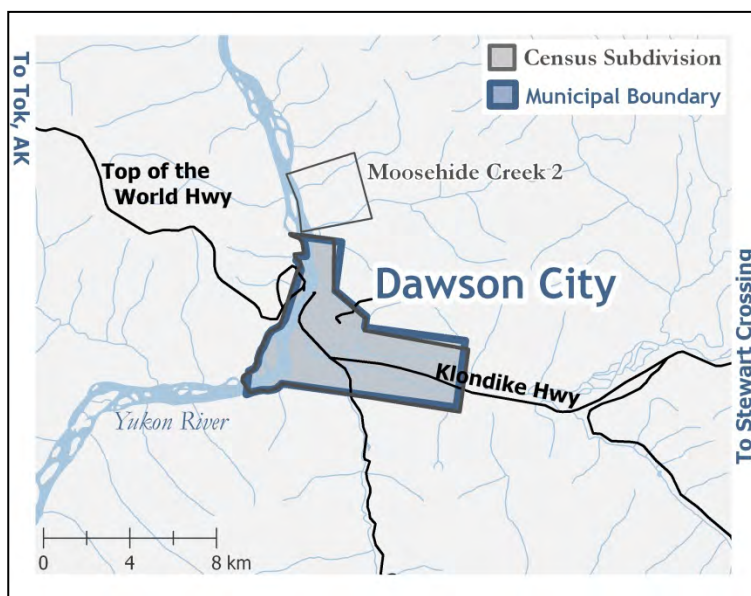


Figure 4-1 Map depicting Census Subdivision and Municipal boundary for Dawson Area (Yukon Bureau of Statistics, 2018)

4.1.1 Regional Population Statistics

- The Yukon Bureau of Statistics estimate that as of December 2017 there was a population of 2,220 people residing in Dawson and the immediately surrounding area.
- This represents approximately 5.7% of Yukon's total population of 38,630 (Yukon Bureau of Statistics, 2018).

- The area includes residents in the unorganized communities of West Dawson, Sunnysdale, Rock Creek and Henderson Corner.
- The population estimates in Table 4-1 show an overall increase in population of 187 people over a 5-year period.
- These estimates exclude a substantial population of non-winter residents and seasonal workers; and are based on data provided by Yukon Government administrative records (Yukon Bureau of Statistics, 2018).

Table 4-1 Population estimates for Dawson area 2013-2017 (Yukon Bureau of Statistics, 2018)

Year	Population
2017	2,220
2016	2,210
2015	2,087
2014	2,040
2013	2,033

As with other small Yukon communities, a significant demographic shift is occurring as the younger groups diminish in number and the number of seniors rises. Over the period from 2002 to 2010, the population under the age of 24 dropped by 31 per cent, while the group over the age of 54 grew by 71 per cent. The challenges of this shift include mismatched housing stock, business succession planning, skilled labour shortages, lack of volunteers, decreasing school enrollment, and increasing demands on health care and social services (Across the River Consulting, 2011).

4.1.2 First Nations

The planning region falls fully within the **Tr'ondëk Hwëch'in** Traditional Territory* (THTT); however, it does not include the whole THTT. A small portion of the north central part of the THTT is located within the North Yukon Planning Region (Annex). TH and **Selkirk First Nation** (SFN) have a small overlap area within the south-east portion of THTT. That area is not part of the Dawson Planning Region.

Areas of the **Vuntut Gwitchin First Nation** (VGFN), the **First Nation of Na-Cho Nyak Dunn** (NND) and SFN Traditional Territories are located immediately adjacent to the planning region; however, they do not overlap within the region. In addition, **White River First Nation*** (WRFN) (not a self-governing First Nation under the UFA)

has identified a land selection in the southeastern corner of the region (see **Section 6.1.2** for more information on WRFN).

As the regional land use planning process is being carried out in accordance with the TH Final Agreement, "Traditional Territories" is defined in the THFA in relation to the geographic area identified as a Yukon First Nation's Traditional Territory on the map referred to in 2.9.0 of the THFA (Letter to WRFN from YG & TH, April 17, 2020), and as agreed upon between First Nations through Contiguous Boundary Agreements (see **Section 6.1.1.1).*

4.1.3 Tr'ondëk Hwëch'in People

Tr'ondëk Hwëch'in are primarily Hän, Gwich'in, and Northern Tutchone people. Tr'ondëk Hwëch'in have lived across western Yukon and eastern Alaska and along the Yukon River for millennia. They continue to maintain strong family/ cultural ties throughout Yukon and Alaska.

For generations, Tr'ondëk Hwëch'in people have lived and travelled in a large area of the Yukon River valley spanning the Yukon-Alaska border. They have relied heavily on the salmon runs of the Yukon River and continue to utilize fish camps along its shores. People continue to hunt big game, trap furbearers and harvest other resources by moving to or utilizing different areas of the land according to the seasons.

Today, Tr'ondëk Hwëch'in maintain strong cultural connections to the region. Language, song and celebration, in addition to cultural and subsistence land use, continue to grow and thrive. The Dänojà Zho Cultural Centre, on the shore of the Yukon River in Dawson City, is a year-round meeting place for cultural activities, performances and special events that celebrate Tr'ondëk Hwëch'in traditions, culture and history. Important sites such as Land of Plenty, Moosehide and Cache Creek, located throughout the region, continue to foster a strong relationship between Tr'ondëk Hwëch'in and their traditional territory. Population highlights include the following:

- Of an estimated 1169 TH citizens, 381 citizens reside in the Dawson Area
- 464 (39%) of the population is under the age of 30, 585 (50%) are between 31 and 64 years old, and 116 (10%) are over the age of 65. (Tr'ondëk Hwëch'in, personal communication, Aug 21 2018)

4.2 Settlement

4.2.1 History Since Contact

Since first contact with Europeans, Tr'ondëk Hwëch'in people and their traditional economy have been significantly impacted by economics, epidemics and conflicts well beyond their homelands (Tr'ondëk Hwëch'in, 2012).

Chilkat traders had long held a monopoly over trade routes from the coast and by the mid 1700's Russian trading goods were being brought into the region. As large Russian and European trading companies overcame the Chilkat monopoly, a new economy evolved based on the trade of fur for trade goods, including guns, steel traps and other manufactured products. These technological advances dramatically improved hunting success resulting in significant changes to wildlife populations and the pattern of traditional land use. In 1874, Jack McQuesten established a trading post for the Alaska Commercial Company at Fort Reliance on the Yukon River, approximately 13 km downriver from Dawson City. The first Yukon town was established 10 years later at the mouth of Forty Mile River (so named for being 40 miles downriver from Fort Reliance), as miners and traders arrived with the discovery of gold in nearby tributaries. Both of these sites were indigenous-used sites prior to European occupation.

Throughout the 1800s and 1900s, a series of epidemics including small pox, scarlet fever, diphtheria, tuberculosis and influenza had a dramatic effect on social organization, trading networks and the cultural landscape of Tr'ondëk Hwëch'in people. As large portions of the population died off, survivors had to regroup. Reduced resource harvesting and gaps in important land and resource management roles resulted in economic decline and changing social structures.

The discovery of gold in the Klondike valley in 1896 led to the establishment of a tiny settlement where the Klondike River flows into the Yukon River. By the summer of 1898, Dawson City, the administrative capital of the Yukon, was the largest city in Canada west of Winnipeg, with a population of 40,000 in the immediate area. The surge of newcomers led to widespread overharvesting of moose and caribou.

As roads surpassed river travel, harvest activities became focused on easily accessed areas along the highway corridors and side roads. Imported foods began to replace traditional sources and gradually people moved closer to roads and away from the river.

By the mid-1950s, government regulation was beginning to erode traditional resource management practices. Traditional activities were being restricted or prohibited and backcountry outfitters began focusing wildlife harvest on the strongest and largest animals. Collective ownership of natural resources was replaced by a system of individual concession holders. Overhunting decimated the Forty Mile caribou herd, once numbering in the hundreds of thousands.

A further loss of traditional knowledge and language skills occurred as many children were sent off to residential school in communities away from their families. The resulting crisis of cultural identity has led many down a path of addiction to chronic health problems (Tr'ondëk Hwëch'in, 2012).

4.2.2 Settlement Areas

4.2.2.1 Tr'ochëk

The importance of Tr'ochëk to Tr'ondëk Hwëch'in culture and history is recognized in Final Agreement provisions that led to the designation of Tr'ochëk as a National Historic Site (THFA Chapter 13, Section 4.6.2). Tr'ochëk is a traditional fishing camp at the confluence of the Klondike and Yukon rivers (Dobrowolsky and Hammer, 2001). The site went through drastic changes during the Gold Rush, changing it from a traditional fish camp to a crowded settlement and industrial site. Chief Isaac, the leader of the Tr'ondëk Hwëch'in during the Gold Rush, guided his people through the upheaval, initially moving them from Tr'ochëk across the Klondike River; then, with the assistance of the Anglican missionary Bishop Bompas, 5 kilometers farther downriver from Dawson City to Moosehide, in the spring of 1897.

4.2.2.2 Moosehide/Jëjik dhä dezhu kek'it

Moosehide is located about 5 km downstream from Dawson City. For thousands of years the location was a traditional camp, sited on a high bench overlooking the river. In 1897, Tr'ondëk Hwëch'in people relocated to Moosehide from Tr'ochëk,

building cabins, a church, mission and a day school. Moosehide remained a vibrant community until the 1950's, when the highways replaced sternwheelers as the main transportation. By 1957, most people had moved into Dawson.

Today Moosehide is a seasonal Village with approximately 25 cabins. Citizens continue to build at the site and use the area surrounding Moosehide for traditional pursuits. A gathering is held every other year at Moosehide, when all people are invited to camp out, share and celebrate Tr'ondëk Hwëch'in traditional culture.

4.2.2.3 **Dawson City**

The town of Dawson City, located 536 km north along the Klondike Highway from Whitehorse, is the only major permanent community in the planning region (note: the Dawson Regional Land Use Plan will exclude areas within Dawson and West Dawson). Dawson is the second largest city settlement in the Yukon after Whitehorse (see population tables **Table 4-2 & Table 4-3**).

At the height of the Klondike stampede in 1898, Dawson City boasted telephones, running water, steam heat, steamboat services and a wide range of elaborate hotels, theatres and dance halls. A year later the gold rush was over; 8,000 people left town in a single summer. By 1902, Dawson City's population had dropped to 5,000 and the economy and community continued to erode through most of the 20th century.

Preservation of buildings and historic areas, an assortment of activities related to the Klondike Gold Rush, and other heritage tourism initiatives draw some 60,000 visitors each year.

Although still supported by the gold mining industry, the main economic contributor in Dawson City is currently tourism. Dawson is also home to a growing arts community hosting a number of annual festivals (e.g. Dawson City Music Festival, Riverside Arts Festival) and a vibrant local market. Students from around the world are drawn to the creative programming at the Klondike Institute of Arts and Culture and the accredited Yukon School of Visual Arts. In addition, the Dawson City Yukon College campus hosts a variety of accredited courses throughout the year.

Table 4-2 Dawson City and immediate area population, Canadian Census (Statistics Canada, 2017)

Year	Population	Change
2016	1,375	+4.2% (+56 people)
2011	1,319	-0.6% (-8 people)
2006	1,327	

Table 4-3 Aboriginal Population of Dawson City, 2016 (Statistics Canada, 2017)

Year	Aboriginal Identity (First Nations, Metis, Inuk, Multiple Aboriginal Identities)	Non-Aboriginal Identity Respondents
2016	310	1,035
% of population	23%	77%

According to Statistics Canada's 2016 Census, the population of Dawson City was 1,375 showing only a slight change in population from 2011 (Statistics Canada, 2012). During the 2016 Census, 310 people identified as Aboriginal or 23% of the respondents in the category **(Table 4-3)**.

4.2.2.4 Other Settlement Areas

Several settlements with permanent residents occur within region outside of the community of Dawson. These areas include: Sunnydale and West Dawson (OIC 1990/118); Bear Creek (OIC 1983/132); and Rock Creek, Henderson's Corner and Flat Creek (OIC 1992/029). Land uses in these areas are governed by Area Development Regulations. These areas are excluded from the regional plan, but existing management plans for such areas are to be considered in development of the plan (YLUPC, 2009).

A small number of residential properties also occur along major highway corridors as a result of spot land applications under Government of Yukon's Rural Residential Land Application Policy, which allow people to acquire land "where existing road access facilitates rational rural residential development" (Government of Yukon, 2012b).

The pattern of settlement in unorganized areas reflects a history of informal evolution of small communities, a phenomenon that continues in the Dawson area. Land for development within planned subdivisions is not readily available and spot land applications and residential use of mineral claims is a persistent symptom.

Some historic communities are indicated on maps but no longer exist as extant settlements, including Granville and Stewart River.

4.3 Economy

The contemporary economy is a mix of market-based activity, primarily in the resource sectors of mining, tourism and forestry, alongside a traditional economy characterized by a stewardship and subsistence mode of production. Government regulation and environmental protection are also a part of the regional economy.

4.3.1 Traditional Economy

The traditional economy continues to be important in a modernized economy. Established patterns of land and resource use are closely tied to central elements of the traditional economy, including stewardship, infrastructure design, technology adaptation, and governance systems. The traditional economy, along with other Tr'ondëk Hwëch'in values and principles, contributes to an adaptive response to landscape-level change and uncertainty in the environment, the economy, and in the availability of resources (Tr'ondëk Hwëch'in, 2012).

4.3.1.1 Definition of Traditional Economy

The traditional economy is based on the harvest of natural resources; it provides meat, fish, berries, fuelwood and income from fur (adapted from Berkes et al., 1994). It also provides raw materials for cultural products such as snowshoes, clothing, footwear, harvesting gear (e.g., fish traps and snares), tools (e.g., knives, sewing implements, scrapers, twist drills and fire drills), weapons (e.g., bow and arrow, spears and clubs), boats (e.g., dugout canoe, birch bark canoe and moose skin boat), cooking ware, baskets, hide dome shelters and arts and crafts products.

The traditional economy has direct value, such as the value of meat harvested; value of hides, antlers and furs as inputs to arts, crafts and cultural products. But the traditional economy also contributes to non-consumptive values such as the cultural

and social well-being of its members, passing on traditional ecological knowledge, kinship and bonding, education in traditional way of life, option to defer harvest to future, leaving resources for future generations and observing changes that are occurring on the land (Tr'ondëk Hwëch'in 2018b)

4.3.1.2 **Importance of the Traditional Economy**

Research has been conducted regarding several northern Aboriginal communities where subsistence economies are not separate and distinct from income-based economies, but serve to supplement wage economies at the individual, the household, and the community level (Usher, Duhaime & Searles, 2003). In a study in the Mushkegowuk Region in 1990-91, it was estimated that the traditional economy was equal to 25% of the average total household income (Berkes, et al., 1994).

For the Tr'ondëk Hwëch'in, ungulates, principally moose, and salmon are an important component of the traditional diet and essential to good health. Caribou are a highly valued source of food, traditional tools and clothing.

Tr'ondëk Hwëch'in citizens hold approximately 40% of trapping concession within the planning region, and the Final Agreement provides for up to 70% ownership through acquisition of available concessions. Guiding, outfitting and trapping contribute important cash for fuel and other supplies, as well as providing families with an opportunity to maintain cultural traditions and spend time on the land.

The importance of traditional land-based activities is not fully accounted for by its in-kind values and percent contribution to the regional economy. Country food is crucially important for nutritional well-being. The activities of harvesting materials are a source of cultural value and social well-being which are more difficult to quantify than harvests.

While the concept of traditional economy was based on the harvest of natural resources, this concept – both in history and in the modern context – also includes the broader traditional aboriginal society, land use and environment (Tr'ondëk Hwëch'in, 2012).

For the Tr'ondëk Hwëch'in cultural and spiritual values are important considerations. The inherent connection to the land and wildlife for First Nations

inevitably results in areas of cultural or spiritual value overlapping with areas of ecological value (Tr'ondëk Hwëch'in, personal communication, September 11, 2018).

The harvest of renewable resources to supplement wage economies is not limited to the First Nations community, and is embraced by the larger populace, as many Dawson families harvest small and big game, as well as non-timber forest products as part of their diets and lifestyles. For example, within the TH traditional territory more than 80 moose are harvested by licensed hunters each year, which is similar to the amount harvested by First Nations people. In some of the major areas harvested by licensed hunters, approximately 60% of the harvest is by local Dawson residents.

4.3.2 Market Economy

Although record levels of hard rock mineral exploration occurred as recently as 2011, the regional economy is strongly linked to tourism and placer mining. The fastest growing sector of the regional economy is in art, recreation and cultural industries.

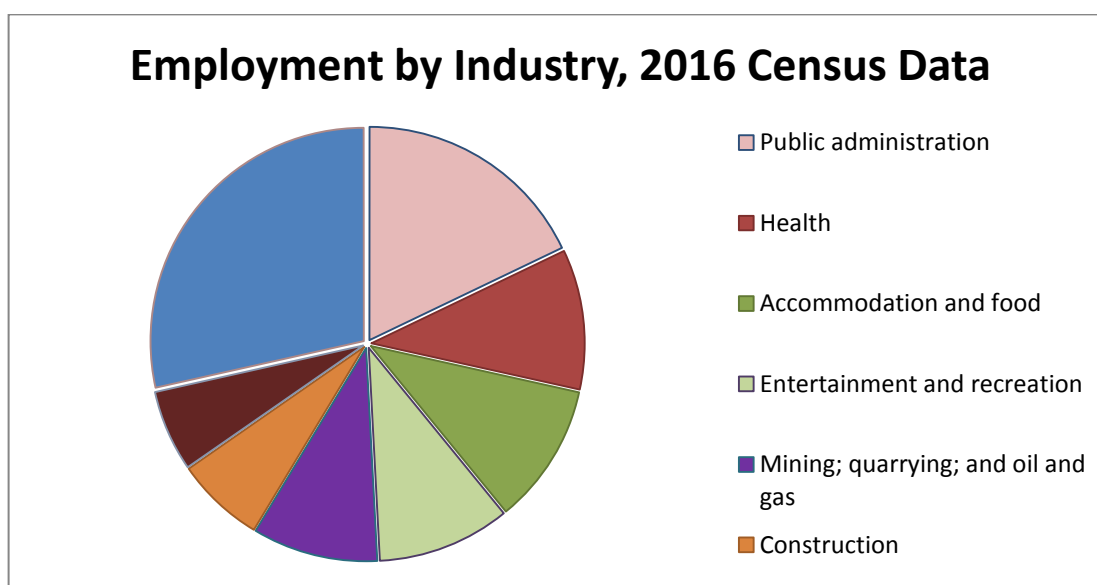


Figure 4-2 Employment by industry, Dawson (Statistics Canada, 2017)

Federal and Yukon governments are important employers, maintaining educational, health and safety services as well as a number of regional resource management offices. Tr'ondëk Hwëch'in government is a substantive economic presence; it is

Dawson's largest employer, maintaining several offices and facilities in the community.

Statistics Canada's employment by industry data for Dawson shows that public administration sector employed 18.2% of the workforce. In addition, the following sectors each employed roughly 10% of the workforce ().

- Health care and social assistance
- Accommodation and food services
- Arts: entertainment and recreation
- Mining; quarrying; and oil and gas extraction

As noted, Mining and Arts each employed about 10 per cent of the workforce. This is considerably higher than the two per cent reported for all of Yukon (**Table 4-4**).

The 2016 Census also shows that Dawson has an unemployment rate of 10.8% compared to that of the Yukon as a whole 9.8%. Some people mine placer gold during the summer and work in another sector for most of the year. Much of the available work is seasonal or short-term and this lack of year-round employment is a major concern among young people. Income is high compared to the rest of Canada but low compared to Yukon as a whole.

The economy is highly dependent on government employment and investment. The economic basis of the region is vulnerable given the small market reach, limited local demand, and considerable reliance on the volatile sectors of tourism and gold mining.

Economic development planning has focused on niche opportunities around the unique cultural, historic and natural characteristics of the region. Areas identified for development include tourism and a traditional knowledge economy. Non-renewable resource development will continue to be important, but requires management to ensure other valued resources are not impacted.

Table 4-4 Dawson and Yukon employment by industry as a percentage of respondents in 2016 Census (Statistics Canada, 2017)

Industry Category	Dawson (%)	Yukon (%)
Public administration	18.2	23.9
Health care and social assistance	10.8	9.5
Accommodation and food services	10.8	7.1
Arts; entertainment and recreation	10.2	2.8
Mining; quarrying; and oil and gas extraction	9.7	2.3
Construction	6.8	9.4
Educational services	6.3	7.5
Transportation and warehousing	5.1	4.9
Administrative and support; waste management and remediation services	5.1	2.6
Other services (except public administration)	5.1	3.6
Retail trade	4.0	9.1
Manufacturing	1.7	1.5
Professional; scientific and technical services	1.7	5.9
Agriculture; forestry; fishing and hunting	1.1	1.1
Utilities	1.1	0.7
Information and cultural industries	1.1	2.5
Finance and insurance	1.1	1.4
Real estate and rental and leasing	1.1	0.9
Management of companies and enterprises	1.1	0.1
Wholesale trade	0.0	1.5

4.3.3 Community Infrastructure

See map **Section 3 – Map #2: Infrastructure, Access and Land Status** for locations of regional and community airports, airstrips, water aerodromes, gravel pits, highways, and secondary/seasonal roads within the region.

The majority of **transmission lines** are routed along highways and other major existing corridors.

Airport Infrastructure: The planning region has one regional airport located roughly 16km from the city core. There are two airstrips located just outside the Region boundary that are maintained by YG-HPW, Chapman Lake and McQuesten.

In summer 2019, the Dawson City Airport was paved for the first time, providing service for a broader range of aircraft. There are many unofficial airstrips scattered throughout the Region that are periodically used by private aircraft, these strips are not maintained by YG (Personal Communication, YG 2019).

The **Quigley Landfill** (located within Dawson municipal boundaries and managed by the City of Dawson) services Dawson City, the Klondike Valley, and the Dempster and North Klondike Highways.

The broader Dawson area is experiencing increased demand for land and services in connection with increased mineral exploration activities, and the current Dawson landfill appears to be reaching its capacity. Concern was expressed in 2008 regarding capacity for construction, renovation and demolition waste (Larsen, 2008; Taylor, 2009). Completion of large capital projects since then, including the wastewater treatment plant and hospital, has likely aggravated this situation. Future growth of residential, commercial and/or infrastructure developments including potential landfill expansion or commissioning a new landfill may require changes to the municipal boundary. Infrastructure planning and management must consider that both Dawson proper and outlying rural areas are being serviced.

In September 2018 an announcement was made for infrastructure funding to go towards improvements to water pipes in Dawson City and the installation of a solar power system at Moosehide (Waddell, 2018).

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5 BIOPHYSICAL SETTING

This chapter provides a landscape scale¹ description of physiography, geology, climate, glacial history, landscape types (i.e., vegetation and soils) and natural disturbance regimes in the planning region and potential impacts from climate change.

5.1 Geology

The planning region is characterized by a diverse geology and is transected by the Tintina Trench. Geology is the foundation for the region's energy, mineral and water resources and also influences planning issues such as climate change and natural hazards (e.g. landslides, earthquakes, floods).

The most distinctive and recognizable geologic feature within the planning region is the northwest-southeast trending Tintina Trench, a nearly 1,000-km long fault line along the continental margin of ancient North America (**Table 5-1 & Figure 5-1**). To the north of the fault lie the "foreland" sedimentary shelf and basin deposits of oceans along the ancient coastline. South of the fault lies volcanic and intrusive formations of island arcs that formed near, then merged with, the coastal shelf (Yukon-Tanana Upland).

Immediately north of the Tintina Fault, rocks in the South Ogilvie and Mackenzie mountains formed from sediment deposited in the Selwyn Basin along the ancient North American coastal margin (shale, slate, sandstone and chert). Volcanic rocks, including basalt flows and breccia, and intrusive rocks, such as diorite and syenite, are also found. East-to-west trending thrust faults from the Wernecke to Southern Ogilvie mountains and steeply dipping rock units combine to produce the distinctively rugged topography of the Tombstone and Cloudy ranges.

Farther north, the North Ogilvie and Nahoni ranges are composed almost entirely of deposits of the ancient continental shelf. Successive layers of erosional sediment and carbonate shelf deposits form the Yukon Block. Known mineral deposits include coal seams in the Kandik basin and silver, copper and zinc mineralization near Rusty

¹ Landscape scale refers here to ecological processes and systems operating at large spatial scales, typically over thousands of hectares, containing a diversity of habitats and species and linked to human activity through ownership, resource management and physical infrastructure.

Springs. Iron sulphide (pyritic) shales naturally produce acidic drainage that becomes mixed and diluted with groundwater or surface water.

South of the Tintina Trench lie deeply weathered metamorphosed sedimentary deposits and younger volcanics and intrusives of the Yukon-Tanana Terrace. These rocks contain a variety of minerals including asbestos, copper and gold. Significant gold deposits have been located in the White Gold district. Pre-ice age rivers draining southward concentrated gold eroding from quartz veins into alluvial (placer) sand and gravel deposits. The most accessible placer deposits have been extensively sluiced and dredged over the last 100 years.

Please refer to the map at [Section 3 – Map #3: Physiographic Units and Simplified Geology](#) for further information on regional geologic formations.

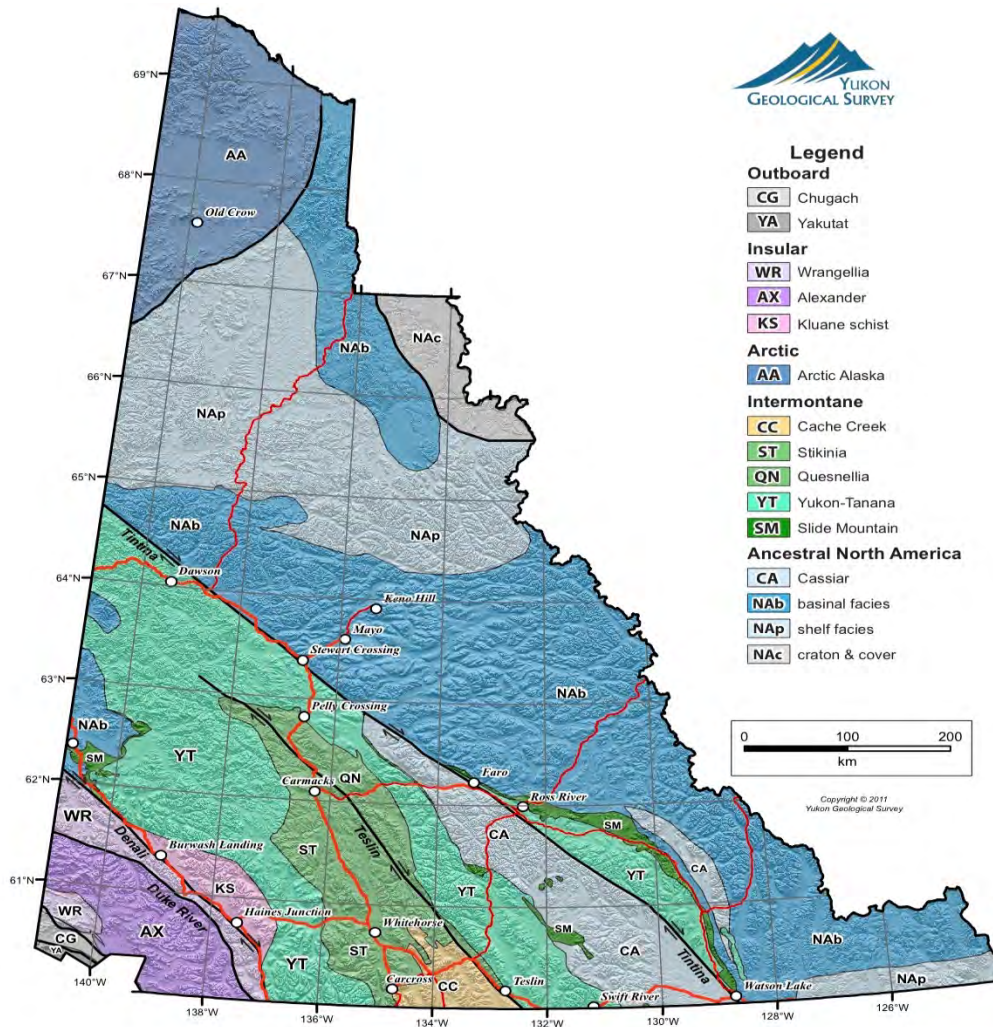


Figure 5-1 Yukon Terranes and Tintina Fault (Colpron and Nelson, 2011)

5.2 Landscape and Glacial History

As part of a greater ice-free landscape once known as **Beringia**, most of the Klondike Plateau and much of the North Ogilvie Mountains remained ice-free for most of the last three million years. This extended unglaciated period has had a major influence on the landforms and ecology of the region.

In the Late Pleistocene, Beringia was a mosaic of biological communities, including large species such as saiga antelope, woolly mammoth, and caballid horses. The region is rich in paleontological faunal remains, often found frozen in permafrost. This ice-free landscape was also important for human occupants of the region, evidenced by archaeological sites dating back approximately 13,500 years BP.

Surficial materials in unglaciated regions consist largely of weathered bedrock, colluvium, re-transported loess (wind-blown silt), and organic and fluvial deposits.

Prior to glaciation, extended cycles of uplift and erosion resulted in a well-developed landscape, with rounded summits and valley systems draining southward to the Pacific Ocean. It was during this period that the “White Channel Gravel,” a significant local source of placer gold, was deposited. Cordilleran glaciation resulted in a reversal of pre-glacial patterns, diverting the Yukon River northwest into the Tanana basin of Alaska. Subsequent evolution of drainage resulted in the reworking and redistribution of alluvial, gold bearing sediments, concentrating placer gold in pay streaks along valley bottoms, alluvial side-fans and bedrock terraces (Duk-Rodkin et al., 2003).

The stratigraphic record of sediments within the region contains one of the most complete records of glacial and inter-glacial periods in North America.

The Ogilvie Mountains are the only area in the planning region that supported glaciers (ice caps) during the last glaciation. These ice caps were surrounded by unglaciated terrain and therefore isolated from the Cordilleran ice sheet to the southeast.

In contrast to the glaciated portions of southern Yukon, V-shaped valleys, convex slopes, rolling broad ridges and bedrock tors characterize the terrain in the

unglaciated portion of the planning region. The U-shaped valleys, alpine cirques and tarns more characteristic of glaciated mountain terrain may be found in the Tombstone Ranges, but due to the absence of glacial moraines elsewhere, few large lakes were created.

With each glacial advance, then retreat of the surrounding ice sheet, large volumes of wind-blown silt, or loess, were repeatedly carried onto the unglaciated landscape, mixing with soil horizons of weathered bedrock. Thicker loess units are found closest to the source in the St. Elias Mountains to the south.

Please refer to the map at [Section 3 – Map #4: Glacial History](#) for further information on regional glacial history.

5.3 Climate

The climate of the planning region is continental (i.e., little temperature moderation by oceans) with long, cold winters and relatively warm summers. Most of the annual precipitation comes in the form of convective showers and thunderstorms from June to August. The driest months are February to April (**Figure 5-2**).

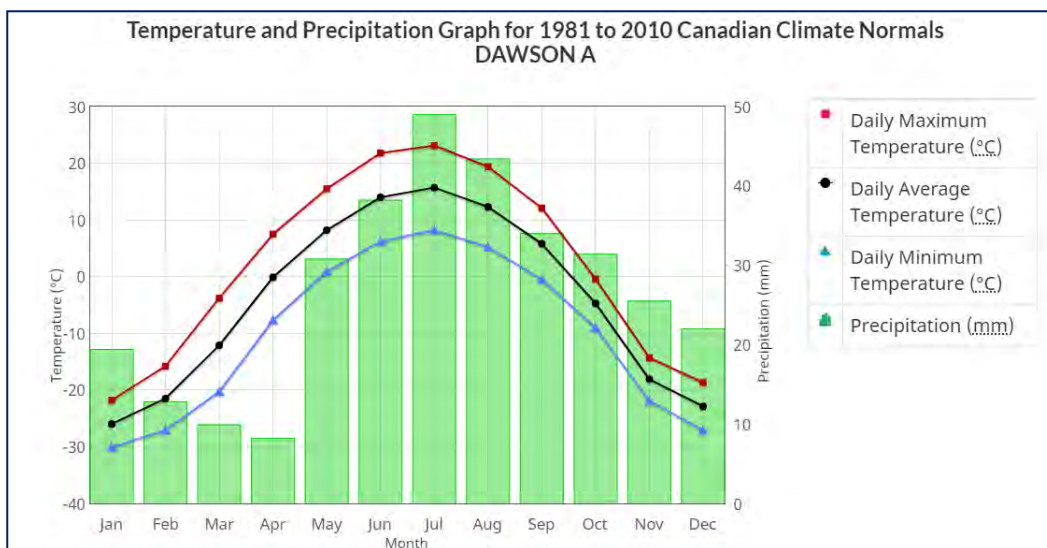


Figure 5-2 Climate Normals 1981-2010, Dawson A Station, temperature and precipitation (Environment Canada, 2018)

The planning region includes an area that receives the highest frequency of lightning strikes in Yukon. Persistent ridges forming in the upper atmosphere can cause prolonged warm, dry periods during the summer. The high portion of the

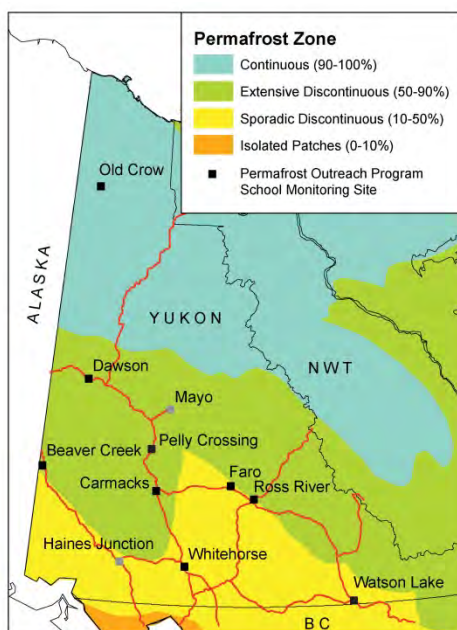
Klondike Plateau, along the Yukon-Alaska border to the west and southwest of Dawson City, is the wettest part of the planning region. While not quite as wet, the South Ogilvie Mountains produce a similar effect, with higher elevations generally receiving more snow and rain.

The Mackenzie Mountains act as a barrier to stop cold arctic air draining into central and southern Yukon. Winter temperature inversions can lead to extremes in temperature; -50 C is not uncommon in major river valleys (Klock et al., 2001).

Natural cycles of climatic variability can cause recurring and persistent changes in regional weather patterns. Two significant circulation patterns causing abnormal temperature and precipitation events are the El Niño/La Niña Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO). The ENSO shifts irregularly between El Niño (warm phase), neutral and La Niña (cool phase) every two to seven years. Recent research has shown that climate change is driving an increase in the frequency of El Nino events – up to twice as frequently (Cai et al., 2014).

5.4 Permafrost

Permafrost is soil that remains continuously frozen year-round, for at least two years. Permafrost is more widespread in the northern and higher-elevation areas of the planning region (**Figure 5-3**). While the depth of permafrost varies, permafrost thicknesses of 60 m have been recorded in the region.



- **Continuous permafrost** occurs where the depth of frozen ground is a relic of colder climatic conditions from glacial periods, and soil remains frozen in spite of aspect or exposure.
- **Discontinuous permafrost** occurs where mean annual temperatures are at or slightly below 0°C, and frozen soil occurs only in sheltered and northerly aspects. In discontinuous permafrost areas, permafrost is generally found on valley bottoms, on most gentle slopes and ridge tops, and on nearly all

Figure 5-3 Permafrost distribution in the Yukon

- north-facing slopes. Steep south-facing slopes are commonly free of permafrost.
- The **depth active-layer** (i.e., depth of seasonal thaw at the ground surface) is generally less than 1 m, although can be deeper where soils are well drained, and as little as 20 cm under the insulating cover of an organic mat. Soils over permafrost are generally moister and cooler than soils in permafrost-free landscapes. Limited infiltration of surface water results in saturation, slow decomposition and low nutrient availability.

The transition from discontinuous to continuous permafrost does not necessarily follow a linear trend with elevation. Low winter temperatures are required to maintain permafrost, however ground temperature may be moderated by snow depth and density, causing permafrost to remain warmer in winter than would otherwise occur in the absence of snow. An increase in winter snow cover could result in increased permafrost thawing, however many other factors, such as the insulating properties of surface moss and organic soil, current average snowpack and redistribution of snow on the landscape play a significant role (Schuur et al. 2008).

5.4.1 Disturbance of Permafrost and Implications

5.4.1.1 Permafrost disturbance

Increasing rates of permafrost melt associated with climate change may cause changes in slope stability and local drainage patterns. Much of the undisturbed discontinuous permafrost south of the Yukon River in Alaska has warmed significantly since the mid-1700s and some of it is thawing (Jorgenson et al. 2001).

Most discontinuous permafrost south of Eagle Plains is warmer than -2 C. This permafrost is easily disturbed and its degradation can be readily initiated by any construction activity that disturbs the natural surface vegetation or drainage.

Linear infrastructure and removal of ground vegetation increases exposure to sunlight and can cause increased thaw and degradation of permafrost.

Placer mining often occurs in permafrost ground which is thawed to access the paydirt below. Typically, frozen ground is exposed to enable thawing and then mechanically removed, or washed away through hydraulic mining processes.

5.4.1.2 Implications

The Disturbance of surface vegetation causes degradation and thaw of permafrost and results in the development of thermo-karst ponds commonly found in valley bottoms. The presence of discontinuous permafrost in this area generally limits groundwater recharge, subsequently affecting the hydrological response of streams. This interaction is described in more detail in Section 9.2.

Wetlands often form over continuous permafrost where ice lenses create a barrier to moisture percolating downwards. Within the region, permafrost is a contributing factor to wetlands being found in places that would be uncommon in other regions – such as the toes of north-facing slopes. Changes to permafrost (climate change induced or otherwise) will affect the presence and frequency of these wetlands (Government of Yukon, personal communication, September 2018).

Permafrost melting can lead to accelerated erosion and may complicate maintenance considerations (EBA Engineering, 2004). This may be cause for concern for the design and maintenance of roads and other infrastructure, as well as creating engineering challenges in the design and construction of buildings. Increased instances of slumps, washouts, subsidence, and landslides along the Dempster Highway associated with permafrost have been noted by both researchers and the engineers studying climate, permafrost and northern infrastructure in the Yukon. Estimates suggest climate change can be attributed to an increase in maintenance costs of \$200,000 per year, since 2005, for the Dempster Highway alone.

Permafrost plays a significant role in the carbon cycle. Carbon stored in permafrost regions is one of the least understood and potentially most significant carbon-climate relationships (Schuur et al., 2008). Under warming soil conditions, melting permafrost could significantly increase release of carbon into the environment, thus potentially contributing to overall greenhouse gas emissions. A recent study also suggests that there is twice as much mercury stored in permafrost than all soils, the atmosphere, and the oceans combined; this may have major global implications as permafrost thaws (Schuster et al., 2018).

5.5 Ecological and Landscape Classification Frameworks (ELC)

Ecosystems are the foundational component to functional healthy habitat and landscapes. Ecosystems can be classified into units of similar physical and ecological function which is an important component of ecosystem-based management and conservation planning. Ecological and landscape classification (ELC) takes into account attributes such as climate, terrain, soil, and vegetation. Knowing these characteristics, and being able to map them helps to make informed and sound decisions on the land.

The Yukon uses two frameworks for classifying ecosystems at a broad scale. A combination of these frameworks is used to characterize and classify the ecosystems of an area.

1 National Ecological Framework (NEF)

- Divides the Yukon into regional landscape polygons, ecoregions. These are based on areas of similar physiography, climate, geology, and soil development. (Figure 5-4)
- Useful at large scales (e.g. 1:1,000,000) for management applications and ecological reporting at broad scales.

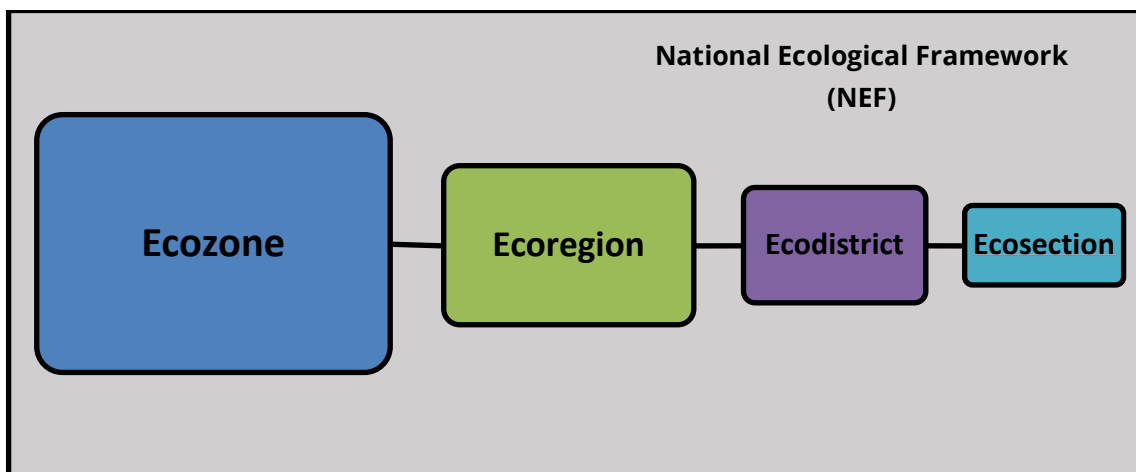


Figure 5-4 Basic illustration of National Ecological Framework hierarchy

2 Yukon Bioclimate Ecosystem Classification (YBEC)

- Uses climate, elevation, terrain and on the ground vegetation information to build bottom up classification which is not limited to physiographic regions. (Figure 5-5)

- Intended for use in applications such as environmental assessment, broad ecosystem description, cumulative effects and biodiversity modeling.

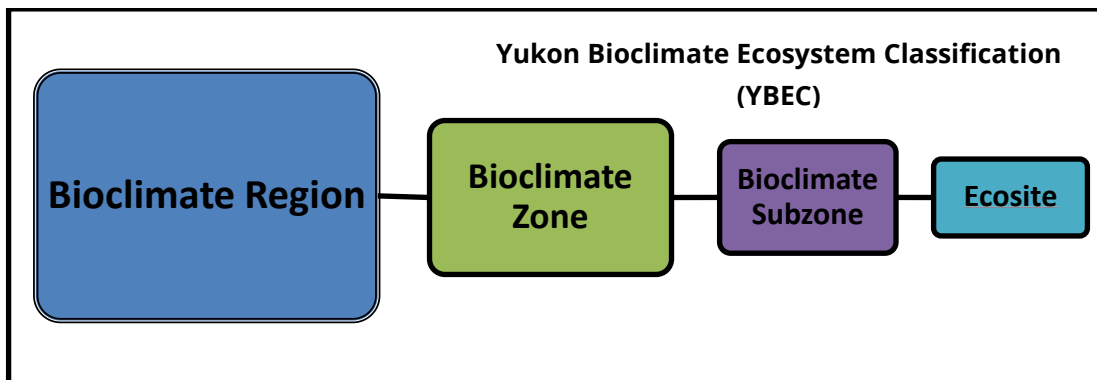


Figure 5-5 Basic illustration of the Yukon Bioclimate Ecosystem Classification (YBEC)

5.5.1 NEF Classification for the Dawson Planning Region

Descriptions of ecodistricts and ecologically significant features in the planning region were completed in 2010 (McKenna et al., 2010).

The Dawson planning region is bisected by the **Taiga Cordillera Ecozone** in the north and the **Boreal Cordillera Ecozone** in the south. The **Taiga Cordillera** is a subarctic region that covers most of the northern half of Yukon and the southwest corner of the Northwest Territories (Smith et al. 2004). The **Boreal Cordillera**, an extension of the boreal forest zone that stretches from Labrador to Yukon, lies over the mid-section of the **Western Cordillera**.

Ecosystems south of the Tintina Trench are dominated by weathered un-glaciated landscape, which are host to a diversity of vegetation communities. This landscape is a mosaic of young serial ecosystems which are a result of frequent forest fire activity to mature serial grassland which contain Beringian plant species. North of the Tintina Trench is characterized by the rugged landscapes of the Ogilvie Mountains which were shaped by various glacial maximums. This area is young in geologic time and shows many signs of a dynamic and erosional landscape.

The two ecozones are divided by distinct geological and climatic features separating them into six ecoregions. An excellent resource for more detailed descriptions of the six ecoregions can be found in Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes (Smith et al., 2004) (see map below Ecoregions

Figure 5-6):

Taiga Cordillera Ecozone

Ecoregions:

Eagle Plains

Mackenzie Mountains

North Ogilvie Mountains

Boreal Cordillera Ecozone

Ecoregions:

Yukon Plateau - Central

McQuesten Highlands

Klondike Plateau

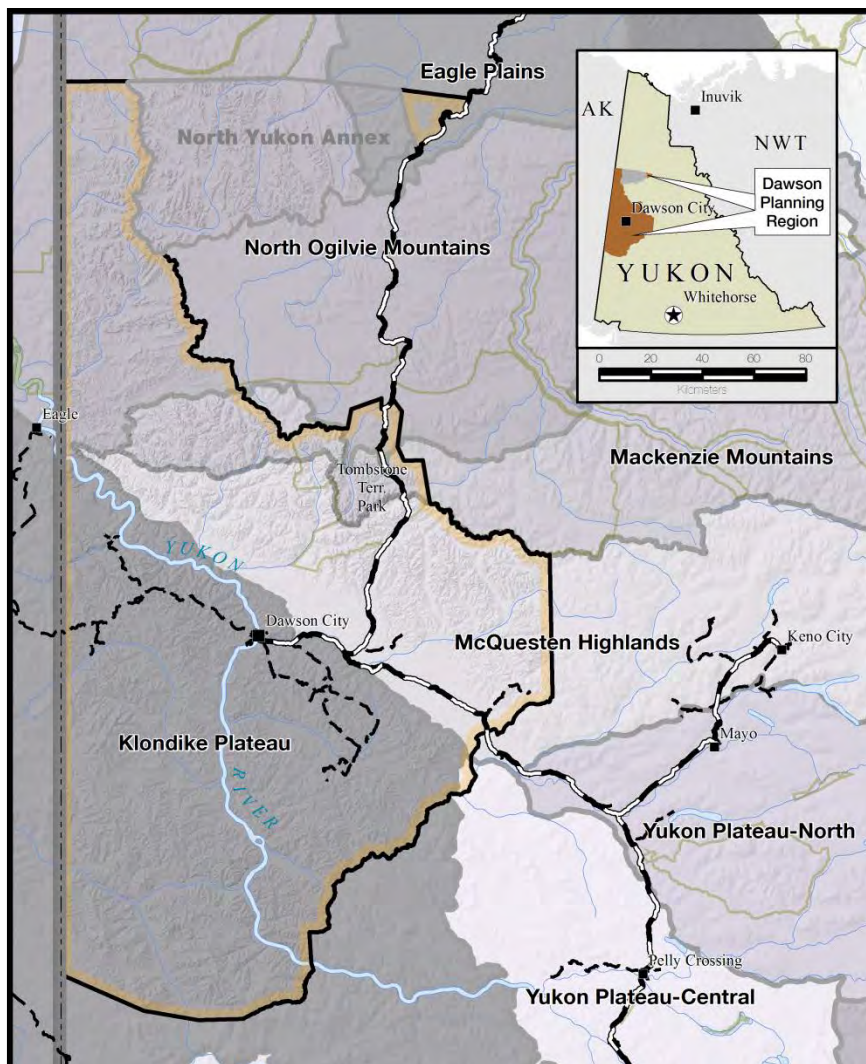


Figure 5-6 Map depicting the six ecoregions within the Dawson region and NYA

Ecodistricts are used to further subdivide ecoregions according to differentiating characteristics of landform, permafrost, soil development, soil texture, vegetation cover, annual precipitation and mean temperature.

Please refer to the map at [Section 3 – Map 5: National Ecological Framework](#) for depiction of regional ecodistrict boundaries.

Table 5-1 separates the Dawson region and the North Yukon Annex into the top three tiers of the NEF classification system. This table shows the area and percent of each ecozone/ecoregion/ecodistrict for the region and the territory to inform ecoregion representation in the territory.

Ecozone	Dawson Region		North Yukon Annex		Yukon Territory	
Ecoregion						
Ecodistrict (2014)	km2	%	km2	%	km2	%
Boreal Cordillera	30,940	77.6%		0.0%	316,165	63.3%
Klondike Plateau	21,296	53.4%		0.0%	36,998	7.4%
Backbone Ranges South	1,213	3.0%		0.0%	1,213	0.2%
Sixty Mile	6,328	15.9%		0.0%	6,565	1.3%
Dawson Range	2,410	6.0%		0.0%	7,658	1.5%
Otter Creek	1,484	3.7%		0.0%	2,484	0.5%
ID9132	27	0.1%		0.0%	684	0.1%
ID9147	4,969	12.5%		0.0%	4,969	1.0%
ID9148	849	2.1%		0.0%	1,961	0.4%
ID9149	3,650	9.2%		0.0%	3,743	0.7%
ID9154	366	0.9%		0.0%	2,133	0.4%
McQuesten Highlands	9,563	24.0%		0.0%	23,592	4.7%
ID9109	1,369	3.4%		0.0%	2,868	0.6%
ID9144	1,799	4.5%		0.0%	3,442	0.7%
ID9151	3,474	8.7%		0.0%	3,475	0.7%
ID9152	464	1.2%		0.0%	464	0.1%
ID9153	2,457	6.2%		0.0%	2,723	0.5%
Yukon Plateau-Central	81	0.2%		0.0%	24,030	4.8%
Rosebud Creek	81	0.2%		0.0%	4,451	0.9%
Taiga Cordillera	8,913	22.4%	5,386	100.0%	133,322	26.7%
Eagle Plains	329	0.8%	656	12.2%	21,985	4.4%
ID9123	328	0.8%	656	12.2%	2,574	0.5%
Mackenzie Mountains	2,524	6.3%		0.0%	32,442	6.5%
North Fork Pass	2,496	6.3%		0.0%	3,012	0.6%
ID9155	28	0.1%		0.0%	2,160	0.4%
North Ogilvie Mountains	6,061	15.2%	4,730	87.8%	41,171	8.2%
Miner River	4,591	11.5%	1,457	27.1%	6,456	1.3%
Ogilvie River	423	1.1%	107	2.0%	5,529	1.1%
ID9126	1,047	2.6%	72	1.3%	5,138	1.0%
TOTAL	39,853	100.0%	5,386	100.0%	499,583	100.0%

Table 5-1 National Ecological Framework classification system table of the Dawson Region

5.5.2 YBEC Classification for the Dawson Planning Region

Under the YBEC classification system the planning region is divided into seven bioclimate zones. A description of each of the bioclimate zones and the extent of the zones within the planning area are presented in **Table 5-2** and **Section 3 – Map: #6 Bioclimate**.

Table 5-2 Yukon bioclimate zones with descriptions and area for Dawson region and NY annex (*Note ranges are approximate)

Bioclimate Zone (Subzone)	Description	Elevation Range (m)*	Area in Dawson Region		Area in North Yukon Annex	
			km ²	% of region	km ²	% of region
Boreal Low (Klondike Plateau) BOLkp	BOLkp covers much of the rolling plateau of the southern end of the region. BOLkp is dominated by mature white and black spruce, trembling aspen, and paper birch. Extensive discontinuous permafrost except on steeper south-facing slopes.	<1,000	21,083	52.90%	0	0.00%
Boreal Low (Yukon Plateau North) BOLyn	BOLyn occupies the broad valleys in the Clear Creek area. Mature forests of the BOLyn are often dominated by white spruce, although mixed forests are common due to frequent forest fires. Permafrost is present.	<800	1533	3.85%	0	0.00%
Boreal High BOH	BOH is found at mid to upper elevations typically the gentle rolling slopes above the large valleys. BOH is characterized by open to sparse coniferous forests dominated by extensive coverage of shrub birch and willow species.	1,000-1,200	5596	14.04%	0	0.00
Boreal Subalpine BOS	BOS occurs at high elevations of the Boreal Cordillera (southern) portion of project area. The BOS consists of stunted coniferous krumholtz with extensive shrub cover. Growing conditions are harsh with minimal soil development.	1,200-1,500	1908	4.79%	0	0.00%
Boreal and Subarctic Alpine Tundra ALP	ALP is found above the subalpine, and is dominated by ground shrubs, lichen and exposed rock. ALP areas may have persisting snow beds throughout the summer with minimal soil development.	>1,500 (>1,200 to the north)	1954	4.90	3211	59.61%
Subarctic Woodland SUW	SUW covers the low and middle elevations of the Taiga Cordillera. Extensive shrub areas in valley bottoms with bands of coniferous forest on the valley sides are characteristic of this zone as a result of cold air drainage and poor drainage	<950-1,100	5011	12.57%	3211	59.61%
Subarctic Subalpine SUS	SUS covers the high elevation shrub and sparsely forested areas in the mountains and plateaus of the Taiga Cordillera	950-1,500	2768	1578	29.30%	

In mountainous areas, bioclimate zone boundaries may be visible as relatively abrupt changes in general vegetation communities or species and are organized along a gradient of transition. In lower elevation or rolling terrain, bioclimate zone boundaries may be subtle and transitional.

5.5.2.1 **Predictive Ecosystem Mapping (PEM)**

The Dawson Region has complete coverage of predicted ecosystems mapping, based on the bioclimate zones, slope, aspect, geology, and land cover (from satellite imagery). 44 phases, or types, of ecosystems were identified. This map can be used to model (or predictively map) the habitat of other species, and to gain a better understanding the region's ecosystems. This mapping is sometimes referred to Ecological Land Classification (ELC). See also **Section 3 - Map #7: Ecological Land Classification**.

5.5.2.2 **Local Ecosite Units**

Ecosites describe ecosystems at a site level and are the smallest unit of classification in YBEC. Climate is the overarching factor which determines ecosite distribution. Ecosites are defined by uniform site conditions which are represented by relative soil moisture and nutrient regimes along with a combination of other site level environmental factors. Preliminary ecosites have been drafted for upland and wetland sites in the Boreal Low Klondike Plateau subzone and are not yet complete at time of publishing this document.

5.5.2.3 **Rare, Unique and Special Features**

The Dawson region contains many features that are identified on the **Unique and Special Landscape Features** map (**Section 3 - Map #8**). While the mapped resources are not an extensive list, they are some of the known features that have been identified as having high conservation value (Government of Yukon, 2012c). Chapter 12: Protected Areas and Conservation Opportunities describes these elements in further detail and how they can be incorporated into the regional land use plan.

5.5.2.4 **Beringia**

As discussed in section 5.2 Landscape and Glacial History, most of the planning region was part of Beringia. Beringia supported many glacial relict species that are found nowhere else in the world. The unglaciated area was a refuge for plants and animals and those arctic,

alpine and boreal species that would eventually repopulate northwestern Canada. Many of these plant and animal populations became isolated following the ice age. The Beringian area covered almost the entire Dawson planning region, excluding only a small percentage of the Mackenzie and North Ogilvie Mountains. This landscape history has implications for the palaeontological, archaeological and mineral resources that are described in Chapters 8 and 13. The Unique and Special Landscape Features map (**Section 3 – Map #8**) identifies the unglaciated areas of interest in the planning region.

5.5.2.5 **Wildlife and vegetation**

Unique features that are of particular importance in the region are identified as being wetlands (as described above), known mineral licks, instances of rare plant and animal species, and intact forest >140 years old. These features are notable due to their rarity, and their contribution to the diversity and resiliency of the ecosystems. **The Unique and Special Landscape Features** map (**Section 3 – Map #8**) highlights the known areas of interest.

5.5.2.6 **Wetlands**

Wetlands cover roughly 10% of planning region (Bond, 2019). Due to their low abundance relative to other areas of Yukon, all wetland areas in the planning region are considered ecologically important. Further discussion on wetlands can be found in **Section 5.6.3 Wetlands**.

5.6 Hydrology

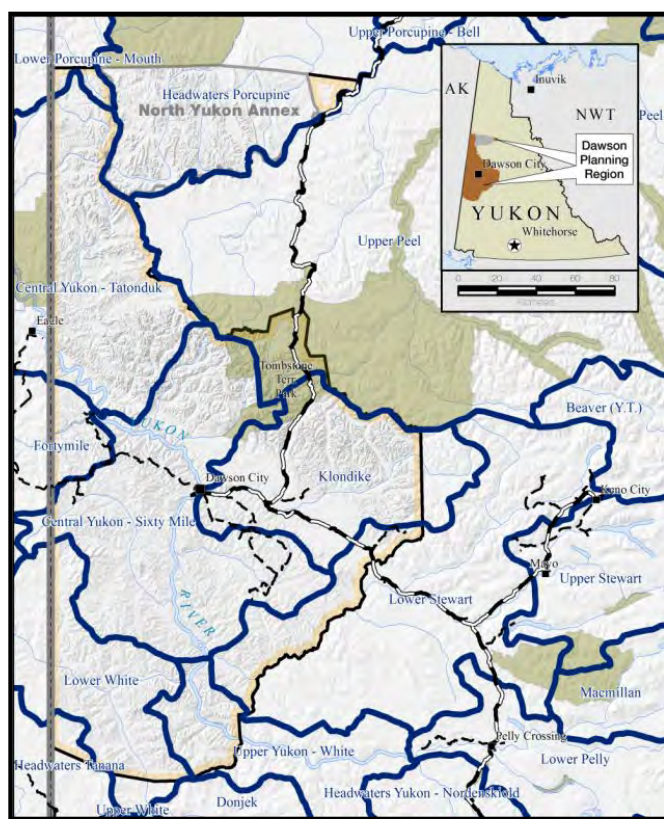
5.6.1 **Watersheds**

Hydrology and hydrologic connectivity are important elements of ecosystem-based management and conservation planning. The largest sub-watershed in the region is the Central Yukon, which includes the tributaries of Sixty Mile River and Indian River. Six sub-watersheds straddle the international boundary into Alaska and five straddle the boundary of the planning region (**Table 5-3, Figure 5-7, and Section 3 – Map #9: Watersheds**). Three of the sub-basins are the headwaters for their respective watersheds: Tanana, Peel and Porcupine.

Table 5-3 Sub watersheds within and adjacent to the planning region

	Drainage Area (km ²)	Area within region + NYA (km ²)	% of Sub-Basin in Region	% of Planning Region + NYA
MACKENZIE RIVER BASIN				
Upper Peel (Blackstone River)	37,523	1,177	3.1	2.6
YUKON RIVER BASIN				
Lower White River	8,269	4,465	54.0	9.9
Upper Yukon – White River	52,735	1,736	3.3	3.8
Headwaters Tanana	14,165	366	2.6	0.8
Lower Stewart River	16,423	2,700	16.4	6.0
Central Yukon – Sixty Mile	12,957	12,693	98.0	28.0
Klondike	8,046	6,894	85.7	15.2
Forty Mile	16,827	1,211	7.2	2.7
Central Yukon - Tatonduk	23,045	7,878	34.2	17.4
Headwaters Porcupine River*	23,685	5,822	24.6	12.9
Lower Porcupine Mouth	4,239	363	8.6	0.8
TOTAL	217,914	45,305	20.8%	100%

***Primarily in the North Yukon Annex (NYA)**

**Figure 5-7 Sub-watersheds in planning region**

5.6.2 Rivers

The **Yukon River** is the largest river in the planning region and generally flows north and west to the Canada-Alaska boundary. Significant tributaries include the **White River** (which contributes inflow from extensive snowfields in the Wrangell–St. Elias Mountains) and the **Stewart River** (which drains the area east toward the Northwest Territories border). When combined with the inflow of the Pelly River, just south of the region, these tributaries result in an increase in width of the Yukon River from 180 m at Carmacks to 300 m at Dawson. Upon reaching the Canada-USA border, the river attains a width of about 450 m. Annual discharge for the Yukon River is shown in **Figure 5-8**.

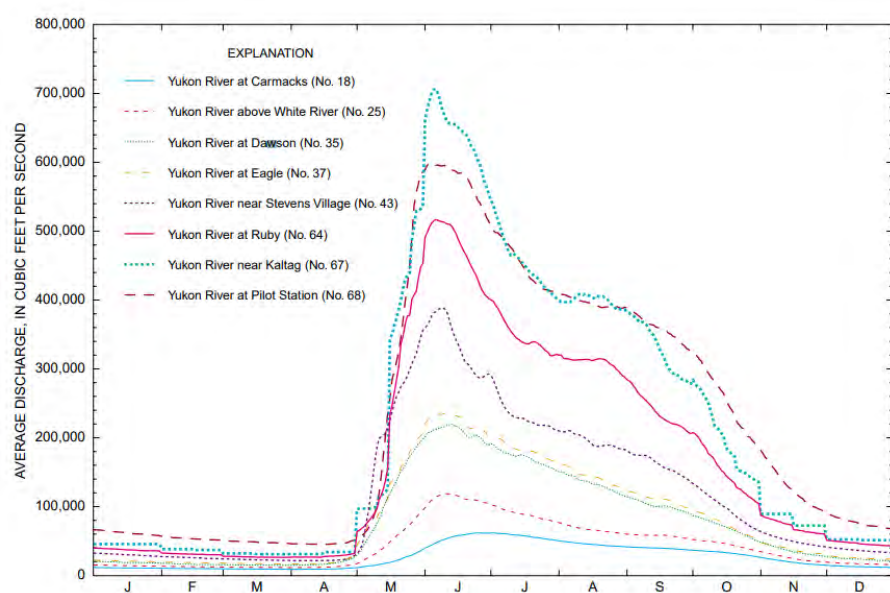


Figure 5-8 Average discharge of the Yukon River at eight locations (Brabets et al., 2000)

In the Taiga Cordilleran ecozone, the underlying permafrost largely controls stream flow characteristics. Runoff is large relative to precipitation because of limited infiltration through the underlying permafrost and low rates of evapotranspiration. Peak flows generally occur in June, although summer rain events can produce secondary peaks and occasionally annual peaks on smaller streams, especially in mountainous areas. Minimum flows generally occur in March and tend to be lower than Boreal Cordillera ecozones to the south because of the effect of lower winter temperatures on groundwater flow. Small streams within this ecoregion frequently experience zero flows, while some intermediate-sized streams may occasionally experience zero winter flows.

In the Boreal Cordilleran ecozone, rapid increase in stream flow discharge occurs in May due to snowmelt, with high flow continuing for a few weeks maintained by summer rainfall.

Streams in the southwest can have peak flows in July or August due to snowfield and glacier melt. Ground water discharge generally continues throughout winter.

5.6.3 Wetlands

Wetlands are important parts of ecosystems, watersheds, and cultural landscapes and cover roughly 10% of planning region (Bond, 2019). They consist of land where the water table is at, near or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation. Wetlands include organic wetlands or “peatlands”, and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat (Canadian Wetland Classification System). They have a number of ecological and economic functions, including:

- Providing important habitats for a number of plants, birds, and other animals;
- Regulating water flows;
- Filtering and regulating water nutrients; and
- Moderating climate change by drawing carbon out of the air.

The Yukon Government has adopted the Canadian Wetlands Classification System to provide a consistent framework for the description of wetlands (National Wetlands Working Group, 1997). The wetland categories are:

- Bogs
- Fens
- Swamps
- Marshes
- Shallow open water

The ecological and economic functions vary among these categories. In the Dawson Region, detailed wetland mapping of these categories only exists for the Indian River watershed (McKenna, 2018 – see also inset of **Map 8 [Section 3 – Map #8: Unique and Special Landscape Features]**). The ELC (see **5.5.2.1 Ecological Land Classification**, above) provided a good indication of the location and general extent of wetland complexes in the region; however, it tends to underestimate their overall amount (Bond, 2019). A recent analysis of wetland complexes in the Tr’ondëk Hwëch’in Traditional Territory noted a sizable complex in the Tintina Trench, with smaller complexes in the valleys of the White, Ladue, Indian Rivers and Scottie Creek (Bond, 2019). Some, but not all, of these overlap with placer mining deposits and prospects.

In addition, the Yukon Government, with partners, is currently working on a Wetland Policy for the territory (Glynn-Morris & Nelson, 2018). The policy is in the initial stages of development and may not be completed in time for the development of the Dawson Regional Plan. At this point, the members of the roundtable who are helping develop the policy have considered several policy tools including:

- No net loss: wetland losses must be offset by gains elsewhere;
- Impact thresholds and acceptable loss: by area, value or function, or representation of different types; and
- Territorially Important Wetlands: the policy would guide how these are selected and how they are to be managed, but regional processes would select them.

No matter which tools and approaches are adopted within the Policy, the Policy will likely look to other processes, like Dawson Regional Planning, to provide detailed management decisions within the Policy.

The Department of Energy Mines and Resources are developing a guide for wetland reclamation for the placer mining industry as a reclamation plan is often a stipulation in the approval or license process (Government of Yukon, personal communication, 2018).

While the importance of wetlands has been identified as a key interest in the planning region, limited data exists on their distribution and status. Available spatial data related to wetlands is shown on **Map #7: Ecological Land Classification** and **Map #8: Unique and Special Landscape Features** in **Section 3** of this report. Any new updated wetland data will be incorporated into the planning process as it becomes available.

5.7 Natural Disturbance Processes

5.7.1 Wildfire

A key influence on the forest ecology of the region, particularly in the southern portion, is wildfire. The Klondike Plateau has some of the highest levels of fire activity in Yukon, with an average fire cycle of approximately 100 years. In extreme fire years, such as 2004, 10 to 20 percent of the plateau can be affected by fire in a single season. In contrast, wildfire occurs much less frequently in the Ogilvie Mountains and is generally limited to forested valley bottoms.

While most precipitation falls during the summer, it results principally from thunderstorms that also bring a relatively high density of lightning strikes. The rolling, forested terrain on plateau portions of the region presents few topographic barriers to fires; combined with

warm summer temperatures means that upland forests experience extensive and frequent burns, resulting in large areas of early-successional shrub and deciduous forest. Frequent wildfire may contribute to a decline in caribou habitat quality, while at the same time providing more browse for moose and snowshoe hare.

Fire history by fire district is shown in **Table 5-4**. The Dawson Fire Management District has the highest frequency of fire and largest area burned by wildland fire in the Yukon. In the Dawson Fire District the number and area of fires occurring annually is highly variable, but the area burned per decade has increased overall since the 1970s (Government of Yukon, 2012b).

Table 5-4 Fire History by Fire Management District, 1960-2011

Fire Management District	Area Burned (ha)	# of Fires
Beaver Creek	317,318.84	229
Carmacks	1,049,553.04	598
Dawson	1,564,474.40	1,063
Haines Junction	16,530.87	252
Mayo	1,260,027.12	800
Old Crow	1,451,838.20	380
Ross River	693,193.48	553
Teslin	43,449.93	212
Watson Lake	825,722.50	753
Whitehorse	142,939.83	1,539

Regional fire history is displayed on the map in **Section 3 – Map #10: Forestry and Fire History pre 1950 to 2018**.

On average, approximately 0.5 per cent of the study area burns in any given year, which results in an average fire cycle of 200 years. This is consistent with a previous assessment of fire rates for central Yukon (McVoy and Burn, 2005). However, a large number of fires occurred in 2004, when approximately eight per cent of the study area burned in a single fire year.

Lightning is by far the most frequent cause of fire (85 per cent) and accounts for over 98 per cent of the area burned. The largest fires, those over 1,000 ha in size, account for less than 15 per cent of all fires, but cause 96 per cent of the burned area (**Table 5-5**). Median fire sizes indicate the high frequency of small fires associated with lightning strikes. When

calculated only on the basis of the larger mapped fire occurrences, median fire size approaches 2,000 ha in the ecodistricts most prone to fire (**Table 5-6**).

Table 5-5 Dawson District fire history by cause of fire, 1960-2011

Fire Cause	# of Fires	% of Fires	Area (ha)
Not Specified	14	1.32	3,531
Lightning	900	84.75	1,539,604
Campfire	2	0.19	<1
Fire Use	3	0.28	<1
Equipment Use	1	0.09	<1
Miscellaneous	10	0.94	10,470
Human General	132	12.43	10,504

Table 5-6 Fire size class distribution, Dawson Region Ecodistricts, 1960-2011

Class	Fire Size (ha)	Area Burned (ha)	# of Fires	% of Fires	% of Area Burned
A	Up to 0.1	13.38	329	18.89	0.00
B	0.11-10	176.62	317	18.20	0.01
C	1.1-10	1,405.26	325	18.66	0.05
D	10.1-100	11,764.57	273	15.67	0.40
E	100.1-1,000	92,941.33	232	13.32	3.19
F	1,000.1-10,000	733,453.95	194	11.14	25.15
G	10,000.1-100,000	1,530,796.9	68	3.90	52.50
H	Over 100,000	545,439.94	4	0.23	18.71

Fire does not occur with the same frequency or intensity in all parts of the region (**Table 5-6 & Section 3 - Map #10: Forestry and Fire History pre 1950 to 2018**). Fire is more common in the southern Boreal ecozone, where a fire cycle of 100 to 200 years is typical, whereas the more northern Taiga ecozone has a fire cycle of more than 500 years. In the Flat Top Mountain area (boreal), the fire cycle was determined to be approximately 75 years, while in the Tatonduk ecodistrict (taiga), the fire cycle was found to be nearly 4,000 years (McVoy & Burn, 2005).

5.7.2 Climate change

Projections indicate that the fire regime in central Yukon will continue to vary from year to year, but overall, the occurrence and extent of forest fires may increase. Within the next 50

years, the projected number of fires could potentially be four times higher than the present level, and the area burned more than seven times greater (McVoy & Burn, 2005).

5.7.3 Limitations of the data:

Discrepancies can occur between the area attribute of the point location and the calculated area for the fire polygon. Mapped areas may include islands of unburned forest within the burned extent. Point fire data are associated with only one ecodistrict, while the fire may straddle multiple ecodistricts. Spatial data may be distorted, causing errors in positional and areal calculations.

5.7.4 Floods

Flooding is most common with the spring freshet in late May or early June during periods of snowmelt or combined rainfall and snowmelt. Flooding may also arise from ice jams that form during spring break-up in May or while freeze-up is occurring in winter. Moderate flooding (i.e., 0.5 to 1 m above flood line) generated by snowmelt occurs with a return period of 20 to 50 years. Periods of intense summer rain may contribute to localized flooding of bridges or culverts near highway stream crossings.

Dawson City is located on the floodplain just below the confluence of the Yukon and Klondike rivers and has been flooded a number of times since 1898. Protective dikes built along the banks of the rivers in 1959, and raised higher in 1968, were insufficient to prevent \$28 million² of devastation to the historic townsite during flooding in the spring of 1979. A new dike was completed in 1987, following much discussion about the impact a dike would have on Dawson City's waterfront. In May 2009, ice jams caused significant spring flooding downriver at Eagle, Alaska. Flooding along the Klondike River, from ice jams that form during spring break-up, annually places communities built within the flood plain at risk, such as Rock Creek and Henderson Corner. Increased activity within the flood plain, such as agricultural land use (e.g. TH Farm), increases potential impacts from flood events within the flood plain.

5.8 Climate Change

“Climate change is a complex problem that impacts natural, human, and cultural systems in many ways. In Yukon, changes to the climate have already been observed and impact our water, ecosystems, landscapes, and ways of life. How climate change is understood and talked about in Yukon is grounded in scientific evidence, the Traditional Knowledge of Yukon First Nations, and the observations of Yukoners”

(Research Northwest & Morrison Hershfield, 2017)

Anthropogenic contributions to climate change originate primarily through the increased emissions, principally carbon dioxide, that result from the combustion of fossil fuels. Other anthropogenic sources include release of methane from decomposition of buried waste in landfill operations. Land use activities such as placer mining that disturb vegetative cover may result in degradation of permafrost, thus contributing to the release of methane.

Historic data indicate that greenhouse gases have been increasing in the atmosphere since industrialization. The Intergovernmental Panel on Climate Change (IPCC), an international body established by United Nations Environment Program (UNEP) and World Meteorological Organization (WMO), suggest that “most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations” (Intergovernmental Panel on Climate Change, 2007).

5.8.1 Trends in Climate Data

The following information represents the trends in climate data for Dawson region, Yukon Territory and Canada.

Dawson

(Werner et al. 2009)

- Warming trends in the Dawson planning region exceed those of southern regions of Canada; from 1955 to 2004 at weather stations in Dawson and Mayo reflect a warming trend of approximately 6°C per century.
- Trends in precipitation over the last century show greater spatial variability, with a 29% per century decline in precipitation in the Dawson area, yet significant increase in the Mayo (27% per century) and Pelly (30% per century) areas.
- An observed increase in stream flows in the Yukon River above the White River from November to April, and decreases in the late summer, suggest that snowmelt could

be occurring faster and earlier in the spring. Such early onset of snowmelt may result in reduced stream flow in the summer and fall.

Yukon

(Research Northwest & Morrison Hershfield, 2017)

- Annual average temperature has increased 2°C over the past 50 years. Winter temperatures have increased 4°C.
- Annual precipitation (rain and snowfall), has increased by 6% over the past 50 years, with the greatest increase in the summer months.

Canada

(Statistics Canada 2011).

- Trends for Canada as a whole indicate a mean annual temperature departure of 1.4 C above normal over the period from 1948 to 2009.
- All eleven climatic regions of Canada showed positive warming trends for the period, but the strongest warming trends are in the far north of Canada (Arctic tundra, Arctic mountains and fjords, Mackenzie District, and Yukon and Northern B.C. mountain regions).
- Trends for these regions show a mean increase from normal temperatures of 1.6 to 2.2 C over the 62-year period.

5.8.2 Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions are one of the pollutants driving climate change. Carbon dioxide (CO₂) is the most well-known GHG. It accounts for the majority of human-caused emissions. CO₂ lasts for decades to centuries in the earth's atmosphere so lowering CO₂ emissions now will help to reduce long-term negative impacts.

In 2016 Yukoners produced 16.4 tonnes of emissions per person. This is the 8th highest per person emissions rate in Canada.

The most significant sources of GHG emissions across Yukon are:

- Transportation: 62% of total emissions, including road and air; and
- Heating buildings: 18% of total emissions (Government of Yukon, 2019).

Further discussion on GHGs and carbon balance may be found in **Chapter 10 – Forests** and **Chapter 14 – Energy**.

5.8.3 Projected Climate Changes

Average annual temperatures are increasing in the planning region. It is expected that temperature increases will be greater in Arctic and sub-Arctic regions than in southerly parts of Canada (Statistics Canada, 2011).

For the *Dawson Climate Change Adaptation Plan* (Hennessey et al., 2011) projected climate changes were derived from the Canadian Regional Climate Model (CRCM) for the 2050s (i.e., an average of the period 2041 to 2070) under the assumption that there is “no change to global consumption of fossil fuels” (it should be noted that the Canadian Global Climate Model 3 (CGCM3) used tends to produce warmer, wetter conditions as compared to other Global Climate Models). Greater uncertainty is associated with projections of future precipitation due to the large variability in precipitation over space and time. Projections indicate a relatively uniform increase in annual average temperature of 2.5°C to 3.5°C by the middle of this century. These are some of the largest projected temperature increases for western North America (Rodenhuis et al., 2007).

These models also show annual average precipitation amounts are expected to increase by 10% to 40% in the Dawson area, while drier conditions are expected to the north and east of Dawson City. More precipitation is expected during the winter months than in the summer.

Assessments of historical data show the following trends for the northern boreal mountains (Reid et al. 2010):

- Increasing annual mean temperature (at least 1 C) throughout.
- Strong increases (greater than 2 C) in spring mean temperature.
- Increasing length of frost-free period (approximately 10 days).
- Increasing mean annual precipitation (approximately 15 cm) in southern portions of the site.
- Decreasing ratio of spring snow to precipitation throughout.
- Decreasing annual snow cover duration.

The results of more recent climate modeling under similar assumptions (limited change in greenhouse gas emissions) are depicted on **Section 3 – Map #11: Climate Change Forecasts**. These forecast changes in annual temperature and precipitation by the year 2100 and show patterns similar to those described above. For the planning region, they forecast:

- A relatively uniform increase in annual average temperature of 4.7°C to 5.3°C by the end of this century.
- Geographically varying increases in annual precipitation from +3cm in flatter terrain to +36cm in more mountainous areas by the end of this century.

5.8.4 Ecosystem Responses to Climate Change

Notwithstanding that natural ecosystems are dynamic and undergo continuous change, the resilience of many ecosystems may be compromised by the unprecedented combination of climate change, changes to natural disturbance regimes (e.g., fire and insect pests) and other global influences, including pollution, over-use of resources and land-use change (Ogden, 2008). A more rapid shift to warmer conditions is likely to result in significant effects on vegetation, habitat and wildlife including:

- Alteration of habitat and vegetation;
- Northward shifts in species habitats;
- Changes to forest composition;
- Invasive species competing with native species;
- Changes in wildlife migration patterns, routes and timing;
- Changes in hibernation periods;
- Changes in snow depth, ice thickness and presence of open water;
- Changing weather patterns;
- Changing water volume and quality;
- Changes in water temperature, impacting invertebrates and fish survival;
- Changes in the rate, frequency and/or intensity of wildfire and floods; and
- Changes to the carbon cycle affecting the balance of atmospheric carbon dioxide levels.

Potential landscape impacts include:

- Increased slumping and mass wasting from melting permafrost and increased slope instability, possibly resulting in catastrophic landslides;
- Increased variability in precipitation and storms;
- Shift in timing of break-up and freeze-up on lakes and rivers;
- Increased precipitation and floods and increased runoff and deposit of sediments and silt in water bodies;

- Altered flow of glacier-fed lakes and rivers; and
- Increased wind and dust.

Researchers recently examined the forecasted climate parameters and associated vegetation communities (these were termed “cliomes”) in Yukon and its protected areas (Roland et al., 2016). They made many predictions and reached several conclusions:

- Over this century, the cliomes throughout the region will shift 1, 2 or, in places, 3 times.
- Cliomes will be somewhat stable until after the 2030s;
- By the end of this century, the boreal forest that characterizes the south of the region will convert into a boreal/aspen parkland similar to northeastern British Columbia;
- By the end of this century, the sparse open forests and tundra of the Ogilvie Mountains in and around Tombstone Park will largely convert to more dense boreal forests like those in southwestern Yukon;
- 76% of Tombstone Park will experience 1 cliome shift; and
- 61% of Fishing Branch Park (just north of the region) will experience 2 cliome shifts.

5.8.5 Potential Land Use Impacts

A changing climate can affect many of the interests and activities in the Dawson planning region. It is therefore important that consideration be given to both challenges and potential opportunities associated with climate change during the planning process. Potential effects of climate change include:

- Damage to infrastructure and increases in construction costs;
- Increase in maintenance costs for access roads;
- Shifts in operational costs for activities;
- Changes in accessibility on the land and rivers;
- Change of areas and timing of hunting, trapping, fishing and other harvesting activities;
- Changes to availability of fish and wildlife populations for harvesting activities;
- Changes to effectiveness of land use practices;
- Lowered operational costs for thawing of permafrost;
- Changes to seasonal conditions for travel over land or water and travel safety;
- Increasing floods, forest fires, storms and other unpredictable weather patterns; and

- Changes in the abundance or distribution of traditional food or medicinal plant resources, adversely affecting the traditional economy.

5.8.6 Adaptation Planning and Research

A comprehensive listing (as of November 2017), of climate adaptation projects that may be of interest to the Commission is located in Appendix B of the *Yukon 'State of Play': Analysis of Climate Change Impacts and Adaptation* report (Research Northwest & Morrison Hershfield, 2017).

Understanding of the magnitude of impacts from climate change will require improved monitoring of groundwater, stream flow and water quality. Local strategies are proposed to address the potential impacts of climate change include (Hennessey et al., 2011):

- Emergency response planning;
- Fire management;
- Infrastructure planning (e.g., wells and waste disposal);
- Additional and continued research and monitoring;
- Integrating climate change considerations into planning processes, new construction and other initiatives (e.g., choice of materials and design);
- Diversifying the economy;
- Increased local food production and storage;
- Education and awareness; and
- Risk assessment and management.

5.8.7 Implications for Conservation Planning

Climate change and changes in cliomes (Roland et al., 2016) should be considerations in conservation planning. **Chapter 12: Protected Areas and Conservation Opportunities** further discusses these changes and how they may be incorporated into the regional land use plan. Roland et al. (2016) suggest the following strategies:

- Maintain connectivity between protected areas by either expanding the current protected area network, or by managing areas outside of protected areas to promote connectivity; and

- Connectivity planning should consider and favour conditions minimally influenced by climate – known as “enduring features” or “geodiversity”. However, more work is needed to map these areas (e.g. rare, unique and special features discussed in **Section 5.5.3**).

5.9 Chapter References

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6 LAND STATUS

This chapter describes the designation of the land within the planning region. The planning region excludes land within the City of Dawson municipal boundary, National Historic Sites and Special Management Areas previously designated under Chapter 10 of the First Nations Final Agreements (FNFAs). The Dawson Regional Land Use Plan includes both Settlement and Non-Settlement Lands throughout the region (YLUPC, 2018).

6.1 First Nation Traditional Territory and Settlement Land

Traditional Territory boundaries evolved over time as economic exchange, harvesting and land stewardship traditions established cultural and familial ties across the landscape. Traditional Territory (TT) boundaries identified through comprehensive land claim negotiations (as per Section 2.9.0 of the Tr'ondëk Hwëch'in Final Agreement) are shown in **Section 3 – Map #1: Regional Overview. Section 6.1.1.1** explains in more detail the **Contiguous Boundary Agreements** that are in place where Traditional Territory of TH, VG and NND overlap in the THFA. Yukon Final Agreements designate settlement lands and give First Nations specific rights and roles with respect to the economic activities, fish and wildlife, land and resource management and other matters (e.g. heritage) within their TT. Many First Nations' rights and benefits established through land claims exist throughout the entire TT including hunting, fishing, economic development and co-management of parks and cultural artifacts.

6.1.1 Traditional Territory

The planning region falls fully within the Tr'ondëk Hwëch'in Traditional Territory* (THTT); however, it does not include the whole THTT. A small portion of the north central part of the THTT is located within the North Yukon Planning Region (Annex). TH and Selkirk First Nation (SFN) have a small overlap area within the south-east portion of THTT. That area is not part of the Dawson Planning Region.

Areas of the Vuntut Gwitchin First Nation (VGFN), the First Nation of Na-Cho Nyak Dunn (NND) and SFN Traditional Territories are located immediately adjacent to the planning region; however, they do not overlap within the region.

**As the regional land use planning process is being carried out in accordance with the TH Final Agreement, "Traditional Territories" is defined in the THFA in relation to the geographic area*

identified as a Yukon First Nation's Traditional Territory on the map referred to in 2.9.0 of the THFA (Letter to WRFN from YG & TH, April 17, 2020).

6.1.1.1 **Overlap Contiguous Boundary Agreements**

TH and VGFN have reached agreement on a contiguous boundary between their respective Traditional Territories. With the exception of the TH portion of the Miner River watershed, the TH/VGFN contiguous boundary defines the northern boundary of the Dawson Planning Region. The TH portion of the Miner River will be planned as part of the North Yukon Regional Land Use Plan Annex.

TH and NND have reached tentative agreement on a contiguous boundary between their respective Traditional Territories. The eastern boundary of the Dawson planning region - south of the Peel Watershed - follows the TH/NND contiguous boundary until it intersects with SFN Traditional Territory, then follows that line south until it intersects with the non-overlapped southern boundary of TH Traditional Territory.

The Resolution of Overlap Contiguous Boundary agreements between TH & VGFN and TH & NND have accompanying Sharing Accords between the Nations that detail how the Nations will manage the overlap areas. Both VGFN and NND have ongoing rights to use the formerly overlapped areas within THTT in accordance with TH laws. This makes them Affected First Nations in the planning process.

6.1.2 **White River First Nation**

WRFN are not a party to the UFA and Chapter 11 Land Use Planning. In February 2013 WRFN presented Yukon and Canada governments with a “Northern Boundary DRAFT Report”, asserting traditional and ancestral territory within the planning region. In correspondence provided by WRFN to the Commission in December 2019, WRFN provided a map of their asserted traditional territory that includes overlap with the planning region and, subsequently, a copy of the “Northern Boundary DRAFT Report”. As indicated in **Section 4.1.2**, “Traditional Territory” is defined by the THFA, and as such, provisions in the THFA that refer to “other Yukon First Nations whose Traditional Territories are included in the planning region” do not include WRFN (Correspondence to WRFN from YG & TH April 17, 2020). Yukon Government have provided interim protection for a parcel of interest to WRFN, for purposes of facilitating a future Land Claim agreement with WRFN. The Yukon Government have a duty to ensure that WRFN is adequately consulted during the regional planning process and they will endeavor to ensure that WRFN has an appropriate forum to

review and provide its views in respect of the draft regional land use plan (Correspondence to WRFN from YG & TH April 17, 2020).

6.1.3 Settlement Lands

Settlement Lands were selected during comprehensive land claim negotiations for various reasons of importance to First Nations, such as cultural importance, particular land use, or family connection to the land. Settlement Lands have various categories (Category A & B, Fee Simple) and types (C-Lands, S-Lands, R-Lands). Refer to **Table 6-1** for more details. Settlement Lands may also be designated as “Developed”, meaning that certain access rights defined with the FN Final Agreements are applicable. Chapter 5 of FN Final Agreements defines the tenure and management of Settlement Lands and describes how Settlement Land will be owned and managed by the First Nation. On Settlement Land, First Nations hold decision-making and legal powers. First Nations make laws on their Settlement Land that apply to all people including, for example, land use planning, zoning, agriculture and business activities.

Table 6-1 Settlement Land categories and descriptions as per FN Final Agreements

Settlement Lands	Description
Category A	Category A Settlement Land is settlement land where a Yukon First Nation has ownership of the surface and subsurface, including minerals. All staking, exploration and mining activity is governed by the First Nations for new mineral interests.
Category B	Category B Settlement Land is settlement land where a Yukon First Nation has ownership of the surface. New and existing staking, exploration and mining activity are governed by the Yukon government.
Fee Simple	Fee simple Settlement Land is settlement land where a Yukon First Nation has the same fee simple title as other land registered in the Land Titles Office.
Community Land (C-lands)	Are those located within or near city limits.
Site Specific Lands (S-Sites)	Are smaller parcels selected to cover specific interests such as cabins or campsites.
Rural Lands (R-Blocks)	Are generally those lands outside of city limits, and are typically larger parcels.

TH has 135 parcels of settlement land within the Region totaling 2,550.85km². This count does not include settlement land within community boundaries (i.e. Tr'ochëk, C4, etc.). WRFN has one parcel within the planning region which is land set aside without a settled claim, and therefore the rights associated with other Site Selections may not apply. Both VGFN and TH have settlement lands within the North Yukon Annex (NY Annex). Refer to **Table 6-2** for more details.

Table 6-2 First Nations' Settlement Lands within the Region and NY Annex (excluding settlement lands within community areas) (from Government of Yukon data, 2018a)

Selection Type	Dawson		North Yukon Annex*		Totals	
	Area (km ²)	Count	Area (km ²)	Count	Area (km ²)	Count
Tr'ondëk Hwëch'in						
Retained Reserves	4.17	3			4.17	3
Community Lands (Cat. B)	1.12	3			1.12	3
R-Blocks	2536.59	52	10.59	6	2547.18	58
Category A	1532.52	33	10.59	6	1543.11	39
Category B	1004.07	19			1004.07	19
Site Selections	8.96	77	0.13	1	9.09	78
Category A	0.58	1			0.58	1
Category B	8.34	76	0.13	1	8.47	77
TH Total	2550.85	135	10.72	7	2561.57	142
Vuntut Gwitchin First Nation						
Site Selections (Cat. A)			0.02	1	0.02	1
White River First Nation						
Site Selections (Cat. B)*	0.06	1				
Total			0.02	1	0.02	1
Grand Total	2550.91	136	10.74	8	2561.59	143
*Land set aside without a settled land claim. Therefore, rights associated with other Site Selections may not apply.						

6.2 Protected Areas

Lands within the planning region currently designated for protection include

- National Historic Sites (Including internationally designated lands)
- Yukon Historic Sites, and
- Special Management Areas designated under Chapter 10 of First Nation Final Agreements

6.2.1 Nationally Designated Lands

Besides the numerous nationally significant historic sites located within municipal boundaries, (including Dawson Historical Complex and Tr'ochëk National Historic Site) – there are two national historic sites that are within the planning region. They are Discovery Claim National Historic Site and Dredge No. 4 National Historic Site.

6.2.1.1 Discovery Claim National Historic Site (Canadian Register of Historic Places, 2007)

- **Location:** A combination of titled lot and active claim: Claim No. 37903, Bonanza Creek and Lot 587, Gr 1052, CLSR YT 58479); Area: 468,419 m²
- **Designation Date:** July 15, 1998
- **Statute:** Historic Sites and Monuments Act (RSC 1985, c H-4)

Discovery Claim National Historic Site of Canada is the place where the Klondike Gold Rush began. It is a legally defined mining claim measuring some 152.4 by 609.6 m (500 by 2,000 feet) located on Bonanza Creek, a tributary of the Klondike River near the City of Dawson, Yukon (Figures 6-1 and 6-2). The claim is owned by the Klondyke Centennial Society and was developed in cooperation with the Government of Yukon and Parks Canada as an attraction, with a one-kilometre long walking trail, interpretive signs and mining exhibits.

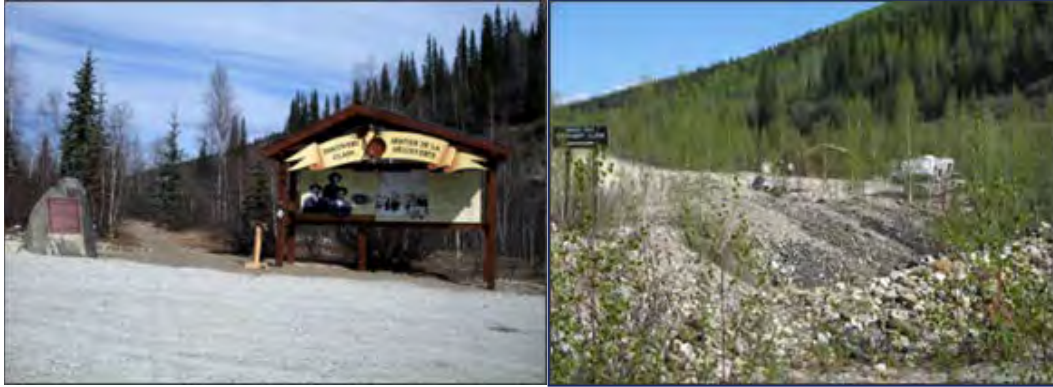


Figure 6-1 Historic tailing piles and trailhead at Discovery Claim National Historic Site (Photo: Government of Yukon)

6.2.1.2 **Dredge No. 4 National Historic Site (Canadian Register of Historic Places, 2006)**

- **Location:** Lot 586, Group 1052, Bonanza Creek, Lot 1009 Quad 1150/14 CLSR YT 70712
- **Designation Date:** September 22, 1997
- **Statute:** Historic Sites and Monuments Act(RSC 1985, c H-4)

Dredge No. 4 is a preserved bucketline sluice dredge used to mine placer gold (**Figure 6-2**). It is located at its last place of operation on Bonanza Creek in the Klondike goldfields just outside of Dawson City, Yukon. Dredge No. 4 is symbolic of the importance of dredging operations in the Yukon (1899-1966), and aspects of the evolution of gold mining in the Klondike from early labour-intensive to later corporate industrial phases of gold extraction.

Managed by Parks Canada, Dredge No. 4, it is one of Yukon's premier heritage tourism attractions.



Figure 6-2 Dredge No. 4 (Photo: Government of Yukon)

6.2.2 Internationally Designated Lands

6.2.2.1 Klondike Gold Rush International Historic Park (Parks Canada, 2012)

- **Location:** Sites in Washington, Alaska, British Columbia and Yukon related to the gold rush trail; Seattle, Skagway, Chilkoot Trail, Thirty Mile, Yukon River Dawson, Discovery Claim and Dredge No. 4
- **Designation Date:** 1998
- **Statute:** Joint declaration between governments of the United States and Canada, commemorating the 100th anniversary of the gold rush

Canadian and American governments signed a joint declaration creating the Klondike Gold Rush International Historical Park to commemorate this shared chapter in the history of the north.

Collectively the individual sites that make up the international park tell the story of what was the last great gold rush:

- Chilkoot Trail National Historic Site of Canada
- “The Thirty Mile” Yukon River, Canadian Heritage Rivers System
- Klondike National Historic Sites of Canada: Dawson Historical Complex National Historic Site, S.S. Keno National Historic Site, Former Territorial Courthouse National Historic Site, Dredge No.4 National Historic Site, and Discovery Claim National Historic Site
- Klondike Gold Rush National Historical Park, Seattle Unit
- Klondike Gold Rush National Historical Park, Alaska

6.2.3 Territorially Designated Lands

6.2.3.1 Tombstone Territorial Park

- **Location and Size:** North Ogilvie and Mackenzie mountains ecoregion – 2,200 km², or 5.5% of the planning region
- **Designation Date:** Management Plan Approved June 25, 2009
- **Statute:** Parks Act, RSY 1986, Ch 126 (Parks and Lands Certainty Act, 2002)

Tombstone Territorial Park (**Figure 6-3**) is established pursuant to Schedule A of Chapter 10 of the THFA. The park is managed under the Tombstone Territorial Park Management Plan in accordance with the THFA, the *Parks and Lands Certainty Act*, the *Wildlife Act* and the *Historic Resources Act*.

Within the park, the THFA imposes a prohibition on locating, prospecting or mining new claims under the *Quartz Mining Act* and *Placer Mining Act*, and on the issuance of new interests under the Territorial Lands (Yukon) Act and the Oil and Gas Act.

Tombstone Territorial Park supports exceptional caribou, grizzly and black bear, moose, and sheep populations. These species have been sustainably harvested by subsistence, resident and non-resident hunters for thousands of years. Today, only TH have the right to harvest fish and wildlife within the park, provided park objectives are met.

Important, intact historical places within the park are related to the Yukon Ditch System that carried water from the Tombstone Mountains to Bonanza Creek, with numerous maintenance camps, supporting infrastructure and equipment.

The area that now contains Tombstone Territorial Park also has special significance for First Nations people. This land sustained many generations of people, and signs of the ancestors can be found in the Hän and Gwich'in place names, ancient archaeological sites and historical encampments, and in Elders' stories and local knowledge. As early as 1972, the United Nations Educational, Scientific and Cultural Organization (UNESCO) recognized the diverse ecology and unique geology of this area. Twenty years later, the Tr'ondëk Hwëch'in requested protection for this part of their traditional territory. With strong public support, the Park's boundaries were finalized in December 1999 and it was officially created on October 25, 2004 after many years of study, planning and negotiation. TH citizens preserve their connection to this land by protecting their ability to participate in activities such as berry picking, hunting, fishing and trapping. They come here to teach the children how to hunt and be responsible stewards, and work with the Government of Yukon and others to ensure the land continues to provide for future generations. The

Commission is required to consider the park management plan when developing the regional land use plan (THFA, Chapter 10, Clause 13.2).

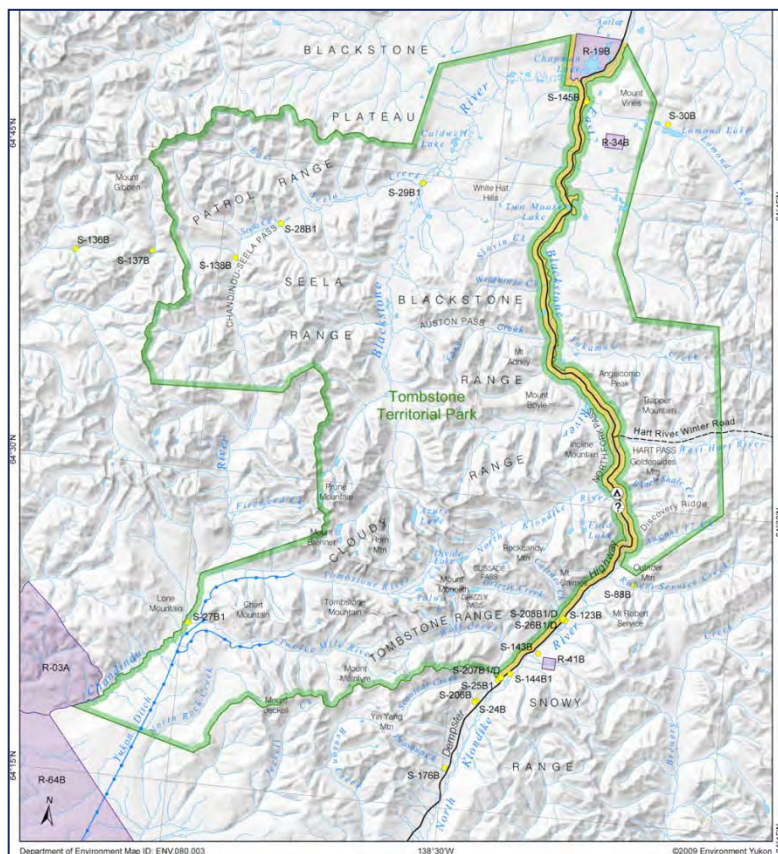


Figure 6-3 Tombstone Territorial Park - Yellow indicates Tombstone Corridor (Government of Yukon, 2009)

The Tombstone Corridor

The intent of the Tombstone Corridor (as shown **Figure 6-3**) is to provide for continued highway maintenance activities, a possible future pipeline, transmission line or other public visitor infrastructure that may be required along the Dempster Highway.

The Tombstone Corridor is described in detail in the park management plan, but is roughly 500m from the center line to the east and west of the highway. In some sections it is defined by landscape features.

The Tombstone Corridor will be managed under the Area Development Act and will not be subject to the provisions of Schedule A to Chapter 10 of the Tr'ondëk Hwëch'in Final Agreement (Government of Yukon, 2009).

6.2.3.2 **Forty Mile, Fort Cudahy and Fort Constantine Historic Site (Ch'ädä Dëk)**

- **Location:** Confluence of the Yukon and Fortymile rivers
- **Designation Date: 2005**
- **Statute:** *Historic Resources Act*, RSY 2002, Ch 109; Tr'ondëk Hwëch'in Final Agreement, Chapter 13, Schedule A, Section 2.3

The Forty Mile, Fort Cudahy and Fort Constantine Historic Site, or simply Forty Mile (Ch'ädä Dëk), is situated on islands and riverbank terraces comprising approximately 50 ha at the mouth of the Forty Mile River where it enters the Yukon River, near the Alaska border (**Figure 6-4**). The site includes a significant material record of late prehistoric Tr'ondëk Hwëch'in use and occupation, overlain by archaeological evidence and collapsed and standing structures from the historic period dating as far back as 1886. Included is evidence of two American trading posts, Yukon's first North-West Mounted Police post, an Anglican mission and church, and a dynamic, mixed community predating the Klondike gold rush.

The Tr'ondëk Hwëch'in Final Agreement requires that Forty Mile be designated as a Yukon Historic Site because of its cultural significance to Tr'ondëk Hwëch'in and to all people of Yukon. For more information on Forty Mile, Fort Cudahy and Fort Constantine Historic Site refer to **Section 8.2.5.2.1**.



Figure 6-4 Confluence of Forty Mile and Yukon Rivers

6.2.4 Adjacent Designated Lands

Existing or proposed protected areas immediately adjacent to the Dawson Region are listed in **Table 6-3** and further describe below.

Table 6-3 Adjacent lands to the Dawson Region with some level of protection

Name	Region	Relation to Dawson Region
Ni'iinlii Njik (Fishing Branch) Territorial Park	North Yukon Planning Region	N
Kit Range/North Cache Creek Special Management Area	Peel Watershed Planning Region	NE
Yukon-Charley Rivers National Preserve	Alaska	NW

6.2.4.1 Ni'iinlii'njik (Fishing Branch) Territorial Park

- **Location and Size:** North Yukon; 6,500 km²
- **Designation Date:** April 2000
- **Statute:** Parks Act, RSY 1986, Ch 126 (Parks and Lands Certainty Act 2002)

The Vuntut Gwitchin First Nation (VGFN), the Government of Canada and the Government of Yukon agreed to establish the Fishing Branch Ecological Reserve pursuant to the Parks Act as set out in the VGFN Final Agreement (Chapter 10, Schedule B).

Fishing Branch is comprised of VGFN Settlement Land R-05A, a wilderness preserve, an ecological reserve and a habitat protection area.

The Fishing Branch area is exceptional primarily because of the seasonal congregation of grizzly bears to feed on fall chum salmon. The chum salmon depend on constant water temperatures of the Fishing Branch River, which wells up through the eroded limestone karst substrate. The characteristics that make it important for grizzly bears also make it rich in diversity of other species, as well as historical record and mythic significance for the VGFN.

6.2.4.2 Kit Range/North Cache Creek

- **Location and Size:** Peel Region; 973km²
- **Designation Date:** August 2019
- **Statute:** Special Management Area in *Peel Watershed Regional Land Use Plan*

Located directly above Tombstone Territorial Park this protected area will serve to maintain the wilderness character of the area and to continue to support community cultural activities. It considered important habitat for Porcupine and Hart River caribou herds, along with other large mammals.

6.2.4.3 Yukon-Charley Rivers National Preserve

- **Location and Size:** Alaska; 10,226 km²
- **Designation Date:** December 1980
- **Statute:** *Alaska National Interest Lands Conservation Act*

The Yukon-Charley Rivers National Preserve lies immediately west of the Dawson planning region, within Alaska. The preserve provides protection for the entire one million-acre (4,046 km²) watershed of the Charley River and a 115-mile (185-km) stretch of the Yukon River. Portions of the preserve are private property under the Alaska Native Claims Settlement Act. Preserve headquarters are located in Eagle, Alaska.

6.3 Other Interests

Third-party interests in the planning region include fee-simple title, leasehold interest, exclusive resource use concession (for example trapping, and outfitting) and land use permit. Other map notations include sites of significant historic, ecological or civil importance. Outside municipal boundaries, most titled third-party interests are rural residential parcels. Disposition of Crown land (by the Government of Yukon under Agreement for Sale, Lease, Easement or Reservation) for the Dawson Region and the NY Annex is shown in

Table 6-4 & Table 6-5 Additional land reservations for heritage sites are listed in **Table 6-6**. Disposition of land for quartz claims, placer claims and prospecting and dredging leases is shown in **Table 6.7**.

Table 6-4 Dawson Region (outside of community areas) Disposition of Crown Land.
Number and area of land disposition by use (from Government of Yukon data, 2018a)

	Agreement for Sale		Lease*		Other§		Reservation		Notation		Total	
	#	Area (ha)	#	Area (ha)	#	Area (ha)	#	Area (ha)	#	Area (ha)	#	Area (ha)
Agricultural	3	66.1	2	302.8			1	974.3			6	1343.2
Airport							4	164.6			4	164.6
Bridgehead							7	55.7			7	55.7
Commercial			9	7.5			1	0.1			10	7.6
Country Residential							3	131.0			3	131.0
Environment							18	108.5			18	108.5
Forestry							4	26.5			4	26.5
Gravel Pit							38	1133.4			38	1133.4
Heritage							16	233.2	1	33.1	17	266.3
Industrial							2	5.1			2	5.1
Institutional			2	0.0			4	3.6			6	3.6
Land Claims							1	1.0	1	2773.7	2	2774.7
Miscellaneous					2	0.04	0	0.0			2	0.0
Parks & Campground							1	6.8			1	6.8
Quartz Mining Claim							1	1324.1			1	1324.1
Residential							1	0.1			1	0.1
Residential - Commercial	3	1.9									3	1.9
Roadway							3	1.8			3	1.8
Trapping			23	8.7	2	0.01					25	8.7
Utility			2	3.7			9	79.6			11	83.3
Wildlife Reserve							1	0.6			1	0.6
Grand Total	6	68.0	38	322.7	4	0.05	115	4250.0	2	2806.8	165	7447.7

§Other includes: YLAR YESAA Non-triggered, YTG Reserve

*Lease includes: "Lease with purchase option"

Table 6-5 North Yukon Annex Disposition of Crown Land. Number and area of land disposition by use (from Government of Yukon data, 2018a)

	Lease		Notation		Total	
	#	Area (ha)	#	Area (ha)	#	Area (ha)
Commercial	1	1.05			1	1.05
Environment			1	2.45	1	2.45
Institutional	1	0.01			1	0.01
Grand Total	2	1.06	1	2.45	3	3.51

Table 6-6 Dawson Area Heritage Reserves (as designated under *Historic Resources Act*)

Name	Location	Area (ha)	Disposition	Map	Historic Function
North Fork Gatehouse and Spillway	North Fork Ditch	24.7	116B02-016	116B/02	Diversion of water from the North Fork ditch into the North Fork Power Plant
Ogilvie Island	Sixty Mile and Yukon Rivers	10.2	115O12-005	115O/12	North West Mounted Police post, sawmill and trading post
Dinner Gulch	Yukon Ditch and the Little Twelve Mile River	2	116B07-002	116B/07	Maintenance camp for the Yukon Ditch
Trail Gulch Diversion	Ridge Road and Yukon Ditch	4.22	2009-0480	116B/03	Pressure box and gate for the Yukon Ditch
Eight Mile Roadhouse	Ridge Road Lot 33	4.05	116B03-144	116B/03	Roadhouse and barn
Murray's Roadhouse	Ridge Road Lot 27	4.03	950026	115O/14	Barn and roadhouse
Eleven Mile Roadhouse	Ridge Road Lot 28	4.05	950026	115O/14	Roadhouse and barn: now a Campground on the Heritage Trail
Fifteen Mile Roadhouse	Ridge Road Lot 29	4.02	950026	115O/14	Roadhouse, outbuildings and barn

Name	Location	Area (ha)	Disposition	Map	Historic Function
Halfway Roadhouse	Ridge Road Lot 30	8.02	950026	115O/14	Roadhouse and barn: now a Campground on the Heritage Trail
Seventeen Mile Roadhouse	Ridge Road Lot 31	4.05	115O14-011	115O/14	Roadhouse and barn
Lot 32	Ridge Road Lot 32	3	115O14-012	115O/14	Junction of the Ridge Road and the road to Gold Bottom Creek
Dome Yukon	Gov't Trunk Road Lot 45	2.02	115O15-024	115O/15	Excavation for Klondike Mines Railway wye, station, sheds, roadhouse, barn
Cooks Roadhouse	Gov't Trunk Road Lot 46	4.02	115O15-022	115O/15	Roadhouse and barn
Sulphur Springs Roadhouse	Sulphur Creek Road Lot 47	4.04	115O15-023	115O/15	Roadhouse and barn
Flag Roadhouse	Ridge Road Lot 48	4.05	115O14-009	115O/15	Barn and roadhouse
Heritage Roadway	Ridge Road and Road to Grand Forks	32.0	115O14-010	115O/14 116B/03 115O/12	The length of the Ridge Road Heritage Trail and the spur road from Eleven Mile Roadhouse to Grand Forks

6.3.1 Quartz and Placer Land Use Permits

Quartz and placer land use permits are subject to a four-stage classification system with each class representing activities with increasing potential to create adverse environmental impacts. Within each class there are thresholds of allowable activities with Class 1 being the least impactful and Class 4 having the highest potential impact. YESAA assessment is required from Class 2 and up (Government of Yukon, 2018b). The **Minerals** chapter of this document (**Chapter 13**) explains further the class system that is shown in **Table 6-8**.

Table 6-7 Disposition of land for Quartz and Placer: Claims, Land Use Permits, Dredging Leases and Prospecting Leases for the Dawson Planning (from Government of Yukon data, 2019)

Status	Count	Area (km ²)	Dawson PR Area (%)
Placer Claims			
Active	17882	1376.1	3.45%
Pending	685	57.8	0.14%
Total	18567.0	1433.9	3.60%
Placer Mining Land Use Permits			
Valid	294	1014.8	2.55%
Pending	3	30.5	0.08%
Total	297	1045.4	2.62%
Placer Leases			
Active Prospecting	80	149.7	0.38%
Pending Prospecting	25	43.9	0.11%
Active Dredging	3	3.8	0.01%
Total	80	149.7	0.38%
Quartz Claims			
Active	39466	7778.9	19.52%
Pending	3174	630.9	1.58%
Total	42640	8409.7	21.10%
Quartz Land Use Permits			
Valid	37	4697.0	11.79%
Pending	1	17.6	0.04%
Total	38	4714.6	11.83%
Quartz Prospecting Leases			
Active	93	14.1	0.04%
Total	93	14.1	0.04%

Table 6-8 Quartz and Placer Land Use Permits by class (from Government of Yukon data, 2019)

Status	Class	Count	Area (km ²)
Quartz Land Use Permits (by Class)			
Pending	3	1	17.6
Valid	3	34	4134.3
	4	2	547.6
	5	1	15.1
Grand Total		38	4714.6
Placer Land Use Permits (by Class)			
Pending	4	3	30.5
Valid	3	8	7.4
	4	286	1007.5
Grand Total		297	1045.4

Table 6-9 Number of active category 4 & 3 land use placer permits by watershed in the Dawson Planning region (from Government of Yukon data, 2019).

Watershed	Count by Class		
	3	4	Total
Forty Mile	0	13	13
Indian	1	70	71
Klondike	4	118	122
Sixty Mile	1	31	32
Stewart	0	34	34
White	0	4	4
Yukon River North	2	14	16
Yukon River South	0	5	5
Grand Total	8	289	297

6.4 Cumulative Effects

Industrial projects in the Yukon are assessed and regulated to, among other things, eliminate or reduce the impacts on important environmental and socio-economic features. However, over time, the relatively small impacts of multiple individual projects may add up to become significant. This accumulation is known as *cumulative effects*. The *Yukon Environmental and Socio-economic Assessment Act* (YESAA) directs YESAB to consider cumulative effects that have occurred or are likely to occur in connection with a project under assessment. YESAB considers the effects of past, present, and likely activities when determining the significance of likely adverse project effects. In their recent information bulletin, YESAB clarified that they are to *consider* cumulative effects during *project assessment*, and that other agencies (including Planning Commissions) are responsible for other areas of cumulative effects management (including planning, monitoring and adaptive management) (YESAB, 2019). See **Section 3 – Map #12: Recent YESAB Applications**.

Cumulative effects management considers the impact of the accumulation of multiple projects on the landscape; this is best addressed at a regional level, rather than on a project basis. To be effective and transparent, cumulative effects management should include:

- Indicators of cumulative effects that can be clearly defined, measured and tracked
- Identify levels of these indicators above which human activities are managed differently (i.e. thresholds), and
- How human activities are to be managed differently when thresholds are surpassed.

The North Yukon Regional Planning Commission set a precedent in the Yukon for how cumulative effects can be managed. One of their main focuses was to manage the cumulative effects of oil and gas exploration and development so that the Porcupine caribou herd is maintained into the future. Their plan (North Yukon Regional Planning Commission, 2009) included two indicators of cumulative effects: *Surface Disturbance* and *Linear Disturbance* (see **Figure 6-5**). Both can be measured and tracked. They then identified areas (*Land Management Units*) that were zoned and managed differently. These zones were based on increasing levels of acceptable disturbance from protected areas (no acceptable disturbance) to *Integrated Management Area – Zone IV* (highest level of acceptable disturbance).

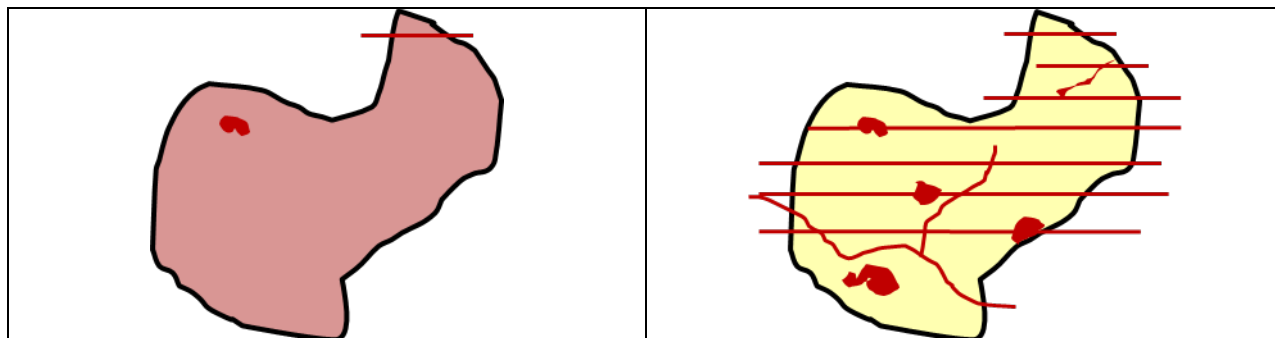


Figure 6-5: Examples of an imaginary Land Management Unit. Left: If it was zoned Integrated Management Area Zone I (Lowest Development), very little *surface disturbance* (dark red) would be acceptable as would be *linear density* (dark red line). Right: If it was zoned Integrated Management Area Zone IV (Highest Development), much more surface disturbance and linear density would be acceptable.

No two regions are the same – they will have different resources, things of value and existing and potential land use issues. Therefore, the Dawson Regional Planning Commission, if it decides to have cumulative effects management as part of their plan, may need to consider other indicators and indicator levels that work best for the Dawson Region.

One common cumulative effect of development is the expansion of road networks. The *Yukon Resource Access Roads Framework* describes the current regulatory process in Yukon used to manage resource access roads. (**see 17.5.2**, below) (Government of Yukon, 2013). The Framework looks to manage and minimize the public and ecological liability associated with unmaintained roads left behind by exploration and mining interests. The Framework applies solely to resource extraction industries, with a focus on quartz or hard rock exploration and development. Currently, the Framework is primarily implemented through extensive reviews of industry proposals by government departments prior to final decisions on major infrastructure development; no infrastructure corridor planning is associated with this Framework.

Since the release of the Framework document, both EMR and the Department of Highways have had ongoing discussions on improving the development and management of roads in the Yukon, specifically unmaintained roads. EMR is in the process of developing resource road regulations which will allow for the ongoing management of resource roads (mining, oil and gas, gravel) from construction, use and maintenance to closure and remediation (**see 17.5.2.2**, below) (Government of Yukon, 2018c). Regional planning can guide and coordinate the activities on the land to utilize the existing infrastructure and to help make informed decisions on new infrastructure.

6.5 Existing Land Use Footprint

The level of existing (and future) surface disturbance in the region will have implications for land use decision making. In 2010, the surface disturbance or the ‘human footprint’ in the DR and NYA was identified, classified and mapped (Mammoth Mapping, 2010). Surface disturbance information was further refined and analyzed by YLUPC in 2014 and presented in a draft report to the previous Commission. According to the DRPC Terms of Reference (YG&TH, 2019), the draft report will be reviewed by the Parties prior to being reviewed and endorsed by the new Commission. Since 2014 there have been no updates to the information on the surface disturbance in the region and thus, this information does not indicate the current state of the disturbance.

Depending of the definition of “disturbed”, an area disturbed forty years ago that is still visible in satellite images may no longer “count” as disturbed if it has revegetated. **Figure 6-6** shows an example of a satellite image.

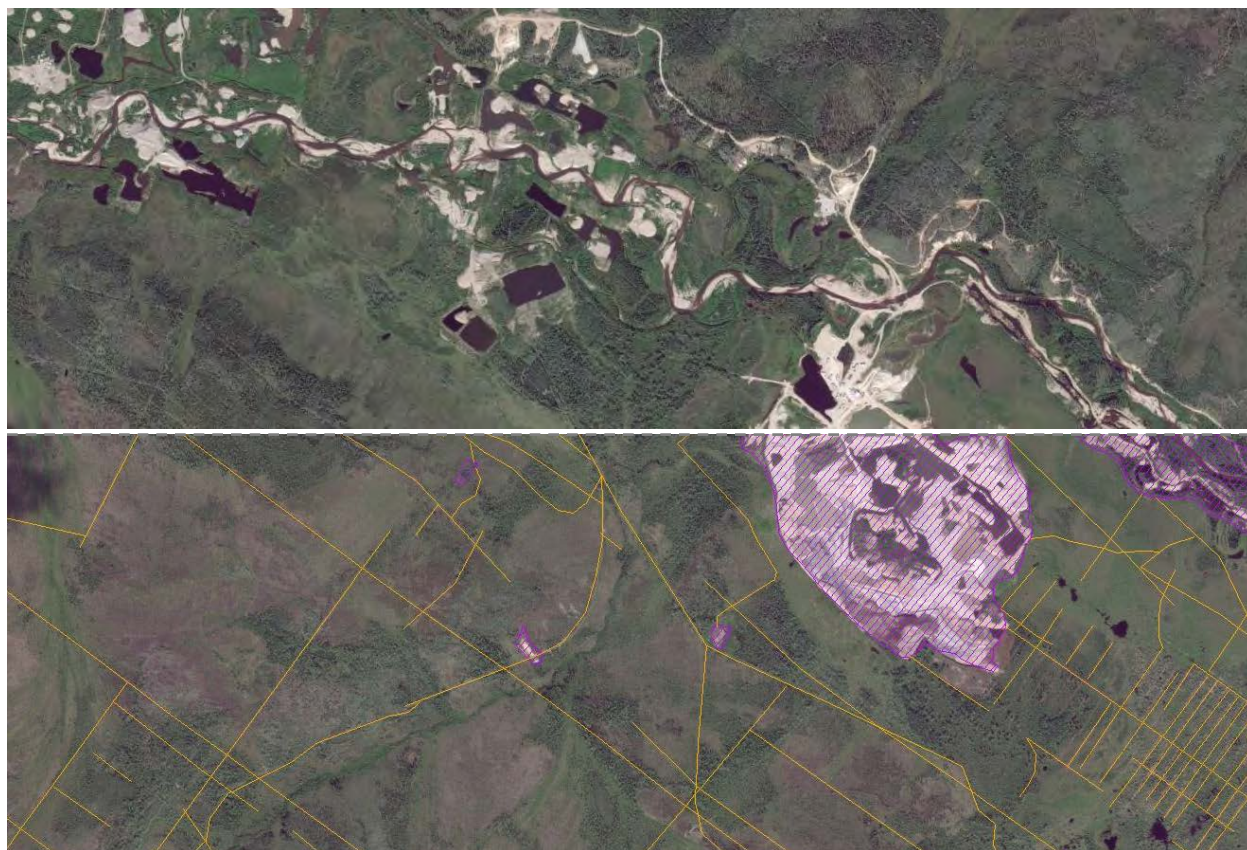



Figure 6-6: Example of satellite (Government of Yukon, 2019) image of part of the Indian River valley. Below the gray dashed line, disturbances mapped in 2010 are shown. Linear disturbances are the feature mapped with orange lines (—), and surface disturbance includes the areas of the purple

hatched areas () and the linear disturbances. Note that some areas mapped as disturbed are green, typically indicating an intermediate level of disturbance and/or recovery.

The existing land use footprint represents direct human development (settlements, mining, etc.) and linear features (roads, trails, etc.) on the landscape. **Table 6-10** provides the sources and area of direct disturbance in the region and **Table 6-11** describes the linear disturbances on the landscape by width and length. See also **Section 3 – Map #2: Infrastructure, Access and Land Status**.

Table 6-10 Sources of direct human development footprint in the Dawson Planning Region (including NY Annex) (YLUPC, 2014)

Direct Footprint Sources	Area (km ²)	Area (% total footprint)
Linear Features (see sub-table below for breakdown of feature types)	68.47	31.11
Developed Area (settlements, rural residential, agriculture and industrial)	8.33	3.78
Gravel Pit / Pull-out	2.64	1.20
Placer Mining	120.70	54.84
Quartz (Hard rock) Mining	7.92	3.60
Uncertain (primarily placer mining-related)	11.30	5.13
Unknown Human Disturbance	0.75	0.34
TOTALS *	220.11	100.00

Table 6-11 Sources of linear features in the Dawson Planning Region (including NY Annex) (YLUPC, 2014)

Linear Feature Width Class	Description	Length (km)	Length (% total)
Low (<4 m width)	Unclassified trails and narrow rough roads	950.80	12.41
Moderate (4-8 m width)	Access roads (seasonal or all-season), mainly to placer and quartz mineral claims/properties	4,140.00	54.02
High (>8 m width)	High use roads and electrical utility transmission corridors	1,280.30	16.71
Unclassified	Linear features not included in Mammoth Mapping (2010). Two general types of features are represented: <ul style="list-style-type: none"> Historical seismic lines of 5-10 m width in Eagle Plain. Major roads and highways (Dempster, Klondike, and Top of the World) represented by National Road Network (>8 m width) 	1,292.12	16.86
	TOTALS *	7,663.22	100.00

The data presented in these tables (**Table 6-10 & Table 6-11**) is based on the 2014 DR planning boundary. The level of disturbance in the NY Annex is minimal (See **Section 3 – Map #2: Infrastructure, Access and Land Status**).

- Most human-caused disturbance is located within the immediate vicinity of Dawson City and placer mining areas
- Non-mining disturbances are associated with small farms, residential, roads & trails, gravel pits, and powerlines
- Approximately 220km² (0.48%) of the DR (including NY Annex) is directly affected by human surface disturbance
- Current and historic placer mining accounts for 55% (120km²) of the total disturbed area
- Linear features account for 31% (69km²) of the total disturbed area (7,660 km)
- All visible disturbances are included in this analysis, potentially including light and recent disturbances (e.g. cutlines cut and surveyed in the winter) and older, more heavily disturbed areas that have recovered with vegetation (e.g. some old placer mines)

6.5.1 Landscape Patterns of Disturbance

Human caused disturbance may be evaluated at a landscape scale using ecodistricts, ecoregions, watersheds or other management zone as a sub-regional unit of summary. In this fashion, areas within the planning region experiencing relatively higher levels of landscape disturbance may be readily identified.

Disturbance levels range from zero in northern parts of the region, where there is virtually no footprint, to up 3.9% in the Goldfields Forest Management Zone.

The Indian River has the highest proportion of surface disturbance of all the watersheds roughly four times the level within Sixtymile and Fortymile watersheds, and more than twice the level of disturbance in the Klondike watersheds (**Figure 6.6**).

No two regions are the same – they will have different resources, things of value and existing and potential land use issues. Therefore, the Dawson Regional Planning Commiision, if it decided to have cumulative effects management as part of their plan, may need to consider other indicators and indicator levels that work best for the Region.

One common cumulative effect of development is the expansion of road networks. The Yukon Resource Access Roads Framework describes the current regulatory process in Yukon used to manage resource access roads. (**see 17.5.2** below) (Government of Yukon, 2013).

Wetland herb ecosystem units are disproportionately impacted by development; less than 0.1% of the planning region is of this class, while about a 1% footprint is found on wetland herb ecosystem units.

Table 6-12 Anthropogenic Disturbance by Watershed

Watershed Name	Area of Watershed in Region (km²)*	Total All Surface Disturbances (km²)	Surface Disturbance (% of Watershed)	Total Linear Features (km)	Linear Feature Density (km/km²)
Headwaters Porcupine*	5,687.30	0.05	0.00	4.54	0.00
Lower Porcupine	352.02	0.00	0.00	0.00	0.00
Blackstone	1,374.42	0.83	0.06	49.82	0.04
Tatonduk River	7,831.95	0.11	0.00	37.14	0.00
Chandindu River	3,266.94	2.30	0.07	245.22	0.08
Klondike River	6,857.04	60.44	0.88	2,208.32	0.32
Indian River	3,457.72	77.06	2.23	1,664.94	0.48
Sixtymile River	5,887.56	32.04	0.54	1,519.58	0.26
Fortymile	1,187.18	6.41	0.54	332.13	0.28
Mt Stewart	11.17	0.01	0.13	2.49	0.22
Stewart River	2,809.47	13.61	0.48	377.94	0.13
Tanana	370.08	1.05	0.28	63.21	0.17
Lower White	4,477.23	3.64	0.08	461.24	0.10
Upper Yukon – White	1,731.92	5.39	0.31	109.89	0.06
TOTAL	45,302.00	202.96	0.45%	7,076.46	0.16%

*Drainage in the North Yukon Annex

6.6 Chapter References

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Section 2



Regional Resource and Land Use Descriptions

7 RESOURCE VALUE

This chapter defines how resources in the planning region are described in the RAR in terms of their contribution to, and impact on, natural, traditional, socio-cultural and economic values. The five values identified and defined in this chapter have been used to provide context to each resource described in Section 2 of the RAR:

- Natural Value;
- Traditional Value;
- Socio-Cultural Value;
- Economic Value; and
- Traditional Economy.

These five values relate to each other and the intention is not to hold them separate but rather create a holistic picture of each resource to assist the Commission when considering land use decisions that ensure for sustainable development. Section 11.1.1.6 of the Final Agreements states that “land use planning must ensure that social, cultural, economic and environmental policies are applied to the management, protection and use of land, water and resources in an integrated and coordinated manner so as to ensure Sustainable Development”.

7.1 Sustainable Development

The Final Agreements set out the following definition for Sustainable Development (NND – DIAND 1993, VGFN – DIAND 1993, TH – DIAND 1998):

"Sustainable Development" means beneficial socio-economic change that does not undermine the ecological and social systems upon which communities and societies are dependent.

Objectives of the Final Agreements for Land Use Planning include the following:

11.1.1 The objectives of this chapter are as follows:

11.1.1.3 to recognize and promote the cultural values of Yukon Indian People;

11.1.1.6 to ensure that social, cultural, economic and environmental policies are applied to the management, protection and use of land, water and resources in an integrated and coordinated manner so as to ensure Sustainable Development.

The obligation to specifically consider First Nation traditional values and Sustainable Development is expressed in Chapter 11:

11.4.5 In developing a regional land use plan, a Regional Land Use Planning Commission:
11.4.5.7 shall promote the well-being of Yukon Indian People, other residents of the planning region, the communities, and the Yukon as a whole, while having regard to the interests of other Canadians;
11.4.5.9 shall promote Sustainable Development

The Commission must ultimately develop a regional land use plan that represents an acceptable balance of resource development, traditional cultural activity and ecosystem services having consideration for conflicting and competing interests, both intra- and inter-generational. These concurrent goals lie at the heart of most contemporary planning challenges. Indeed, Sustainable Development is not the endpoint for a land use plan, but rather a measure of its ongoing utility (Campbell, 1996).

7.2 Resource Terminology

From an indigenous perspective the use of the term ‘resource’ to describe fish and wildlife, habitat, or other natural or cultural components which make up the world around us, is not fully compatible with how people see and understand the natural world. For Tr’ondëk Hwëch’in the natural world, of which humans exist within, has value unto itself, regardless of its ‘resource’ value to humans. Within Tr’ondëk Hwëch’in world view all animals are sentient, spiritual beings, who live their lives as part of a great cycle of reciprocity. Considering these as solely resources for human use is seen as disrespectful, whereas recognizing their intrinsic value to the ecosystem is a part of the fabric of TH culture and teaching stories.

Though the RAR does not endeavor to change this commonly used terminology throughout the text, it strives to use this language in the most respectful manner by recognizing the inherent issues which arise from its use.

7.3 Values Definitions

The total value given to a resource may include direct and/or indirect use benefit(s) as well as non-use benefit(s). We receive direct use benefits through ecosystem services and inputs into our economic activities, indirect use benefits from non-consumptive appreciation, and non-use benefits from intergenerational and intra-generational gifting, such as knowledge received from a conserved resource. Some resources are valued simply because we know they exist, even though they do not appear to have a social value; this is called an intrinsic value.

Direct use benefits:

Examples include timber for building homes, wild animals for hunting and trapping and flood

Indirect use benefits:

Examples include wildlife viewing, nature-based appreciation and spiritual relationship

Non-use benefits:

Examples include sharing of resource-based knowledge, rare plant species and

Determination of resource value is subjective. The relative importance of different resources or prevalence of one perspective over another, or the equitable distribution of cost and benefit from resource use is a function of the emotional, spiritual and political forces in society. Few would disagree that natural systems have intrinsic value, but this does not provide much insight on how to identify, describe and measure values for biodiversity and biological function. Some resources have very low economic value but high utility value. For example, water has a very low market price but very high use value. In contrast, diamonds have a very high market price but relatively low use value. Spiritual values are especially difficult to quantify, such as the value of viewing wildlife in its natural state (Secretariat of the Convention on Biological Diversity, 2007).

Trade-offs are often improperly characterized as being between “jobs” and the “environment,” rather than being viewed as an effort to achieve economic growth, fairly distribute the benefits, and maintain ecosystem integrity. What kind of jobs, who gets them, and who bears the costs (social, economic and environmental) are important considerations in the promotion of traditional cultural value and achieving Sustainable Development.

7.4 Values Described in the Resource Assessment Report

Each of the resources discussed in the following chapters are described in terms of their contribution to and/or impact on natural, traditional, socio-cultural and economic values, such that a more holistic view might be taken of how the Commission should consider balancing these aspects of Sustainable Development.

7.4.1 Natural Value

The Canadian Boreal Initiative (CBI) provides a description for ecosystem services, as being, the benefits people obtain from ecosystems. Listed below are some ecosystem services which are specific to Canada's boreal region (Wilson & Anielski, 2005):

- Habitat
- Atmospheric stabilization (oxygen, carbon dioxide and ozone balance)
- Climate stabilization (greenhouse gas absorption, cloud formation)
- Disturbance avoidance (storm protection, flood control)
- Water stabilization and water supply (water storage, water filtering)
- Provisioning (food, timber, fiber)
- Erosion control and sediment retention (prevention of soil loss, storage of silt, drainage)
- Soil formation and nutrient cycling (weathering of rock, accumulation of organic material)
- Waste treatment
- Pollination (genetic diversity)
- Biological control (e.g., pest control by birds)

One may describe natural value as the value of ecological functions provided, and the natural capital contained in forest, land, water and wildlife resources. While this report does not the assign monetary value to ecosystem services in the Dawson planning region, there have been attempts to assign a monetary value on ecosystem services. The CBI approach calculates a dollar value of natural resources, ecological systems and processes (e.g., purifying water, regulating climate and producing oxygen), which is termed the Ecological Services Product (ESP). This value can be compared to the Gross Domestic Product (GDP), which quantifies economic production of natural resource development (e.g., timber, minerals, hydro-electricity, oil and gas) without the value of natural capital and ecosystem services. While it is possible to maintain a positive GDP while unsustainably depleting resources, consideration of the environmental costs (e.g., restoration of groundwater aquifers) is required to provide the complete accounting of the costs of resource development.

The CBI analysis of ecosystem services provided by boreal forests found them to be an order of magnitude (i.e., more than ten times) greater than the value of minerals and timber found within them.

7.4.2 Traditional Value

The Tr'ondëk Hwëch'in worldview (Tr'ëhudè) considers people, the land and all resources to be interdependent components:

"When our world was different than it is today our culture hero Tsà' Wëzhè (Beaver Man) travelled our territory and brought order to the world. He established relationships with our non-human relatives and formalized our responsibilities to them and to each other.

His journey and the agreements he made are Tr'ëhudè, our way of life, our law. Living our law by engaging with our land brought our society into existence and has shaped our culture and created our identity. Central to this is the requirement to uphold a reciprocal relationship with the land and all living things and to maintain the integrity of our homeland as an interconnected entity.

This is the essence of TH's existence as Dënezhu." – TH Land Stewardship Framework excerpt (2019)

Based on this worldview, Tr'ondëk Hwëch'in believes in holistic management of all system parts, rather than piece-meal protection of site-specific resources. The intended outcome of this management approach is intact land (with all that it includes) and maintained land relationships that allow for a thriving traditional economy and culture. The cultural landscape extends to the fullest reach of traditional First Nation traditional territory and includes everything and everywhere in the Traditional Territory (Tr'ondëk Hwëch'in, 2012). As described by Sharp (2004) as cited in Tr'ondëk Hwëch'in (2012):

The use of the land is tied to knowledge of the land...people do come to know some areas of the land intensely, often in a detail staggering to those raised in more densely settled areas, but that is not the issue. Knowing a territory is not remembering where every rock is placed or where every species of plant grows; it is having a sound understanding of the nature of animate beings within the land and how those beings relate to each other and to particular kinds of local environments. [People] could not have survived through a detailed knowledge of place within a dynamic and constantly changing environment but have survived through a detailed understanding of how animate life relates to other forms of animate life and interacts with climate and environment. Knowing a territory is not memorizing where things are but understanding how things relate to each other.

Documented heritage resources within the planning region are dominated by archaeological or evidence-based anthropological research. Material remains are an important reminder of cultural values but places, areas, stories, traditional use and historic resource management practices together form a larger, cultural landscape. This cultural landscape consists of broad geographic areas reflecting patterns of human activity that have evolved over a long period of time, or where spiritual or aesthetic values are associated with the landscape.

Important cultural landscapes include those associated with traditional and historic activity along the Yukon River; in the Tombstone, Blackstone and Ogilvie river headwaters; and within the Klondike Valley.

Stories are often grounded in the physical landscape, linking events with places on the land. For example, stories were told in the fall, during the move downriver from fishing camp to winter hunting. Some of those stories associated Tachokaii's experience to a particular place at a specific time of year, providing relevant seasonal subsistence knowledge and linking together places to form a cultural landscape.

Though approached holistically, some places in the planning region may be considered to be of higher traditional value and have a higher potential to contain heritage resources.

Chapter 8 of this document (**Heritage**) discusses in further detail, providing examples and specific areas.

In Tr'ondëk Hwëch'in culture, heritage is characterized by intangible values attached to the landscape - values not necessarily tied to the presence of artifacts or human remains, but to spiritual connections with the land. Interpreting stories and traditional knowledge, in an attempt to extract facts from them, severs them from their cultural context. Recognizing overlapping cultural landscapes facilitates an understanding of different perspectives on the relationship between people and the natural environment.

The Yukon River is the central element of the Tr'ondëk Hwëch'in cultural landscape. Athapaskan stories include narratives about Tachokaii, the mythic river traveller who travelled from the origins of the river to its mouth and transformed the world from chaos to order. At the end of his trip he arrives at the ocean and vanishes, leaving responsibility for the world to humans (Neufeld, 2011).

The land out there is our grocery store, our medicine store and clothing store, we need to look after it and protect it for our grandchildren. – Tr'ondëk Hwëch'in Elder

Traditional value encompasses the broader concept of a traditional economy. The Tr'ondëk Hwëch'in traditional economy is based on the harvest of natural resources; it provides meat, fish, berries, fuelwood and income from fur (adapted from Berkes et al., 1994). It also provides raw materials for cultural products such as snowshoes, clothing, footwear, harvesting gear (e.g., fish traps and snares), tools (e.g., knives, sewing implements, scrapers, twist drills and fire drills), weapons (e.g., bow and arrow, spears and clubs), boats (e.g., dugout canoe, birch bark canoe and moose skin boat), cooking ware, baskets, hide dome shelters and arts and crafts products.

For the Tr'ondëk Hwëch'in, ungulates, principally moose and caribou, and salmon are an important component of the traditional diet and essential to good health. Caribou are a highly valued source of food, traditional tools and clothing.

For the Tr'ondëk Hwëch'in cultural and spiritual values are important considerations. The inherent connection to the land and wildlife for First Nations inevitably results in areas of cultural or spiritual value overlapping with areas of ecological value.

Over time, stewardship practices in the traditional economy influence the ecology. The goals for Conservation in Yukon First Nation Final Agreements provide insight on the traditional values associated with management of resources. For example, the THFA (TH-DIAND 1998) provides the following definition:

“Conservation” means the management of Fish and Wildlife populations and habitats and the regulation of users to ensure the quality, diversity and Long Term Optimum Productivity of Fish and Wildlife populations, with the primary goal of ensuring a sustainable harvest and its proper utilization.

The THFA further states as an objective in **Chapter 16 - Fish and Wildlife:**

16.1.1.7 to integrate the relevant knowledge and experience both of Yukon Indian People and of the scientific communities in order to achieve Conservation.

A traditional economy can provide structure and on-the-ground capacity for monitoring, research, management, protection, enhancement and reclamation in a manner consistent with modern roles for stewardship in a sustainable resource economy. Though based on traditional values and long-standing relationships with the land, what has been termed the ‘traditional’ economy is not something in the past, but an active contributor to the modern mixed economy, utilizing modern means in a contemporary world. Traditional economic activity is also considered under the heading of Economic Value.

7.4.3 Socio-Cultural Value

The “social systems” aspect of Sustainable Development is understood to include “the relationships, networks and norms that facilitate collective action” or alternatively as “the shared knowledge, understandings, and patterns of interaction that a group of people bring to any productive activity” (Duxbury and Gillette, 2007). Expressed in terms of “social capital,” social systems include local governance, community organization, capacity building, participatory planning, access to information, collaboration, and partnerships.

According to the British Columbia Round Table on the Environment and Economy (1993) as cited in Duxbury and Gillette (2007), sustainable communities have sufficient social capital to:

- Achieve and maintain personal health: physical, mental and physiological;
- Provide adequate and appropriate shelter and food for themselves;
- Have opportunities for gainful and meaningful employment;
- Improve their knowledge and understanding of the world around them;
- Find opportunities to express creativity and enjoy recreation in ways that satisfy spiritual and psychological needs;
- Express and enjoy a sense of identity and belonging through heritage, art and culture;
- Be assured of mutual social support from their community;
- Enjoy freedom from discrimination and, for those who are physically challenged, move about a barrier-free community;
- Enjoy freedom from fear, and security of person; and
- Participate actively in civic affairs.

A distinction is made between “social systems” and culture, the latter of which may be defined as (Canadian International Aid Agency, 1998):

A collection of distinctive traits, spiritual and material, intellectual and emotional, which characterize a society or a social group. It includes, besides the arts and letters, ways of life, fundamental human rights, value systems, traditions and beliefs.

Culture has traditionally been viewed as a part of the “social” dimension of sustainable development, but cultural capital (e.g., heritage, arts, food, music and literature), as distinct from social capital, has largely been ignored. Although not specifically included as a component of Sustainable Development, as defined by the Final Agreements, culture has come to be considered as a key element in the sustainable development framework.

For this report, social and cultural values are together considered to include aesthetic, educational, recreational, historical, and non-industrial resource use (e.g., fuelwood

harvesting, hunting, fishing and berry gathering) as well as non-use value (e.g., wilderness, wildlife viewing and quiet, peaceful use and enjoyment).

7.4.4 Economic Value

The total economic value of a resource comprises both use and non-use values associated with that resource (CBI, 2009). Subsection 7.2 of this chapter described the economic value of natural resources, ecological systems and processes as well as the natural capital contained in forest, land, water and wildlife resources.

Typical and traditional economic activities both contribute value to the Yukon economy through primary resource production, wage labour, purchase of goods and services, and payment of taxes and royalties. Economic value may also be embedded in the infrastructure that enables economic activity, such as in trails, harvest sites and hunting camps, roads, communication towers and airports.

Economic value may directly comprise production or consumption potential, or be inferred such as population growth/decline, number of building permits, number of border crossings or total retail sales. Indications of economic potential include employment opportunity, availability of skilled and healthy workforce, resource inventory (e.g., minerals, forests, energy and water), intra and inter-sectoral diversity, local business development, competitiveness, innovation and attractiveness to investors.

Economic potential may also be inferred by access and connection to communication networks, via infrastructure such as roads, ports, information, communication technology, transportation and energy.

Economic values considered as part of public investment in roads for resource development include (Government of Yukon 2013):

- Estimates of mineral reserves
- Projections for development time and lead-up costs
- Production estimate and schedule
- Payments to government (e.g., taxes and royalties)
- Employment
- Wages and salaries
- Possibly affected communities and First Nations
- Estimates of possible impacts on Yukon population

7.4.5 Traditional Economy

The traditional economic value of a resource is largely discussed in the Economic Value section for each resource, however there is often overlap to other values due to the strong ties to the land and the cultural nature of the Traditional Economy. A comprehensive definition of Traditional Economy as it is defined by the Tr'ondëk Hwëch'in people is provided in **Section 4.3.1**.

7.5 Risks and Uncertainty

Planning and resource management cannot achieve Sustainable Development without consideration and management of risk and uncertainty. Some factors influencing economic, ecological and social values are either unpredictable or have uncertain outcomes, such as:

- Climate change;
- Anthropogenic disturbance;
- Cumulative effect of human activity;
- Invasive species;
- External market forces; and
- Utility of mitigation technology.

In each of the Resource Chapters in Section 2 (**Chapters 8-17**) the authors have attempted to provide the Commission with possible areas of risk and uncertainty based on the Parties input and the best available information. The *Risk and Uncertainty* sections are not intended to be an exhaustive list, nor do they evaluate the risks, they simply identify (some of) the risks for the consideration of the Commission.

In order to accommodate the uncertainty of these factors, the Land Use Plan should identify acceptable levels of change to resource and cultural values to manage the risks. In the case(s) of rapid, intense and/or widespread change, adaptive management approaches could be more responsive.

7.6 Chapter References

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8 HERITAGE

8.1 Highlights

- First Nations in the region have a broader interpretation of heritage resources than what is defined in Government of Yukon legislation
- The First Nations view their traditional territory as a holistic cultural landscape, with land at the center of culture. Heritage is understood as a way of life, it is alive and changing
- Tr'ondëk Hwëch'in have traditionally occupied, travelled or harvested in virtually every corner of the planning region. Traditional use sites, spiritual and story locales, harvest areas, as well as long ago sites all contribute to the cultural fabric of the TH landscape
- The region holds the highest concentration of historic sites in the territory, relating to gold mining from the late 19th century to the 1960s, First Nations history and early fur trade in the region.
- Prehistoric and archaeological sites in the planning region span the period from the end of the last Ice Age to historic times
- Placer mining activity has been one of the principal discovery mechanisms of ice age fossil remains with exceptional preservation. Virtually every creek with intact frozen silts and gravels in the unglaciated parts of the planning region has potential for palaeontological resources.
- Heritage resources are an important attraction for the region and provide substantial economic benefits through heritage tourism.
- Large areas of the planning region have not been surveyed for heritage resources. Increasing land access and human activities, particularly land clearing and disturbance of sediments, raises the potential for impacts. Heritage resource assessments and the use of best management practices help in mitigation.
- YG has identified specific areas that are expected to have high concentrations of heritage resources that are at risk of loss due to increased demand for land access and human activities.
- The proposed Tr'ondëk—Klondike World Heritage Site region is on Canada's shortlist to be nominated as a UNESCO World Heritage Site. The proposed property submitted to UNESCO in January 2017 comprised 38 251.26 hectares of lands and water, and included the Bonanza Creek valley and, parts of the Klondike and Yukon River Valleys. In 2018 the nomination was withdrawn by Canada for reassessment, to be resubmitted for UNESCO's consideration in the future.

- The effects of climate change have the potential to impact heritage resources through thawing of permafrost, rising water levels, accelerated erosion and sedimentation, and more frequent storms and wildfires.

8.2 Description of Resource

8.2.1 Overview and Definitions

Due to the region's rich cultural heritage and unique landscape, it is rich in heritage resources including, but not limited to, historical, archaeological, and paleontological records. This section describes the inventory of heritage resources that are found in the Dawson Planning Region, and identifies areas of heritage artifact potential in the region that remain undisturbed. This section also highlights the interpretation of heritage from a First Nations perspective, broadening the definition to root it in the landscape and understanding heritage as a way of life.

Heritage resources are defined and interpreted differently by the Government of Yukon and the First Nations governments of the region.

8.2.1.1 Government of Yukon

Government of Yukon utilizes the term "historic resources" as defined by Section 2 of the *Historic Resources Act* (RSY 2002, c 109):

'Historic Resource' includes

(a) a historic site,

(a) a historic object, and

(b) any work or assembly of works of nature or human endeavor that is of value for its archaeological, palaeontological, pre-historic, historic, scientific, or aesthetic features.

The act further defines these terms as follows:

'Historic sites' are sites of historic significance that are designated by the Minister under Part 3 of the Act. In particular:

15(1) The Minister may designate any site as a historic site when satisfied that the site is, whether in itself or because of historic resources or human remains discovered or believed to be at the site, an important illustration of

(a) the historic or pre-historic development of the Yukon or a specific locality in the Yukon, or of the peoples of the Yukon or locality and their respective cultures; or

(b) the natural history of the Yukon or a specific locality in the Yukon, and has sufficient historic significance to be so designated.

'Historic object' is any of the following, as per Section 61(1):
(a) an archaeological object that has been abandoned,
(b) a palaeontological object that has been abandoned,
(c) an abandoned object that is designated under subsection (2) as a historic object [on a recommendation by the Yukon Heritage Resources Board, the Commissioner in Executive Council may designate as a historic object any object more than 45 years old that is believed to have sufficient historic significance].

'Archaeological object' , as per Section 61(1), means an object that
(a) is the product of human art, workmanship, or use, and it includes plant and animal remains that have been modified by or deposited in consequence of human activities,
(b) is of value for its archaeological significance, and
(c) is or has been discovered on or beneath land in the Yukon, or is or has been submerged or partially submerged beneath the surface of any watercourse or permanent body of water in the Yukon.

'Palaeontological object' , as per Section 61(1), is the remains or a fossil or other object that indicates the existence of extinct or prehistoric plants or animals [not including human remains], and that
(a) is of value for its historic or palaeontological significance, and
(b) is or has been discovered on or beneath land in the Yukon, or is or has been submerged or partially submerged beneath the surface of any watercourse or permanent body of water in the Yukon.

- **'Ethnographic object'**, as per Section 61(1), means an item of material culture relating to the history and traditional culture of an ethnic group.
- **'Human remains'**, as per Section 61(1), means non-fossilized remains of human bodies that have historic significance and are found outside a recognized cemetery or burial site.

Human remains are managed under the *Guidelines Respecting the Discovery of Human Remains and First Nation Burial Sites in the Yukon* (Government of Yukon, 1999).

The definitions contained in the *Historic Resources Act* (and what is considered by Government of Yukon to be heritage resources for management purposes) are clearly focused on "objects", "sites", "items of material culture", and other physical remains.

8.2.1.2 Tr'ondëk Hwëch'in

Some of these definitions are focused on physical objects and material remains. However, as explained in *Tr'ondëk Hwëch'in Best Practices for Heritage Resources* (Tr'ondëk Hwëch'in,

Tr'ondëk Hwëch'in Heritage

The Tr'ondëk Hwëch'in have a broad definition and perception of what heritage is and what it includes. Heritage is not something from the past, but a way of life reflected in the beliefs, values, knowledge, and practices passed from generation to generation. Heritage permeates all aspects of First Nation lives, communities, and governance. It includes much more than the material remains that are left behind. These heritage resources are understood as physical reminders of what is truly important.

2011):

Note: There are differences between definitions in the *Historic Resources Act* and the *TH Heritage Act*. Much of what TH considers to be heritage resources would not be protected under Yukon legislation (e.g., net fishing sites along the river, trails worn into side slopes of steep hills, or perennial snow patches) (Tr'ondëk Hwëch'in, personal communication, August 23, 2018).

8.2.1.2.1 *Definitions from the Tr'ondëk Hwëch'in Heritage Act*

Provides direction for the management of Yukon First Nations heritage and culture and defines the following terms (2016):

Archaeological	means relating to the field of archaeology, the scientific study of cultures through the examination of their material remains such as buildings, graves, tools, and other artefacts.
Cultural Landscape	refers to the unity of culture, history, the spirit world, the land and its inhabitants.
Ethnographic	<ul style="list-style-type: none"> i) means relating to the branch of anthropology called ethnography, concerned with ethnicity or ethnic groups, used to describe an object or other tangible or intangible aspects of a particular ethnic/cultural group; and ii) can include archaeological and paleontological objects.

Heritage Resources has the same meaning as in the Final Agreement which includes, Moveable Heritage Resources, Heritage Sites and Documentary Heritage Resources.
Heritage Site has the same meaning as in the Final Agreement, and includes intangibles associated with the Yukon First Nations concept of “cultural landscape.”
Historic Resources means relating to field of history. Yukon First Nations history is a dimension of a dynamic living heritage that is transmitted through stories, place names, families and a way of life. In the holistic Yukon First Nations worldview the term “Historic” is included within the term “heritage.” This act therefore does not distinguish between Historic Resources and Heritage Resources. Historic Resources include tangible and intangible evidence of Yukon First Nations heritage.
Paleontological means relating to the field of palaeontology, the scientific study of past life using fossil and paleontological evidence.
Yukon First Nations <ul style="list-style-type: none"> i) has the same meaning as in the Tr’ondëk Hwëch’in Final Agreement and includes “Yukon Indian People.” ii) refers to the collective and shared ethnicity of “Yukon Indian People,” and may also refer collectively to the group of First Nations located in Yukon.
Yukon First Nations Heritage refers to <ul style="list-style-type: none"> i) the way of life and worldview inherited from previous generations, and ii) both tangible and intangible elements of Yukon First Nations heritage.

8.2.1.2.2 *Definitions from the Tr’ondëk Hwëch’in Final Agreement*

Chapter 1 of the THFA provides the following definitions (TH – DIAND 1998):

‘Heritage Resources’ includes Moveable Heritage Resources, Heritage Sites and Documentary Heritage Resources.
‘Moveable Heritage Resources’ means moveable non-documentary works or assemblies of works of people or of nature that are of scientific or cultural value for their archaeological, palaeontological, ethnological, prehistoric, historic or aesthetic features, including moveable structures and objects.
‘Heritage Site’ means an area of land which contains Moveable Heritage Resources, or which is of value for aesthetic or cultural reasons.
‘Documentary Heritage Resources’ means Public Records or Non-Public Records, regardless of physical form or characteristics, that are of heritage significance, including correspondence, memoranda, books, plans, maps, drawings, diagrams, pictorial or graphic works, photographs, films, microforms, sound recordings, videotapes, machine- readable records, and any copy thereof.

'Yukon First Nation Burial Site' means a place outside a recognized cemetery where the remains of a cultural ancestor of a Yukon Indian Person have been interred, cremated or otherwise placed.

Chapter 13 (Heritage) provides additional definitions:

'Public Records' means records held by any department or agency or public office of any level of Government, and records which were formerly held by any such department, agency or public office.

'Non-Public Records' means all Documentary Heritage Resources other than Public Records.

'Place Names' includes Yukon Indian place names.

8.2.1.2.3 *Land-based Heritage Resources*

The Tr'ondëk Hwëch'in Heritage Department uses the term *land-based heritage resources* (LBHR) as an overarching classification for heritage resources in their traditional territory that warrant protection, preservation and management. LBHR are defined as areas of particular heritage interest or value stemming from the traditional, cultural, or historic relationships to the land. These are usually rooted in place and can be of value for both tangible and intangible reasons. LBHR also include the moveable heritage resources connected to, and in situ with, the non-moveable components. LBHR resources can include, but are not limited to, the following:

- Harvestable resources (e.g. wildlife, fish, and plants, and their habitats);
- Migration routes, waterways, salt licks, and calving areas;
- Medicines;
- Raw materials (e.g., bark, wood, stone, bone, fibres, and dyes);
- Place names (the stories and where they connect with the land);
- Camps, trails and caches;
- Burial sites;
- Sacred sites;
- Traditional knowledge; and
- Archaeological and historic sites.

Activities on the land that are rooted in ancestral family practices (e.g., hunting, fishing, trapping and other subsistence activities) are also considered heritage resources (Tr'ondëk Hwëch'in 2012a,b).

For the Tr'ondëk Hwëch'in, heritage is rooted in the landscape, and heritage resources are all of those things that support or result from a people's connection to the land and to their place in the world. Recorded oral histories, archives, artifacts, songs, stories and cultural landscapes are therefore also included.

Tangible resources on the land are considered indicators of larger areas with multiple values and uses (Tr'ondëk Hwëch'in 2012a):

For instance a cabin is not of value for the small piece of land on which it sits. Rather it indicates a greater scope of use in a larger area. People had many camps and cabins which were used as centre points for their larger individual and family hunting and trapping territories. This is true today as well....tangible resources like cabins, hunting blinds, trails, caches, camps, and graves are all markers on the land that speak to traditional land use.

Stewardship of the land while conducting resource harvesting, travel and recreation activities ensures that heritage is kept alive and protected. These land use patterns reflect a consistently changing and evolving system of resources, and it is difficult to pinpoint areas on a map that have higher value than others. Maps showing specific locations of heritage resources "...are not comprehensive. They in no way reflect the scope or richness of heritage values on the land...the very nature of heritage – that it changes and evolves over time – means that no static report or map will truly reflect the community's values with any justice" (Tr'ondëk Hwëch'in 2012a).

8.2.1.3 **Vuntut Gwitchin (VG) and Na-Cho Nyäk Dun First Nations**

VG and NND First Nations share this broader perspective of heritage resources as being more than the material remains left behind, but rather as reflections of an entire way of life and an ongoing and active connection to the land (NND, 2016). For example, for VGFN "culturally significant areas" are defined as "places where traditional land use activities occurred, including subsistence harvesting, travel routes, and communities and camps. Culturally significant areas may also be the place of stories or legends" (North Yukon Planning Commission, 2007).

8.2.2 Cultural Landscapes and Living Heritage

Cultural landscapes are defined as “large intact tracts of land that allow for the continual practice of resource harvesting and associated land management activities, and for habitat conducive to healthy wildlife species” (Tr’ondëk Hwëch’in, 2012a). TH also defines the cultural landscape as a component of the traditional economy. Cultural landscapes include intact tracts of natural landscape which allow traditional societies to practice their resource harvesting; transportation, shelter and harvest site infrastructure; management practices such as prescribed burning that enhance and protect ecological systems; seasonally shifting land and resource use patterns; and use of Aboriginal language place names (Tr’ondëk Hwëch’in 2012a).

Cultural landscapes and First Nations culture and heritage may or may not be expressed in material remains or substantial modifications of the landscape. For example, frequently used traditional trail networks which linked resource harvesting opportunities, camping

locations, important landscape features and gathering places may leave visible traces on the landscape but marine routes might not. Campsites and seasonal settlements typically had limited physical infrastructure developments, but some harvesting infrastructure was more extensive. For example, caribou fences were constructed to herd or corral animals into situations where they could more easily be killed, often along with snares that strangled the animals. These fences were constructed from poles and could run for distances of many kilometers. Deadfall traps constructed of several large logs used a baited triggering mechanism that crushed the animal (Tr’ondëk Hwëch’in 2012a).

Culture and Place

Where artifacts or visible remains of activities are present, they are more important as indicators of the broader relationship between culture and place. This relationship, as described by Prosper (2007):

...spatial practices and performances transform largely unmodified wilderness into meaningful cultural spaces symbolizing a collective consciousness that is inextricably associated with a geographical territory.

Aboriginal cultural landscapes remain relevant as long as they are continually reinvested with cultural meaning through practice and inhabitation, but revert back to wilderness, emptied of their cultural significance, if these cease. They are geographical territories whose cultural significance, and by consequence heritage value, stems from the continuity of a relationship between culture and place that is integral to cultural identity.

Tr'ondëk Hwëch'in is currently developing detailed map data for cultural land use including current community. Once available, it will be used to create **Map #13: Tr'ondëk Hwëch'in Land Use** in **Section 3**.

8.2.2.1 Place Names

Stories associated with place names tell us about where people have travelled, lived, gathered and hunted. Names are given to rivers, mountains, trails, lookout points and other important areas that signify the relationship between the community and the land. Elders tell stories about how a particular place came to be or about the people who spent time there, and about events that happened there in the distant past and in historical times. They locate a place not by means of a map, but by means of a story, and use places instead of dates to organize and focus their memories of the past (Tr'ondëk Hwëch'in, 2012a).

Peel Watershed Planning Commission (2008): Yukon First Nations heritage is:

...intrinsically tied to the landscape, the environment and the wildlife that inhabit it...their heritage and culture is represented as much by expansive natural features – such as mountains, mountain ranges, lakes, and rivers and the stories embedded in these places – as it is by archaeological artifacts, fishing camps or tent rings.

Heritage resources are inextricably linked to cultural survival and vitality, and Prosper (2007) notes that it is important to:

...move away from a material and artifactual notion of heritage toward one that privileges the relationships and practices that give rise to artifacts and other cultural expressions. In the case of cultural landscapes, this means focusing on human relationships with the land and the spatial practices through which they are formed.

8.2.2.2 Culturally Important Areas

There are many important cultural locales identified by TH within the Tr'ondëk Hwëch'in Traditional Territory and located within the planning region. These areas may not have a particular designation, but have been identified as being of cultural value and importance to the Tr'ondëk Hwëch'in (Tr'ondëk Hwëch'in 2013a, 2013b).

Moosehide and Tr'ochëk are two sites that are of particular significance to the TH people. The descriptions below are written from a TH perspective (Tr'ondëk Hwëch'in 2013b):

Tr'ochëk – the point of land between the Klondike/Tr'ochëk and Yukon/Chu kon dëk Rivers – is the heart of Tr'ondëk Hwëch'in traditional territory. For hundreds of years, our people came here to fish for salmon, hunt moose up the Klondike Valley, and meet with neighbouring First Nations with whom our ancestors would feast, trade and intermarry.

The importance of Tr'ochëk in our history and culture is formally recognized through the Tr'ondëk Hwëch'in Final Agreement and more recently through its designation as a National Historic Site (2002). Today, we seek to protect Tr'ochëk's cultural resources and create a peaceful place of natural beauty for relaxation and contemplation where our citizens and others can learn of Tr'ondëk Hwëch'in history and culture.

Moosehide Village, located five kilometres downriver from Dawson, is an excellent place for a settlement. It is on a high bench well above flood level. There are good views up and downriver, ideal for spotting game. Nearby Tëjik dhä hä dëk/Moosehide Creek provides fresh water. This site was our main home for over 50 years.

In the spring of 1897, our grandparents and great grandparents began building cabins at Jëjik dhä dënezhu kek'it/Moosehide Village as well as a church and mission house for resident Anglican missionaries. While the settlement was their base, they also travelled on the land, spending time at fish camps, trap lines, hunting camps and favourite berry patches.

Although Elders are reluctant to pinpoint specific areas as having a higher value than others they did point out a number of locations that are culturally important and need to be considered during planning. These include:

- Northern portion of planning region, including the Ogilvie Mountain Range and Tombstone area;
- River corridors – especially Yukon, Klondike, and Stewart Rivers;
- Dempster Highway corridor;
- Traditional travel routes and corridors;

- Sacred sites, story sites, burials;
- Important sites, particularly Moosehide Village and surrounding area, Twelve Mile, Halfway Village Fort Reliance, 40 Mile, Tr'ochek and Land of Plenty (R-22);
- Areas associated with current traditional economic practices – trapping, homesteading; and
- All Settlement Lands.

8.2.3 The Paleontological Record

Most information in this section was provided by the Government of Yukon's Department of Tourism and Culture, Heritage Resources Branch (Government of Yukon 2013a with updates in 2018/19) or Cultural Services Branch unless otherwise noted. Sources cited in the text but not listed in the References section of this chapter may be obtained from the Cultural Services Branch.

The planning region lies at the eastern limit of the ancient landscape of Beringia, which connected North America with Eurasia across the exposed Bering Land Bridge, and remained unglaciated for more than three million years (for more information on Beringia and the glacial history of the region see **Section 5.2** of this report). The region contains well-preserved fossil and geological evidence of a long history of environmental change and species evolution and adaptation.

- Over 139 fossil localities are currently known in the Dawson area, with many of the most important sites in the placer mining areas (e.g., Klondike Goldfields, lower Stewart River, Thistle Creek, Black Hills Creek, Henderson Creek, Fifteenmile Creek and Sixtymile River watersheds).
- Pre-Ice Age fossils are also likely to be found in outcrops in the Ogilvie Mountains, north of the Tintina Trench and in the Tatonduk River, Miner River and Ogilvie River areas.
- Virtually every creek with intact frozen silts and gravels in the unglaciated parts of the planning region has high potential to preserve fossils of Ice Age mammals (Government of Yukon 2013a).
- The placer gold mines in the planning region are Canada's most significant and productive sources of newly discovered, permafrost preserved Ice Age fossils.

Paleontological remains indicate a rich community of large mammals that is much more diverse than it is today. During the late Ice Age around 20,000 years before present (BP), mammal species in the region included mammoth, steppe bison, horse, helmeted musk ox, musk ox, mountain sheep, saiga antelope, caribou, cave lion, grey wolf, black footed ferret, scimitar cat and short-faced bear. Around 14,000 BP the climate began to warm, the continental glaciers retreated, and the steppe-like habitat began to disappear. Populations

of several of the large mammals that thrived throughout the Pleistocene era (the geological period spanning approximately 2.6 million to 11,700 years BP) began to decline and went extinct. At this time, in response to an increase in shrub and forest vegetation, other mammals such as moose and wapiti crossed the Bering Land Bridge from Asia into the Yukon for the first time. Some species surviving these extinctions and persisting into the Holocene era (after about 11,000 years ago) include bison, caribou, sheep, brown bears and wolves.

8.2.3.1 **Placer Mining and Paleontology**

This connection between placer gold mining and Ice Age fossils goes back to the Klondike Gold Rush over 100 years ago. As soon as frozen ground was moved, early gold miners found fossils of Ice Age mammals and spurred a “fossil rush” to the Klondike by several international museums and institutions. The region continues to attract scientists from all over the world annually to examine the internationally renowned Ice Age fossils and geology. Numerous distal volcanic ash beds (tephra) found in the frozen Ice Age sediments and soils provide a detailed chronological record for climate and environmental changes spanning the last three million years. Relic permafrost discovered on Dominion Creek is the oldest known ice in North America at over 750,000 years old. Thousands of new fossils are uncovered annually and collected as part of management activities of the Government of Yukon Paleontology Program.

Placer gold mines in the planning region are North America’s most significant source of ancient DNA preserved in Ice Age bones, plants and soils.

- A horse fossil discovered at a placer mine on Thistle Creek dating to over 750,000 years old recently yielded the world’s most ancient genome.
- A partial ancient horse carcass with mummified hide, hair and intestines dating to over 26,000 years BP was discovered on Last Chance Creek in 1992.
- The Klondike placer mines are also Canada’s most productive source of fossil mammoth ivory, some of which is sold internationally on the commercial market (Zazula and Froese 2011, Froese et al. 2009).
- In 2016 rare, mummified remains of two ice age animals - a caribou calf and a wolf pup - both carbon-dated to more than 50,000 years old, were dug up from the permafrost by gold miners near Dawson City, Yukon.

8.2.4 **The Archaeological Record**

Most information in this section was provided by the Government of Yukon’s Department of Tourism and Culture, Heritage Resources Branch (Government of Yukon 2013a, with updates in

2018/19) or Cultural Services Branch unless otherwise noted. Sources cited in the text but not listed in the References section of this chapter may be obtained from the Heritage Resources Branch.

- As of June 2019, there are 451 recorded archaeological sites in the planning region. These are predominantly prehistoric sites that span the period from the end of the last Ice Age to historic times.
- Known concentrations of archaeological sites and traditional patterns of land use by Tr'ondëk Hwëch'in indicate the upper Forty Mile / Ch'édä Dëk, Upper Chandindu and Upper Blackstone River areas were a focus of seasonal caribou exploitation throughout the prehistoric period.
- The Yukon River, Klondike River and Chandindu River were major travel corridors to hunting territories and were themselves the focus of fishing, trapping, and moose hunting subsistence activities.
- The ancient terraces along the Yukon River have been identified as potentially preserving some of the earliest evidence of human populations in the unglaciated Beringian landscapes of the late Ice Age.
- The upper Miner River-Ogilvie River area has had little research but has high potential for archaeological resources, with cave sites similar to those in the Ni'inlii Njik/Fishing Branch area to the north. Additional upland sites are also expected to occur in the Ogilvie Mountains (North Yukon Planning Commission, 2007).

Inventory information is lacking for large portions of the planning region. Furthermore, data is often biased toward roads, developments, or other areas, such as where assessments have been conducted for planning or mitigative reasons (e.g. Tombstone Territorial Park). **(Refer to Map #14: Paleontological, Archaeological and Historic Localities.)**

A caribou antler punch, which would have been used as an implement to flake stone for stone tools, was recovered from site KIVi-1 along Hunker Creek in the Klondike district. This artifact provided a date of 11,350 radiocarbon years BP or about 13,000 calendar years old. This cultural horizon is seen by many North American archaeologists to represent one of the earliest populations to colonize North America in the late Ice Age.

Archaeologists speculate that an intensified use of rivers in the late Holocene is tied to the technological innovation of fish traps and weirs, set in the shallow sloughs and tributaries of the Yukon River. Contact with new groups or the appearance of new peoples in neighbouring regions likely brought about these and other technological innovations in the

Late Prehistoric period. The development or escalation of trading relationships with coastal groups centered around native copper may have seen the spread of innovations in fishing technology. The late prehistoric and contact period components of the Forty Mile / Ch'édä Dëk and Tr'ochëk sites represent occupations in this dynamic period of Yukon prehistory.

8.2.5 The Historic Record

Most information in this section was provided by the Government of Yukon's Department of Tourism and Culture, Heritage Resources Branch (Government of Yukon 2013a, with updates in 2018/19) or the Cultural Services Branch unless otherwise noted. Sources cited in the text but not listed in the References section of this chapter may be obtained from the Heritage Resources Branch.

- As of December 2018, there are 1,389 records of historic resources in the planning region (mostly dating from the early 1900s to the late 1960s). This is the highest concentration of historic resources in the territory.
- There is evidence of engineering works, industrial infrastructure such as power plants and dams for hydroelectric projects, transportation infrastructure (e.g., roads, roadhouses, railways), dredges, dredge camps, communities, gravesites, police posts, cabins, placer and quartz mining, trapping and farming.
- It is a multi-layered history, as many of these sites were used or occupied by both First Nations and newcomers.
- Like archaeological sites, known historic resources are protected under the Historic Resources Act (RSY 2002, c 109).

The Dawson area was one of the earliest areas to be settled by newcomers to the Yukon. Fur trading during the 1870s at Fort Reliance was preceded by early prospecting discoveries along the Fortymile River which gave rise to the permanent settlement at the mouth of that river by 1887. Documented historic First Nation sites throughout the region demonstrate continued land use by the Tr'ondëk Hwëch'in (e.g. fishing, hunting, trapping).

Systems of transportation, trading and communication grew up to service the needs of the newcomer population. Entire communities began, flourished and declined in tandem with the industry. New technology was developed to meet the challenge of the shallow rivers and frozen ground. Mining evolved as individual miners gave way to small operations with adjoining claims, which were in turn overtaken by large-scale corporations requiring large tracts of land, power and water. The corporate industrial mining phase came to an end in 1966 when the stagnant price of gold made it no longer profitable (Hogan, 1995).

A field program to document these resources was initiated by the Government of Yukon's Historic Sites Branch in the 1980s, and a large portion of the known sites have been recorded in the Yukon Historic Sites Inventory (YHSI). In response to the recent increase in exploration, mining and development in the Dawson region, Government of Yukon Historic Sites staff are conducting annual field inventory projects to document, research and update records of historic resources. Much progress has been made in ground-truthing the baseline information and gathering new information. Furthermore, the Tr'ondëk Hwëch'in Heritage department documents, records and inventories historic sites related to First Nations historic use of the region on an annual basis.

Many areas in the planning region have large concentrations of historic resources which have been documented and inventoried, including the Klondike Goldfields, the Fortymile river, Sixtymile River, Stewart River, the Twelve Mile River, and the Klondike river valley. The Yukon River is also likely to contain historic resources related to transportation, trapping or farming. The Yukon River has not been inventoried and the likelihood of remaining historic resources is high, including the early settlement of Ogilvie (a Heritage Reserve), which is located on Ogilvie Island. The White River has also not been inventoried and is likely to contain roadhouses and wood camps related to sternwheeler traffic.

Heritage resources in more remote areas are not as thoroughly documented, but are less likely to be disturbed, and if intact are more likely to retain important information about their function and cultural context (Hogan, 2003).

Aside from legislation, there are three types of management regimes that pertain to historic places in the Yukon (**Section 8.4.1** will describe the management regimes in more detail):

1. National, territorial or municipal designation as a historic site;

- *The Klondike Gold Rush International Historical Park* – Includes National Historic Sites of Canada. (more detailed description of park in **Section 6.2.2**)
- Two National Historic Sites – *Discovery Claim and Dredge No. 4*

Note: Numerous other nationally significant historic sites are located within the Dawson area (e.g., Dawson Historical Complex, Bear Creek Compound and Tr'ochëk). However, because they are located within the municipal boundaries of Dawson City, they are managed under a separate regime and "excluded" from the regional land use plan.

2. Sites identified under First Nation Final Agreements;

- One Territorial Historic Site designation in progress – *Forty Mile, Fort Cudahy and Fort Constantine / Chëdä Dëk* – this is also a Heritage Reserve and is jointly owned and managed by Tr'ondëk Hwëch'in and Government of Yukon. In future it is intended that Tr'ondëk Hwëch'in and Yukon Government will have joint ownership of the site (Tr'ondëk Hwëch'in, personal communication, August 23, 2018)

3. Heritage reserves.

- 15 Heritage Reserves (these are listed in **Chapter 6 – Land Status Table 6-4.**)

The following sub-sections provide a brief description of the heritage values for these and other significant historic places within the planning region.

8.2.5.1 National Historic Sites

8.2.5.1.1 *Discovery Claim National Historic Site*

As described in the Canadian Register of Historic Places (2008), Discovery Claim is a legally defined mining claim measuring some 152.4 by 609.6 m (500 by 2,000 feet) located on Bonanza Creek, a tributary of the Klondike River near the City of Dawson. It is significant as the site where gold was discovered on the afternoon of August 16, 1896 – the event that triggered the Klondike Gold Rush.

The claim is owned by the Klondyke Centennial Society and was developed in cooperation with the Government of Yukon and Parks Canada as an attraction, with a one-kilometer long walking trail, interpretive signs and mining exhibits.

8.2.5.1.2 *Dredge No. 4 National Historic Site*

Dredge No. 4 is a preserved bucketline sluice dredge used to mine placer gold. It is located at its last place of operation on Bonanza Creek in the Klondike Goldfields just outside of Dawson City. Dredge No. 4 is symbolic of the importance of dredging operations in Yukon (1899-1966), and aspects of the evolution of gold mining in the Klondike from early labour-intensive to later corporate industrial phases of gold extraction (Canadian Register of Historic Places, 2006).

Managed by Parks Canada, the dredge was excavated, refloated and relocated to higher ground in 1991 and 1992. A major stabilization program is ongoing for Dredge No. 4. It is one of the Yukon's premier heritage tourism attractions.

8.2.5.2 **Historic Sites and Routes under the Tr'ondëk Hwëch'in Final Agreement**

8.2.5.2.1 *Ch'ëdä Dëk / Forty Mile, Fort Cudahy and Fort Constantine Historic Site*

This site is known simply as "Forty Mile" or as Ch'ëdä Dëk in the Hän language (the name for the Fortymile River, meaning "creek of leaves"). Forty Mile/Ch'ëdä Dëk is situated on islands and riverbank terraces comprising approximately 50 hectares at the mouth of the Fortymile River where it enters the Yukon River, 67 km upstream from the Alaska border and 88 km downriver from Dawson City. (Government of Yukon and Tr'ondëk Hwëch'in, 2011). The Fortymile River begins in Alaska and, with its great network of tributaries, drains an area of 1,830 km² (706 square miles). It got its name not because of its length, but because of its estimated distance downriver from the old trading post of Fort Reliance. First Nations people have gathered here at the confluence of these two major rivers for over 2,000 years to hunt, fish, trade and visit (Tr'ondëk Hwëch'in, 2013b).

Section 13.4.6.1 of the Tr'ondëk Hwëch'in Final Agreement (TH – DIAND, 1998) requires that Forty Mile / Ch'ëdä Dëk be established as a Designated Heritage Site, with specific provisions noted in Schedule A of Chapter 13 (Heritage), because of its cultural significance to the Tr'ondëk Hwëch'in and to all people of the Yukon.

Elder Mary McLeod has spoken of how people from the Forty Mile / Ch'ëdä Dëk and Dawson areas hunted together in the fall. They met at a long caribou fence in the mountains near Chicken, Alaska, southwest of Forty Mile / Ch'ëdä Dëk. While awaiting the animals, they repaired the fence. Caribou were driven into this structure where they would be trapped by snares set into the fence, then shot with bows and arrows or stabbed with spears.

Other times, the caribou were driven into a ring of people, where the disoriented animals were easy prey for arrows. In spring, the Hän from the Forty Mile / Ch'ëdä Dëk and Dawson areas also gathered here to catch fresh grayling, usually through the ice using a line and hooks. The Arctic grayling (*Thymallus arcticus*), called srejl in the Hän language, are present in significant numbers at the mouth of the Forty Mile River / Ch'ëdä Dëk during spawning (Tr'ondëk Hwëch'in, 2013b).

Today the Forty Mile, Fort Cudahy and Fort Constantine Historic /Ch'édä Dëk Site is co-managed by the Tr'ondëk Hwëch'in and the Government of Yukon, and will be designated as a Yukon Historic Site under the *Historic Resources Act* (Tr'ondëk Hwëch'in, 2013b).

Sections 13.4.6.3 to 13.4.6.6 and Schedule C of the Tr'ondëk Hwëch'in Final Agreement (TH – DIAND, 1998) specifically refer to several heritage routes and sites within TH Traditional Territory (Table 8-1) (also identified on maps in Appendix B of the Agreement). Many of the sites identified are also Settlement Land parcels.

Numerous TH Settlement Land parcels were selected for their heritage resources values and importance for traditional economic pursuits. These include gathering sites for plants and medicines, traditional hunting and fishing camps, trapping areas, wood harvesting sites (some that supplied the sternwheelers), burial sites, village sites, resting places while travelling, and traditional gathering locations. Many of these parcels are used for educational purposes today (e.g., youth harvesting camps), and many also contain recorded archaeological sites and features (Tr'ondëk Hwëch'in, 2012a).

Table 8-1 Heritage Routes and sites identified in Chapter 13 of THFA

Heritage Routes	Eagle to Old Crow
	Dawson to Fort McPherson
	Hän Migration
	Dawson to Tetlin
	Dawson to Moosehide
Heritage Sites	Caribou fence areas in Blackstone Uplands/Chapman Lake area
	Old village site area at White River
	Traditional gathering site at Yukon River
	Archaeological/grave site at confluence of Stewart River and Yukon River
	Hän/Peel gravesites along Dempster Highway
	Traditional Gathering site at Dempster Highway/Blackstone River
	Traditional food gathering/village sites at headwaters of Ogilvie River
	Traditional hunting/fishing village at Mission Island in Yukon River
	Billy Silas spiritual site at Rosebud Creek

8.2.5.3 Other Historic Sites, Routes and Resources

The following tables (**Table 8-2** to **Table 8-5**) summarize the other major historic sites and resources in the Dawson planning region, with their main functions and dates of use.

Thomas (2007) notes some additional important areas throughout TH Traditional Territory that were utilized during the historic period, including:

Table 8-2 Additional important areas throughout TH TT as per Thomas (2007)

Name	Location	Date	Historic function
Black City	Blackstone uplands		Caribou camps
Guggieville	Mouth of Bonanza Creek and Rabbit Creek	1898-1930s	Industrial site
Halfway Creek town site	Mouth of Halfway Creek (4km down from Fifteenmile River	?-1950s	Townsite
Lee Creek	Klondike River	1911-1967	Industrial Site
Seela Pass	Headwaters of Chandindu, Fifteenmile and Blackstone Rivers		Travel route for caribou Hunting
Log Cabins Place	Ogilvie River	1890s-1930s	Winter camp

Table 8-3 Major historic settlements, farms and graves in the planning region (also see **Table 8-4** for communities associated with dredge camps and other industrial sites)

Name	Location	Date	Historic function
Fort Reliance	Yukon River	1874-1886*	Hän settlement and fur trading post
Forty Mile / Ch'édä Dëk, Fort Cudahy and Fort	Confluence of Yukon and Fortymile rivers	1886-1930s*	Caribou and fish camp, fur trading post and police post, townsite and cemetery

Name	Location	Date	Historic function
Constantine			
Granville	Dominion Creek	1898-1966	Goldfields townsite and mining camp
Ogilvie/Sixtymile	Confluence of Yukon and Sixtymile rivers	1892-1925	Farming, settlement and police post
Grand Forks	Confluence of Bonanza and Eldorado creeks	1897-1910	Goldfields townsite and cemetery
Stewart/Fort Nelson	Confluence of Yukon and Stewart rivers	1884-1950s*	Na-Cho Nyäk Dun fish camp, fur-trading post, village, gardening and roadhouse
Sunnydale	Sunnydale Slough on Yukon River	Early 1900s	Agricultural community of ten homesteads and watchman's cabins for winter shipyards
Indian River Hay Farm	Indian River valley	1902-1950s	Hay farming for horses used by stages on Overland Trail
McKinnon Creek Farm	Indian River valley	1902-1920s*	Hay farming for horses used by stages on Overland Trail
Strachan/Fournier Farm	Klondike Highway near airport	Early 1900s-unknown	Commercial dairy operation, then a family farm
Gold Run Creek Cemetery	Gold Run Creek	Early 1900s-1920s*	Cemetery related to early goldfields miners
8 Below Pup, 21 Below Pup, and Remington Pup Cemeteries	Dominion Creek	1898-unknown	Cemeteries (3) related to goldfields miners, settlements and camps

*Approximate time period

Table 8-4 Major historic industrial sites in the planning region

Name	Location	Date	Historic function
Cliff Creek Mine and railway	Cliff Creek and Yukon River	1899-1903	Coal mining – for heating and electricity for Dawson City residents

Name	Location	Date	Historic function
Coal Creek Mine, railway and power house	Confluence of Coal Creek and Yukon River to Coal Creek Mine	1903-1915	Coal mining – for heating and electricity for Dawson City residents and power for dredges
Discovery Claim National Historic Site	Bonanza Creek	1896	Small-scale gold mining
Dredge No. 4 National Historic Site	Bonanza Creek	1913-1958	Large-scale gold mining/dredging
Yukon Ditch System – multiple sites including Shovel Camp, Dinner Gulch Maintenance Camp, and Twelve Mile Power Plant	Ogilvie Mountains to Bonanza Creek	1906-1933	Water diversion and hydroelectric power production for hydraulic gold mining/dredging
North Fork/South Fork Ditch System, multiple sites, including Power Plant and Lee Creek Maintenance Camp	North Fork of Klondike River to goldfields and Dawson	1908-1967	Hydroelectric power production for gold dredging and for use by Dawson City residents
Acklen Ditch	Moosehide Creek to Thomas Gulch	1907	Water diversion for hydraulic gold mining and dredging
Dredges No. 2,3,6,7,8,9,10,11 and 12	Various locations in the Klondike Goldfields	1910-1966	Large-scale gold mining/dredging
Holbrook Dredge	60 Mile River	1915-1941	Large-scale gold mining/dredging

Name	Location	Date	Historic function
Bruin Creek Dredge Camp	Fortymile River and Bruin Creek	1934-1938	Large-scale gold mining/dredging and community
Bear Creek Compound	Bear Creek	1905-1966	Large-scale gold mining/dredging and community
Miller Creek Dredge Camp	Miller Creek	1895-1970s*	Small and large-scale gold mining/dredging and community
Glacier Creek Dredge Camp	Glacier Creek	1940s to present*	Small and large-scale gold mining/dredging and community
Fortymile River Camp	Fortymile River	1900-1912	Large-scale gold mining/dredging and community
Henderson Creek Dredge Camp	Henderson Creek	1947-1956	Large-scale gold mining/dredging and community
No. 10 Dredge Camp	Dominion and Jensen creeks	1938-1964	Large-scale gold mining/dredging and community
Bonanza Creek Dredge Camp	Bonanza Creek and Mosquito Gulch	1910-1966	Large-scale gold mining/dredging and community
Readford	Quartz and Calder Creeks	1900-present	Small and large scale gold mining/dredging and community
Bonanza Dam	Bonanza Creek valley	1907-1967	Water supply for hydraulic mining
Adams Creek Dam	Bonanza Creek valley	1906-	Water supply for hydraulic mining
French Gulch Dam	Eldorado Creek	1908-1939	Water supply for hydraulic mining

*Approximate time period

Table 8-5 Major historic route-related resources in the planning region

Route/Resource	Date	Historic Function/Location
Overland Trail, including remains of roadhouses and related sites	1902-1920s	Winter route for mail/passenger and freight service from Dawson City to Whitehorse
Ridge Road, including remains of trail, roadhouses and related sites	1899-1902	Main supply route for miners in goldfields, from Klondike City/Dawson to Dominion/Sulphur creeks
Glacier Creek Trail, including remains of roadhouses and related sites	Early 1900s	Trail connecting Dawson City via Swede Creek to Sixty Mile River mining area and communities
Klondike Mines Railway, including remains of railbed, stations and related sites	1906-1914	Transportation route from Klondike City/Dawson to head of Sulphur Creek
Goldfields Road, including residences, roadhouses, and related sites	Early 1900s to present	Road “loop” connecting Dawson to various locations in the goldfields (e.g., Hunker, Bonanza, Sulphur and Dominion)
Yukon River “Sternwheeler Graveyard” site	Early 1900s	Repair depot for Dawson shipyards of British Yukon Navigation Company and sternwheeler remains

8.2.1 Data Gaps and Limitations

Mapped heritage resource information in the planning region is biased towards archaeological, paleontological, and historic sites. Detailed map data for cultural land use including current community use is very limited. Recent mapping by Tr’ondëk Hwëch’in is working to address this data gap. Part of the challenge of capturing this information is that it is dynamic, it is time consuming to collect and relies on heavy participation by citizens. In addition, this type of information is often seen as private family knowledge and is not shared.

8.3 Resource Values

8.3.1 Natural Value

Heritage resources, in the broader First Nations concept, are valued for their ability to maintain people’s connection to the land. Stewardship of the land maintains ecological integrity and respects natural/ecosystem services.

The major drainage basins of unglaciated northern and central Yukon preserve exceptional evidence of Ice Age animals and environments. As modern rivers cut down through the sediments, the frozen silts containing bone and plant materials are exposed. Fossil bones that wash out of the silt bluffs along the rivers of the region may be found re-deposited on point bars on rivers. Fossils of invertebrate animals (e.g., shells, trilobites), vertebrates (e.g., fish) and plant impressions may be discovered in bedrock throughout the Yukon, especially in alpine areas with abundant outcrops.

8.3.2 Traditional Value

The Tr'ondëk Hwëch'in have traditionally occupied, travelled or harvested in virtually every corner of the planning region. Today this presence is reflected in many physical and non-physical indicators such as trails, name places and archaeological sites. Traditional use of medicinal plants, edible plants, fish, furbearers and big game continue to have strong cultural importance and help to maintain a strong connection between TH people and the land.

For the Tr'ondëk Hwëch'in, heritage is rooted in the landscape. Taking care of the land is critical as all the land's resources are a valuable part of this heritage. TH heritage is kept alive and protected when TH people hunt, fish and harvest. This stewardship protects the land and its resources (Tr'ondëk Hwëch'in, 2012a).

The broader definition of heritage resources advocated by Tr'ondëk Hwëch'in also includes traditional economic activities (e.g., hunting, fishing, trapping, berry picking and harvesting medicinal plants). Increased levels of access could impact these culturally significant areas positively (e.g., making it easier to get to areas of importance) or negatively (e.g., also opens these areas to other land uses and users).

Section 2.2 of the *Tr'ondëk Hwëch'in Land and Resources Act* (Tr'ondëk Hwëch'in, 2004) defines a “traditional activity” as “an activity undertaken by a citizen on a non-commercial basis for the purpose of obtaining food or providing for subsistence, or for a ceremonial, spiritual or cultural purpose, and any activity incidental thereto, and includes trapping.” The heritage resources of the region are highly valued for their role in maintaining opportunities for traditional economic activities. The value of highest priority to TH Elders is the ability to be active stewards of the land in traditional ways (Tr'ondëk Hwëch'in, 2012a). Continuing use of the land and its heritage resources maintains knowledge systems, provides educational values, promotes social relations and maintains a sense of place.

8.3.3 Socio-Cultural Value

The Yukon's heritage sites and resources are a tangible record of the people, events and activities that have shaped our way of life and our environment. Historic sites represent the technologies, designs and ideas that are the framework of our society and the basis for our future. Many sites are landmarks within a community, are associated with remarkable people or historical events, or are places that have cultural, social, scientific or architectural significance (Government of Yukon, 2013*b*).

Heritage sites are places of profound importance. For example, the Government of Canada describes National Historic Sites in this way (Parks Canada, 2013*b*):

They bear witness to this nation's defining moments and illustrate its human creativity and cultural traditions. Each national historic site tells its own unique story, part of the greater story of Canada, contributing a sense of time, identity, and place to our understanding of Canada as a whole.

National historic sites, located in all provinces and territories, can be found in almost any setting - from urban and rural locales, to wilderness environments. They may be sacred spaces, battlefields, archaeological sites, buildings or streetscapes. They can range in size from a single structure to linear canals spanning great distances. Many national historic sites are still used today for work and worship, commerce and industry, habitation and leisure.

Historic resources can help define a region and have socio-cultural benefits of providing a sense of belonging to a place by connecting community members to the past and entrenching a sense of responsibility of care for a place. Heritage resources and sites also can create a uniqueness of place to which community members benefit.

8.3.4 Economic Value

The heritage resources of the Dawson area are one of the main reasons for tourists to visit, and they provide substantial economic benefits to the region's businesses and residents

People come to experience the living legacy of the Gold Rush by touring the numerous historic sites in the region, including heritage trails such as the Ridge Road Trail, and many

of the premier heritage structures including Dredge No. 4 or the suite of structures that make up the Klondike National Historic Complex.

A major draw to the region is Indigenous culture, which can be experienced at the Dänojà Zho Cultural Centre on the Dawson City waterfront, the biennial traditional gathering at Moosehide, Tr'ochëk, Forty Mile, and many other places, venues, and events across the region. Cultural tourism has been identified as a major economic sector in the region with opportunity for future growth.

Also of interest to many visitors are the extensive opportunities for outdoor activities, two of the most popular of which are canoeing and boating on the Yukon River, whose natural and cultural heritage make for a rich and rewarding voyage.

8.3.4.1 **Management and interpretation of heritage resources**

The heritage sector contributes to the economy directly by providing employment opportunities such as heritage site caretakers, TH heritage department employees, summer student positions, Dänojà Zho Cultural Centre interpreters and staff, and archaeological fieldwork assistants.

Parks Canada provides tours within the Klondike National Historic Site complex and guided tours are provided by local tour operators for Dredge No. 4 National Historic Site. Discovery claim, the free claim, Claim 33, and Gold Bottom Tours.

The *Dänojà Zho* (Long Ago House) Cultural Centre in Dawson City is a dramatic exception to the town's gold rush theme by drawing on the much older traditions of the Tr'ondëk Hwëch'in. *Dänojà Zho* officially opened in July 1998 and is an important visitor attraction as well as a community gathering place. Visitors have an opportunity to learn about TH culture and heritage from guided tours, displays, films, storytelling and other special events. The gift shop sells locally handcrafted clothing, footwear and jewelry (Klondike Visitors Association 2013). The centre is described by Olson (2009) in Tr'ondëk Hwëch'in (2013b) as:

...a symbol of our history, our perseverance, pride and hope. It rose from the desire to make a strong presence in the traditional territory of the Tr'ondëk Hwëch'in that would speak to and for us and would not be bound to the "gold rush" era. The Centre would show that we are a strong people.

8.3.4.2 Heritage Tourism

The tourism industry is a major economic contributor to the region and much of the lure of for the tourism industry is the rich and vibrant heritage attributes. **Chapter 16: Tourism and Recreation** of this report provides specific economic values for the region's tourism sector.

8.3.4.3 Traditional Economy

The traditional economy has direct value, such as the value of meat harvested and the value of hides, antlers and furs as inputs to arts, crafts and cultural products. It also contributes to cultural and social well-being of First Nation members by contributing to traditional ecological knowledge; kinship and bonding; education in traditional way of life; observing changes that are occurring on the land; and exercising traditional protocols of acting as stewards caring for the land.

The traditional economy includes the production of a range of cultural products: snowshoes, clothing, footwear, harvesting gear (e.g., fish traps and snares), tools (e.g., knives, sewing implements, scrapers, twist drills and fire drills), weapons (e.g., bow and arrow, spears and clubs), boats (e.g., dugout canoe, birch bark canoe and moose skin boat), cooking ware, baskets, hide dome shelters and arts and crafts products. Many of these products require raw resources derived from traditional harvesting such as furs, hides, bones or antler. The knowledge, skills and abilities to produce these goods, as well as the knowledge and relationship with the land required to harvest or collect the raw materials, has value from a heritage perspective. The market for authentic Aboriginal products such as these exists and continues to develop. There are opportunities to produce and sell these types of goods as well as develop markets through brand value (Tr'ondëk Hwëch'in, 2012a).

This concept is not something new – First Nations people have always been flexible and able to adapt to changes in their environment. When newcomers arrived in the Yukon, people were able to take advantage of a number of new economic opportunities, including traditional crafts mixed with participation in a cash economy.

...the women of Moosehide had quickly mastered the knack of thriving in a market of shortages and high demand. In December 1897, they were earning \$20 to \$40 per day making moccasins and gloves for the miners. Within a few months, the price of native Moosehide moccasins had escalated from 75 cents to seven dollars. Moosehide gloves now cost eight dollars. (Beaumont and Edwards, Undated)

8.3.4.4 **UNESCO Tr'ondëk – Klondike World Heritage Site**

The proposed Tr'ondëk—Klondike World Heritage Site is one of thirteen sites identified in Canada's current Tentative List for World Heritage Sites as having strong potential to meet the high standards required for nomination under UNESCO (Parks Canada, 2018). Project partners including Tr'ondëk Hwëch'in, City of Dawson, Government of Yukon, Parks Canada, Klondike Visitors Association, Klondike Placer Miners Association, Dawson City Museum, Dawson City Chamber of Commerce and Yukon Chamber of Mines worked together with local residents from 2013 to 2018 to pursue a successful inscription of Tr'ondëk-Klondike on the World Heritage List. In May 2018, the project partners jointly decided to withdraw the nomination from consideration by the World Heritage Committee (Tr'ondëk Hwëch'in, personal communication, 2018).

The regional tourism industry identifies this designation as the primary opportunity for growth in the sector going forward, with potentially significant economic benefits. The *Regional Economic Development Plan for Tr'ondëk Hwëch'in Traditional Territory* (Klondike Development Organization 2013) identified nomination advancement as a priority project for implementation. It is expected that strong marketing through the international lens of the globally recognized UNESCO logo will attract more visitors — including higher-spending international and winter visitors — and encourage private-sector investment in new and expanded facilities and services we will all enjoy. This will provide a much-needed boost to not only tourism, but also to other primary industries such as mining and agriculture that can take advantage of these, improving the long-term economic sustainability of Dawson and the Yukon (Tr'ondëk Hwëch'in, personal communication, 2018).

The project partners and Parks Canada consider that this unique site, which commemorates Indigenous culture and mining activity as key elements, would be a valuable contribution to the World Heritage List. Pending reassessment of the proposed site's values and boundaries, Canada (in collaboration with Yukon-based partners) may

resubmit the Tr'ondëk-Klondike nomination to UNESCO in the future (Government of Yukon, personal communication, September 21, 2018).

8.3.4.5 **Regional Economic Development Plan (REDP) for the Tr'ondëk Hwëch'in TT**

A number of tourism enterprises were identified within the REDP which depend on heritage resources within the planning region. These include:

- expanded Dawson region tourism marketing strategy by the Klondike Visitors Association, specifically moving beyond the Klondike Gold Rush theme to include TH heritage, local arts and culture, and wilderness adventure; and
- a focused TH Heritage Tourism Initiative. Specifically, the plan notes that: Tr'ochëk National Historic Site of Canada, Forty Mile / Ch'ëdä Dëk Heritage Site, Tombstone Territorial Park and Danoja Zho Cultural Centre combined have the critical mass to act as the foundation of a unique First Nation heritage tourism feature that will appeal to new and existing visitor markets, including the important cultural traveler segment.
- World Heritage Nomination, see above.

8.4 Resource Management

8.4.1 **Regulatory Framework**

The following sections note legislation and regulations that specifically address protection of heritage resources. Determination of potential significant adverse impacts of projects on heritage resources prior to land disposition decisions is accomplished through the *Yukon Environmental and Socio-economic Assessment Act* (YESAA) process described below. Additional protocols and requirements may also apply if work is being conducted on First Nation Settlement Land.

8.4.1.1 **Historic Sites and Monuments Act (Canada)**

The *Historic Sites and Monuments Act* (RSC 1985, c H-4) provides that sites which demonstrate nationally significant aspects of Canada's history may be considered by the Historic Sites and Monuments Board of Canada (HSMBC) for designation as a National

Historic Site. More information on the HSMBC can be found below in subsection **8.4.2.**

Boards and Councils.

National designation does not provide formal protection to the site and is commemorative in nature only (Government of Yukon 2013a).

8.4.1.2 Tr'ondëk Hwëch'in Heritage Act

The *TH Heritage Act 2016* provides direction for the management of Yukon First Nations heritage and culture, in order to:

i.	recognize and affirm the inherent right of the Tr'ondëk Hwëch'in over its heritage and culture;
ii.	recognize and affirm the Tr'ondëk Hwëch'in Self-government Agreement Section 13 powers over Tr'ondëk Hwëch'in heritage and culture;
iii.	recognize the uniqueness of Yukon First Nations concepts of heritage; and
iv.	fulfil the Tr'ondëk Hwëch'in Final Agreement Chapter 13 provisions to respect and foster the culture, history and values of Yukon First Nations People.

Under the Act, Tr'ondëk Hwëch'in heritage is managed in accordance with the Tr'ondëk Hwëch'in Final Agreement and the inherent right of the Tr'ondëk Hwëch'in respecting heritage and culture. The act affirms that defining the culture and values of Tr'ondëk Hwëch'in is within the exclusive jurisdiction and authority of the Tr'ondëk Hwëch'in and that the determination of whether or not a Heritage Resource discovered or found within the Traditional Territory of the Tr'ondëk Hwëch'in can be readily identified as directly related to Yukon First Nations history and culture is the exclusive jurisdiction of the Tr'ondëk Hwëch'in, and shall be made in accordance with this Act (Tr'ondëk Hwëch'in, 2016).

8.4.1.3 Tr'ondëk Hwëch'in Final Agreement

Under Chapter 13 of the Tr'ondëk Hwëch'in Final Agreement (THFA), the First Nation owns and manages all heritage resources that reside on Settlement Land. Ethnographic heritage resources within TH Traditional Territory that are directly related to the culture and history of Yukon Indian People are also owned and managed by the First Nation. Schedules A and B to Chapter 13 in the THFA identify certain sites (i.e., Tr'ochëk and Forty Mile/ Ch'ëdä Dëk) as specifically identified for designation as Historic Sites.

8.4.1.4 **Tr'ondëk Hwëch'in Land and Resources Act**

The *Tr'ondëk Hwëch'in Land and Resources Act* (Tr'ondëk Hwëch'in, 2004) provides further protection of heritage resources from disturbance on Settlement Land. Section 9(d) states that no person shall disturb a burial site, a site of paleontological or archaeological interest, a historic site or a heritage site unless permitted under a TH law. Section 54(c) specifies that every grant of a permit or land disposition is subject to the right of TH Council to vary the terms as required for the protection and preservation of burial sites, sites of paleontological or archaeological interest, or of historic or heritage importance.

On non-Settlement Land, Tr'ondëk Hwëch'in government manages the protection of ethnographic moveable heritage resources within its Traditional Territory.

8.4.1.5 **Territorial Lands (Yukon) Act and Land Use Regulation**

- Under Section 21 of the act, the Commissioner in Executive Council may set apart and appropriate territorial lands for the sites of places of burial grounds and historic sites.
- Pursuant to that section, the *Land Use Regulation* requires that no permittee shall conduct a land use operation within 30 m of a known monument or a known or suspected archaeological site or burial ground, unless expressly authorized in their permit or in writing by an inspector (Section 9).
- If a suspected archaeological site or burial ground is unearthed or otherwise discovered in the course of a land use operation, the permittee must immediately suspend the land use operation on the site and notify the engineer or an inspector of the site's location and nature of any unearthed materials, structures or artifacts (Section 15).

8.4.1.6 **Historic Resources Act (Yukon) and Archaeological Sites Regulation**

The purpose of the act is defined in Section 1(1) as:

...to promote appreciation of the Yukon's historic resources and to provide for the protection and preservation, the orderly development, and the study and interpretation of those resources.

Historic resources are defined in Section 2 as:

(a) a historic site [i.e., one officially designated under Section 3];
(b) a historic object [defined in Section 61 as an archaeological or paleontological object that has been abandoned, or an abandoned object that is designated as an historic object by the Commissioner]; and

(c) any work or assembly of works of nature or of human endeavor that is of value for its archaeological, paleontological, pre-historic, historic, scientific, or aesthetic features.

These historic resources are protected from disturbance under the act and the associated *Archaeological Site Regulation*. It is unlawful to actively search for, excavate, disturb, or alter a historic site or remove artifacts from a site without a permit issued under the regulation. The *Archaeological Sites Regulation* applies to all Crown lands and waters in Yukon other than those within the boundaries of a national park, lands set aside as a national historic site, or lands identified as exempt in the Schedule. The regulations define an archaeological site as “a site where an archaeological object is found” (Section 1), and no survey or documentation of archaeological sites may be conducted without a permit.

Some historic sites are officially designated as such. Historic resources not privately owned and on Commissioner’s land are managed by the Government of Yukon, Cultural Services Branch on a case by case basis. There are also 16 Heritage Reserves within the planning region (see **Chapter 6 - Table 6-4**) set aside by the Government of Yukon Lands Branch for an indefinite term for the use of a historic site, and managed jointly by the Lands Branch and Cultural Services Branch.

8.4.1.7 Yukon Environmental and Socio-economic Assessment Act (YESAA)

Under the act, socio-economic effects include effects on economies, health, culture, traditions, lifestyles and heritage resources and must be considered by the proponent, the assessor, and the decision body that determines whether to allow the project to proceed. YESAA Section 2(1) defines a heritage resource as:

a) a moveable work or assembly of works of people or of nature, other than a record only, that is of scientific or cultural value for its archaeological, paleontological, ethnological, prehistoric, historic or aesthetic features;
b) a record, regardless of its physical form or characteristics, that is of scientific or cultural value for its archaeological, paleontological, ethnological, prehistoric, historic or aesthetic features; or
c) an area of land that contains a work or assembly of works referred to in paragraph (a) or an area that is of aesthetic or cultural value, including a human burial site outside a recognized cemetery.

In addition, Section 42(1) of the act states that the assessor must take into consideration:

g) the need to protect the rights of Yukon Indian persons under final agreements, the special relationship between Yukon Indian persons and the wilderness environment of Yukon, and the cultures, traditions, health and lifestyles of Yukon Indian persons
--

and other residents of Yukon.

Project proposals that require a disposition of land in order to be undertaken often include activities that may have longer term or even permanent effects on heritage resources (e.g., destruction of heritage resources from land clearing, reduced or lost access to heritage resources or sites, or changes to biophysical characteristics of project area that affect heritage resources). YESAB Operational Policy No. 2011-01 recognizes this and requires that a “heritage resource assessment” be included with any such proposal to ensure that the potential effects are identified and properly assessed. The policy notes that, generally, areas of increased heritage potential are in proximity to water bodies, creeks and rivers, wetlands, on terraces, ridges and knolls with viewpoints and recommends the proponent contact local First Nations to seek their input (YESAB, 2011).

For projects where the assessment determines that significant adverse effects may occur on heritage resources, the proponent and/or YESAB may propose various mitigation measures to eliminate, reduce or control these adverse effects including (YESAB, 2011):

- Avoidance measures such as realigning boundaries to establish a buffered area between the project activities and the heritage resources;
- Site protection where a heritage site may be protectively covered or stabilized to prevent site destruction; and
- Systematic data recovery, such as documenting heritage resources before disturbing or removing them.

8.4.1.8 **Quartz Mining Act, Placer Mining Act and Land Use Regulations**

Under the *Quartz Mining Act* (QMA) and the *Quartz Mining Land Use Regulation* a proponent is required to provide adequate information about potential significant adverse effects on heritage resources, as well as identify proposed mitigation measures for any Class 1-4 program (see **Chapter 13 – Minerals** for a description of Program Classes under the QMA). New access road development is an example of an activity with high potential to impact heritage resources.

Under the *Placer Mining Act* and the *Placer Mining Land Use Regulation* a project proponent is required to provide information on any potential adverse effects to heritage resources as a result of the project. Areas that have not been previously mined or landscapes with known high archaeological values would be of particular concern for new projects.

Both of these regulations require that proponents avoid and protect known heritage resources. Activities must not be carried out within 30 m of a known archaeological or

paleontological site. Any new artifacts or sites discovered during the course of a project must be flagged and a 30-metre buffer zone established to protect the site from any further disturbance. The discovery must also be reported to Yukon and/or First Nations governments.

8.4.2 Policy Direction

8.4.2.1 Government of Canada

Parks Canada has an important role in the planning region given the wealth of officially designated historic sites and vast amount of heritage resources. Parks Canada's mandate includes protecting the commemorative integrity of the sites it administers and operates. This includes:

- Preserving the site's cultural resources, and
- Communicating its heritage values and national significance.

The *Standards and Guidelines for the Conservation of Historic Places in Canada* (Parks Canada, 2010) is a guiding document based on internationally recognized conservation principles for preservation, rehabilitation and restoration.

Parks Canada has also developed guiding documents specifically for the Dawson Historical Complex, including design standards for buildings (2013a).

8.4.2.2 Government of Yukon

The Government of Yukon's management responsibilities for heritage resources under the provisions of the Umbrella Final Agreement (UFA) Chapter 13 and the *Historic Resources Act* are outlined in the *Operational Policy for Heritage Resources Management on Yukon Lands* (Government of Yukon, 2010a). Under the UFA, ownership of heritage resources generally follows ownership of the land, with the exception of ethnographic moveable heritage resources directly related to the culture and history of Yukon Indian People, which are owned by the First Nation in whose traditional territory the objects are found. Heritage sites designated under the *Historic Resources Act* or identified in First Nation Final Agreements are protected, and development and other activities are addressed in the Management Plans for those sites. Non-designated sites and non-moveable heritage resources not identified in the Final Agreements are managed under the *Historic Resources Act*.

The *Historic Resources Impact Assessment and Mitigation Requirements Relating to Land-Altering Developments* (Government of Yukon, 2003) is another policy document to fulfill the mandate of preservation and protection of historic sites as identified by the Umbrella Final Agreement and the *Historic Resources Act*. The objective is to avoid unnecessary impacts on historic sites; preserve sites wherever possible; and to promote recovery of information and artifacts from sites that cannot be preserved (Government of Yukon, 2011a).

Guidelines: Respecting the Discovery of Human Remains and First Nation Burial Sites in the Yukon (Government of Yukon, 1999) provides direction and information on the actions to take upon discovering a burial or grave site. Government agencies and First Nations maintain an inventory of these sites so that they are not disturbed. However, many undiscovered sites are unmarked and could be damaged or destroyed through land use activities (Government of Yukon, 1999).

Historic sites and heritage resources are protected under the *Historic Resources Act*, and YESAA is used as a tool to ensure heritage resources are considered and any significant adverse impacts mitigated for proposed development projects.

Other than sites specifically identified for protection, there is a general recognition that not all heritage sites are known and that heritage resources can be discovered anytime at any place, in which case they are reported accordingly and dealt with on a case-by-case basis. The use of best management practices are encouraged, including avoiding or using extra caution in areas with known or inferred high potential for heritage resources and utilizing a 30 m buffer around any known resources. Government of Yukon staff may conduct heritage resource assessments for specific projects, with the goal of maximizing knowledge of heritage values in advance of landscape disturbance.

Since the proclamation of the *Historic Resources Act* and establishment of the Yukon Paleontology Program in 1996, the Government of Yukon has the mandate to manage, collect and preserve fossils uncovered on Yukon lands during placer gold mining activities in the Klondike region. Prior to this, most of the fossil remains found in the region were collected by scientists and later archived by the Canadian Museum of Nature in Ottawa.

Due to the recent increase in exploration and mining in the Klondike region, the Yukon Paleontology Program has made a concerted effort to increase its field site monitoring and

fossil collecting activities in the region. In the summer of 2011, the Yukon Paleontology program established a seasonal field office near Dawson City in order for program staff to better meet the demands of the placer mining industry and be readily available to collect recently discovered fossils. Placer miners that discover fossils at their mines are required to put these fossils aside and contact the Paleontology Program. This recent focus on the Klondike has significantly increased the abundance, quality and recognition of Ice Age fossils that are now part of the Government of Yukon's fossil collections.

8.4.2.3 Yukon First Nations

For Tr'ondëk Hwëch'in, protecting culture and heritage means (Tr'ondëk Hwëch'in, 2012b):

- Recognizing, conserving, and promoting TH heritage and cultural resources and values, including traditional land use practices associated with fish and wildlife and other traditional harvesting;
- Ensuring Tr'ondëk Hwëch'in citizens connection to land is protected;
- Ensuring the continuation of First Nation culture and traditional economy; and
- Maintaining the integrity of, and access to, important community use areas [i.e., important locations for current subsistence harvest activities, cultural pursuits, and travel purposes...hunting, fishing, trapping, wood cutting, berry picking, and general travel].

Tr'ondëk Hwëch'in government has stated a desire to advance a broader definition of heritage resource management, such as citizen stewardship and usage of culturally important places and heritage resources (Tr'ondëk Hwëch'in, 2012b). TH also note the complications of ownership and management issues related to heritage resources due to the differing definitions used between governments.

TH has developed their own suite of best management practices for heritage resources – these are described in **Section 8.4.3 – Best Management Practices** but include Heritage Resource Assessments as a standard tool for determining the heritage potential and the extent of heritage resources in a project area, assessing the impact a project will have on heritage resources, and recommending mitigations for the protection of identified resources (Tr'ondëk Hwëch'in, 2011).

8.4.2.4 **Boards and Councils**

8.4.2.4.1 *Yukon Heritage Resources Board (YHRB)*

Established in 1995 under Chapter 13 of the Umbrella Final Agreement (UFA). Its duties and responsibilities are outlined in Chapter 13 as well as in the *Historic Resources Act* (Part 1, Section 4). The Board's mandate is to provide advice to governments on issues that affect Yukon's heritage resources. Under the UFA, the Board may make recommendations to federal and territorial ministers and to Yukon First Nations regarding the management of Moveable Heritage Resources and Heritage Sites or any other related matter including traditional knowledge and languages.

The Board may also be asked to make determinations pursuant to Section 13.3.2.1 (ownership of contested heritage resources) and 13.3.6 (management of ethnographic objects and paleontological or archaeological objects). Under the *Historic Resources Act*, the Board is to advise the Minister on appropriate policies, guidelines and standards for designation of historic sites, care and custody of historic objects, and making regulations under the act as well as the use of the Yukon Historic Resources Fund. Also, sites that are nominated for designation are forwarded to Yukon government's Historic Sites Unit for review and then referred to the YHRB for evaluation and recommendations to the Minister.

The YHRB supports a broad view of heritage that encompasses not only objects, artifacts and buildings, but also trails and routes, oral and written history, and languages and works with a variety of groups to fulfill its mandate (YHRB, 2006).

8.4.2.4.2 *The Historic Sites and Monuments Board of Canada (HSMBC)*

Created in 1953 with the *Historic Sites and Monuments Act*. The HSMBC can recommend sites for designation as a national historic site. Sites can commemorate places, people and events linked to various aspects of Canada's political, economic and social history (Parks Canada 2012b).

8.4.2.5 **Inter-Jurisdictional Initiatives**

The Canadian Register of Historic Places (CRHP) provides a single source of information about all historic places recognized for their heritage value throughout Canada. Since 2001, federal, provincial and territorial governments have worked together to develop the CRHP and core programs such as conservation standards and guidelines (Parks Canada, 2013b).

8.4.3 Current Best Management Practices

Best management practices (BMPs) are integral to recognizing and protecting heritage resources. When BMPs are not adhered to there is risk that heritage resources will be altered, disturbed or destroyed by land use activities.

Some land use activities that can negatively impact heritage resources include:

- brushing or clearing for cut lines, construction of camps and other infrastructure, construction of airstrips or landing pads, or other activities; and
- development of trails and access roads, stripping and trenching activities or other removal of vegetation and sediments.

BMPs have been developed to mitigate many of these potential impacts, provide guidance on the appropriate way to carry out development and land use activities, and promote a better appreciation for the importance of protecting heritage resources.

Recommended actions and mitigation measures include (where possible):

- Avoiding disturbance of surface and subsurface;
- Avoiding areas of high potential for heritage resources;
- Avoiding summer/all-season road construction (winter roads generally do not result in impacts on buried heritage sites and resources, but surface sites such as brush camps and graves are still vulnerable);
- Minimizing the number of, or eliminating, stream crossings;
- Informing staff of laws protecting heritage resources;
- Locating camps in existing clearings or former camp sites and more than 100 m from any water bodies; and
- Having trained environmental or heritage monitors on staff to recognize and avoid heritage sites and features.

The *Handbook for the Identification of Heritage Sites and Features* (Gotthardt and Thomas 2007) is a small booklet with colour pictures that was designed to be used in the field, to assist non-archaeologists in recognizing heritage resources they may encounter.

The Government of Yukon has developed a series of industry-specific BMPs:

- *Yukon Mineral Exploration Best Management Practices for Heritage Resources* (Government of Yukon, 2010b)
- *Yukon Placer Mining Best Management Practices for Heritage Resources* (Government of Yukon, 2010c)

- *Yukon Wilderness Tourism Best Management Practices for Heritage Resources* (Government of Yukon, 2009)
- *Oil and Gas Best Management Practices for Historic Resources* (Government of Yukon, 2006)

In addition, the Yukon Chamber of Mines has produced the *Yukon Mineral and Coal Exploration Best Management Practices and Regulatory Guide* (Yukon Chamber of Mines, 2010).

Tr'ondëk Hwëch'in government has developed the *Tr'ondëk Hwëch'in Best Practices for Heritage Resources* (Tr'ondëk Hwëch'in, 2011) with the objectives of protecting cultural, heritage and archaeological resources and First Nations burial sites in TH Traditional Territory; providing insight into First Nations concepts and values pertaining to heritage and culture; and sharing information with industries working within TH Traditional Territory to ensure cultural and heritage resources, as understood by First Nations people, are protected.

The main recommendation in this document is that early initial contact with the First Nation "is the best way to ensure proper protection of cultural or heritage resources in a project area," and that contact with the First Nation should be made regardless of whether the project is on Settlement or non-Settlement Land.

YESAB operational policies (discussed in the previous section) also recognize that public knowledge or information about the location of heritage resources may increase the risk of looting, disruption or vandalism, and recommend that information submitted to YESAB should exclude precise site location and other sensitive information (YESAB, 2011).

Locations of known heritage sites and resources can be obtained from Government of Yukon's Heritage Resources Branch and from First Nations, although some coordinates obtained prior to the use of GPS are less precise and may vary by up to 200 m (Government of Yukon, 2010b). Development activities are not permitted within 30 m of a known archaeological or historic site or a burial site. If a site or resource is discovered during the course of activities, work must be halted and the site marked or flagged and buffered from any further disturbance by at least 30 m.

8.5 Risks and Uncertainty

8.5.1 Heritage Resources and Climate Change

Climate change, particularly rising temperatures, has the potential to impact heritage resources through thawing of permafrost, rising water levels, accelerated erosion and sedimentation, and changing weather patterns (e.g., more frequent storms and wildfires). Damage to structures from ground instability could cause increases in maintenance and operational costs as well as engineering challenges.

The Canadian Register of Historic Places notes that “climate change is not simply a danger for the future, it also poses a significant threat to our past” and lists the Dawson Historical Complex as an example (Parks Canada, 2013*b*):

Recent climate change makes it more and more likely that the permafrost upon which Dawson City was built will begin to thaw. The loss of the stable permafrost ground upon which the historic buildings of Dawson City stand will compromise the stability and architecture of the buildings, and result in the loss of an important historic site from an important page in Canadian history.

In the broader context of heritage resources, climate change can impact traditional harvesting activities through changes in fish and wildlife populations, changes in water quality and quantity, and/or changes in accessibility on land and rivers.

8.5.2 Other Risks and Uncertainties

Heritage resources are identified as a valued socio-economic component for projects that could adversely affect heritage resources in most project reviews under YESAA (Personal Communication, YESAB, January 2020). The need to assess potential impacts on archaeological resources has grown with increasing mining and exploration activity in the planning region. Unauthorized collection and/or damage and loss are a greater possibility when there is increased activity in a previously isolated area.

While many heritage resources have been identified and their locations are known, there are large areas of the planning region where no inventories have been conducted or where little documentation exists. New resources and sites are discovered regularly, and increasing land cover disturbance through increasing demand for land access and human activities raises the potential for additional discoveries and potential disturbance.

Specific areas were identified by the Government of Yukon as being at risk for loss of heritage resources (Government of Yukon 2011*b* & *and updated 2018/19*):

- Areas along the Yukon River and the early settlement of Ogilvie located on Ogilvie Island
 - The Yukon River has not been inventoried and the likelihood of well-preserved historic resources related to transportation, trapping or farming is high.
- Areas south of Blackhills Creek, the Sixtymile drainage, Yukon River, and the Coffee Creek drainage
- Sites located along Hunker, Dominion, Bonanza, Eldorado, Quartz, Sulphur, and the Indian River
 - The last inventory project occurred in the early 1990s. The need to assess potential impacts on historic resources has grown as the exploration and development of placer and quartz mines increases
- Upper drainages of the Tatonduk, Miner, Whitestone, Eagle, Fifteenmile and Chandindu rivers
 - Although inventories are incomplete for large portions of the planning area, these areas are expected to have similar high concentrations of prehistoric site values (as those in and around Tombstone Park)
- Ancient river terraces along the Yukon River
 - Identified as potentially preserving some of the earliest evidence of human populations in the unglaciated Beringian landscapes of the late Ice Age
 - Due to intensive mining in the Klondike Goldfields over more than a century, the prehistoric archaeological record of this area is largely unknown
 - Additional evidence of late ice age human presence may yet be found preserved in the frozen mucks, much like the fossil paleontological evidence

Government of Yukon has limited paleontological resource inventory information for much of the planning region outside of the historical footprint of the Klondike Goldfields. The lack of paleontological regulations under the *Heritage Resources Act* makes it difficult to enforce industry compliance, and Government of Yukon submissions have noted there is a substantial unregulated commercial trade in fossils from the Klondike region (Government of Yukon 2011*b* & 2019).

Based on the ethnographic record and seasonal land use patterns, archaeological sites are expected to be located on areas of level, well-drained ground near the Yukon River and its major tributaries. Rivers and streams were used as travel corridors to access resource

areas such as moose habitat or salmon harvesting localities. The Ogilvie River, Blackstone Uplands, and North Klondike River basin were the focus of traditional Tr'ondëk Hwëch'in winter subsistence activities and also likely locations for archaeological sites, with proximity to water expected to be less critical for winter sites (Thomas, 2007).

Construction of stream crossings often requires the physical modification of stream banks, and can therefore result in significant disturbance of heritage sites since the majority occur within 100 m of water bodies such as streams, rivers, lakes and ponds (Government of Yukon, 2006). High latitude and alpine and sub-alpine areas where little or no soil development has occurred are also particularly vulnerable to disturbance (Government of Yukon, 2009).

Archaeological resources in high latitude and alpine and sub-alpine areas where little or no soil development has occurred are particularly vulnerable to disturbance.

Historic era sites and artifacts associated with the Klondike Gold Rush and subsequent Euro-Canadian occupations and gold mining occur mostly in the area of Dawson City and the Gold Fields.

However, Thomas (2007) notes that because of the sheer volume of transient gold seekers that migrated to the Klondike in this period, many if not all of the Klondike River and upper central Yukon River and in particular, the tributary streams were prospected and worked for minerals. As a result, historic era sites and artifacts can be found nearly everywhere throughout the river and stream valleys of the region.

Government of Yukon recognizes that the majority of known heritage resources are documented as a result of conducting heritage assessments for development projects (Friis-Baastad, 2013):

We have a sort of complex relationship with development...almost everything we know comes as a result of getting out there and doing assessments for this work...if we didn't develop, we wouldn't learn half of what we do.

- Yukon archaeologist Ruth Gotthardt (Gotthardt & Thomas, 2007)

The biggest challenge is trying to protect heritage resources that no one knows of. A new GIS-based predictive mapping tool may allow archaeologists to make educated guesses about where to search for evidence of ancient activity and where today's developers should

be most careful. Using satellite photographs, archival reports and oral records can help determine where potential heritage sites may be located.

Some areas with high heritage value have been staked with quartz mining claims (Government of Yukon 2011*b*, 2019):

- Yukon Ditch System west of the Klondike River
 - Potential for hiking trails and interpretation of this monumental project is high, as it is likely one of a kind in Canada. It will be necessary to limit access roads across the ditch and to minimize mining impacts on the historic resources.
- Ridge Road Hiking Trail
 - Developed for cyclist and pedestrian use, it is a fragile trail system. It is necessary to restrict access to motorized vehicles due to trail maintenance reasons and public safety for trail users. The area has mineral claims and consideration will be required to ensure existing use is not negatively impacted.

Also, traditional economic activities in significant heritage and current community use areas, especially during important seasonal use periods, can overlap with industrial uses. “Conflicts between heritage, subsistence harvesting and industrial land uses are likely to occur wherever they overlap” (Tr’ondëk Hwëch’in, 2012*b*).

The location and level of use of all community use areas are not well documented, and use areas may change over time given availability of resources and travel conditions. New road or trail access may not be appropriate if it expands access to sensitive heritage areas, but other traditional trails could be more intensively used. “Many heritage resource trails are worthy of protection or intense management, while others may be incorporated into well-utilized transportation corridors” (Tr’ondëk Hwëch’in, 2012*b*).

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9 WATER

9.1 Highlights

- Water's location and availability is never static and each phase of the hydrologic cycle plays an important role in supporting ecosystems.
- The Yukon River is a major contributor of water and solutes to the Bering Sea and Arctic Ocean ecosystems. Changes in the Yukon River, either flow, temperature or water quality, could also influence these ecosystems.
- Few lakes or large open water wetlands exist in the region, all are significant to waterfowl.
- The water resources of the region are highly valued for habitat, sustenance, transportation, economic activity, recreation and spiritual qualities.
- The Dawson region is considered data sparse; the region has four active hydrometric stations, three active snow survey courses and one long term water quality monitoring station managed by Water Resources Branch.
- Break-up of the Yukon River at Dawson has advanced by a week in the last 30 years.
- Stresses on watersheds from increased development pressure and climate change can compromise the health and productivity of aquatic and terrestrial ecosystems and affect their ability to provide ecosystem services.
- Future industrial demand for water is expected to increase.
- A large number of industries in the region utilize water, rely on the availability of water for their operations and have the potential to impact water resources.
- Water use and protection are considered during assessment and regulatory processes. Water licenses contain operating conditions, discharge standards and requirements for monitoring, sampling and reporting.
- Tr'ondëk Hwëch'in Elders and community members have identified water as of utmost importance, essential for the health of every part of the land and for every aspect of survival.
- From a holistic perspective, indicators of an unhealthy watershed may include decreased fish and wildlife populations or changes in the distribution and health of fish and wildlife, which in turn affects the health of people who eat these foods.
- EMR is developing a guide for wetland reclamation for the placer mining industry as a reclamation plan is often a stipulation in the approval or license process.
- The Government of Yukon is developing a Wetland Policy for the territory which will not be completed in time for the Dawson Regional Planning process, however the

Policy will likely look to other processes, like Dawson Regional Planning, to provide detailed management decisions within the Policy.

- Some predicted impacts associated with climate change include changes to soil moisture and runoff regimes, shifts in vegetation, changing drainage from permafrost loss and altered fire cycles.

9.2 Description of Resource

Water moves constantly through the hydrologic cycle as surface water, ground water and atmospheric water (**Figure 9-1**). Water's location and availability are never static and each phase of the hydrologic cycle plays an important role in supporting ecosystems.

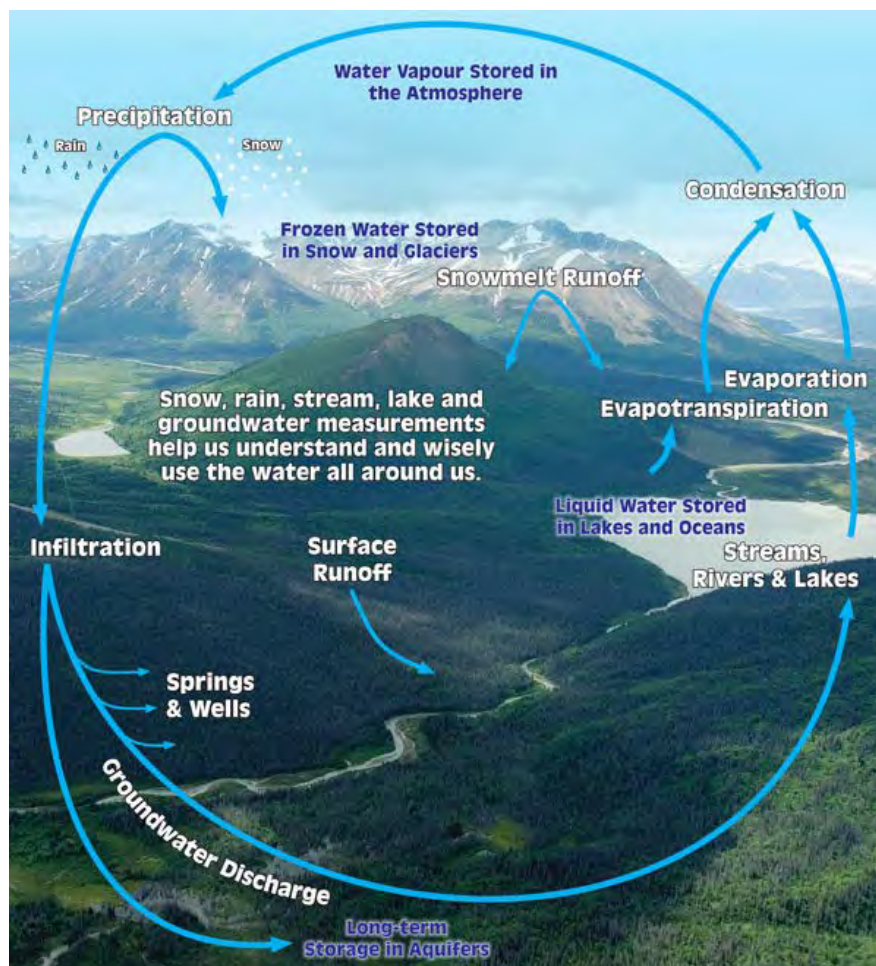


Figure 9-1 The Hydrologic Cycle (Image: Government of Yukon)

9.2.1 Atmospheric Water

Atmospheric water is water present in the atmosphere either as a solid (snow or hail), liquid (rain) or gas (fog or mist).

Mean annual precipitation throughout the region ranged from 200 to 500 mm during the period from 1961 to 1990. The northeastern part of the region experiences higher precipitation, ranging from 400 to 800 mm per year (Hennessey et al., 2011). Local trends in precipitation vary considerably from station to station, with precipitation falling mainly during convective showers from June through August. (Klock et al., 2001).

9.2.2 Groundwater and Aquifers

Groundwater is water located beneath the earth's surface in the cracks and spaces between soil, sand and rock. Technically, groundwater is the water below the saturated zone or water table.

Groundwater is recharged when precipitation falls on the land surface and seeps into the soil, and from other surface water sources. It drains steadily towards discharge points in streams, rivers, marshes, lakes and oceans or in the form of springs and flowing wells. The nature of groundwater formations has a major effect on the volume of surface runoff (i.e., when there is more water on the surface than the underground materials can absorb) and in dry periods the flow of some streams may be supplied entirely by groundwater.

During the late winter in the Yukon, streamflow consists almost entirely of groundwater. Throughout the Yukon River Basin, estimated groundwater contribution to total annual flow can be as high as 50 per cent, although this is largely dependent on geology and permafrost coverage. Trends in streamflow investigated over 20 to 50-year periods in the Yukon River Basin showed significant increases in estimated groundwater flow and minimal change in annual flow. Walvoord and Stiegl (2007) note that the increasing winter flow is thought to be due mainly to greater groundwater input to streams (as cited in Government of Yukon, 2011a).

Changes in permafrost affect groundwater flow, chemical composition, temperature and seasonal ice thickness.

9.2.3 Surface Water

Surface water consists of all rainfall, snowmelt and groundwater draining into a particular water body such as a river, lake or ocean.

In the absence of glacial “scouring” and glacial deposits, few lakes are found in the Dawson region relative to other parts of Yukon. Much of the open water, floodplains and wetlands lie in the Boreal Low bioclimate zone (Grods et al., 2012) (**Section 3 – Map #6: Bioclimate**).

Surface flow varies seasonally and annually. Three basic patterns of runoff are exhibited throughout the Yukon River Basin: lake runoff, snowmelt runoff and glacier runoff. Most runoff occurs from May to September and, in general, from October until late April to mid-May runoff is minimal and streamflow gradually decreases (although the timing and characteristics of runoff differ for each sub-watershed – see **Section 3 – Map #9: Watersheds**).

Seasonal differences in streamflow occur amongst the Taiga Cordillera and Boreal Cordillera ecozones (**Refer to Map #5: National Ecological Framework**) due to the biophysical attributes of the area. The climate, topography, and presence of permafrost all contribute to streamflow variations. For more detailed information on streamflow for the region, refer to Smith et al. 2004.

9.2.4 Wetlands

Wetlands are land where the water table is at, near or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation.

Wetlands include organic wetlands or “peatlands”, and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat (Canadian Wetland Classification System www.wetlandpolicy.ca/). Wetlands often have very close connections with the groundwater system as important recharge areas or as receivers of significant discharge. They absorb the impact of hydrologic events such as floods; filter sediments and toxic substances; supply food and habitat for many species (See **Chapter 12: Protected Areas and Conservation Opportunities**); and are valuable recreational areas. Wetlands are considered regionally scarce in the Dawson region. There are no large open water wetland complexes in the planning region, but there are several small wetland areas, and

areas of bog and fen peatlands. Permafrost has a major role in the presence of wetlands in this region. **The wetlands in the region are discussed in greater detail in Chapter 5 (5.6.3).**

9.2.5 Cryosphere (Frozen Water)

The cryosphere is the portion of the hydrologic system that comprises frozen water, including snow cover, ice cover on lakes and rivers, glaciers, ice caps, frozen ground (i.e., permafrost), and sea ice.

In the Yukon, elements of the cryosphere influence the timing, magnitude and character of surface water flows. The extent of permanent ice and snow within the region is very limited, generally confined to north facing cirques in the Ogilvie Mountains.

Permafrost distribution, thickness, and the thickness of the active layer (i.e., the surface layer that thaws annually) play an important role in influencing the movement of water. Ice-rich permafrost (**Figure 9-2**) restricts rain or snowmelt infiltration into the ground, resulting in the formation of ponds or wetlands, but a thicker active layer will result in greater recharge of groundwater.

Water (snow) is stored in the winter snowpack. When it melts in the spring, it becomes a significant portion of the water available for streamflow and provides soil moisture recharge.



Figure 9-2 Ice-rich permafrost, northern Dawson ranges (*Photo: Yukon Permafrost Network*)

The river ice break-up period is particularly influential, since it often coincides with the arrival of the spring freshet. Backwater produced by broken and jammed ice can increase

water levels on rivers already receiving large amounts of discharge from snowmelt runoff. The resulting high water often floods riverside communities.

There is an excellent record of break-up dates for the Yukon River at Dawson (**Figure 9-3**) (Government of Yukon, 2018). Over the period from 1896 to 2009, break-up has occurred as early as April 28 and as late as May 29, with a mean date of May 9. Break-up at Dawson has advanced by a week in the last 30 years, with a record early break-up date of April 23 in 2016 breaking the previous record by 5 days. The Klondike River has experienced mid-winter break-ups and flooding in 2002 and 2015. The Water Resource Branch, with the help of program funding and Public Safety Canada contributions, continues to improve its flood forecasting and monitoring capabilities. A similar trend is seen on the Porcupine River at Old Crow.

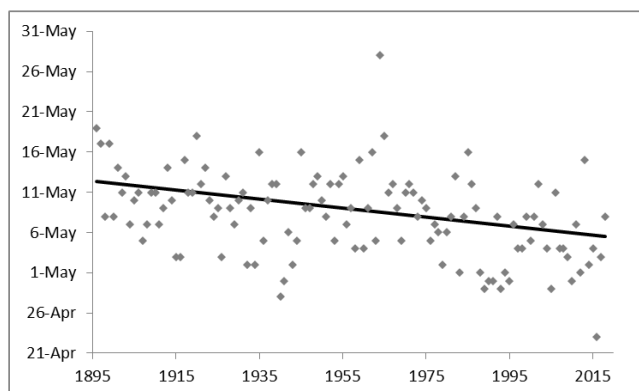


Figure 9-3 Yukon River at Dawson break-up dates 1896-2017 (Government of Yukon, 2018)

9.3 Resource Values

9.3.1 Natural Value

Water is an essential component of the ecosystem and plays a role in all ecosystem services:

- Provisioning services – fresh water
- Regulating services – water regulation, water purification, waste treatment and storm protection
- Supporting services – soil formation and retention, nutrient cycling, water cycling and provision of habitat

Rivers play a vital role in the hydrologic cycle by acting as drainage channels for surface water and providing opportunities for recharge of water. Rivers provide habitat,

nourishment and a means of transportation for numerous species. Rivers shape the surrounding landscape and how people can use its waters.

Habitat including riverside cliffs, wetlands, marshes and peatland areas provide suitable nesting sites and plenty of food for many bird species, particularly those using the Tintina Trench as a migration corridor. The numerous river tributaries that drain into the trench provide migration routes and spawning grounds for salmon; many other wildlife species utilize the rivers, lakes, wetlands and riparian areas as important habitat areas.

Sedimentation, the river provides an important source of nutrient-rich sediments to the land it passes through. Each year about 20 million tons of sediment is deposited on flood plains and in braided reaches of the Yukon River as alluvial sediments (Brabets et al., 2000).

The Yukon River watershed is fundamental to the Bering Sea ecosystem, providing most of the freshwater runoff, sediments and dissolved solutes in the eastern part of the sea. At its mouth, the average annual discharge of the river is 227,000 cubic feet per second and it transports about 60 million tons of suspended sediment annually into the Bering Sea (Brabets et al., 2000). The waters of the Bering Sea also move northward to the Arctic Ocean; of the 10 largest inputs into the Arctic Ocean, the Yukon River ranks fifth and contributes eight per cent of the total discharge (Brabets et al., 2000).

Wetlands provide many ecosystem services including: Flood and drought mitigation, water filtration, market goods (including timber and harvestable plants and animals), and carbon storage.

Stresses on watersheds from increased development pressure and climate change can compromise the health and productivity of aquatic ecosystems and affect their ability to provide these services. Without adequate water, natural systems cannot be sustained unless nature's water needs are satisfied before water is allocated for other needs (Government of Yukon, 2011a).

9.3.2 Traditional Value

We need to limit what we do on the land in order to protect the water.

Water must be protected because everything depends on it.

Our watershed is our most important resource. The mountains to the north feed our watershed.

The smallest creeks feed our rivers. We need to protect them too.

- Tr'ondëk Hwëch'in citizen comments (Tr'ondëk Hwëch'in, 2012)

The water resources of the region (e.g., rivers, lakes and wetlands) are highly valued for their role in providing important fish and wildlife habitat, food, drinking water, nutrient-rich sediments, transportation connections, opportunities for traditional economic activities, and as landscapes with spiritual and aesthetic value.

Traditional family fish camp locations help reinforce connections to history, culture and language. Wildlife such as moose rely heavily on the rich habitat of wetlands, river valleys and lakes, creating opportunities for subsistence hunting.

Elders have also observed an increase in the pollution of water and in the damage to spawning streams by mechanized industrial activities that occur alongside creeks, which in turn affect subsistence-harvesting activities (Tr'ondëk Hwëch'in, 2012).

Rivers allow for ease of movement through the landscape, using watercraft during summer months and by snow machines, snowshoes and dog teams in winter. Access to many TH Settlement Land parcels is via the Yukon River, and these lands hold importance for heritage resources, agricultural potential and traditional economic resource pursuits.

The community is particularly concerned about the cumulative impacts of activities on water and the potential for activities in specific locations to impact the entire watershed. The Elders stress that water is part of a system, not a single resource. Any damage to water will eventually be seen in deteriorating health of the land, fish and wildlife, plants, and people.

9.3.3 Socio-Cultural Value

Access to water is highly valued for both aesthetic and practical purposes. Most Yukon communities began along the water's edge, as rivers provided travel routes in the early days. The Yukon and Klondike rivers as well as others in the region continue to be important year-round access corridors for hunting, fishing and recreational opportunities.

The Yukon River corridor has recreational, historical and educational value and provides opportunities for angling and wildlife viewing as well as the aesthetic qualities of a northern wilderness river. The Yukon River Quest is the longest annual canoe and kayak race in the world and consistently attracts hundreds of paddlers every year.

Snow is important for recreational and tourism activities, including snowmobiling, dog mushing and cross-country skiing.

9.3.4 Economic Value

The total economic value of water may be approached holistically. For example, the Canadian Council of Ministers of the Environment prepared a *Water Valuation Guidance Document* (2010) to help establish how water valuation can assist in addressing water management issues, particularly in relation to conservation actions, infrastructure investment, water quality standard setting, water pricing, water allocation and compensation for use or damage. The total economic value of water considering all types of "value" (i.e., economic, cultural, spiritual and intrinsic value) may more fully account for both the use of water (e.g., household water supply or irrigation for agriculture) and the ecosystem services provided or supported by water resources (e.g., nutrient cycling, habitat provision and recreation).

For the purposes of this report economic value will be considered only for the direct uses of water (i.e. for irrigation, consumption, manufacturing, recreation etc.). It is important to note that the more holistic or altruistic 'non-use' values do contribute to the overall economic value of water (**Figure 9-4**).

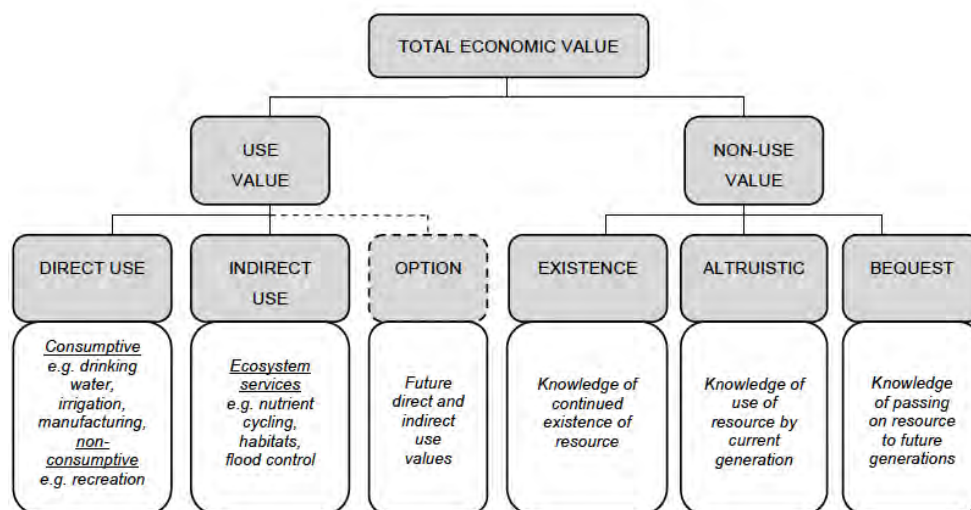


Figure 9-4 Total Economic Value of Water (Canadian Council of Ministers of the Environment, 2010)

A large number of industries in the region utilize water, rely on the availability of water for their operations and have the potential to impact water resources.

9.3.4.1 Transportation

Prior to construction and upgrading of the Klondike Highway in the 1950s and 1960s, the Yukon River was the major commercial highway in the region. Today, barge transportation of fuel and supplies provides an economical alternative for seasonal resource industry activity and a ferry provides service across the Yukon River, linking the City of Dawson with the Top of the World Highway and, eventually, Alaska. Numerous small landings provide access to a network of exploration trails and roads. River ice is also important in the region for winter transportation.

First Nations used water corridors for travel to areas of harvesting opportunities, camping spots, gathering places and other significant locations (Tr'ondëk Hwëch'in, 2012).

9.3.4.2 Domestic Use

Water is used in communities and residences for drinking, cooking, bathing, laundry, cleaning, sewage disposal and treatment, and other household needs such as watering lawns and gardens and washing vehicles.

More than 97% of Yukoners rely on groundwater for their domestic needs (Government of Yukon, 2011a). In the City of Dawson, the municipal government undertakes supply and distribution of domestic water; private wells are used in areas not serviced by the piped infrastructure or truck delivery systems. A summary of Yukon water wells compiled in May 2006 shows one domestic well in the Dawson City-Bear Creek area as well as 10 wells in the Dawson City-General Area. Of these 10, three are municipal wells; three are commercial (highway maintenance, Dawson airport and Klondike Valley fire hall); and four are recreation wells for the Yukon River campground (Government of Yukon, 2006).

9.3.4.3 Hydroelectric Power

Hydroelectric power is the main form of electricity production in Yukon, ranging from the large four-turbine plant at Whitehorse Rapids to small, in-stream micro-hydro installations serving only one user. The Mayo Hydro Facility services the Dawson region. Built in 1951, it produces five megawatts (MW) and the addition of Mayo B in 2012 added another 10 MW of power. Water Use License HY99-012, expiring in 2025, requires a minimum flow of 2.8 m³/s to pass through the Mayo and Wareham dams (Government of Yukon, 2011a). Yukon Energy continues to assess potential hydro project options to meet growing energy demand. Secure access to water is critical for existing and new hydroelectric power generation, and there is concern about long-term climate change impacts and extreme events that could affect hydro systems in the future.

In 2018 a project proposal for geotechnical investigations and mapping for the North Fork Hydro Project, located in the Klondike watershed, was submitted to YESAB and approved. The North Fork Hydro Project is identified as a specific provision in Chapter 7, Section 7.8 of the TH Final Agreement and is explained further in **Chapter 14 Energy**.

9.3.4.4 Quartz Mining

Quartz (i.e., hard rock) mining is not a significant water user, but all phases of mining activities from exploration to closure can affect water resources. Water is used for drilling, dust control, ore excavation and production, including the milling process. Water that

comes in contact with ore or waste rock requires treatment before being discharged. While water quality is often the most important management consideration in hard rock mining, water supply can also be a significant issue, such as in the management of inflows of storm water and runoff. To the extent possible, mining operations maximize recycling of water in order to minimize both their freshwater make-up requirements from surface or groundwater sources and their wastewater treatment requirements.

9.3.4.5 **Placer Mining**

Water is critical to every stage of placer mining, and may require the diversion of existing watercourses while mining takes place. If permafrost overlies the deposit, water is used to thaw the frozen ground, wash the gold loose, and carry the slurry of gold, sand and gravel to the sluice box. In the sluicing process, gravels are washed in flowing water and the heaviest particles, including gold, settle to the bottom. Many other fine materials are washed away, resulting in high concentrations of suspended sediments in the sluicing water. Settling ponds are used to reduce the turbidity of the water before it is discharged back into the stream.

Cumulative calculations for permitted water withdrawal for placer activities in the planning region have not been completed, and is a significant data gap in water management regime within the planning region.

9.3.4.6 **Tourism**

Water resources are highly valued in the tourism and recreation sectors. The Yukon River is a major asset for the region's wilderness tourism operators (e.g., canoeing, motorboat tours and rafting are some of the most popular trip activities) as well as for private businesses such as the Klondike Spirit boat excursion and for independent recreational travellers. Various landing sites and docks are also associated with water access.

9.3.4.7 **Forestry**

Sustainable forest management has a critical influence on the hydrology and water quality of watersheds. Forests play an important role in regulating water quantity and forest land management can have a critical impact on the timing of surface flows, water quality, groundwater recharge and floodplain maintenance. The main forest management activities affecting water resources include construction of access roads, harvesting, replanting and pesticide application.

9.3.4.8 **Agriculture**

Most of the two per cent of land suitable for agriculture in the Yukon is restricted to the major river valleys. Yukon farmers need water for four principal uses: irrigation water for crops, potable water for crop washing, potable water for livestock and potable water for home use. Access to irrigation water is necessary for reliable production in most areas. As elsewhere in Canada, irrigation of crops represents the largest water use by agriculture sector. The amount of water required for irrigation ranges from 100 m³/acre/year for hay to 1,700 m³/acre/year for vegetable crops (Government of Yukon 2011a).

One of the biggest constraints on growth of the agricultural sector in Yukon is the accessibility of water; the amount of agricultural land adjacent to watercourses is limited. River access or the availability of surface water in nearby creeks or ponds directly influences the type of crops that can be grown. Many current agriculture leases are under-utilized, at least in part because of lack of access to water or limited irrigation infrastructure (Government of Yukon 2011a).

9.3.4.9 **Oil and Gas**

There are no producing oil and gas wells in the Dawson area. However, exploration activity is increasing in the Eagle Plains area immediately to the north and east of the planning region, for both conventional and unconventional oil and gas plays.

Conventional oil and gas operations use water for three main purposes (Government of Yukon 2011a):

- Drilling muds – A typical Eagle Plains well would require 200 to 500 m³ of water per month.
- Water flooding – The secondary recovery of oil requires the addition of water.
- Ice roads – The construction of ice roads to gain access to oil and gas wells requires approximately one million gallons per mile or 2,352 m³/km. It would require 100 to 300 m³ per day to build an ice road in the Eagle Plains area. One road, built in 2005 by Devon Canada, was 15 km long.

Excluding the construction of ice roads, water use in oil and gas production is consumptive, as the water is injected into sub-surface formations or disposed of in deep wells and not returned to the source. Industry concern about water availability in Yukon centers on the large water use requirement for ice roads. Industry is increasingly reducing its use of surface water, using deep sources that are typically saline or brackish; this would be the only practical water source in the Eagle Plains area for a water intensive operation. Fresh

water is essential for ice roads and drilling muds and there may be constraints in winter during periods of low flow.

9.3.4.10 **Fisheries**

Yukon's freshwater fishery is dominated by recreational angling, with a small component of commercial, domestic and First Nations fisheries concentrated on lake trout and lake whitefish (Government of Yukon 2011a).

9.3.4.11 **Traditional Economy**

Water resources support the traditional economy by providing travel corridors important for the harvest of fish and wildlife. Access to water is important for land users and generally camps and infrastructure are spatially connected with rivers, creeks, or lakes, and located along these transportation corridors. Much, if not all of the resources which are vital to the traditional economy require access to clean water within their habitat/ecosystem.

9.4 Resource Management

The following sections note legislation and regulations that specifically address water protection. Other acts and regulations dealing with mining, land development, forestry, pesticide use, hazardous materials handling, or other industrial activities may also include measures to safeguard water. Additional protocols and requirements may also apply if work is being conducted on Settlement Land.

9.4.1 **Regulatory Framework**

9.4.1.1 **First Nations Final Agreements**

Chapter 14 - Water Management, Section 14.8.1 of the Tr'ondëk Hwëch'in Final Agreement (TH – DIAND 1998) states:

14.8.1 Subject to the rights of Water users authorized in accordance with this chapter and Laws of General Application, a Yukon First Nation has the right to have Water which is on or flowing through or adjacent to its Settlement Land remain substantially unaltered as to quantity, quality and rate of flow, including seasonal rate of flow.

Chapter 14 also establishes a compensation system, which complements the statutory compensation provisions of the *Waters Act*. Consistent with the principle of prior allocation, it protects Yukon First Nations and Yukon Indian People who may suffer adverse effects, loss or damage from new use of water licensed under the act or from other water uses.

Chapter 5, Section 5.8.0 notes that the bed of a waterbody that lies entirely within a parcel of Settlement Land is also considered Settlement Land.

9.4.1.2 **Fisheries Act**

Watershed-based *Fisheries Act* authorizations from Fisheries and Oceans Canada (DFO) are in place for placer mining activities in Yukon River North, Fortymile River, Indian River, Klondike River, Sixtymile River, Stewart River and White River. The authorizations extend to individuals or companies conducting placer mining in the watershed that hold a valid Water Use License pursuant to the *Yukon Waters Act* and include undertakings such as the construction of diversion channels, in-stream works, water acquisition and discharge of sediment from settling facilities. In addition, Section 36(3) of the *Fisheries Act* concerns the prohibition for the deposit of a deleterious substance of any type in water frequented by fish and is enforced by Environment and Climate Change Canada (Personal Communication DFO, Jan 2020).

9.4.1.3 **Navigation Protection Act**

All construction of works built or placed in, over, through or across navigable waterways must be licensed by the federal Navigable Waters Protection Program. Licenses are issued with conditional uses and construction requirements so that the water body remains navigable, even during construction. While recent legislative changes restrict application of the act, the portion of the Yukon River within the Dawson planning region remains subject to its provisions.

9.4.1.4 **Environment Act**

The *Environment Act* has a number of associated regulations that provide for water monitoring and protection. These include the *Special Waste Regulations*, *Spills Regulations*, *Storage Tank Regulations*, *Solid Waste Regulations*, and *Contaminated Sites Regulation*.

Permits are issued primarily by the Environmental Programs Branch of the Government of Yukon's Department of Environment. For example, solid waste permits are issued to all operators of public waste disposal facilities where waste is being or has been disposed on site. Permits require the installation of groundwater wells and regular monitoring of water quality in the wells and surface water around the facility, both while the facility is in operation and afterward.

9.4.1.5 **Public Health and Safety Act**

Drinking water standards for large public systems are set out in the *Drinking Water Regulation* including source selection and protection, system maintenance and upgrades, permits and reporting, operations, and sampling. Almost all Yukon communities, including the City of Dawson, rely on groundwater wells for their drinking water. Groundwater wells must meet strict criteria for siting, construction and operation. Performance tests are done to determine the yield of the well as well as the characteristics of the aquifer it draws from and the influence of surface water. Wells are tested for bacteria and other health-related parameters.

Drinking water permits and sewage disposal permits are issued by the Government of Yukon's Department of Environment, Environmental Health Services Branch.

9.4.1.6 **Waters Act**

The *Waters Act* (2003) regulates surface and ground water use from water bodies, alterations to watercourses and deposition of waste into water bodies. Schedules 5 through 10 of the *Waters Regulation* define the activities and uses that trigger the need to obtain a water license.

Water licenses are issued by an independent administrative tribunal, the Yukon Water Board.

Schedule 2 of the *Waters Regulation* provides a classification of undertakings falling into nine different categories of activity in which a water license can be issued. (**Figure 9-5**).

The allowable water use limits set out under those licenses provide a broad picture of how water use is divided in Yukon. As shown in **Figure 9-5**, placer mining dominates the allowable licensed use by a substantial margin, accounting for 97% of the gross allowable water use.

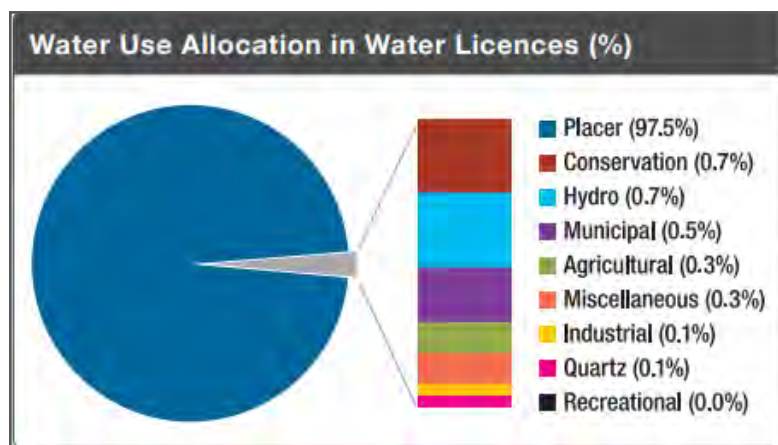


Figure 9-5 Yukon water license use allowances by license type per cent, September 2014 (Government of Yukon, 2014b)

As of September 2010, total allowable water use under all active water licenses in Yukon was 2,844,000 m³/day. Totals by license type vary widely from less than 2,000 m³/day for conservation to over 2,600,000 m³/day for placer mining (**Figure 9-6**).

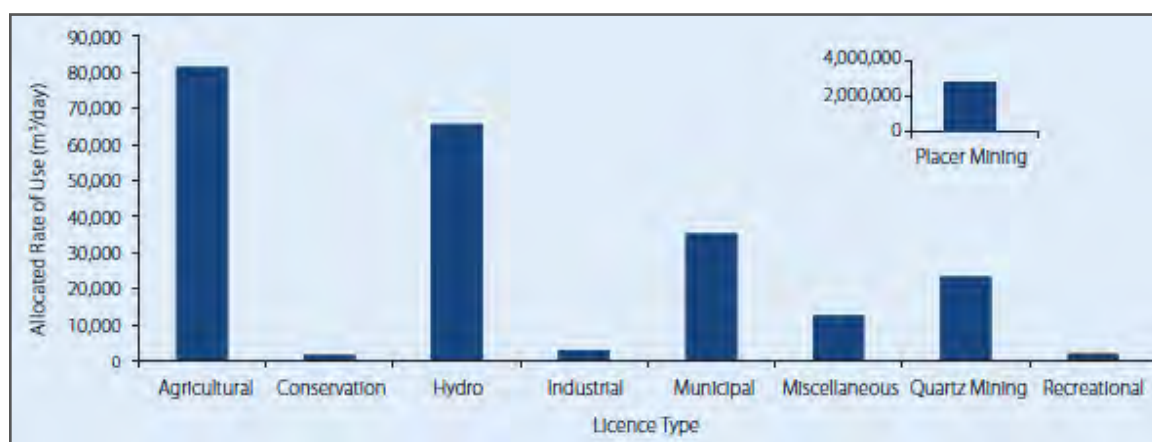


Figure 9-6 Yukon water license use allowances by license type amount, September 2010 *Note: Placer in upper right corner* (Government of Yukon 2011a)

These values represent only the amount of water that could be used by licensees. Actual water use varies by year given the extent of activities (e.g., for placer mining), climatic conditions (e.g., for agriculture irrigation) and population size (e.g., for municipal). In the Government of Yukon's 2011 assessment of water and climate change vulnerabilities (Government of Yukon, 2011a) it is noted that data on actual annual water use is not "currently collated on a watershed basis due, in part to relatively low pressures in most large watersheds"

Water use and protection are considered during the assessment and regulatory processes. Water licenses contain operating conditions, discharge standards and requirements for monitoring, sampling and reporting. (Government of Yukon, 2011a).

Water licenses outline allowable water use, deposit of waste and mining activities, including the construction of dams and diversions. Sediment discharge standards are outlined in the relevant watershed authorization under the Fish Habitat Management System for Yukon Placer Mining. Licensee requirements for sampling, monitoring and reporting of water quality objectives and aquatic health is carried out along with monitoring by government agencies (Government of Yukon, 2011a).

9.4.2 Policy Direction

A more in-depth description of roles and responsibilities with regards to water in the Yukon can be found in the appendices of the *Water for Nature, Water for People: Yukon Water Strategy and Action Plan* (Government of Yukon, 2014).

A wide variety of governments and management agencies make decisions about water resources in Yukon.

9.4.2.1 Government of Yukon

Water for Nature, Water for People: Yukon water strategy and action plan was released on June 11, 2014. It clarifies the Yukon government's approach to addressing complex water issues and establishes a framework of goals and priority actions, which in turn are based on a vision and set of principles. Short- and long-term priority actions are proposed in the form of policies, plans and programs.

Stated goals for the Yukon Water Strategy are:

- *Water for People* – Ensure accessible, safe and sufficient water for drinking and other purposes, including commercial, recreational, heritage, cultural and spiritual uses and values. Promote sustainable and wise use of water to support environmental, social and economic needs.
- *Water for Nature* – Sustain water quality and quantity for aquatic and terrestrial health and ecosystem services. Respect the intrinsic value of water.

The Strategy calls for the following actions:

- Better understand and manage Yukon's Groundwater;
- Improve the sharing of information about Yukon's water;
- Maintain/improve access to safe drinking water;
- Improve water management programs;
- Promote the sustainable use of water; and
- Plan for water needs now and in the future.

9.4.2.1.1 *Wetland Policy*

One of the recommendations of the *Water Strategy* is to create a wetland policy for the territory (Government of Yukon, 2014). The policy is in the initial stages of development and will not be completed in time for the development of the Dawson Regional Plan. In addition, EMR is developing a guide for wetland reclamation for the placer mining industry as a reclamation plan is often a stipulation in the approval or license process (Government of Yukon, 2018).

Within the Government of Yukon, there are six departments with responsibilities for water resources.

- | | |
|----------------------------|-------------------------------------|
| • Environment | • Energy, Mines and Resources (EMR) |
| • Community Services | • Health and Social Services |
| • Executive Council Office | • Highways and Public Works |

9.4.2.2 **Government of Canada**

The *Federal Water Policy* (Government of Canada, 1987) that was released by Environment Canada in 1987 continues to provide policy guidance for management of water resources by Canada.

Several departments within the federal government have responsibilities for Yukon waters.

- Environment Canada
- Aboriginal Affairs and Northern Development Canada
- Fisheries and Oceans Canada
- Transport Canada

9.4.2.3 **Yukon First Nations**

Yukon First Nations have rights in relation to water that are set out in Final Agreements. These include use and protection of water on, and flowing past Settlement Lands and use of water for trapping, non-commercial harvesting, and traditional heritage, cultural, and spiritual purposes. In addition, the Council of Yukon First Nations nominates one-third of the members of the Yukon Water Board. Many First Nations own and operate their own drinking water systems.

Yukon First Nations that have signed Final and Self-Government Agreements have certain water rights and management responsibilities, including the power to enact laws.

9.4.2.4 **Municipal Governments**

Incorporated Yukon communities such as the City of Dawson build and manage water and wastewater systems and solid waste management facilities.

9.4.2.5 **Boards and Councils**

YESAB, the Yukon Water Board, Regional Planning Commissions, and Renewable Resource Councils all play important roles with respect to Yukon waters.

9.4.2.6 **Other Stakeholders**

Non-government organizations such as the Yukon River Inter-Tribal Watershed Council (YRITWC), the Yukon Conservation Society, and the BC/Yukon Water and Waste Association advocate and act to protect and conserve water. Tr'ondëk Hwëch'in and the YRITWC manage an active layer permafrost monitoring station as well as water monitoring programs in the region (Tr'ondëk Hwëch'in, 2013). Industry (from large mining companies to local water-well drillers), community organizations and even ordinary citizens are responsible for protecting Yukon waters.

9.4.2.7 Inter-Jurisdictional Initiatives

Yukon participates in a number of regional and national water initiatives including the Mackenzie River Basin Board, Canadian Council of Ministers of the Environment, Council of the Federation Water Stewardship Council, and the Federal-Provincial-Territorial Committee on Drinking Water.

9.4.3 Current Best Management Practices

The five main mechanisms by which contamination and alterations to flow conditions can be detrimental to water quality, fish and other aquatic life are:

- Increased runoff;
- Sedimentation;
- Nutrient and contaminant influxes;
- Temperature alterations; and
- Flow alteration.

Yukon and First Nation governments and industry groups have developed Best Management Practices (BMPs) to mitigate many of these potential impacts. BMPs cover materials and methods for; erosion and sediment control, such as vegetation management and revegetation; contaminant control such as proper fueling practices; and fish specific guidelines for activities such as the use of fish screens and water pumping. They also detail best practices for working in and around water bodies, such as installing culverts, diverting streams, fording streams, setting up docks and barge landings, and minimizing site footprint (Government of Yukon, 2011*b*).

BMPs have also been developed to address the impact of wilderness river travelers on the environment and on the experience of other river users (Wilderness Tourism Association of the Yukon, 2013). See **Section 3.5** for a listing of BMPs.

9.4.4 Monitoring Activity

A wide range of governments, departments and organizations are engaged in water monitoring and data collection in the Yukon. Due to the cross-boundary nature of the territory's watersheds, the groups include both Canadian and American government and non-government agencies, as well as First Nation organizations and universities from both countries.

9.4.4.1 Water Quality Objectives and Guidelines

There is no single measure that constitutes good water quality or that defines the health of a watershed. Generic water quality guidelines are scientifically determined and indicate the maximum allowable concentration of substances for a particular water use, such as human consumption or recreation or supporting aquatic life, and serve as the targets for environmental protection (Government of Canada, 2012).

Monitoring programs help measure the changes in water quality over time, determine levels of water contaminants, establish a scientific basis for guidelines, identify emerging issues and threats, and track the results of remedial measures or regulatory decisions (Government of Canada, 2012).

Governments use both guidelines and objectives to protect water quality and to describe how much of a substance should be permitted. For example, the Government of Yukon often refers to the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* prepared by the Canadian Council of Ministers of the Environment.

Other indicators of water quality are less quantitative and reflect more of a holistic view of the watershed. For Indigenous people and subsistence land users, aspects of a healthy watershed include healthy animals and healthy people who live there, clean water, a beautiful landscape and the natural food chain in its original abundance. This view is reflected in a Yukon River Inter-Tribal Watershed Council (2002) statement:

Even though streams and rivers may fall within the stated standards and guidelines at a given time, when sampled, the watershed may not be healthy in the holistic sense of providing an environment for the flora and fauna of the watershed.

Indicators of an unhealthy watershed can be: decreases in fish and wildlife populations, changes in animal distribution or increased incidence of tumors and cysts on fish and wildlife, which in turn affects the health of people who eat these foods.

9.4.5 Monitoring Water

Monitoring agencies, networks and data collection programs gather information on Yukon's water resources. They include territorial, federal, and cross-boundary agencies and networks. A detailed description of the various agencies and monitoring networks, and details of their programs can be found in (Government of Yukon, 2011*b* & Government of Yukon, 2011*b*).

Water is monitored on the basis of these three categories:

- ✓ Aquatic Health
- ✓ Water quantity
- ✓ Water quality

The Department of Environment's Water Resources Branch holds the primary responsibility. The Hydrology Section's role is to carry out environmental impact assessments and reviews of water license applications; monitor the compliance of water use licenses; provide estimates of peak and low flows for the design and operation of hydraulic structures, such as highway stream crossings, flood protection works and water supply reservoirs; operate the Yukon flow forecasting and monitoring program, including preparing the Snow Survey Bulletin and Water Supply Forecast; provide estimates of the magnitude and timing of peak stream flow and water level for flood-prone communities, for the purpose of allowing sufficient lead time for the implementation of emergency measures; provide general services to the public; and monitor climate change impacts.

Water Resources Branch is responsible for four active hydrometric stations, three active snow survey courses and one long-term water quality monitoring station and three long-term groundwater monitoring stations within the Dawson planning region.

The region is considered data sparse; increased water quality and quantity baseline data is required to adequately understand and assess the impacts of future

9.5 Risks and Uncertainty

9.5.1 Water and Climate Change

Water resources are one of the highest priority issues with respect to climate change impacts and adaptation in Canada. Waterways, wetlands and riparian zones in the planning region provide important ecological functions and can provide resilience to climate change. There is a need to enhance understanding and awareness of climate change in the region

and to encourage development and implementation of adaptation strategies. Increased monitoring and expanded research is required.

Scenarios Network for Alaska and Arctic Planning (SNAP)

In an effort to better understand where and when changes in hydrology are likely to occur, SNAP and Yukon College collaborated to develop a tool for mapping future growing-season water availability in Yukon. Results showed that much of the Yukon is likely to remain water-limited during summer months with some regional drying, particularly in the boreal regions. However, the greatest impacts to ecosystem hydrology may come from associated changes such as lengthened growing season and increased growing degree days, vegetation shifts, changing drainage from permafrost loss, and altered fire cycles (SNAP, 2011).

9.5.1.1 Permafrost

One of the major ecological features of the region is the presence of permafrost, and thus the uncertainty of what will happen in the region when faced with a warming trend is of concern. If permafrost melts the implications of this would be (Brabets et al., 2000):

- Drier soil
- Release of stored carbon into the atmosphere
- Dissolved organic carbon could affect all trophic levels in stream communities
- Increase recharge of aquifers (ground water)
- Increase base flow in streams, but decrease summer peak flows

An increase in natural factors such as wildfire can also affect permafrost; after a fire, the change in surface conditions results in soil warming and increased active depths. The soil may become well drained and may no longer have a perched water table. Thus, the hydrology changes and areas that once were wetlands become completely drained

General climate trends and projections affecting Yukon water resources are shown in **Table 9-1**. All of these changes present challenges to continuing water use and management.

Table 9-1 General climate trends and projections affecting Yukon water resources (Government of Yukon, 2011a)

Factors	General trends
Temperature	Over the last several decades, winter and summer temperatures have increased in all Yukon regions and the forecast is for continued warming. A relatively uniform increase in annual temperature of 2.5 C to 3.5 C is projected for Dawson for the 30-year period to the 2050s.
Precipitation	Increased precipitation has been observed for some areas, especially increased winter precipitation in the northern regions and increased summer precipitation in southeast and central Yukon. Most projections suggest continued increases.
Snowpack	Northern Yukon has experienced significantly decreased winter and early spring snow depths, and earlier snowmelt and decreasing period of snow cover have been observed throughout the Arctic. Given the strong sensitivity of spring snowmelt timing to spring temperatures, a continued trend of earlier snowmelt and associated earlier peak flows can be expected.
Evaporation and Evapotranspiration	Climate change could have a critical impact on evapotranspiration, and therefore on water availability, with increasing temperatures resulting in increased evaporation.
Permafrost	Increasing air temperatures are leading to permafrost warming and degradation and this is expected to be greatest within the discontinuous and sporadic zones where the permafrost is warmer and more susceptible to thawing.
Glaciers	A 22-per cent reduction in glacial cover was calculated over the last 50 years in Yukon's St. Elias and Mackenzie mountain ranges and continued glacial decline could have a profound influence on the hydrology of Yukon's glacier-dominated basins.

Factors	General trends
River Ice	<p>An advance of five days per century was calculated for break-up timing on the Yukon River at Dawson between 1896 and 1998. In the last two decades, the advance has been even more dramatic. A trend of increasing water level during break-up from the early 1970s to the present for Dawson has also been observed. Projections about the severity of ice jamming are not readily made given the complexity of factors, but the occurrence of a midwinter break-up event and associated ice jam on the Klondike River in 2002-3 indicates a possible shift in Yukon's river ice regime.</p>
Streamflow	<p>There are indications that Yukon stream flow characteristics are being affected by climate change, although they vary by hydrologic regime and season. These include increased winter low flows and an advanced spring freshet in mountainous streams, increased annual mean and peak flows in glacierized basins in southwestern Yukon, decreased peak flows and increased minimum winter stream flow within the continuous permafrost zone, and increased winter flow and a declining trend in average flows in summer in the Yukon River Basin. Increased river flow is generally projected for high-latitude rivers to the end of the 21st century.</p>
Groundwater	<p>Trends in stream flow investigated over periods of 20 to 50 years in the Yukon River Basin showed significant increases in estimated groundwater flow. The largest increases were detected in the Yukon River headwaters and in the Porcupine River watershed. Trends or projections of groundwater availability or recharge for community water supplies have not yet been well documented.</p>
Erosion and Sediment Transport	<p>Changing hydrological conditions could cause increased erosion and sediment transport. These conditions include permafrost degradation (both through increased peak flows and permafrost-related landslides), glacial retreat, and changing snowmelt and spring break-up conditions.</p>

Factors	General trends
Metals and Contaminants	Permafrost thaw will likely lead to changes in groundwater flows and the quantity and quality of organic carbon in rivers, streams and lakes (with associated possible changes in metals and contaminants levels).
Solute and Nutrient Concentrations	Warming air temperatures leading to permafrost thaw and degradation can have significant impacts on hydrology, ecosystems and biogeochemical cycling. Changes in the timing and magnitude of glacial melt will also lead to changes in solute and nutrient concentrations.
Water Temperature	Lakes and rivers across the northern hemisphere are already exhibiting higher temperatures in response to warmer conditions, with surface water temperatures up as much as 2 C since the 1960s. Warmer water cannot carry as much oxygen as cooler water and this also means changes to the internal structure of lakes (e.g., more evaporative water loss, shallower thermoclines) that affect habitat, water volume and water chemistry.
Extreme Events	There appears to be an upward trend in the number of heavy snowfall events for autumn and winter over northern Canada, with no change in intense precipitation events. The Klondike River mid-winter break-up event, rapid lake drainage from thermokarst development in the Old Crow Flats, and Southern Lakes flooding (highlighting the effect that increased glacial melt and summer precipitation can have) are other extreme events of note in the last decade.

9.5.1.2 **Hydro power production**

Many potential effects of climate change that will affect the flow and availability of water have major implications for hydro power production.

9.5.1.3 **Oil and gas**

Access to water, particularly from small creeks, by the oil and gas sector for the construction of ice roads in the Eagle Plains area could be impacted by changing flow regimes in the continuous permafrost zone.

9.5.1.4 **Municipalities**

There is significant concern about protecting groundwater (drinking water sources) from contamination. Flooding and erosion are hazards to people, buildings, and roads and can cause extensive property and infrastructure damage. Water is also vital to the protection of homes and forests from fires.

9.5.1.5 **Agriculture**

Changing temperatures, precipitation and evaporation conditions will affect agriculture most strongly through the amount of irrigation water required to produce a crop.

9.5.1.6 **Fish**

Changes to habitat, vegetation, snow conditions, weather patterns, and water volume and quality could impact fish and wildlife populations that residents of the region rely on for subsistence harvesting. For example, droughts or deficit streamflows in the Yukon River Basin primarily affect anadromous fish, such as salmon, which may not have sufficient streamflow to migrate upstream or whose eggs may not survive if they become exposed as stream levels decline (Brabets et al., 2000). Elevated levels of suspended sediments can adversely affect aquatic life by clogging gills, covering fish spawning sites or altering habitat of benthic organisms; land cover disturbance by activities such as mining can accelerate sedimentation processes, and metals and organic contaminants also commonly adsorb on suspended sediment (Brabets et al. 2000).

9.5.1.7 **Mining Industry**

Increased low flows and earlier spring snowmelt could benefit the placer mining industry, but shorter ice-road seasons would limit access to mining and exploration sites. For hard rock mining, management of on-site water could become more challenging. Hydrologic changes could also challenge efforts to divert clean water.

9.5.1.8 **Forest**

Increased prevalence of forest fires, insect disturbances and changes to forest species could have dramatic effects on forests and water resources in forested watersheds.

9.5.1.9 **Groundwater**

Changing permafrost conditions could pose threats to the quality of groundwater supplies if buried sewage systems and landfills are impacted.

9.5.2 **Other Risks and Uncertainties**

- Agriculture can have a negative impact on water quality mostly from non-point-source pollution (run-off from fertilizers, pesticides, etc.) Yukon's semi-arid climate, limited summer precipitation, and riparian setbacks have, to date, prevented intensively used agricultural areas from impacting waterways (Government of Yukon, 2011a).
- Very little information exists on the distribution of freshwater fish and their important habitats in the planning region.
- Groundwater is a vital resource to the majority of Yukon communities as a source of drinking water, but the groundwater regimes associated with community water supplies are relatively unstudied (Government of Yukon, 2011a).
- The Yukon River is a major contributor of water and solutes to the Bering Sea and Arctic Ocean ecosystems. Changes in the Yukon River, either flow or water quality, could also influence these ecosystems.
- There is a major gap in the level of baseline data describing permafrost terrain. The Yukon Geological Survey is involved in a number of projects to improve the available data (Yukon Permafrost Network, 2013).

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10 FORESTS

10.1 Highlights

- The forested areas of the region are part of a large, complex and dynamic circumpolar boreal region.
- The boreal forest provides essential habitat for many of the region's flora and fauna, including moose and caribou. It also helps mitigate climate change as the boreal forest processes and stores carbon.
- Wildfire is an important driver of diversity in forest type, seral stage and age class, which in turn provides a variety of habitats for birds and wildlife, cultural landscapes and harvest opportunities.
- Yukon forests boast a number of important values including:
 - Environmental: Ecosystem services such as fresh water, carbon storage, and erosion control; fish and wildlife habitat.
 - Economic: Timber and other harvested forest products, tourism opportunities, trapping and hunting, and traditional economy.
 - Social and Cultural: Cultural and historical resources, traditional arts, outdoor recreation opportunities, and natural beauty.
- The Forest Resources Act provides a comprehensive planning, tenures, compliance and enforcement regime to support the sustainable use and management of forests in the region.
- As per Chapter 17 of the THFA, forest management in the region is guided by the Dawson Regional Forest Resources Management Plan which was developed in partnership between Government of Yukon and Tr'ondëk Hwëch'in.
- The timber supply analysis (TSA) for the Dawson Forest Resources Management Plan has been completed as of mid-2019.
During the first iteration of the Dawson Region planning process the Land Management Units identified in the Plan Alternatives package were loosely based on the Dawson Forest Management Units (See **Section 3 – Map #10: Forestry and Fire History pre 1950 to 2018**).
- The Dawson Forest Management Plan must be consistent with the Dawson Region Land Use Plan.
- There are currently 12 Timber Harvest Plans (THP) that have been developed in the Dawson Region and there is interest in developing a THP for the goldfields area.
- There are 4 Commercial Forest Harvest permits in the Dawson Region.

10.2 Description of Resource

Named for Boreas, the Greek god of the North Wind, the boreal ecosystem accounts for almost one-third of the earth's forested land and has been called the world's largest ecosystem. The boreal forest in the planning region is an extension of the boreal forest zone that arcs across the continent from Yukon to the Atlantic coast in Labrador (**Figure 10-1**).

Of the 26,223 km² of the planning region that lies within the Boreal ecozone, approximately 75% is covered by either coniferous (60%) or mixed (15%) forest (Smith et al., 2004). Most of the planning region north of the Ogilvie Mountains lies within the un-forested Taiga Cordillera ecozone.



Figure 10-1 Canada's boreal forest region (Canadian Forestry Association, 2005)

The boreal forest contains many plant communities because of the diverse habitats provided by mixed landforms and fire. Fires are frequent; most forest stands are less than 100 years old, although some islands may escape fire and be cloaked in old growth forest. A unique feature of the central Yukon boreal forest within the planning region is the mix of grasslands on south-facing slopes and boreal forest vegetation on north-facing slopes underlain by near-surface permafrost.

The dominant tree species in the forest are black spruce, white spruce, trembling aspen and birch. Additional details about forest cover can be found in **Section 5.5 - Ecological and Landscape Classification Frameworks ELC**.

Forest productivity in the region is generally classified at poor or low, a small portion (6%) is classified as good and (28%) is considered as having medium productivity. Good sites can produce trees that reach 20-25m at maturity and are most often found in riparian areas and south-facing upland slopes (DFMPT, 2013).

Natural cycles of disturbance, regeneration and natural succession are fundamental to the boreal forest. These cycles create diversity in forest type, seral stage and age class, and are essential for a healthy, resilient forest ecosystem. Forest fires are the most significant natural disturbance impacting forest composition in the area (**See Section 5.7 – Natural Disturbance Process and Section 3 – Map #10 Forestry and Fire History pre 1950 to 2018**). The fire history of the area is reflected in the mosaic of forests of different age classes across the landscape (**Figure 10-2**). The age class distribution shows the predominant age range between 30 and 120 years. The age classes covering the largest areas of the forested land base are between 30 and 50 years, with older age classes of forest covering successively smaller land areas. The relatively limited area of older forest (that is over 130 years) results from frequent stand-replacing wildfires that occur in the area, particularly in mature coniferous forest.

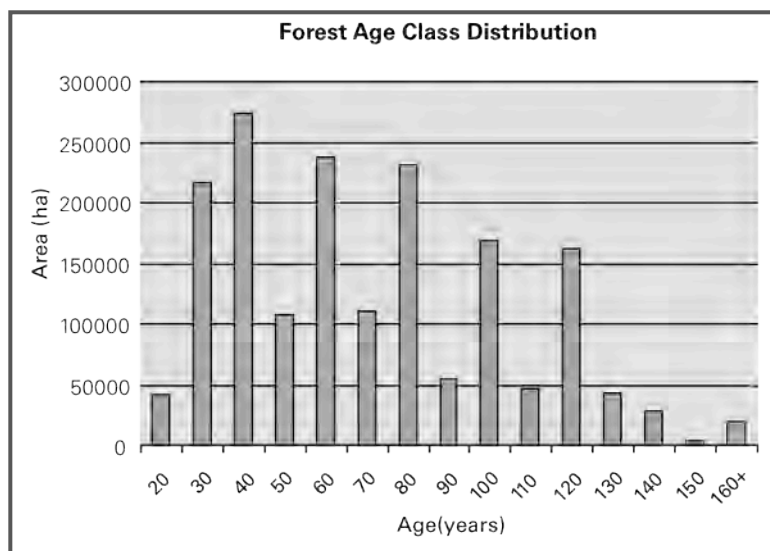


Figure 10-2 Forest age class structure (DFMPT, 2013)

Updates for the following subsections were provided by the Government of Yukon in their revisions to Chapter 10 Forestry (Government of Yukon, personal communication, September, 2018).

10.3 Resource Values

10.3.1 Natural Value

10.3.1.1 Habitat

10.3.1.1.1 *Fauna*

The mosaic of forest ecosystems provides a diversity of habitats that is constantly changing. The boreal forest provides habitat for many ecologically and economically important mammals, such as caribou, wolves, bear, moose, sheep, marten and lynx. More than 180 bird species have been recorded within the planning region, including 76 species that are confirmed to breed within the region.

10.3.1.1.2 *Flora*

In the Yukon portion of the boreal forest, over 1,110 species of flora are identified, including 127 species of grass (*Poaceae*), 118 species of *Asteraceae*, 115 species of sedge (*Cyperaceae*), 93 species of the mustards or crucifer family (*Brassicaceae*), 52 species of the rose family (*Rosaceae*), 37 species of saxifrages family (*Saxifragaceae*) and 36 members of the snapdragon family (*Scrophulariaceae*) (Cody, 1996).

10.3.1.1.3 *Wetland Habitat*

The boreal forest contains wetlands areas that support a high level of biodiversity and provide habitat for birds, mammals, amphibians, fish, invertebrates and plants. Wetlands are key indicators of environmental health and play an important role in regulating river flow and water filtration. Maintenance of quantity and quality of water is important for sustaining populations of Chinook and Coho salmon, anadromous Bering cisco, whitefish, arctic grayling, lake trout, northern pike and dolly varden.

10.3.1.1.4 *Habitat Connectivity*

The forest also allows for movement of wildlife between key habitat areas. Integrity of forest habitats, connectivity between key habitats, resilience to pests and ability to recover from disturbance are important indicators of ecological health.

10.3.1.2 **Soil Retention and Erosion Control**

Forest cover keeps soil from being exposed and limits the loss of soil due to wind and rain. Additionally, disturbance of forest cover can result in the melting of permafrost which can lead to slumping, erosion and ponding of surface water.

10.3.1.3 **Carbon Cycling**

Tarnocai and Lacelle (1996) have concluded that Yukon's boreal forest stores seven billion tonnes of carbon in its soils, peat and forests, an amount equivalent to 33 years of Canada's annual carbon emissions (as cited by Canadian Boreal Initiative, 2012).

During photosynthesis, trees produce oxygen and convert carbon dioxide, a "greenhouse gas," into woody tissue and leaves, thus locking carbon away for decades or centuries until the trees burn, decompose or are used in other processes. Some of the carbon from leaves and woody debris is stored in the forest soil.

10.3.1.4 **Forest Health**

A diversity of forest species, age class and seral stages provides resilience against insect pests and pathogens. Forests of a single species type are more susceptible to pest invasion. Other regions in the Yukon have experienced pest infestations in areas of relatively uniform, mature stands of trees, for example, the spruce bark beetle infestation affected over 350,000 ha of spruce trees near Haines Junction (Government of Yukon, 2010).

Climate change may impact the rate of spread and extent of forest insects and diseases and invasive species. The Government of Yukon monitors when there is an infestation threat.

Some mammals, like caribou and marten, depend on older forest types. If the rate and extent of wildfire increases this may require focused conservation efforts. (Reid et al., 2010).

10.3.2 Traditional Value

- *I still gather plants and medicines all over.*
- *Animals need the forest. If you take care of the forest then you're taking care of the animals.*
- *Every tree has a job to do. Logging leads to erosion.*
- *Protecting the land from clear cuts should come before money.*
- *Large timber needs to be protected from mining and forestry.*
- *Bear root, onion, caribou moss, mushrooms ... important food source.*

- Tr'ondëk Hwëch'in citizen comments (Tr'ondëk Hwëch'in, 2012)

10.3.2.1 Traditional Knowledge

Over thousands of years, Yukon First Nations have evolved a close and efficient relationship to the land, making use of a large variety of trees, shrubs, herbs, moss and fungi for food, fuel, medicine, fiber for clothing and building, and cultural materials for ceremonial use. Likewise, many species of wildlife found in the forest are used for food, clothing, medicine, decoration and other purposes.

The knowledge of where, when and how to harvest resources and how to preserve, prepare and use them is part of their traditional knowledge passed from generation to generation. Traditional knowledge of animal and plant resources, communicated through stories, legends, and place names, are essential to cultural values and social practices of the First Nation people of the region. Elders are concerned that development activity might impact their ability to continue harvesting these resources, and thus limit the passing of traditional knowledge along to youth.

10.3.3 Socio-Cultural Value

Boreal forests contain high recreational, educational and cultural value. Some activities relate directly to the forest resources, such as fuel wood gathering, plant harvesting, and mushroom and berry picking. Other activities occur in the forested landscape, including photography, nature viewing, hiking, bird watching, wildlife viewing, paddling, trail riding, cross country skiing, snowmobiling and dog-sledding. Activities occur in close proximity to access features, often on or adjacent to water bodies or wetlands, within coniferous forest and mixed forest landscape types. Recreation opportunity within the region is addressed in more detail in **Chapter 16 – Tourism and Recreation**.

Remote areas within the boreal forest that have experienced minimal historic human activity are valued as areas of high ecological integrity.

Forests generate local opportunities through both timber and non-timber forest values. Wage-based employment in forestry and logging, tourism, arts, food production, and traditional economic activities such as fuel wood harvest, fishing, hunting and trapping are important socio-cultural values that rely on healthy forest environments. The current annual demand in Dawson is approximately 2,500 m³ for sawlog and 1,100 m³ for fuel wood (Government of Yukon, 2011a).

Forest harvesting activities should consider potential impact on aesthetic qualities of scenic landscapes.

10.3.4 Economic Value

10.3.4.1 Traditional Economic Activity

The forest provides for harvest and use of traditional foods, including caribou, moose, bear, sheep, grouse, rabbit/hare, freshwater fish, and salmon. Many plant species including mushrooms, berries and shrubs are gathered for their nutritional or medicinal properties.

Raw materials such as wood, stone, bone, antler, fiber and dyes are also gathered for subsistence and cultural use. The boreal forest also provides habitat for furbearers, including wolf, fox, lynx, marten and beaver that provide an important source of cash income for First Nation trappers.

A portion of harvested resources is consumed directly by hunters and their families, and portions are traded, bartered, shared or otherwise given away. Over time, with the advent of commercial suppliers, subsistence hunters have increased their use of cash and store-bought foods, and the portion of food coming from traditional harvest activity has decreased.

10.3.4.1.1 *Monetizing Traditional Harvest Activity*

Estimating the dollar value of traditional harvest activity is difficult. Cultural values such as maintenance of traditional knowledge do not readily translate to economic value and there are limitations to our understanding about the distribution of social benefit from natural resource use (Brown and Burch, 1992).

In a Canadian Forest Service study of two First Nation communities in the Northwest Territories, Nahanni Butte and Fort Liard, the cash replacement value of materials harvested from the forest – wild meat (moose, fish, bear, caribou, rabbit, grouse), animal furs, firewood, and crafts – was estimated to be between \$950,000 and \$1.7 million per year (Beckley and Hirsch, 1997). This did not include medicinal plants, wood products made for their own use, skin clothing, bush cabins or guiding activities from tourism and hunting, or for uses on which no monetary value can be placed, (e.g., as a source of spiritual and cultural inspiration and well-being). The study concluded that financial compensation for the harvested materials could not adequately replace many of the items and would not constitute an acceptable alternative, as the harvesting and related activities are integral to the peoples' way of life.

10.3.4.2 **Timber**

Forestry activity in the region began around the late 19th century. The timber industry has had a rich history and was integral to shaping Dawson. The industry is a major part of the heritage legacy of the region and indeed the territory (Canadian Register of Historic Places, 2006).

- Since 2011, forestry, logging and activities in support of them contributed approximately \$800,000 to the Yukon's real GDP (Government of Yukon, 2016).
- The industry is small scale, and high year-to-year variability in timber supply and harvest activity is a factor in the growth of the forestry sector.
- The largest commercial operator presently is Arctic Inland Building Products, which began operations with a portable sawmill in 1975 and a permanent lumber outlet in Dawson in 1980. Products from the mill are distributed throughout the Yukon and Alaska.
- There are approximately 20 individuals employed in the forest sector in the Dawson Region (note that this number does not include employees of Arctic Inland) (Government of Yukon, personal communication, August 2019).

Timber harvest requires road, trail or river access. Often, road access created by other land users creates opportunity for the efficient harvest of mature timber. Incidental salvage from other industrial operations is considered to be of marginal value and is done only when considered economical to do so.

There are taxes and a variety of fees associated with forest management activities. Stumpage rates in Yukon can include up to four fees including timber, reforestation, development, and road use fees. Fees are calculated based on volume of timber harvested and are adjusted annually. Currently, timber fees are \$1/m³ and restoration fees are

minimum \$5/m³. In some situations, the Government of Yukon may set lower timber fees as an incentive for timber harvesting.

10.3.4.2.1 *Biomass Production*

As an alternative to burning fossil fuel, forest products can be utilized in the form of cord wood, wood chips, or wood pellets to heat buildings. Biomass is a renewable and carbon neutral energy source (Personal Communication Yukon Wood Products Association, December 2019). The Dawson City water treatment facility uses a biomass system fueled with locally produced wood chips.

10.3.4.2.2 *Silviculture Strategic Plan*

The Silviculture Strategic Plan (Government of Yukon, 2018) provides a framework for reforestation and silviculture activities in the territory. Tree planting activity associated with regeneration of harvested areas occurred in 2005 with the planting of 50,000 seedlings in the North Klondike area and in 2017 with the planting of 10,000 birch seedlings planted in the Bonanza area south of Dawson and the Dognose area on the Dempster Highway 10,000 birch seedlings were grown locally for the 2017 plant.

10.3.4.2.3 *Annual Allowable Cut (AAC) and Annual Harvest*

The annual allowable cut (AAC) in the Dawson region is 5,000 m³/year of coniferous trees and 2,000 m³/year of deciduous trees (Government of Yukon, 2011c). The timber supply analysis (TSA) for the Dawson Forest Resources Management Plan has been completed as of mid-2019 and a process is currently underway to determine a new AAC.

Representatives from Tr'ondëk Hwëch'in government, Dawson District Renewable Resources Council and Government of Yukon (Forest Management Branch and the Department of Environment) were part of a collaborative technical committee that guided the TSA process and have developed a final report of their findings. The Directors of each organization are set to begin the annual AAC decision process, at which time the final timber supply analysis report will be released for public and First Nations review. Feedback regarding the AAC decision will be considered during the review period which is anticipated to occur in late fall to early winter of 2019-2020.

A monitoring program of permanent sample plots (PSPs) is designed to measure growth and yield to determine how forest stands grow over time. PSPs are one of the most reliable

methods of monitoring long-term forest growth development. Growth and yield information helps forest managers with forest management planning. PSPs can also provide additional value to forest managers by providing information to help calibrate or validate remote sensing data analyses. Remote sensing is a cost-effective way to produce temporally and spatially consistent monitoring information for large forested landscapes, but accurate remote sensing of forests cannot be done without field measurements for calibration and validation.

The current annual harvest is estimated to be 3,600 m³ (Government of Yukon, personal communication, September 19 2018).

10.3.4.2.4 *Personal Fuelwood*

A considerable amount of the fuel wood for the region is harvested through personal fuel wood permits provided by Tr'ondëk Hwëch'in or Yukon Government. Personal fuel wood harvest in the off sets the monetary cost of heating thereby contributing to the traditional/mixed economy of the region. Areas are identified on both Settlement Lands and Commissioners for personal fuel wood harvest, including along the Dempster Highway, on Bonanza Creek Road, along the Klondike Highway at Flat Creek, and off of the Top of the World Highway

10.3.4.2.5 *Commercial Fuelwood*

Significant demand for wood also came from the steamboat industry. Steamers travelling between Whitehorse and Dawson would consume two cords of wood per hour, requiring boats to stop every four to five hours to refuel. In the *Dawson Forest Resources Management Plan* (DFMPT, 2013), it is noted that between 1898 and 1956 an estimated 300,000 cords of wood were harvested for operations of the sternwheelers. Today, an average of five to 10 permits are issued to commercial wood-cutters each year, harvesting between 600 and 700 m³ of firewood annually.

Major sources for fuel wood are dry wood from recent fires and white birch stands surrounding Dawson. Harvesting occurs in fall and winter and requires a permit.

The manufacture of biofuel from wood waste is an economic and environmental opportunity in the region. Cordwood, wood chips and wood pellets have the lowest cost per energy unit of the available heating fuels in Yukon. Burning wood is 30 to 50 per cent cheaper than using heating oil. Burning wood is deemed 'carbon-neutral' with respect to

contributions to greenhouse gas emissions. Using modern, efficient, safe and clean wood burning appliances to reduce consumption of fossil fuels is part of Yukon's Bioenergy Strategy. The Waste Water Treatment Facility in Dawson is presently utilizing woodchips from a local sawmill as an energy source.

10.3.4.2.6 *Non-timber Forest Products*

Harvest and processing of non-timber forest products, such as mushrooms and tree sap (birch syrup), contribute to the economic value of forests. Personal fuel wood harvest and berry-picking are also important as economic and recreational activities. Traditional economic activity also relies on non-timber forest products, for example traditional medicine, specialty foods and teas, essential oils, floral décor and cultural crafts.

10.3.4.2.7 *Trapping*

Numerous trapping concessions are held within the forested areas for harvest of furbearers such as wolf, lynx, beaver and marten. Harvesters report more active trapping in broadleaf/mixed wood riparian environments and throughout conifer and shrub areas (Tr'ondëk Hwëch'in, 2012).

10.3.4.2.8 *Tourism*

Tourism opportunities within the boreal forest are somewhat constrained by short summers and long winters. Tourism activity can be affected by forestry operations where impacts to visual or aesthetic quality impact on visitor experience, such as the routing of access for timber harvest or clear-cutting near areas of high visitor use. There is very limited impact on tourism from the small-scale forest management operations in the region (Government of Yukon, personal communication, September 19 2018).

10.4 Resource Management

The following sections note legislation and regulations that specifically address forest resource management. Other acts and regulations dealing with mining, land development, water use, or other industrial activities may also include measures to safeguard forest resources. Additional protocols and requirements may also apply if work is being conducted on Settlement Land.

10.4.1 Regulatory Framework

10.4.1.1 First Nations Final Agreements

Chapter 17 Forest Resources

Section 17.3.1 of the Tr'ondëk Hwëch'in Final Agreement states:
17.3.1.1 Yukon Indian People shall have the right, during all seasons of the year, to harvest Forest Resources on Crown Land for purposes incidental to the exercise of their traditional pursuits of hunting, fishing, trapping and gathering;
17.3.1.2 each Yukon First Nation shall have the right, during all seasons of the year, to harvest Trees on Crown Land to a maximum of 500 cubic meters per calendar year for non-commercial community purposes;
17.3.1.3 Yukon Indian People shall have the right during all seasons of the year to harvest Forest Resources on Crown Land incidental to the practice of their traditional customs, culture and religion or for the traditional production of handicrafts and implements.

Section 17.3.4 states that the rights set out in 17.3.1, noted above, do not apply to Crown Land:
17.3.4.1 Where the exercise of a right conflicts with the carrying out of any activity authorized by Government;
17.3.4.2 That is subject to a surface lease or an agreement for sale, unless the Person, other than Government, holding such interest consents; or
17.3.4.3 Where access by the public is limited or prohibited

Section 17.5 sets out a process for development of Forest Resource Management plans on Settlement and Non-Settlement Land.

Within the planning region, the Minister may establish the order for preparing Forest Resource Management plans after Consultation with First Nations and their Renewable Resource Councils within their respective Traditional Territory ("Consultation" used as defined in the TH Final Agreement). The TH Final Agreement establishes priority for forest inventory on Canada Land Inventory Class 4 and 5 soils in the North Klondike and Klondike River watersheds; within the Yukon River corridor; within the Chandindu and Thane Creek watersheds; and in the McQuesten River watershed.

Section 17.5.5 requires Forest Resource Management plans to take into account:
17.5.5.1 the principle of sustainable use of Forest Resources;

17.5.5.2 the principle of an integrated and balanced approach to the management and protection of interests in and uses of Forest Resources in a watershed;
17.5.5.3 the principle of integrated Forest Resources Management on Settlement Land and Non-Settlement Land;
17.5.5.4 the Forest Resources harvesting and management customs of Yukon Indian People;
17.5.5.5 Fish and Wildlife Harvesting rights and management plans as set out in Chapter 16 - Fish and Wildlife;
17.5.5.6 the knowledge and experience both of the Yukon Indian People and scientific communities in Forest Resources Management and use; and
17.5.5.7 the principle of implementing the plan on a watershed basis.

Section 17.6.1 requires a Forest Resource Management plan and a Forest Fire Management Plan to be consistent with any approved regional land use plan.

10.4.1.2 **Territorial Lands Act and Regulations**

The *Territorial Lands (Yukon) Act* (SY 2003, c 17), *Territorial Lands Regulation* (YOIC 2003/50) and *Land Use Regulation* (YOIC 2003/51) set out the regulatory framework for protection, control and use of the surface of land in Yukon, and establish a system of permits for the use of territorial land, conditions of those permits and fees for issuance of them.

The *Territorial Lands Act* provides for the unimpeded right for movement of timber along waterways and trails, around natural obstacles and the right to use or repair works constructed for the movement of timber.

The *Territorial Lands Regulations* set out the process for disposition of territorial lands. The Minister may reserve from the disposition of territorial land the right to cut timber. The regulations also prohibit the cutting of timber on leased territorial land without a permit.

The *Land Use Regulations* establish authority over the use of territorial land, including the requirement for permits for any clearing, grading or trail cutting exceeding 1.5 m in width; setting conditions on the crossing of water; and setting standards for restoration of stream channels. Exceptions to the regulations are provided for timber operations conducted pursuant to the *Timber Regulation* (s16 of the *Territorial Lands Act*).

10.4.1.3 **Forest Resources Act**

The purpose of the Forest Resources Act (SY 2008, c 15) is to promote the sustainable use of forest resources for the benefit of current and future generations by ensuring that the environmental, economic, social and cultural interests of all users of the forest are considered with the need to promote the health of forests.

The Act and the Forest Resources Regulation provides a comprehensive forest management regime in the territory, which includes:

Forest resource management plans establish requirements for forest management, identify areas where harvesting may occur and establish guidelines for the harvesting of forest resources. The Act requires the Minister to consult First Nations and consider the interests and intentions of other land users and stakeholders prior to establishing the planning areas for a forest resource management plan. Forest resources include all flora but does not include wildlife or their habitats.

See also ***Forest Resources Act: Standards and Guidelines Forest Resources Roads*** for information pertaining to standards relating to the construction, maintenance, modification and decommissioning of forest resources roads (Government of Yukon, 2015).

A review to the Forest Resources Act is slated to occur in 2019/2020.

10.4.1.4 **Forest Protection Act**

The *Forest Protection Act* (RSY 2002, c 94) and regulations empower the forest supervisor and forest officers to enforce provisions for the control of access, burning of inflammable material, use of fire, or operation of machinery, during the fire season. The fire season is defined in the act as beginning April 1 and ending September 30, but may be extended or shortened as necessary.

10.4.2 **Policy Direction**

10.4.2.1 **Dawson Forest Resources Management Plan**

In 2013, the Tr'ondëk Hwëch'in and the Government of Yukon approved the Dawson Forest Resources Management Plan (FRMP) (DFMPT, 2013) for both Settlement and Non-Settlement land in the planning region.

Specific objectives are established for sustainable forest management in the Dawson planning area:

1. Conserve biological diversity
2. Maintain forest ecosystem health and productivity
3. Conserve and maintain soil and water systems
4. Maintain and enhance multiple socio-economic benefit from timber and non-timber forest resources
5. Strengthen traditional uses of forest resources by Tr'ondëk Hwëch'in citizens
6. Respect rights of all forest users

The Dawson FRMP is a strategic, overarching, landscape level (1,000,000 ha) plan provides principles, goals, objectives and directions for forest management and forest resources development in the region. Timber harvest plans (5,000 ha to 300,000 ha) and site plans (1 ha to 500 ha) are subsequently prepared at successively smaller scales.

The FRMP prescribes an adaptive management framework which refers to, in this context, a formal approach to learn from the responses of existing forest management actions, determine how to best improve current approaches, and therefore improve overall management practices (Government of British Columbia, 1999).

The Dawson FRMP divides the forest management region into 17 watershed-based landscape units, adjusted to reflect forest productivity conditions (**Figure 10-3**). Key values are identified in each unit that must be considered when planning for timber harvest.

These values are:

- Wildlife key areas;
- Parks and protected areas;
- Ungulate winter ranges;
- Heritage resources;
- Historic trails and routes;
- First Nation Settlement Lands;
- Wildfire history (1946 to 2005);
- Mining activity;
- Outfitting concessions;
- Forest cover;
- Community infrastructure; and
- Wilderness tourism key areas.

A strategic designation system is applied to reflect management intent for each unit.

More detailed zoning may occur prior to harvest operations to identify specific objectives for conservation, general forest management or local forest planning areas (see **Figure 10-3**).

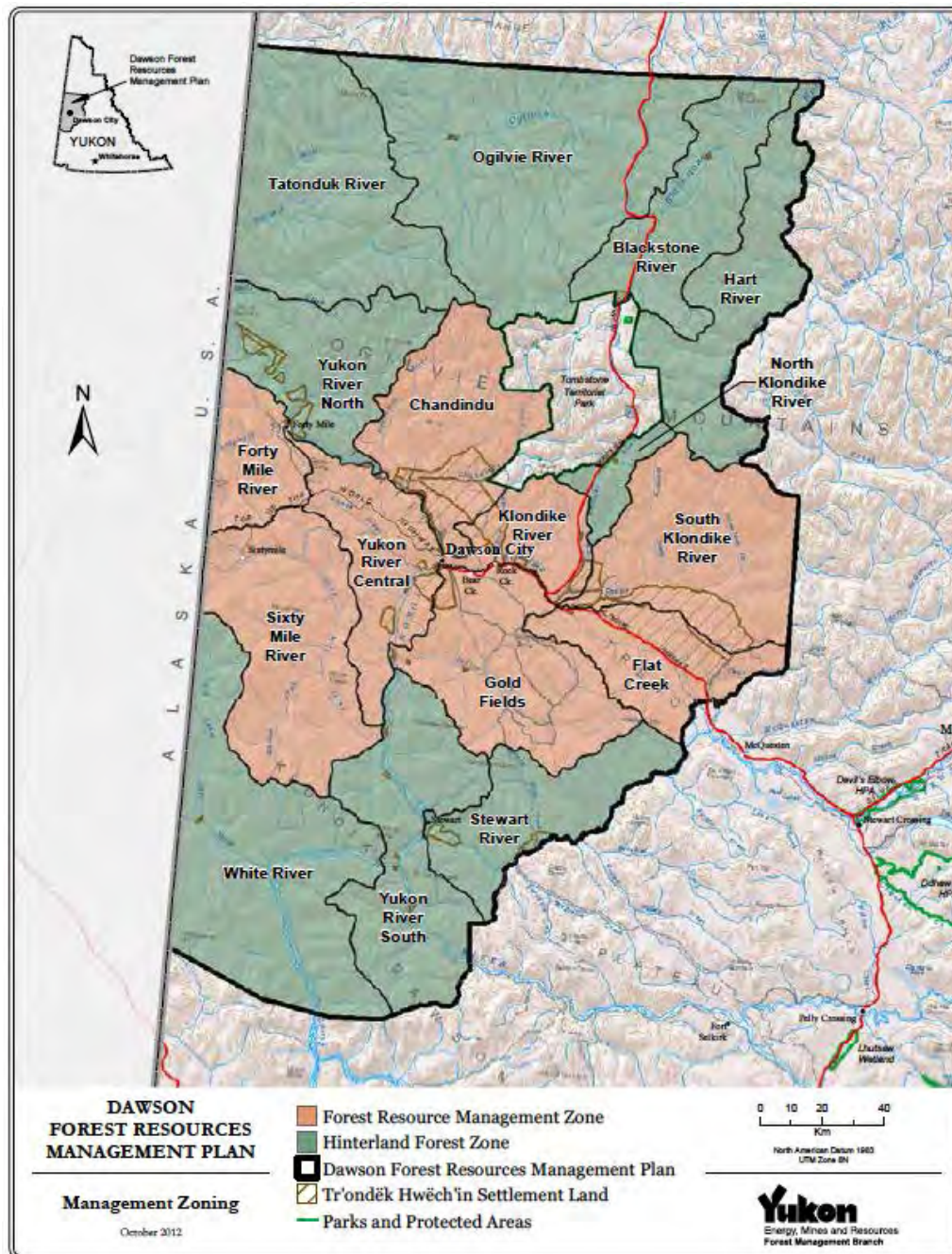


Figure 10-3 Forest Management Zones and landscape units in the Dawson FRMP

Table 10-1 Description of Dawson Forest Land Use Zones

Forest Land Use Zone	Description
Hinterland Forest Zone (HFZ)	<ul style="list-style-type: none"> • High wildlife, habitat and/or cultural value • Uncertainty around land use and economics • Small-scale non-commercial harvesting only
Forest Resource Management Zone (FRMZ)	<ul style="list-style-type: none"> • High forest economic value • Working forest where selected areas are prioritized for harvest planning or conservation • May provide for long-term tenure and woodlots • Management objectives for biodiversity and wildlife
Community Forest Development Zone (CDFZ)	<ul style="list-style-type: none"> • Municipal and developed areas • Local community use

Dawson Forest Land Use Zones and Dawson Regional Planning

The 17 forest landscape units for the Dawson region are outlined in **Figure 10-3**. During the first iteration of the Dawson Region planning process Land Management Units (LMUs) for the plan alternatives were created in part by using the landscape units presented in the Forest Management Plan. These were based mostly on watershed boundaries, modified to fit local access and development patterns. In the northern and southern parts of the region, LMUs are mostly based on watersheds. In some cases the boundaries were changed to match already identified areas (e.g., Tombstone Park or adjacent regional land use plans) or to keep certain values or interests together (e.g., existing claim blocks, extent of oil and gas basins, or key wildlife habitat areas). These LMUs can be found in the *'Dawson Regional Planning Commission: Plan Alternatives'* package (DRPC, 2014).

10.4.2.2 Timber Harvest Plans

Timber harvest plans (THP) are landscape-level operational plans that guide the access and harvest of wood, and identify environmental and social values and provide direction on addressing these values. A THP ranges in area from 5,000 to 300,000 hectares and may extend over landscape units or watershed boundaries. THPs have been developed for 12 areas within the Dawson FRMP (**Table 10-2**) Additional timber harvest plans will be

developed in forest resources management zones as the need for access to fuel wood and sawlogs is identified. There is an interest in developing a landscape level timber harvest plan for the Gold Fields unit.

Table 10-2 Timber Harvest Plans Dawson Forest Resource Management Area

Timber Harvest Area			Landscape Unit	Area available for Harvest (ha)	Volume available for Harvest (m ³)*
Bonanza Creek II			Goldfields	238	10,268
Bonanza Creek			Goldfields	241	13,212
Bruin Creek (III)			Forty Mile	95	5,022
Bruin Creek (II)			Forty Mile	1,200	10,500
Bruin Creek			Forty Mile	65	4,200
Clear Creek			Flat Creek	103	5,000
Dempster Highway			South Klondike	98	7,350
Dome Road			Klondike	48	4,800
Dominion			Goldfields	667	23,043
Flat Creek			Flat Creek	343	16,250
North Fork			South Klondike	220	18,230
Five Mile			Klondike	320	12,000
Top of the World	Klondike River	147	10,510		

* Allowance made for riparian management, wildlife management and operational constraints

It is imperative that the Dawson regional land use plan and the FRMP be integrated and coordinated to ensure that land uses for forestry management and other resources are accounted for. The integration of any specific rules or conditions for land use, or any guidelines together with forest management and timber harvest planning, will be required to ensure that the desired future forest landscape conditions maintain multiple values. As per Section 17.6.1 of the Tr'ondëk Hwëch'in Final Agreement, forest resources management plan may require amendment in order to be consistent with the regional land use plan.

10.4.2.3 Forest Health Assessment

Forest insects and diseases occur naturally in the boreal forest and normal population levels as well as natural outbreaks can provide many ecological benefits. Yukon is divided into five forest health zones which are surveyed on a rotational basis focusing on forest stands that are the most susceptible to the 10 forest health agents of greatest concerns. Aerial surveys were conducted in the Dawson district in 2009 and 2015. Information on the forest health status of the Dawson district can be found below in **Section 10.5 Risks and Uncertainty**.

10.4.2.4 Wildland Fire Management Policy

Government of Yukon's Wildland Fire Management Unit has established priorities for response to occurrences of wildland fire (**Table 10-3**). Five wildland fire management zones have been identified and applied across the Yukon landscape.

Table 10-3 Wildland Fire Management Zones (Government of Yukon, 2003)

Zone	Management Action
Critical Fire Management	<ul style="list-style-type: none"> • Greatest human values • Protection of human life and values at risk • Fire exclusion zone • Rapid and aggressive fire attack
Full Fire Management	<ul style="list-style-type: none"> • Recreation, aesthetic and community values • Protection of people, property or resources • Initial attack and ongoing fire suppression
Strategic Fire Management	<ul style="list-style-type: none"> • Moderate human values relative to high ecological and wilderness values • Initial attack, then response to consider factors such as weather, drought and fire load
Transitional Fire Management	<ul style="list-style-type: none"> • Lower density of human values and low to moderate resource value • Fires assessed prior to action being taken • Cost justifiable action where protection of values consistent with long-term cost effective benefit

Zone	Management Action
Wilderness Fire Management	<ul style="list-style-type: none"> • High ecological and wilderness values relative to low human values • Wildland fire expected to fulfill ecological function • Response limited to confirmation and surveillance

An example of this for the Dawson area is provided in **Figure 10-4**.

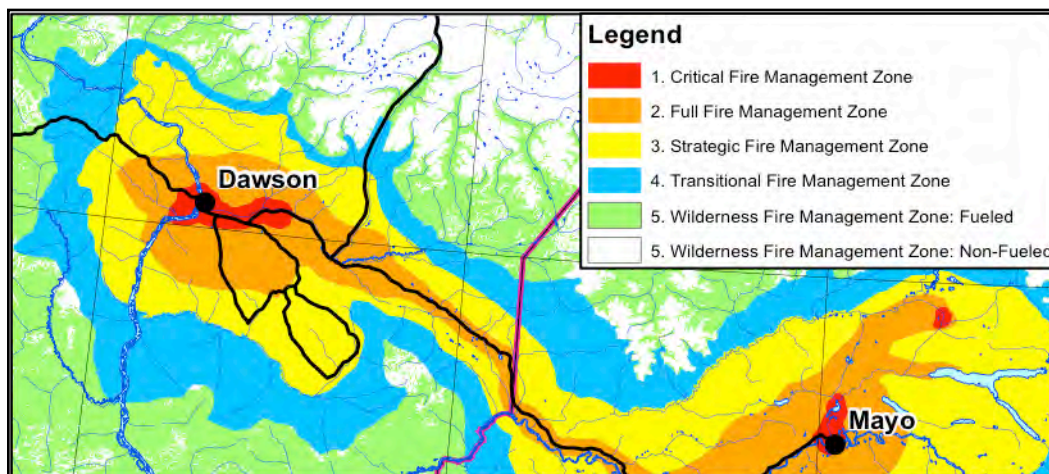


Figure 10-4 Zonation of fire response in the Dawson region (Government of Yukon, 2003)

10.4.2.5 Other Stakeholders

Yukon Wood Products Association is a non-profit society formed in 2007 to represent forest industry businesses that manage, harvest, manufacture or sell wood products.

Conservation organizations, industry stakeholders and First Nation leaders have initiated broad initiatives for conservation of the boreal forest ecosystem within Canada. In 1999, the Sub-Committee on Boreal Forest of the Standing Senate Committee on Agriculture and Forestry observed that maintaining ecological complexity and ecosystem resilience of the forest are the most important factors in decreasing the impact of climate change (Senate Subcommittee on the Boreal Forest, 1999). Coalitions such as the Boreal Leadership Council have goals related to maintaining forest health and respect for the rights of First Nations while in pursuit of sustainable development and long-term economic benefit. Objectives for implementation of the Boreal Forest Conservation Framework include protection for at least 50 per cent of Canada's Boreal Forest in a network of large protected areas (Canadian Boreal Initiative, 2012).

10.4.3 Current Best Management Practices

The Dawson FRMP identifies several strategic directions that should be considered best management practices in relation to forest health. Other guidelines for activity in and around water, for minimizing impact on heritage resources, and for minimizing disturbance to wildlife are also relevant to timber harvesting and forest management activities. These best management practices include:

- Maintaining a variety of cut block sizes and corridor retention provides habitat for interior forest, early seral and edge species.
- Where it is economical and efficient to do so, salvage of timber should occur prior to mining operations.
- Reflect natural disturbance regimes in forest management.
- Utilize existing access to reduce land use conflict caused by road access.
- Locate access away from permafrost areas.
- Aggregate timber harvesting activity in time and space.
- Avoid winter harvest of critical winter moose habitat, cover and forage.
- Manage operations to minimize seasonal conflict with breeding and nesting birds.
- Develop cut blocks that simulate natural forest openings and blend into the visual landscape.
- Manage access using gates, natural barriers and access restrictions.

10.4.4 Monitoring Activity

Adaptive forest management provides flexibility to modify management actions based on ecosystem response. The Dawson FRMP, recommends a suite of indicators that could be monitored for improving understanding of ecosystem response. Government of Yukon and Tr'ondëk Hwëch'in, guided by the Dawson FRMP, are working together to develop a sustainable forest monitoring program (Government of Yukon and Tr'ondëk Hwëch'in, 2017). Priority indicators will be used to assess how well forest management fulfills the objectives stated in the FRMP. Indicator results are informed by quantitative and qualitative data. 42 indicators were selected and prioritized for monitoring and results are currently being analyzed, including forest area, by type and age class, in each landscape unit.

10.5 Risks and Uncertainty

The boreal forest relies on natural disturbance processes for continuous renewal. Insects, fire, landslides and windthrow contribute to the range in forest cover type, seral stage and

age class. This in turn provides a diversity of habitats that support a broad range of valued wildlife, bird and fish species.

10.5.1 Forest Health Concerns

Generally in the region the health of the forest is considered good. In more recent years, however, there have been concerns noted about the health of the aspen forest in the region with an increase in the presence of aspen serpentine leafminer and the large aspen tortrix, as well as issues related to snow and ice damage. Continuing to monitor the health of the forests in the region is important as the local forest health issues, and the condition of the aspen forest in the region in particular, may tell us more about how the forest is responding to climate change (Government of Yukon and Tr'ondëk Hwëch'in, 2017).

10.5.2 Drought

The greatest risk to Yukon forest health comes from tree dieback due to drought. Aspen typically occupies the driest sites on the landscape, and is first to exhibit dieback from drought-induced stress. In 2009, die-off south of Dawson and in the lower Stewart, lower White and Yukon drainages affected about 2,500 ha of spruce forest, leading to an increase in secondary spruce bark beetle activity. An increase in the occurrence of drought conditions may occur with a warming climate.

10.5.3 Invasive Species

Under the *Forest Resources Act* the director may establish standards or guidelines related to silviculture treatments concerning the prevention and control of invasive species.

Re-vegetation requirements exist for sites disturbed during natural resource extraction under the *Yukon Quartz Mining Act* (2003), the *Placer Mining Act* (2003) and under the *Land Use Regulations of the Territorial Lands (Yukon) Act* (2003). These regulations require vegetated areas disturbed by operational activities to be returned to a state that either allows re-vegetation by native plants or the site should be left in a state that closely resembles the pre-disturbance conditions.

The Yukon Invasive Species Council (2011) is a group working to address the threats posed by invasive species through prevention, early detection and rapid response, control and management, research and education. Council members come from different governments, industry and the public.

10.5.4 Disturbance from Access

The creation of linear features and surface disturbance associated with forestry operations contribute to fragmentation of the forest ecosystem. Most of the environmental impacts of timber harvesting can be anticipated and mitigated. Harvest patterns that mimic natural disturbances are used to minimize the cumulative effects of clearings and cut blocks. Strategies to reduce the number of stream crossings and maintain riparian buffers are critical to aquatic ecosystem function. Maintaining visual aesthetics in proximity to tourism facilities and scenic landscapes is also a consideration during timber harvest planning.

Forest resource roads are temporary roads built to assist the harvesting of forest resources. Depending on access management objectives, the public and other potential users may be permitted to use forest resources roads. Facilitating access into new areas creates opportunity for recreation in the forms of hunting, boating, fishing and driving off-road vehicles. It also increases the potential for human disturbance of wildlife and human-caused wildfires.

10.5.5 Climate Change

Among the potential effects of climate change are melting permafrost, an increase in the frequency and severity of fire, spreading of forest insects and diseases, altered patterns of surface drainage, seasonal access constraints, and changes in forest regeneration and succession.

Both climate and climate change influence the structure and function of forest ecosystems and plays an essential role in forest health. Climate changes directly and indirectly affect the growth and productivity of forests through changes in temperature, rainfall, weather, and other factors. In addition, elevated levels of carbon dioxide influence plant growth. These changes affect complex forest ecosystems in many ways

Climate change may also allow species of insects that are currently problematic to coniferous trees in southern Yukon to move into the DFRMP area. E.g. Spruce beetle and northern spruce engraver.

Adaptive management approaches that respond to climate change are consistent with sustainable forest management objectives for conserving biological diversity, maintaining productivity and health of forest ecosystems, carbon and nutrient cycling, water management, and enhancing long term socio-economic benefit. Continuous monitoring is necessary, though, to evaluate the effectiveness of management practices, and where

necessary modify and improve management responses to achieve these management objectives (Ogden, 2008).

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11 FISH and WILDLIFE HABITAT

11.1 Highlights

- Focal Species are identified at a landscape scale due to the fact that they are widely dispersed and their habitat requirements also encompass many other species' habitats. For example, a healthy grizzly bear habitat not only benefits the grizzly bear, but many other species that live within the same landscape.
- There are many species that occur in the region that have been assessed by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) and subsequently listed on Schedule 1 of the Species at Risk Act (SARA), including grizzly bear, wolverine and caribou.
- There are 46 mammal species in the planning region; mammalian biodiversity is higher in the southern portions of planning region.
- Moose populations appear stable within the TH traditional territory, however there are a few 'Game Management Sub-Zones' that are experiencing over-hunting pressures likely due to the ease of access.
- Key areas for waterfowl include wetlands, riparian areas adjacent to rivers and creeks and the flyway along the Tintina Trench.
- Due to the migratory habits of salmon and caribou there are additional transboundary management considerations both nationally and internationally.
- Mineral licks, lakes and wetlands, riparian zones, grassland slopes, unglaciated mountains, springs, old growth forest and rare plants all represent important habitat requirements for the animals of the region.
- Wetlands are considered ecological hotspots and are considered to have a high threat magnitude in the region.
- For most species late winter habitat is most critical for survival although it may not be used every year.
- The Tintina Trench is a major migration route within the planning region, and the diversity of habitats within it sustains a wide range of birds.
- Fish and wildlife habitat is a valued resource in the region both for direct (e.g. hunting, trapping) and indirect (e.g. wildlife viewing, tourism) use values.
- It is largely recognized that reducing habitat fragmentation and maintaining landscape and habitat connectivity is an important consideration for regional planning.

11.2 Description of Resource

Relative to other parts of Canada, the region is remote and largely undeveloped. The region supports a variety of wildlife species including moose, caribou, sheep, furbearers, freshwater fish and salmon. Much of the wildlife and habitat information for focal species, fish and birds in the planning region was taken from a summary prepared by the Fish and Wildlife Branch of the Government of Yukon's Department of Environment (Government of Yukon, 2011a). An extensive list of research and local knowledge sources about wildlife and habitat within the region is provided in that report. Additionally, more recent species information was provided by Tr'ondëk Hwëch'in (personal communication September 2018 & August 23, 2019) to accompany their submissions from 2012 & 2013 (TH, 2012 & TH 2013). The Government of Yukon also provided updated species information (personal communication, September 2018). For species that have been assessed by COSEWC (listed in **Section 11.2.3.7**) their Status Reports can be found on the Government of Canada's website <https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife/status-reports.html>.

11.2.1 Ecosystems and Habitats

An ecosystem is the community of living organisms (e.g. plants and animals) interacting with the physical environment (non-living, e.g. rocks, nutrient cycles, energy) of an area (big or small). For a more detailed description of the ecosystems in the region refer to **Section 5.5**. Very generally speaking, a habitat is an animal's home. A good quality habitat provides space, food, water, and shelter for the different stages of an animal's life cycle. The mosaic of forest ecosystems provides a diversity of habitats that is constantly changing. Wildfire is the dominant driver of change, creating diversity in forest habitat in the southern boreal portion of the planning region.

The boreal forest provides habitat for many ecologically, spiritually, and economically important mammals. Species diversity (the number of different species) is generally higher in the southern portions of the region; this is due to many factors including harsher climate conditions and the characteristics of the vegetation in the north (Smith et al. 2004). Distinct and unique Beringian landscapes in the far north contain species not found anywhere else in the world.

In the Yukon portion of the boreal forest, over 1,110 species of flora are identified (Cody, 1996).

- 127 species of grass (*Poaceae*)
- 118 species of *Asteraceae*
- 115 species of sedge (*Cyperaceous*)
- 37 species of *Saxifragaceae*
- 36 members of the snapdragon family (*Scrophulariaceae*)
- 93 species of crucifer (*Brassicaceae*)
- 52 species of *Rosacea*

11.2.2 Focal Species Habitat Suitability Analysis

In 2012 the Yukon Government conducted *Local Knowledge-Based Habitat Suitability Mapping in the Dawson Land Use Planning Region*, which included descriptions of focal species' habitat requirements and corresponding maps were produced (see **Section 3-Maps #15-20**). The following discussion on focal species habitat is largely based on this analysis unless otherwise noted (Clark, 2012).

Knowledge-based habitat suitability modeling is a common method of assessing habitat quality for wildlife species across Yukon. These types of models rank species-habitat relationships based on local, expert, or traditional knowledge. This knowledge is used in addition to scientific data (hydrological, ecological, and/or geologic features) to produce maps that highlight wildlife key areas and ecologically important areas (Clarke, 2012). Local knowledge of wildlife habitat and perceived suitability across the planning region was collected for a suite of **focal species** (Clarke, 2012).

Focal species are those animals that occur widely throughout the planning region and have habitat requirements that encompass those of many other species in the ecosystem. Focal species are identified as those of particular conservation, subsistence or cultural value within the planning region (Clarke, 2012).

The focal species chosen for the Dawson Habitat Suitability Analysis were:

Caribou | Moose | Sheep | Grizzly Bear | Beaver | Muskrat | Lynx | Peregrine Falcon

11.2.2.1 Habitat Suitability Analysis: Method

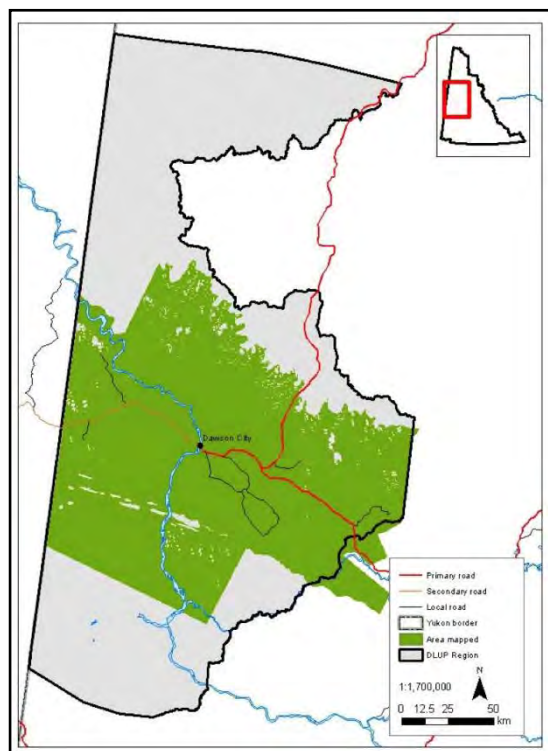
A four-level ranking system was used to indicate the potential of a habitat to support the above focal species

0= none 1= low 2= moderate 3= high

This classification was derived from various data sources using Geographic Information Systems (GIS) Ecological Classification schema

- Land cover data from satellite (i.e. forest cover)
- Fire History and linear surface disturbance
- Aerial photos
- Digital elevation models
- Topographic data for waterbodies and watercourses
- Local knowledge sources

Forest habitats are differentiated by degree of canopy closure (i.e., dense, open and sparse); non-forested habitats include non-vegetated areas, wetlands, waterbodies, meadows and shrublands.



Due to the limited extent of land cover data, habitat suitability was mapped for only a portion of the planning region, as shown in **Figure 11-1**.

It is important to note that habitat use varies according to seasonal timing, and the timing of seasonal changes varies between the northern and southern portions of the planning region. Seasons defined for focal species in the planning region is shown in the following **Table 11-1**.

Table 11-1 Seasons used in focal species habitat models

Season	South of Ogilvie Mountains	North of Ogilvie Mountains
Early Winter	Mid-October – early February	Early October – mid-January
Late Winter	Early February – late April	Mid-January – mid-May
Spring	Late April – late May	Mid-May – mid-June
Summer	Late May – early September	Mid-June – mid-August
Fall	Early September – mid-October	Mid-August – early October
Grizzly pre-denning	Early September – mid-October	Mid-August – early October
Grizzly post-denning	Late March – late April	Mid-April – early May

Key Habitat for Focal Species

- Late winter habitat is most critical for most species, including moose, caribou and sheep; although it may not be used every year, in high snow years these areas become essential to survival.
- Spring calving and lambing areas for focal mammal species are also considered key habitat areas.
- For non-migratory woodland caribou, including the Hart and Clear Creek herds, key habitat includes winter range, migration corridors and fall rutting areas.
- Wetlands habitats are well known as ecological hotspots. The interaction of land and water along the edge of rivers and creeks support a variety of complex and productive ecosystems in the riparian zone. The wetlands in the region are considered to have a high threat magnitude according to the Canadian Wildlife Service (2018).

In addition to key seasonal habitat requirements, rare and ecologically important features in the planning region also need to be considered when assessing habitat for species. Some of these features include:

- Old growth areas (i.e., forest greater than 140 years old);
- South-facing grassland slopes along major river valleys;
- Unglaciaded alpine areas above 1,300 m; and
- Mineral licks.

These features are limited in the planning region, but provide unique habitat for rare mammal, birds and invertebrate species. Refer to **Section 3 – Map #8: Unique and Special Landscape Features** for the known locations of some of these features.

11.2.3 Select Species' Status and Habitat Requirements

The following section uses the best available knowledge to describe the status, requirements, and habitat for a selection of species in the Dawson Region.

11.2.3.1 Caribou

Refer to Section 3 – Map #15: Caribou Herd Ranges

Both barren ground and northern mountain caribou occur in the planning region. The ranges of the barren ground Porcupine and Forty Mile (FMCH), Hart River, Nelchina and Clear Creek caribou herds cover nearly the entire planning region. It is thought the Forty Mile herd once ranged from Dawson City to Whitehorse during winter periods.



Woodland Caribou (Source: YG, Department of Environment website)

Together with all of Canada's barrenground herds, the Porcupine caribou herd was assessed as threatened by COSEWIC in 2016 (CWS 2018); however, at about 218,000 (2017 assessment), the herd is doing relatively well. It is the largest herd in the Yukon. The Forty Mile herd is smaller but is increasing. In recent years, its growth has accelerated. The status and designation of these herds under the *Species at Risk Act* (SARA) is undergoing review. A management plan required under the federal Species at Risk (SAR) legislation sets out habitat objectives for northern mountain caribou in Yukon, which includes Hart River and Clear Creek herds. Population status for caribou herds in the planning region is shown in **Table 11-2**.

There are five caribou herds that live in or travel through the region – Porcupine, Fortymile (FMCH), Hart River, Clear Creek, and Nelchina. All of the herds (with the exception of Nelchina) are subject to regulated harvest and have a variety of management tools associated with them such as, species plans, community fish and wildlife plans and harvest plans. Wildlife managers are working to develop harvest management tools for the FMCH.

- **Hart River and Clear Creek** caribou are populations of Northern Mountain caribou and are listed as a Species of Special Concern under SARA. There is a federal management plan for this species. The Hart River and Clear Creek caribou harvest is regulated via Schedule B, general open season, of the Yukon Wildlife Regulation. In recent years, harvest of the Hart River caribou herd has approached the upper sustainable harvest levels and measures are expected to be implemented to manage the harvest (TH, personal communication, September 2018)
- The **Porcupine** herd is a barren ground caribou herd that is managed between the Yukon, Northwest Territories and Alaska under the terms of the Porcupine Caribou Management Agreement. Barren ground caribou were assessed in 2016 as Threatened by the COSEWIC and are currently being considered for formal listing under SARA. If listed, critical habitat will need to be defined and protected, and a recovery plan will need to be drafted. Their harvest is regulated under Schedule B of the Wildlife Regulation in Yukon. The Government of Yukon is currently analyzing historical collar data to develop “kernel density” maps (maps of high use, by season) and maps of migratory pathways. These may help the Commission identify key habitats and / or timing windows (TH, personal communication, August 2019)
- The **Fortymile** herd is a large migratory caribou herd that ranges between Alaska and the Yukon, while calving exclusively in Alaska. During its documented peak abundance the herd occupied a range of 256,000 km², half of which fell inside the Yukon as far south as Lake Laberge. Although there is some uncertainty around exactly how large the herd was, it was clear that there were many tens of thousands of animals in the Fortymile Caribou Herd. Several increases and decreases in population have occurred, with the most recent decline seeing the herd reduced to a population size of 5,000 to 7,000 in the early 1970’s. The herd then increased and appeared to stabilize at about 22,000 caribou in the early 1990’s. During this period, the herd ceased to cross the international border into Yukon in large numbers.
- A management plan (*Fortymile Caribou Herd Harvest Plan 2012-2018*) for this herd was originally developed in 2006, by Alaska. TH and Yukon Government are working to develop a harvest plan that will guide future use of this herd in Yukon. Regulations have been developed to enable a licensed harvest (Schedules B and C of Wildlife Regulation) (TH, personal communication

September 2018). The Government of Yukon is currently completing a habitat model for this herd which may help identify key habitats.*

**Information from this study was presented to the Commission February 2020.*

Table 11-2 Population status of caribou herds within the planning region**

Herd	Population Trend	Population Estimate	Last Survey	Survey Method
Porcupine	Increasing	218,000	2017	Photo-count
Forty Mile	Increasing	72,000	2017	Photo-count
Nelchina	Stable	47,000	2016	Photo-count/modeled
Hart River	Stable	2,700	2016	Mark-Resight
Clear Creek	Unknown	900	2001	Stratified random quadrat sampling

***Input for this table came from Government of Yukon personal communication, September 2018 and TH personal communication, September 2018*

The Top of the World and Dempster highways are the two major roads that bisect caribou herd ranges and represent major disturbances to habitat and wildlife, including human disturbance and activity associated with access. A number of other seasonal roads, such as the Hart River Road, Sixtymile Road and the Clear Creek Road, have similar local effects.

11.2.3.2 **Moose**

Refer to Section 3 – Map #16: General Moose and Sheep Habitats



Moose (Source: YG, Department of Environment website)

The area southeast of Dawson City supports a stable moose population at relatively high densities. These areas also experience high moose hunting pressure and contain a relatively large human footprint.

Moose are known to use different habitats based on sex and stage of life history. Habitat selection patterns of adult moose differ from cows with one or more calves, the latter being primarily associated with habitats that provide protection from predators (Dussault et al. 2005 as cited in Morrison and Wong 2012).

Both adult moose and cows with calves were observed to avoid wetland, shrub, conifer and mixed wood vegetation types within their immediate surroundings. The reasons for avoidance are not known, but age of forest stands may be a factor, although the analysis was for the late winter period only (Poole and Stuart-Smith 2006, Lundmark and Ball 2008, both as cited in Morrison and Wong, 2012).

Home range surveys for moose show seasonal elevation migration patterns. In early winter, moose inhabit subalpine areas, but move to river valleys for the remainder of the season, primarily to avoid deep snow (Johnston et al. 1984 as cited in Morrison and Wong, 2012). Late winter habitat is generally found near rivers, in shrub and aspen stands adjacent to mature white spruce trees, which intercept the snow as it falls and keeps it off the ground.

In most years, average annual snowfall is not sufficient to cause moose to move to their late winter range. However, in years of high snowfall accumulation, approximately one in every 10 years, availability of late winter range is critical to survival.

Human disturbance features did not affect habitat selection of cows with calves, and adult moose appeared to prefer areas closer to wider linear features, perhaps for ease of movement through the landscape. (Morrison and Wong, 2012). Conflict along linear features often occurs as moose-vehicle collisions, or through predation pressure by wolves; however, habitat suitability models indicated no avoidance of linear features.

The Yukon Government has drafted a new habitat-based moose density model for a southern portion of the region. This will be presented to the Commission when complete.

11.2.3.3 **Sheep**

Refer to Section 3 – Map #16: General Moose and Sheep Habitats



Dall's Sheep (Source: YG, Department of Environment website)

Alpine tundra and mountain ranges in and to the northwest of the Tombstone Ranges are important year-round habitat for sheep, although large portions of the region known to harbor sheep have never been surveyed. Sheep return regularly to the same winter ranges, lambing areas and migration corridors, and consequently these habitats are considered as key habitat.

Sheep late winter habitat may be characterized as having high elevation, close proximity to rugged and highly convex

topography, southerly aspects and access to escape terrain (i.e., greater than 27-degree slope). Generally, late winter habitat is found on steep, south facing slopes where strong winds and sunshine prevent snow accumulation. Late winter is a critical period, as snow becomes hard packed. Late winter feeding areas are a small portion of the sheep's annual range, and access to late winter habitat is presumed to be a limiting factor for Dall sheep (Barichello et al. 1987 as cited in Barker, 2012). In May and June, ewes give birth on steep cliff faces to reduce vulnerability to predation. Movement corridors are well-worn routes between summer and winter range, mineral licks and other key habitats. Alpine regions near Mount Klotz and the Tombstone Ranges are identified as key winter range.



Grizzly Bear (Source: YG, Department of Environment website)

11.2.3.4 Grizzly Bear

Grizzly bears have been assessed as a species of “Special Concern” by COSEWIC. Grizzly bears require diverse habitats dispersed over large areas and they are susceptible to disturbance by humans. Few studies have been conducted on grizzly bears in the planning region. There is a good understanding of seasonal food requirements for grizzly bears (e.g., soapberry and sweetvetch), but little is known about population or denning ecology. Denning sites are presumed to be limited by the occurrence of permafrost (Pearson 1976 as cited in Government of Yukon, 2011a).

High quality food production and security influence bear habitat preference. Adult females may avoid areas of high quality food production if they are predominated by adult males. Habitat suitability maps based on seasonal food preferences may allow for better prediction of the distribution of grizzly bears.

Other factors affecting grizzly bear distribution include human-caused mortality, territorial behavior, and denning. The primary causes of mortality are hunting, bear vehicle collisions and lethal removal of problem bears from areas with high human density.

Based on expert opinion, habitat suitability and harvest rates, the estimated grizzly bear population in the Dawson Region is approximately 530 bears or 12 per 1,000km² (Government of Yukon, 2011a).

Table 11-3 Estimated Grizzly Bear density in the Dawson Region by ecoregion (Government of Yukon, 2011a)

Ecoregion	Bears per 1,000km ²
Central and North Yukon Plateau	15
Mackenzie Mountains	14
Klondike Plateau and North Ogilvie	11
Eagle Plains	9

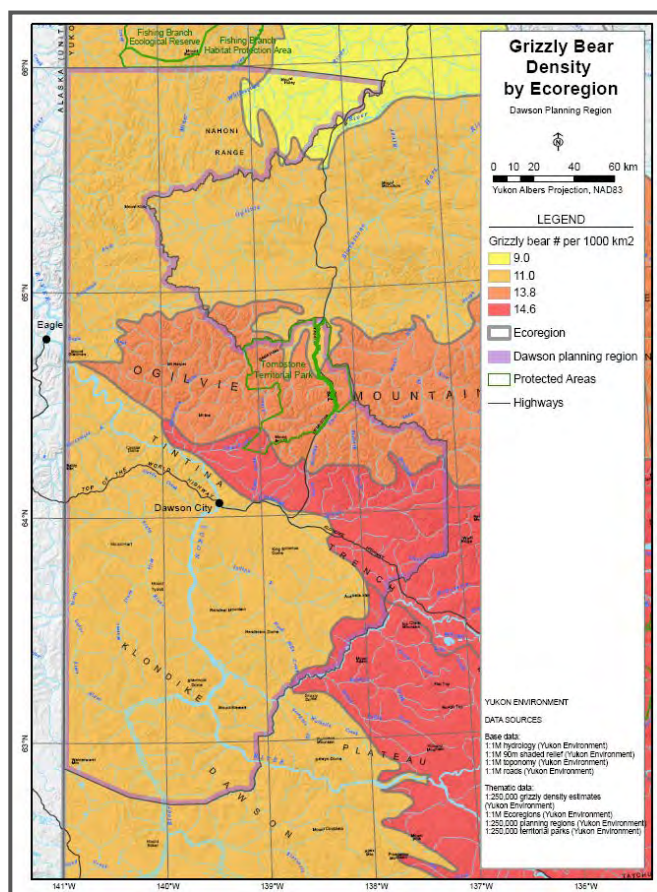


Figure 11-1 Grizzly bear density by ecoregion (Government of Yukon, 2011a)

11.2.3.5 **Lynx**

Lynx populations correlate with abundance of snowshoe hare. Ideal habitat for snowshoe hare consists of early, mid and late successional forests of mixed softwood and hardwood species. These are the areas experiencing frequent but relatively small wildfires.

The Klondike Valley has been identified as having high concentrations of both lynx and hare*. During periods of low relative abundance, this area, west of the Dempster corner, acts as a refugium for hares and lynx. However, this area is in a priority fire protection zone close to human settlement and thus will not likely continue to benefit from periodic wildfire.



Lynx (Source: YG, Department of Environment website)

Areas exhibiting similar disturbance occur as a result of placer mining, but these areas do not become good hare habitat for several decades post-mining. Logging may be an alternative for sustaining lynx/hare cycles, if harvest practices can mimic the natural disturbance patterns of small fires. Outside the Klondike Valley area, little is known about the distribution of either species.

**It should be noted for the Commission that the Dawson Technical Working Group (TWG) has identified the that there is a data gap with regards to the Lynx population status and abundance in the Dawson Region.*

11.2.3.6 **Beaver and Muskrat**

Refer to Section 3 – Map #17: Beaver and Muskrat Habitat

Beavers are fairly common in the planning region, albeit at low relative densities. The few population surveys that have been conducted in the region indicate preference for streams and rivers with extensive wetlands, low stream gradients and relatively little seasonal fluctuation in water levels. Beavers appear to avoid areas of conifer cover, recent forest fire or fluctuating water levels. The ability to store sufficient food for the extended winter season is considered a limitation to the northern distribution of beavers.

Through workshops, local wildlife experts identified the following as important characteristics of good pond-dwelling beaver water bodies:

- They do not freeze to the bottom
- They have a source of inflow and outflow
- They occur in a sequence, rather than as isolated water bodies
- They are surrounded by poplar and willow to provide food and lodge-building materials

While beavers may occupy streams and rivers, within the planning region the use of water bodies appears more common. Beavers often use existing tailings ponds, particularly those surrounded by shrub habitat, or live in culverts.

Colony density is a measure of the quality of beaver habitat. Streams identified as good habitat were Rosebute Creek, Clinton Creek, Eldorado Creek, sections of the Klondike River, Dominion Creek, Indian River, Bonanza Creek, Chandindu River and Davidson Creek.

Muskrat have similar requirements for aquatic habitat, but with greater preference for herbaceous vegetation.

11.2.3.7 **Rare Mammals / Species at Risk**

Mammal species at risk are generally habitat specialists and therefore require high value or unique habitats. The distribution of rare species is poorly understood.

- *Cougars* are specially protected under the *Wildlife Act*.
- *Ogilvie collared lemming* is the only mammal endemic to the Yukon (is not found anywhere else in the world). It is the Yukon's rarest mammal, and is only found within the Tombstone area.
- *The pygmy shrew* is a rare mammal found only on the Blackstone and Fortymile rivers.
- *The woodchuck* is a rare sub-species found in the Indian River area, in the Forty Mile townsite and in the Klondike Valley.
- *Wolverines* were assessed as a species of "Special Concern" by COSEWIC, and as "Sensitive" in the Yukon. Their dens are rarely found and are considered as key habitat. It is believed that deep snow (i.e., greater than one meter) with snow tunnels is an important habitat feature. Dens are not found in densely forested areas; it is suspected that wolverines den in alpine habitats. Along the Dempster Highway, wolverines are associated with taiga and in similar habitat as caribou (Pretzlau 2006 as cited in Government of Yukon 2011a).

Below is a list provided by the Canadian Wildlife Service (CWS) identifying the species at risk that may be found in the Dawson Planning Region (CWS, 2018).

Table 11-4 Terrestrial species at risk that may be found in the Dawson Regional Planning Area. List current at the time of writing (January 2020). As best practice, species that are assessed by COSEWIC but not yet listed on Schedule 1 of SARA should be considered in a manner similar to listed species. The Species at Risk Public Registry should be consulted for the most up to date information on species at risk in a particular area <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>

Terrestrial Species at Risk*	COSEWIC Designation	SARA Status	Government Organization with Primary Management Responsibility**	Recovery Strategy, Action Plan or Management Plan posted on the Species at Risk Public Registry
Bank Swallow (<i>Riparia riparia</i>)	Threatened (2013)	Schedule 1, Threatened	ECCC	
Barn Swallow (<i>Hirundo rustica</i>)	Threatened (2011)	Schedule 1 Threatened	ECCC	
Common Nighthawk (<i>Chordeiles minor</i>)	Special Concern (2018)	Schedule 1 Threatened	ECCC	Recovery Strategy
Horned Grebe (<i>Podiceps auritus</i>)	Special Concern (2009)	Schedule 1 Special Concern	ECCC	
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	Special Concern (2018)	Schedule 1 Threatened	ECCC	Recovery Strategy
Red-necked Phalarope (<i>Phalaropus lobatus</i>)	Special Concern (2014)	Schedule 1 Special Concern	ECCC	
Peregrine Falcon (<i>Falco peregrinus</i>)	Not at Risk (2017)	Schedule 1, Special Concern	YG	Management Plan
Rusty Blackbird (<i>Euphagus carolinus</i>)	Special Concern (2017)	Schedule 1, Special Concern	YG	Management Plan
Short-eared Owl	Special	Schedule 1,	YG	Management Plan

Terrestrial Species at Risk*	COSEWIC Designation	SARA Status	Government Organization with Primary Management Responsibility**	Recovery Strategy, Action Plan or Management Plan posted on the Species at Risk Public Registry
<i>(Asio flammeus)</i>	Concern (2008)	Special Concern		
Collared Pika <i>(Ochotona collaris)</i>	Special Concern (2011)	Schedule 1, Special Concern	YG	
Grizzly Bear <i>(Ursus arctos)</i>	Special Concern (2012)	No Status	YG	
Little Brown Myotis <i>(Myotis lucifugus)</i>	Endangered (2013)	Schedule 1, Endangered	YG	Recovery Strategy
Wolverine <i>(Gulo gulo)</i>	Special Concern (2014)	No Status	YG	
Woodland Caribou, Northern Mountain Population <i>(Rangifer tarandus caribou)</i>	Special Concern (2014)	Schedule 1, Special Concern	YG	Management Plan
Caribou (Barren-ground population) <i>(Rangifer tarandus)</i>	Threatened (2016)	No Status	YG	
Spiked Saxifrage <i>(Micranthes spicata)</i>	Special Concern (2015)	Schedule 1 Special Concern	YG	
Yukon Podistera <i>(Podistera yukonensis)</i>	Special Concern (2014)	Schedule 1 Special Concern	YG	
Gypsy Cuckoo Bumble Bee	Endangered (2014)	Schedule 1 Endangered	YG	

Terrestrial Species at Risk*	COSEWIC Designation	SARA Status	Government Organization with Primary Management Responsibility**	Recovery Strategy, Action Plan or Management Plan posted on the Species at Risk Public Registry
(<i>Bombus bohemicus</i>)				
Western Bumble Bee, <i>mckayi</i> subspecies (<i>Bombus occidentalis mckayi</i>)	Special Concern (2014)	No Status	YG	
Suckley's Cuckoo Bumble Bee (<i>Bombus suckleyi</i>)	Threatened (2019)	No Status		
Transverse Lady Beetle (<i>Coccinella transversoguttata</i>)	Special Concern (2016)	No Status	YG	
Notes: * Fisheries and Oceans Canada has responsibility for aquatic species (not listed here). ** Environment and Climate Change Canada has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the <i>Migratory Birds Convention Act</i> . Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Yukon Government. Populations that exist in National Parks are managed under the authority of the Parks Canada Agency.				

11.2.3.8 Other Mammals

Other mammals present in the planning region include shrew, wolf, squirrel, mice, voles, lemmings, porcupines, coyote, black bear, marten, fox, otter, and bats.

For a complete listing of every mammal and bird species that is known to occur in the planning region (based on best available data from the Government of Yukon, 2011a), please refer to the 2013 RAR.

11.2.4 Birds

The Tintina Trench flyway is a unique and important feature for migratory birds in the Region, particularly during spring and fall migration periods (Personal Communication, CWS 2020),

Refer to Section 3 – Maps #18: Bird Habitats and #19: Migratory Birds

Observations over the past hundred years have recorded 182 species, 76 of which are confirmed to breed and 38 of which spend their winters in the planning region. Tombstone Territorial Park is one of the best places in North America to observe subarctic breeders such as Gyrfalcon, Long-tailed Jaeger, Northern Wheatear and Smith's Longspur (Yukon Bird Club, 2010).

Birds of conservation concern include (CWS, 2018):

Bank Swallow	Barn Swallow	Buff-breasted Sandpiper	Common Nighthawk
Horned Grebe	Olive-sided Flycatcher	Red-necked Phalarope	Peregrine Falcon
Rusty Blackbird	Short-eared Owl		

There are 4 species of grouse and 3 species of ptarmigan. Sharp-tailed grouse occur sporadically in the region with concentrations occurring in the southern half of the region. The species is sensitive to disturbance owing to how subpopulations aggregate in a limited area over the breeding, nesting and brood rearing period.

11.2.4.1 **Raptors**

With the exception of Gyrfalcons, raptors are predatory birds that migrate to the area to breed. Gyrfalcons are year-round residents found where their primary food source of ptarmigan is abundant. Raptors are of conservation concern throughout North America. Raptor key areas have been identified along the Yukon River corridor to the south, and in alpine areas along the Dempster Highway corridor and the Nahoni Range to the north. Summer nesting areas are key because of specialized nesting requirements. Disturbances within two kilometers of nesting sites can damage breeding success (Government of Yukon, 2009).

Local knowledge of Peregrine Falcons suggests the importance of steep cliff faces adjacent to water, where prey such as waterfowl is present. There is no relationship between nesting sites and aspect, or with surrounding vegetation. Unlike Bald Eagles and Osprey, which commonly nest in large trees near the shore of lakes or rivers, falcons and Golden Eagles prefer cliffs, with nests typically occurring at least 25 m off the ground. Breeding pairs will often return to the same nest site year after year. Exact locations of nesting sites are kept confidential to protect birds from illegal activities.

11.2.4.2 **Waterfowl**

The regionally scarce lakes and wetlands in the planning region are valued habitat as areas where waterfowl congregate during spring and fall staging, and for summer nesting and moulting. This is commonly referred to as “staging”. There are key wildlife habitat areas for waterfowl within the Tintina Trench (Personal Communication, CWS 2020) and in the northern portion of the planning region (Personal Communication, TH March 2020). The Flat Creek wetlands are also hotspot for several species, including waterfowl. Refer to **Section 3 – Map #19: Migratory Birds** for more details.

11.2.5 **Invertebrates**

Large portions of the planning region were unglaciated during the Pleistocene and support insect species not found anywhere else in the world. 55 butterfly species were recorded in a survey along the Top of the World Highway and near Mount Klotz (Crispin and Guppy 2007 as cited in Government of Yukon, 2011a). This represents over half of all butterfly species found in the Yukon. 28 species of moths (i.e., 10 per cent of species found in the Yukon), including four globally rare species (e.g., tiger moth) are found in the planning region.

11.2.6 **Fish**

The planning region extends across three major drainage basins. The southern portion of the region drains northwest via the Yukon River; the northern portion drains north via the Porcupine River, then to the Yukon River; and the Blackstone River in the Tombstone Ranges drains eastward to the Peel and Mackenzie drainage.

Freshwater Fish

At least 19 species of fresh water or non-salmon anadromous fish (such as the Arctic Lamprey) are also present in the Yukon section of the planning region. There are very few lakes in lowland areas and some lake dwelling species are absent or at very low levels of abundance. Most populations of all species live only in streams, rivers and off channel

habitats in the summer. Many stocks, such as Arctic Grayling, are highly migratory and move from downstream overwintering areas to upstream summer feeding areas. The lower Porcupine River supports large and migratory populations of various whitefish species which use the river and travel to lakes to overwinter. The fish of the upper Porcupine River are less well known, although large populations of Arctic Grayling have been observed at the Fishing Branch weir. Bering Cisco, a species of “Special Concern” to COSEWIC, has been recorded at Dawson City.

Salmon

- Three species of salmon utilize the planning region, Chinook, and Chum have populations in the Yukon section, and these species are joined by Coho in the Porcupine watershed (Personal Communication, Al von Finster Jan 2020).
- In spite of high levels of suspended sediment near Dawson City, the Yukon River remains an important migratory habitat for juvenile and adult Chinook and Chum salmon.

The overall distribution of spawning is relatively well understood. Less is known of the distribution of rearing and overwintering habitat for Chinook. Chinook from throughout the upper Yukon Basin enter, rear and overwinter in Planning Region streams. Rearing has been documented on the Sixtymile River and tributaries as far upstream as Boucher Creek, on the Fortymile and tributaries to the Yukon/Alaska border and beyond and most streams tributary to the Yukon and Klondike Rivers. A very few overwintering habitats have been identified due to the difficulty in conducting wide ranging winter surveys. Fall Chum Salmon only spawn in high quality ground water discharges and are relatively insensitive to disturbance. They appear to be widely distributed in the Planning Region but at low levels of abundance. The Chum fry move directly to the ocean when they emerge. The portion of the Porcupine River in the Planning Region has received less attention. The spawning distribution of Chinook, Fall Chum and Coho is relatively well understood, but the juvenile distribution is not well known. The Blackstone and other tributaries of the Peel River in the Planning Region are upstream of Aberdeen Falls, which is a barrier to upstream salmon and other fish passage (Personal Communication, Al von Finster, Jan 2020).

Refer to Section 3 – Map #20: Salmon Habitat

11.2.6.1 Fish and Water Body Monitoring

The cultural and economic importance of salmon and their habitats has been recognized through a number of initiatives. These included pipeline related studies in the 1970s; Placer mining related field investigations for stream classifications and effects of sediment

in the 1980s and 1990s; salmon restoration and related studies and initiatives in the 1990s and early 2000s; studies related to the Yukon Queen II cruise ship in the late 1990s and early 2000s; and studies on the Clinton Creek asbestos mine from the early 1980s to present. Activities continue through the TH Chinook Salmon restoration program on the Klondike River and the collection of water temperature data on the North Klondike River. Chinook salmon spawning information has been collected through a series of adult radio-tagging and stream assessment projects (Personal Communication, Al von Finster, Jan 2020).

- **Fish of the Dempster Country Project:** Annual (2013-2016) project established baseline data on fish and their habitat (s) within the southern Dempster region in the Tombstone Territorial Park Highway Corridor. Focus on sites within the (east arm and main-stem) Blackstone River. The report suggested that the Blackstone Drainage area is important habitat for the bio-diversity of the area, but is an area that is experiencing increased pressure from human activities. In addition, the area is considered important habitat for the Northern Dolly Varden, a species identified as special concern by COSEWIC (McHugh, 2017)
- **Coffee-Gold and Northern Access Route (NAR) studies:** have also contributed to the available information on fish in the region (TH personal communication, July 12, 2018).
- **Yukon Placer Secretariat - Fish Habitat Management System:** Monitor water quality, aquatic health and economic health in the Indian River and Klondike River areas in the planning region (Government of Yukon, 2018b).

11.3 Resource Values

11.3.1 Natural Value

Relative to other parts of Canada, the planning region is remote and largely undeveloped. Many areas remain in a highly natural state with low levels of anthropogenic (human-caused) disturbance. The Boreal and Taiga Cordilleran ecozones of Yukon have some of the last extensive boreal, subalpine and alpine habitats in North America (Smith et al. 2004). Fauna occurring in the planning region have remained relatively consistent for over a thousand years. The boreal region is unique in North America for having a strong Pacific salmon run.

Wildlife species are important to habitat composition and function. Beavers, for example, modify surface drainage, regulate water flow and provide habitat for other species. Birds and insects are vital to the dispersal of genetic material such as seeds and pollen. Salmon cycle nutrients from the oceans to the forest.

Wildlife may also have negative influence on natural value. Invasive plant or animal species may compete or even displace native species in the absence of other natural or cultural controls.

Potential conflict with natural values of wildlife may also occur where land use activities result in the loss of habitat, overexploitation (e.g., over-trapping) or fragmentation and loss of connectivity in habitat.

11.3.2 Traditional Value

Our cultural practices and our technology are formed by our land. We have learned how to live with this landscape by responding to the challenges that it presents. Our non-human relatives, especially the salmon and the caribou, are our teachers. We live with them and we live like them. We journey as part of a dynamic and fluid community. As we move through our territory we concentrate and disperse as the land requires.

We are Dënezhu. The people of this land (Appendix D)

The traditional economy depends on sustainable harvesting of fish, wildlife and plants. Harvesting of resources has been an important traditional economic activity for thousands of years. An annual “round” was typical in the traditional economy – people following natural cycles of animal migration and seasonal abundance of fish and plants. People were also opportunistic; they would go to where the resources were or would follow caribou or travel for game. Places of harvest and travel routes might change from year to year.

Salmon and ungulates (principally moose) are an important component of the traditional diet and essential to the good health of the Tr'ondëk Hwëch'in. Caribou are a highly valued source of food, traditional tools and clothing.

Environmental knowledge held the traditional economy together: an in-depth understanding of complex relationships with the natural world that helped ensure survival. Family groups continuously shared information, passing knowledge from old to young throughout their lifetime. People worked together, providing a context for teaching and practice of skills.

Traditional stewardship practices contribute to the health of wildlife habitat, ensuring a sustainable harvest over long periods of time. Selective harvesting was the principle management tool, along with habitat alteration to improve browse, reduce pests, ensure areas for fish spawning or remove obstacles to migration routes. Shifting patterns of harvest activity were used to conserve and rebuild natural resource capital. Elders place the highest priority on the ability to act as active stewards of the land.

Stewardship includes using knowledge about land and wildlife resources as an economy. Guiding and outfitting are traditional activities, but stewardship includes Elders sharing their knowledge and providing guidance in information-based projects. Traditional knowledge provides observations about cyclical patterns in natural populations (e.g., migration, movement, population growth and decline) and changing environmental conditions. During time spent on the land, traditional resource users are front-line observers of environmental conditions and constantly monitor for change or unusual conditions.

Small, mobile family groups would often gather along the Yukon River during late spring and early summer for salmon fishing; boat building; mending of traps, nets and drying racks; and tanning hides. Later in summer, plants and berries would be harvested. Fall was the time to head into the uplands for hunting sheep, caribou and moose in preparation for winter. At strategic locations in headwaters of the Fortymile, Ogilvie and Blackstone rivers, fences were constructed to intercept migrating caribou. As food became scarcer, groups would disperse into small, semi-permanent family fish camps, surviving off of small game, berries and salmon. In early spring, people would harvest freshwater fish (e.g., grayling), small game, waterfowl, beaver and muskrat. In late spring, people would move back to the Yukon River to prepare for fishing, and the round would be repeated. Late summer runs of spawning salmon and the migration of caribou herds through the region in fall are regarded as part of the relationship between the human, natural and spiritual worlds.

Cultural and spiritual values are important considerations. The inherent connection to the land and wildlife for First Nations inevitably results in areas of cultural or spiritual value overlapping with areas of ecological value.

In an “economic value framework” wildlife values are expressed in terms of consumptive use, non-use and indirect benefit (Adamowicz et al., 1991). Consumptive use values have a direct impact on wildlife populations, such as hunting or trapping. Non-use values do not directly affect wildlife populations and include activities such as wildlife viewing, bird watching and study. Indirect benefit comes from the publication of articles, photographs and similar media that express enjoyment and interest in wildlife. In describing the traditional economy, wildlife values might include (InterGroup Consultants, 2008):

- Direct use values – value of meat harvested; value of hides, antlers and furs as inputs to arts, crafts and cultural products
- Non-consumptive use values – value of recreational enjoyment from traditional harvest activity, value of kinship and bonding, value of education in traditional way of life, value of option to defer harvest to future, and the value of leaving resources for future generations

11.3.3 Socio-Cultural Value

Fish and wildlife and their habitats are highly regarded for intrinsic and spiritual values in addition to the benefits associated with consumptive use of wildlife resources or economic activity associated with fish and wildlife harvest. . Within Tr’ondëk Hwëch’in world view all animals are sentient beings, who live their lives as part of a great cycle of reciprocity. For example, the Tr’ondëk Hwëch’in believe that salmon give themselves willingly to humans, returning each year to feed the people, animals, and plants of the region; and contribute to the overall health of the ecosystem. The Tr’ondëk Hwëch’in have had a relationship with salmon for thousands of years, according to archaeologists. Local elders suggest that this relationship has gone on since time immemorial. This is similar of all fish and wildlife species within cultural landscape of the Tr’ondëk Hwëch’in, to whom the first nations maintain an important cultural and spiritual connection (Winton, 2015).

Wildlife and natural scenery are important draws for tourism and recreational activities that benefit the regional economy.

11.3.4 Economic Value

Fish and wildlife habitat is an excellent example of the confluence of economic value and the traditional economy. Commercial uses of wildlife include guided hunting and outfitting, trapping, and wild game meat processing. These activities usually involve few participants and have limited impact on the regional economy relative to the value of ecosystem services and the non-consumptive benefits of wildlife and wild spaces.

In the Dawson Region there are:

- 42 traplines
- 4 outfitting concessions

Traplines in the Dawson Region are subject to the Dawson Region Renewable Resources Council Trapline Allocation Criteria and Guidelines and these stipulate minimum efforts for reassignments of traplines. THFN holds approximately 40% of their guaranteed Yukon Indian People held traplines (70%).

Healthy wildlife and good quality habitat generate economic benefit by attracting visitors from outside the planning region for hunting or wildlife nature viewing, who in turn spend money on local goods and services. The scale of such impacts is regional in nature, as the closure of an area to tourism or recreational opportunity may simply result in a shift of expenditure from one region to another. While expenditures are not an appropriate measure of value for wildlife per se, such approaches allow the regional economic value of wildlife and habitat to be inferred and incorporated into an economic analysis.

Many people in the Dawson area (over 50 per cent of the Dawson City residents surveyed in 2011) prefer wild meat such as moose, caribou and fish, obtained either from personal hunting and fishing or shared within families or through informal barter systems (Conservation Klondike Society, 2011).

When combined with Government of Yukon harvest statistics, the value of local wild meat harvest can be estimated at \$285,000 or 19.4 per cent of the total value of Klondike meat consumption, based on pound-for-pound store replacement value (Conservation Klondike Society, 2011).

11.4 Resource Management

The following sections note legislation and regulations that specifically address fish and wildlife habitat. Other acts and regulations dealing with fish, wildlife, harvest, habitat alteration, water use or other activities may also include measures to safeguard fish and

wildlife habitat. Additional protocols and requirements may also apply if work is being conducted on Settlement Land.

11.4.1 Regulatory Framework

11.4.1.1 First Nations Final Agreements

In Chapter 11 – Land Use Planning of the First Nation Final Agreements it is stated:

11.4.5	In developing a regional land use plan, a Regional Land Use Planning Commission:
11.4.5.8	shall take into account that the management of land, water and resources, including Fish, Wildlife and their habitats, is to be integrated

Chapter 16 – Fish and Wildlife, Section 16, of the First Nation Final Agreements state:

16.3.2	The management and Harvesting of Fish, Wildlife and their habitats shall be governed by the principle of Conservation.
16.4.2	Yukon Indian People shall have the right to harvest for Subsistence within their Traditional Territory, and with the consent of another Yukon First Nation in that Yukon First Nation's Traditional Territory, all species of Fish and Wildlife for themselves and their families at all seasons of the year and in any numbers on Settlement Land and on Crown Land to which they have a right of access pursuant to 6.2.0. subject only to limitations prescribed pursuant to Settlement Agreements.

Chapter 10 – Special Management Areas of the First Nation Final Agreements state:

10.6.0	Relationship to the Land Use Planning and Development Assessment Processes
10.6.1	Special Management Areas established after the effective date of Settlement Legislation shall be:
10.6.1.1	consistent with land use plans approved in accordance with Chapter 11 - Land Use Planning; and
10.6.1.2	subject to the provisions of Chapter 12 - Development Assessment.

This would apply to Tombstone Territorial Park and any alteration to Ni'iinlii njik (Fishing Branch).

11.4.1.2 Canada Wildlife Act

The act allows for the creation, management and protection of wildlife areas for wildlife research activities, or for conservation or interpretation of wildlife. It protects and manages resources to preserve habitats critical to migratory birds and other species.

11.4.1.3 **Migratory Birds Convention Act (Canada)**

The purposes of this act are to regulate the hunting of migratory birds and ensure conservation of migratory bird populations through the establishment of sanctuaries. The act prohibits any person from depositing into water or on area frequented by migratory birds any substance that is harmful to the birds.

11.4.1.4 **Species at Risk Act (Canada)**

This act is aimed at preventing at-risk wildlife species from disappearing, to facilitate the recovery of wildlife species and manage species of special concern. The act permits Canada to protect habitat of endangered or threatened wildlife species.

11.4.1.5 **Yukon Wildlife Act**

The act administers hunting of terrestrial wildlife for non-subsistence purposes and hunting by those who are not beneficiaries of a Yukon First Nation Final Agreement. The act requires a person to have a permit to hunt or trap game animals, game birds and fur-bearing animals. Wildlife hunting and trapping of protected wildlife or in wildlife sanctuaries is prohibited.

Part 2 of this act establishes and regulates outfitting, guiding and trapping. It allows licensed Yukon outfitters the exclusive right to guide non-resident and non-Canadian hunters within established concession areas in Yukon.

The *Wildlife Regulation* (O.I.C. 2012/84), Section 8 describes areas where hunting is prohibited, including:

The act and associated regulations do not apply to Tr'ondëk Hwëch'in citizens or other Yukon First Nation citizens who have obtained written consent from TH to hunt within their traditional territory.

11.4.1.6 **Tr'ondëk Hwëch'in Fish and Wildlife Act (2009)**

This Act protects the right of Tr'ondëk Hwëch'in (TH) citizens to harvest fish and wildlife for subsistence in the traditional territory, provides authority to regulate harvesting on settlement land and ensure it is conducted in a respectful way, and establishes management practices that conserve fish and wildlife species for future generations.

11.4.1.7 **Fisheries Act (1985)**

Section 35 of this Act is meant to prohibit the harmful alteration, disruption, or destruction of fish and fish habitat and section 36(3) of the Act prohibits the deposit of a deleterious substance of any type in Canadian waters frequented by fish. An authorization may be issued for projects in which this will happen, typically with an aquatic effects monitoring program and/or a fish habitat offsetting plan. For much of the region, watershed-based authorizations address placer-mining specifically.

Jurisdictional responsibilities for enforcement of the Act in the Yukon are complicated. The Government of Yukon has responsibility for management of freshwater fish and fisheries including establishing policies and regulations. In all other cases (including fish habitat), the Federal Government retains administration and enforcement responsibility through Fisheries and Oceans Canada. Fisheries and Oceans Canada enforces the clauses related to deposition of deleterious (including sediment), but Environment Canada enforces the pollution prevention clauses (Government of Yukon 2011*b*, p.8 and updated via personal communication with DFO, January 6, 2020).

11.4.1.8 **Yukon Environment Act**

The act ensures management of the environment, preservation of biological diversity and promotes sustainable development.

11.4.1.9 **Parks and Land Certainty Act (Yukon)**

Parks are established under this act to provide protection and management of areas that are of territorial significance. Parks may be established as an ecological reserve, natural environment park, wilderness preserve, recreation park or other type of park as prescribed by regulation. Within a park, all development, use and activity require authorization. Within ecological and wilderness preserves, no industrial development is permitted.

11.4.1 **Policy Direction**

11.4.1.1 **Tombstone Territorial Park**

Tombstone Territorial Park is designated as a natural environment park. A management plan was approved in 2009. Implementation of the management plan is intended to achieve the objectives for the Tombstone Territorial Park as set out in Schedule A to

Chapter 10 – Special Management Areas of the Tr’ondëk Hwëch’in Final Agreement. The Tombstone Management Plan should be considered in the creation of the regional plan (TTPMC, 2013).

11.4.1.2 **Ni’iinlii njik (Fishing Branch)**

Management plans were first established in 2004 and updated in 2010 for the Ecological Reserve, Wilderness Preserve and Habitat Protection Area. The plans work together to protect the cultural, historic and scientific significance of the biodiversity in the area, particularly salmon and grizzly bears; to provide habitat protection; and provide a buffer against human activity that might affect the wilderness values of the area. Ni’iinlii njik Management Plan should be considered in the creation of the regional plan, but is out of the regional planning area.

11.4.1.3 **Forty Mile Caribou Herd Management Plan (In progress)**

It is anticipated that a ‘Harvest Management Plan’ (HMP) will soon be approved and implemented. It is expected to address wildfire management within key caribou habitat, impacts of mineral exploration on caribou and their habitat, and guidance for YESAB review processes in order to mitigate any industrial activity that might affect habitat of the Forty Mile caribou herd. In particular, the importance of their range within the region as habitat for winter use should be emphasized, such that disturbance during that period may be constrained.

11.4.1.4 **Other Stakeholders**

Land claim and trans-boundary agreements established several public bodies to inform decision making on fish, wildlife, habitat and forest in a manner respecting traditional values and traditional economic activity.

Porcupine Caribou Management Board (PCMB) is a co-management board established under a 1985 agreement between Government of Canada, Government of Yukon, Government of the Northwest Territories, Inuvialuit Game Council, Gwich’in Tribal Council and the Council of Yukon First Nations. Objectives of the agreement aim to co-operatively manage, as a herd, the Porcupine caribou and its habitat within Canada so as to ensure the conservation of the herd with a view to providing for the ongoing subsistence needs of native users.

Yukon Fish and Wildlife Management Board (YFWMB), established under Chapter 16 of the UFA is the principal instrument for fish and wildlife management in Yukon.

The Yukon Salmon Sub-Committee was established in the UFA as a sub-committee of the YFWMB and is the primary instrument for salmon management in the Yukon.

The Dawson District Renewable Resources Council was established in Chapter 16 of the Tr'ondëk Hwëch'in Final Agreement (THFA) to provide local community input on resource management decisions affecting fish and wildlife (under Chapter 16 of the THFA) and forests (under Chapter 17 of the THFA) within Tr'ondëk Hwëch'in Traditional Territory, and to provide an advisory role to YFWMB on matters of concern to community members.

Yukon Placer Secretariat was established to coordinate the completion and implementation of the Fish Habitat Management System for Yukon Placer Mining.

11.4.1.5 **Big Game Outfitting Land Application Policy**

This policy facilitates applications for license or leasehold tenure for pre-existing sites with longstanding use by outfitting concession holders. The policy is only intended to allow application for sites that are directly related to the operation of outfitting concessions as authorized pursuant to the Wildlife Act. Sites that are approved for leases or licenses pursuant to this policy are limited to big game outfitting purposes.

11.4.1.6 **Trapping Cabin Land Application Policy**

This policy facilitates the provision of land for trapping cabin purposes. Land tenure for trapping is conditional on trapping concessions issued under the Wildlife Act.

11.5 Risks and Uncertainty

11.5.1 **Climate Change**

A key finding of the Arctic Climate Impact Assessment (ACIA) was that animal species' diversity, ranges and distribution will change as a result of climate change. Habitats are predicted to shift northwards in latitude and upwards in elevation. It is expected that there will be more forest and less tundra in the Arctic, and a general decline in wetlands (ACIA, 2004).

The potential exists for a cascading impact from climate change, especially in arctic systems

where there are fewer species performing similar roles (as prey species, for example). Moss and lichen are particularly vulnerable to climate change. As a primary winter food source for caribou and other species, a decline in moss/lichen leading to a decline in caribou populations would also affect species that hunt them (including wolves, wolverines, and humans) as well as species that scavenge on them (such as red foxes and various birds). The well-being of individuals and local communities dependent on caribou will also be affected (ACIA, 2004).

The effect of climate change can vary between species, or be both positive and negative population factors. Long-term changes in snowfall and the timing of spring may alter the distribution and abundance of moose, caribou and deer. More snow makes movement difficult, and reproductive success is tied to snow patterns and the availability of food in calving season. Less snow may provide better habitat conditions for moose, but facilitate ease of movement for predators. A delay in spring thaw may impact bird migration, while a warmer climate may improve survival of chicks through longer nesting season and increase in food availability (Government of Yukon, 2006).

In the face of environmental stresses associated with climate change, wildlife populations must either adapt to change, relocate to more suitable habitat, or face extirpation and extinction. Species most at risk are those at the edge of their range; those with specific and limiting habitat requirements; those that cannot move easily between areas; or those that adapt less readily to changing environmental conditions. Human activity places additional stress on wildlife populations, which in turn compromises subsistence hunting and fishing.

Ensuring ecological integrity is maintained across a broad range of environmental gradients provides the greatest opportunity for wildlife to adapt to climate change.

11.5.2 Linear Disturbance

Linear disturbance is human caused alterations to the landscape that follow a linear pattern, for example the creation of roads and trails, and seismic lines for mineral exploration. One of the effects of linear disturbance is what is known as habitat fragmentation, whereby a large piece of land is broken up or fragmented into smaller pieces of land (Alexander & Gailus, 2005). This fragmentation can cause a number of issues for wildlife populations because it leads to smaller and more isolated patches of habitat. Not all animals are affected the same way and some species are more sensitive than others to linear disturbance. The species affected can undergo local extinction, negative genetic effects due to inbreeding, and increased vulnerability to natural events such as flood and fires. **Habitat fragmentation is acknowledged as a primary cause of**

species decline worldwide. It is largely recognized that reducing fragmentation and maintaining landscape and habitat connectivity is an important consideration for regional planning (Alexander & Gailus, 2005).

11.5.3 Cumulative Effects

In the Deh Cho Cumulative Effects Study (Ray 2000), Salmo et al. (2004) identified roads as having the greatest cumulative effect because they represent corridors where vehicle traffic is likely to occur, re-vegetation of the right-of-way is prevented, and hunting and vehicular mortality is concentrated. Animals may avoid otherwise suitable habitat areas that lie close to roads. Other linear and surface disturbances such as trails, cut lines, and mined areas can disturb and stress wildlife populations, fragment habitat areas, reduce habitat quality and disrupt traditional harvesting practices. While it may be that activity levels, not roads themselves, are the more likely cause of impact on wildlife populations, all corridors facilitate a greater range and efficiency of predator movement (e.g., wolves and humans). Marten and lynx are particularly susceptible to habitat fragmentation ((Hargis et al. 1999, Koehler and Aubry 1994) as cited in Ray 2000).

11.5.4 Trans-Boundary Management of Caribou and Salmon

Migratory species like caribou and salmon transcend jurisdictional boundaries, and these populations are subject to differing management objectives at the national level.

The Yukon's management emphasis for the Fortymile Caribou herd is to re-establish its former range; Alaska maintains a secondary goal of increasing harvest. In Canada, licensed harvest re-opened in 2020 and Tr'ondëk Hwëch'in actively supports harvesting of this herd (Personal Communication, TH March 2020). Meanwhile, Alaska continues to harvest 2,200 caribou per season, and propose an increase to harvest levels of 15% once the herd reaches 70,000 animals (Personal Communication, TH, March 2020).

The Porcupine Caribou herd is cooperatively managed between the Yukon, Northwest Territories and Alaska under the terms of the Porcupine Caribou Management Agreement. This is done with support from the Porcupine Caribou Management Board (PCMB). In addition, there is an agreement between the Government of Canada and the Government of the United States on the Conservation of the Porcupine Caribou Herd.

In the Yukon, the goal of the Yukon Salmon Sub-Committee is to preserve salmon stocks in order to maintain this vital part of the Yukon ecosystem, economy and lifestyle. The policy of the Alaska Department of Fish and Game is to manage the salmon runs to the extent possible for maximum sustained yield and to allow for spawning escapement to natal

waters in Canada. Management of the Yukon River salmon fishery is complex because of overlapping multi-species runs, the increasing efficiency of fishing gear, allocation issues, and the immense size of the Yukon River drainage (Yukon River Panel, 2013).

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12 PROTECTED AREAS and CONSERVATION OPPORTUNITIES

12.1 Highlights

- The Dawson Planning Region currently includes one protected area (Tombstone Territorial Park - which accounts for roughly 5.5% of the region) and three adjacent protected areas (Yukon-Charley National Preserve, Kit Range / North Cache Creek [SMA] and Fishing Branch Habitat Protection Area).
- When planning for protected and conservation areas, key considerations include ecological representation, landscape connectivity, biodiversity, focal species, site distribution across the landscape, ecological boundaries, area size and climate change resilience.
- Areas of broad conservation interest in the planning region include intact sub-watersheds, river corridors, lichen-rich habitats, wetlands and the Tintina Trench flyway.

12.2 Overview

The purpose of this chapter is to provide an overview of protected areas and conservation opportunities in the Dawson Planning Region. The chapter describes the process and tools that are used in the Territory to identify sites for protected areas and conservation opportunities. In addition, the chapter includes a discussion of broad areas of conservation interest in the region (e.g. river corridors), conservation best practices (e.g. connectivity), and wildlife resources that warrant conservation priority (e.g. specific wildlife habitat needs). Information for this chapter has been provided by the YG Department of Environment (YG 2019) and Tr'ondëk Hwëch'in (2019b), unless otherwise stated.

Protected and conserved areas are the best tool for conserving global, national and regional biodiversity and slowing biodiversity loss. Biological diversity underpins ecosystem functioning and the provision of ecosystem services essential for the health and preservation of all living beings. The importance of maintaining biological diversity is essential for healthy ecosystems and it provides for food security, human health, the provision of clean air and water; it contributes to local livelihoods and economies.

Within Yukon, regional land use planning is currently the primary tool used to identify new protected and conserved areas. These areas not only protect fish and wildlife, their habitats and the broader ecosystems, but also ensure protection of sites with cultural and historical importance, ecosystem services people rely on as well as contribute to climate change mitigation and adaptation.

There are many considerations that go into site selection and network design of protected areas. Yukon Final Agreements, legislation and policy emphasize certain elements of importance. The values of First Nations people also emphasize the importance of protected spaces.

This section describes the site selection elements and site/network design elements that should be considered. It also describes our knowledge and information regarding values within the Dawson Planning Region. There will be additional values of importance to Tr'ondëk Hwëch'in, or other values identified through local or traditional knowledge.

For example, Tr'ondëk Hwëch'in is currently undertaking a substantial project called **Ninānkāk hoʒo wëk'ātr'ënòhcha: Tr'ondëk Hwëch'in Land Stewardship Framework** (LSF). Ninānkāk hoʒo wëk'ātr'ënòhcha is the Hän translation for "We look after our land." The overall purpose for the LSF is to enable us to take strong stewardship actions over the lands and waters in Tr'ondëk Hwëch'in Traditional Territory (TT). This is being accomplished by capturing and recording the essence of our cultural traditions and beliefs Tr'ëhudè ("Our Way of Life") in documents, that describe Tr'ondëk Hwëch'in citizens' relationship to the Land (TH 2019a).

Tr'ondëk Hwëch'in has been working on components of the LSF since October 2018, that include researching and learning about Indigenous Protected and Conserved Areas (IPCAs), and gathering techniques and methodologies from Revitalizing Indigenous Law for Land, Air and Water (RELAW) and the Indigenous Law Research Unit (ILRU) that will be used in creating a values framework. It is expected that information generated from LSF outputs (e.g. mapping products) can be provided to the Commission for consideration by way of TH Technical Working Group (TWG) members (TH 2019a).

We are Dënezhu. The People of This Land

"We are people of this land. It has shaped us for generations and we have cared for it as it has cared for us. The land itself brought our worldview into being. It teaches us that we are an essential part of a bigger environment. We understand ourselves and our place in the world in relation to all other beings. This is the foundation of our identity..."

...Our reciprocal relationship with the land and with each other is fundamental to our existence as Dënezhu. It is the lived expression of Tr'ëhudè. The purpose of reciprocity is the maintenance of relationships. Our existence depends on the principle of mutual benefit gained through an active, long-term exchange of goods, energy, thoughts, ideas, and more. It involves sharing, acknowledgement, gratitude, and humility, all of those principles that ensure our survival. The legacy of relational sustainability is an intact homeland that will continue to support our people. Reciprocity is harmony and balance realized.” (TH 2019a)

12.3 General Concepts

The following are definitions for common concepts in conservation biology:

Biodiversity	“The variety of life found in a place on Earth or, often, the total variety of life on Earth.” (Encyclopedia Britannica, 2019)
Conservation	“Means the management of Fish and Wildlife populations and habitats and the regulation of users to ensure the quality, diversity and Long Term Optimum Productivity of Fish and Wildlife populations, with the primary goal of ensuring a sustainable harvest and its proper utilization.” (THFA, Chapter 1 – Definitions)
Cumulative Effects	Changes to the environment that are caused by an action in combination with other past, present and future actions.
Ecological Integrity	An ecosystem has integrity when it is deemed characteristic of its natural region, including the composition and abundance of native species and biological communities, rates of change and supporting processes (Parks Canada, 2000).
Ecological Thresholds	An ecological threshold is the point at which a relatively small change or disturbance in external conditions causes a rapid change in an ecosystem. When an ecological threshold has been passed, the ecosystem may no longer be able to return to its state by means of its inherent resilience.
Habitat Connectivity	Tracks of intact land intended to facilitate the movement of individual (distinct) wildlife species between areas of core habitat.
Landscape Connectivity	The degree to which the landscape facilitates movement of multiple species among resource patches.
Resilience	Ecosystem resilience is the ability of an ecosystem to resist damage and to recover quickly or ‘bounce back’ after a disturbance such as a fire. Ecosystem resilience is increasingly important with respect to the impact of climate change in the

	north.
Source-sink dynamics	A theoretical model used by ecologists to describe how variation in habitat quality may affect the population growth or decline of organisms. Since quality is likely to vary among patches of habitat, it is important to consider how a low-quality patch might affect a population.
Special Management Areas (SMA)	Areas intended to maintain important features of the Yukon's natural or cultural environment for the benefit of Yukon residents and all Canadians while respecting the rights of Yukon First Nations. Examples may include but are not limited to: Watershed Protection Areas, Territorial Parks and/or Habitat Protection Areas. (THFA, Chapter 10 – Objective and Definitions)

12.4 Regulatory Context

Parks and protected areas may be established in the planning region through federal legislation (e.g. *Canada National Parks Act*), territorial legislation (e.g. *Parks and Land Certainty Act*) or First Nation Final Agreements. For example, territorial parks and protected areas established under the *Parks and Land Certainty Act* provide protection and management of areas that are of territorial significance. The purpose of the Act is to establish parks:

- To implement obligations under settlement agreements;
- To provide for the protection and management of representative areas of ecological significance and other special places in the Yukon;
- To provide recreational opportunities for Yukoners and visitors; and
- To encourage public understanding, appreciation and enjoyment of the Yukon's natural environment as a legacy for future generations.

In addition, the preamble to the *Parks and Land Certainty Act* describes a number of goals and objectives, including recognizing the need to protect at least one representative core area within each of the 21 ecoregions located in the Yukon. According to the Act, parks may be established as an:

- Ecological reserve (no industrial development is permitted);
- Wilderness preserve (no industrial development is permitted); and
- Parks (development, use and activity require authorization);
 - Natural environment Park
 - Wilderness park
 - Other park as prescribed by regulation

For a more detailed description of the regulatory framework related to parks and protected areas, please refer to Chapter 11 – Fish and Wildlife of this report.

The *Species at Risk Act* (SARA) is directed at preventing wildlife species from becoming extinct or lost from the wild, helping in the recovery of species at risk and promoting stewardship. The Act prohibits the killing, harming or harassing of listed species; the damage and destruction of their residences; and the destruction of critical habitat. (CWS, 2018)

12.5 Existing Parks and Protected Areas

Table 12-1 lists existing or proposed protected areas within or in close proximity to the planning region. Existing or proposed protected areas are also shown on **Section 3 -Map #2: Infrastructure, Access and Land Status**. **Figure 12-1** gives a regional scale perspective on the protected areas (existing and proposed) surrounding the planning region.

Table 12-1 Protected areas within or adjacent to the planning region

Within Planning Area*	Directly Adjacent to Planning Area*	Within 50km of the Planning Area
Tombstone Territorial Park (2,200km ² or 5.5% of region)	Yukon-Charley National Preserve, Alaska	Fishing Branch Wilderness Preserve
	Fishing Branch Habitat Protection Area	Devil's Elbow Habitat Protection Area
	North Cache Creek / Kit Range (Peel Watershed SMA)	Wind River and Bonnet Plume Watersheds (Peel Watershed SMA)

**Existing parks and protected areas within and adjacent to the planning region are described in Section 6.2 (Protected Areas) in the Land Status chapter of this report.*

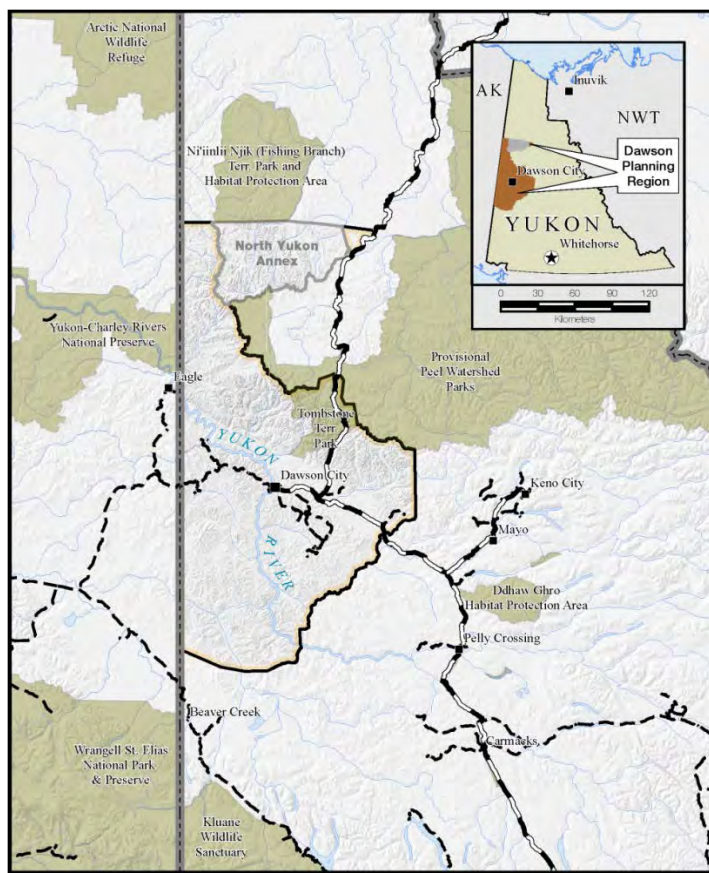


Figure 12-1 Regional scale view of parks and protected areas surrounding the Dawson Planning Region

12.6 Site Selection

Site selection elements are the ecological values that are important to consider when planning for protected areas. The following values will be discussed in this section:

- **Ecological Representation**
- **Areas Important for Biodiversity**
- **Focal Species**

These elements ensure that the full range of biodiversity is included within the protected and conserved area network. Our current knowledge and understanding of all ecosystems, species distribution and occurrences and the processes that sustain biodiversity is incomplete, but we do not need to have all of the specific details to inform planning. Using both **coarse** and **fine filter** approaches help identify sites when considering the protection of biodiversity.

Coarse Filter

Ecoregions and ecodistricts are the coarse filter by which to assess sites for their suitability

to be protected (see **Section 5.5** Ecological and Landscape Classification Frameworks (ELC)). Fine filter seeks to capture specific elements of biodiversity that are either not captured within the coarse filter, or deserve extra site-specific attention beyond the high priority landscapes identified by the coarse filter. It is important to note that all protected and conserved areas have positive outcomes for biodiversity. However, some areas will have a greater positive impact than others. Sites that have overlapping site selection elements are of high value and higher priority to conserve than those with single elements (unless that single element is unique and cannot be captured anywhere else), as these areas will have the greater positive impacts to biodiversity as a whole.

Fine Filter

Data used to inform site specific information for the fine filter elements can come from scientific, traditional or local knowledge.

12.6.1 Ecological Representation

The goal of ecological representation is to have a representative sample of biodiversity to ensure the long-term viability of all species and ecosystems within protected area networks (CCEA 1989 and 1992, Margules & Pressey 2000, Dudley & Parish 2006, Kukkala & Moilanen 2008 and Cooke 2017). It ensures that protected areas are established in the right places so that together they represent the range of ecosystems on the landscape. North American jurisdictions all use a coordinated set of ecoregions that match across boundaries and seek a unified goal of ecological representation.

However, the ecoregion scale is very large to be used as the only metric by which to select areas to ensure ecological representation. Ecodistricts are smaller scale ecological units within each ecoregion which can also be used as biodiversity surrogates (Stoms, et al., 2005).

Ecoregion representation is a goal in the Parks and Land Certainty Act (PLCA). Section 1(b) of the PLCA states that “the purpose of this Act is to establish parks”, in part “to provide for the protection and management of representative areas.” The PLCA Preamble articulates the goal “to protect one representative core area within each of the twenty ecoregions that are located primarily within the Yukon”. There are currently 21 ecoregions in Yukon.

12.6.1.1 **Current State of Ecological Representation within the Planning Region**

Ecoregions within the Dawson Planning Region are shown on **Section 3 - Map #5: National Ecological Framework**. Ecoregion boundaries for Yukon have been recently redrawn based upon improved information. Within the Dawson planning region, this resulted in the creation of one new ecoregion. The McQuesten Highlands is a new ecoregion that has been created based upon improved information. It is made up of portions of the original Yukon Plateau-North and McKenzie Mountain ecoregions. The boundary of Yukon Plateau North has been amended such that it no longer occurs within the Dawson Planning Region.

Table 12-2 shows the percentage of each ecoregion within the planning area in addition to how much of the ecoregion is currently protected in the Yukon.

Table 12-2 Ecoregion Assessment for the Dawson Planning Region

Ecoregion	Percent of Ecoregion within Planning Region	Percent of Ecoregion Currently Protected*
North Ogilvie Mountains	26.24	25.48
Eagle Plains	4.54	7.02
Mackenzie Mountains	7.85	6.5
McQuesten Highlands	40.53	3.24
Klondike Plateau	57.56	0
Yukon Plateau-Central	3.36	0.87

*In total for Yukon including portions outside of the planning region

12.6.2 **Areas Important for Biodiversity**

Areas important for biodiversity should be considered at the ecosystem, species and genetic level (i.e. species at the edge of their range). Areas important for biodiversity can include areas with:

- threatened species or threatened ecosystem types;
- geographically restricted species;
- geographically restricted assemblages;
- geographically restricted ecosystem types;
- wholly intact ecological communities with supporting large-scale ecological processes;
- key or critical habitat and resources; and/or
- ecological hotspots (IUCN, 2016).

12.6.2.1 Threatened Species or Threatened Ecosystem Types

This group includes species assessed by COSEWIC and/or listed on Schedule 1 of the federal *Species at Risk Act (SARA)*. They include species that have been assessed as endangered, threatened, or species of special concern. This group also includes species listed as “specially protected” under the *Yukon Wildlife Act*.

Species known to occur within the Region that have been assessed by COSEWIC and/or are listed on Schedule 1 of SARA are listed in Chapter 11 (see Table 11-4). As best practice, species that are assessed by COSEWIC but not yet listed on Schedule 1 of SARA should be considered in a manner similar to listed species (Personal Communication, CWS 2020).

12.6.2.2 Geographically Restricted Species

These species are classified as rare and unique, either on a national or territorial basis. Geographically restricted species found within the Dawson Planning Region are listed in **Chapter 11 - Fish and Wildlife Habitat**. This also includes species **endemic** to Beringia.

Endemic Species are species (plants or animals) that are only found in one geographic location and nowhere else in the world.

12.6.2.3 Geographically Restricted Assemblages

These are groups of species that are nationally or territorially restricted in area. Within the Dawson Planning area, this category includes groups of species related to Beringia.

12.6.2.4 Geographically Restricted Ecosystem Types

These are nationally or territorially rare and unique ecosystems, habitats and landscapes. Within the Dawson Planning Region, this includes:

- **Intact forest that is greater than 140 years old** - Old-growth forest is limited across the planning region. It provides important habitat for several mammal, bird and invertebrate species through its unique structural and compositional qualities (e.g., decaying trees and abundant coarse woody debris).
- **Unglaciaded areas greater than 1,300 m in elevation** - These areas are considered important seed sources for post-glacial re-instatement of subarctic boreal conifers across western North America (Savidge, 2012).

- **Areas with dolomite or limestone dominated bedrock** that were unglaciated - These areas typically support rare plants and insects.
- **Wetlands** – These areas support a high level of biodiversity compared to other ecosystem types in Yukon, providing habitat for birds, mammals, amphibians, fish, invertebrates, and plants. Compared to elsewhere in the territory, wetlands are in low abundance across the Dawson Planning Region which increases their importance to the area.

12.6.2.5 **Wholly Intact Ecological Communities with Supporting Large-Scale Ecological Processes**

Protection of intact, large natural landscapes is a key consideration for biodiversity conservation. Large intact ecosystems with minimal human disturbance are more likely to have high ecological integrity including intact ecological functions and processes. These areas are also likely to be more resilient to natural disturbances and climate change. Protected areas that are large with minimal human disturbance are able to sustain the natural functioning and evolution of ecosystems on a long-term scale.

12.6.2.6 **Key Habitat and Resources**

These areas are important to key wildlife life cycle events or individual and population health. They can play an important role as wildlife resources (i.e. mineral licks) that are used by many different wildlife species. Higher species abundances are typically found in these areas or higher numbers of a single species congregating in one area at specific times of the year (i.e. caribou calving grounds). If these habitat areas or resources are disturbed or destroyed, there can be significant impacts to population numbers or animal health.

SARA defines critical habitat as the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species. In addition, protection of important wildlife habitat is mandated under Yukon's *Wildlife Act*. Under the Act, Habitat Protection Areas may be designated because of the sensitivity of the area to disturbance, the likelihood of disturbance and the importance of the area as habitat for any population, species or type of wildlife.

Key habitat and resources that are known to occur, or are likely to occur, within the Dawson Planning Region include:

- Mineral licks;
- Sensitive fish over-wintering, and summer rearing habitat;
- Bear denning areas;
- Winter range, and calving and rearing areas for ungulates (moose, sheep, and Fortymile, Clear Creek, Nelchina, Hart River and Porcupine caribou herds) (Tr'ondëk Hwëch'in, 2012);
- Fish spawning habitat;
- Raptor nesting habitat;
- High-alpine rocky outcrops;
- Waterfowl migration staging areas; and
- Colony nesting bird habitat.

12.6.2.7 **Ecological Hot Spots**

Ecological hot spots are areas characterized by high biodiversity, ecological productivity, or high levels of endemic species and subspecies. These areas serve as refugia during landscape-level disturbance events (e.g. forest fires) and enhance **ecosystem resilience** in a changing climate.

Ecological hot spots known to occur within the Dawson Planning Region include all wetland types and areas with dolomite or limestone dominated bedrock that were unglaciated (see discussion above in “Geographically Restricted Ecosystem Types”).

12.6.3 **Focal Species**

Focal species are animal and plant species that provide an essential ecological function or that are indicative of essential habitat conditions. There are many other reasons why focal species are identified, but they are most often wildlife species. Focal species in the Dawson Planning Region include:

- Barren-ground caribou;
- Woodland caribou;
- Raptors;
- Sheep;
- Moose;
- Grizzly bear;
- Salmon;

- Wolf;
- Wolverine; and
- Collared Pika (due to its narrow range of potential habitat).

Refer to **Chapter 11 Fish and Wildlife Habitat** for more information on focal species specific to the Dawson Planning Region.

12.7 Key Considerations in Site and Network Design

A variety of important criteria should be considered when identifying and designing protected areas. The design features described below help to ensure long-term ecological viability, resilience, and adaptability not just within the protected area network, but also within the broader ecosystem.

12.7.1 Distribution Across the Landscape

No area would adequately capture all of the biodiversity representative of the whole planning region. As such, the establishment of geographically distinct protected and conservation areas is essential. Even within an ecoregion or ecodistrict, biodiversity is not evenly distributed. Depending on the size and specific location of a protected area, several protected areas of adequate size may be needed to achieve all of the protected and conserved area network goals.

12.7.2 Ecological Boundaries

12.7.2.1 Natural Boundaries

The boundaries of protected and conserved areas should be designed to ensure the ecological integrity of the site. The shape of a protected area can affect ecosystem function and the health of wildlife populations within a protected area. Clear boundaries can help in clarifying and enforcing where a protected area is located. Boundaries should be proposed that can be easily identified (e.g. heights of land, waterbodies). In both cases, using ecological boundaries to define site boundaries is best.

12.7.2.2 Watersheds

Watersheds are key to defining ecological structure, function and productivity on the landscape. Incorporating whole watersheds is the most effective tool for ensuring high water quality through the protected area. Watershed boundaries can also be used to

define planning areas (e.g. landscape management units). If a whole watershed cannot be included within a protected area, it is important to include upland areas in addition to their more biologically diverse associated lowland areas. The same concept applies to ensuring that upstream areas are included if the specific areas of focus are in a downstream area.

Sites based on watershed boundaries are the most effective approach for managing conservation, recreation, and other values. Watershed-based protected areas encompass ecological boundaries, are practical to implement and to recognize on the ground, and can be scaled or aggregated/subdivided by referring to higher/lower order watersheds. They should apply to whole drainage basins including headwaters.

12.7.2.3 **Ecotones**

Higher levels of biodiversity may be found where ecological boundaries meet. These areas are called **ecotones**. For example, where two different ecodistricts meet you can find species that are typical of both ecological units in that area. Including ecotones within protected areas can be an effective method of preserving biodiversity.

12.7.3 **Size**

Determining the size of a protected or conserved area requires consideration of several key factors. If the purpose of the site is to protect a single definitive species feature located in a fixed area (e.g. Coal River Springs Ecological Reserve) the site needs to be large enough to ensure that the feature and any associated functions are maintained. If the purpose of the site is to be ecologically representative, or to conserve the ecological integrity of an intact landscape then the site will need to be larger.

Research suggests that areas should be large enough to accommodate major landscape disturbances such as wildfires, insect outbreaks and climate change (Cooke 2017; Government of Yukon 2019). For example, “a conservation area that is too small could lose characteristic ecosystems and biodiversity elements, such as old growth forest stands and associated biodiversity, in a single fire event” (Cooke 2017, p.22). Historically, the dominant disturbance type in Yukon has been wildfire (Bormann and Likens 1979; Shugart and West 1981). However, pressure from human activities also needs to be considered and research indicates that areas should be large enough to minimize human impacts from outside the protected area (Jones et al. 2018). For example, the effects of increasing linear and surface

disturbance should be considered when planning for conservation areas in the Dawson Planning Region.

The habitat requirements of umbrella species can also be used to help define the size of protected and conserved areas. Umbrella species have significant conservation value by virtue of defining the spatial needs in which most other species in the ecosystem are likely to be protected.

In terms of landscape resiliency, recent research in conservation biology suggests that in order to be effective at preserving biodiversity, protection of 25-75% of terrestrial areas may be required (Cooke 2017; Coristine et al. 2018; Dinerstein et al. 2019). In this regard, “protected area conservation should include areas of particular importance for biodiversity and ecosystem services that are ecologically representative and well-connected and integrated into the broader landscape” (Coristine et al. 2018)

12.7.4 **Connectivity and Resilience**

Ecological connectivity is important between areas of high conservation value both within and adjacent to the planning region. Retaining landscape-level connections between habitats is integral to healthy, resilient and sustainable ecosystems (Cooke 2017; Coristine et al. 2018). A well-connected network does not mean that all sites within the network need to be touching or in very close proximity; it means that species are able to effectively move between sites and across the landscape.

Connectivity is structural (physical) and functional (behavioral). For example, in mountainous regions, mountain blocks can be impediments to functional connectivity, where valleys and mountain passes are important movement corridors.

In addition, there is a strong relationship between landscape connectivity and resiliency such that the “resilience of populations and species can be fostered through strategic protection of areas that increase connectivity” (Coristine et al. 2018, p.539). Landscape connections promote the natural movement of wildlife and function as corridors for biological genetic exchange. Connecting landscapes through corridors also “reduces species loss, improves core ecosystem functions, and can contribute to the provision of some ecosystem services, such as pollination (Coristine et al. 2018, p.540).

When planning for landscape connectivity and resilience, the concept of ecological thresholds should also be considered. An **ecological threshold** is the point at which a

relatively small change or disturbance in external conditions causes a rapid change in an ecosystem. When an ecological threshold has been passed, the ecosystem may no longer be able to return to its state by means of its inherent resilience. For example, the application of ecological thresholds can be a useful management tool when addressing issues related to the conservation of threatened flora and fauna, the impact of habitat loss, or the effects of fragmentation on terrestrial species.

12.7.5 Climate Change Resilience

Land use planning in the north needs to consider the impacts of a changing climate. Some of the effects of climate change are already being experienced in the planning region such as permafrost thaw, increasing risk of wildfires and habitat change (Rowland et al. 2016). Planning for climate change resilience supports conservation objectives by allowing wildlife populations to adapt to shifting habitats and ultimately helps to prevent extirpation and extinction.

In addition, a researcher at the University of Alaska Fairbanks is finalizing a map and analysis of important areas in Yukon and Alaska for connectivity under climate change scenarios. If available, this work could be considered as the planning process progresses.

In summary, the following criteria should be used to maximize an ecosystem's resilience to climate change (refer to the *Dawson Regional Land-use Plan Preliminary Conservation Values Assessment*, Government of Yukon, 2012 for further details on each of these strategies):

- Protect adequate and appropriate space;
- Represent vegetation types and diverse gene pools across environmental gradients;
- Limit the stresses on ecosystems;
- Use adaptive management and strategy testing;
- Design for complexity, resiliency and redundancy;
- Design across multiple scales;
- Include areas along climatic gradients; and
- Promote connectivity and avoid fragmentation.

12.8 Priorities and Opportunities

12.8.1 Ecologically Important Features and Wildlife

Tr'ondëk Hwëch'in has identified wildlife habitat that warrant conservation priority including:

- Key areas for caribou herds, including the Fortymile, Clear Creek, Nelchina, Hart River and Porcupine caribou herds;
- All mineral licks; and
- Moose, sheep, fish, and their habitats (Tr'ondëk Hwëch'in 2018).

Tr'ondëk Hwëch'in have also expressed the importance of protecting the boreal forest, which supports a wide range of values including wildlife habitat, ecological health, carbon sequestration, and a sustainable renewable resource economy.

In addition, submissions from the Canadian Wildlife Service (CWS, 2018) highlight the importance of considering migratory birds and species at risk. Key considerations include, but are not limited to, the following:

- **Tintina Trench Flyway** – This is a unique and important feature for migratory birds in the Dawson Planning Region, particularly during spring and fall migration periods.
- **Caribou** – Barren-ground caribou, which includes the Porcupine Caribou Herd (PCH), were assessed as Threatened by COSEWIC in 2016. Consultation is currently underway regarding the listing of the species on Schedule 1 of SARA. In addition, the expanded use of the Fortymile and Nelchina caribou herds in the planning region should also be reviewed and considered.
- **Spiked Saxifrage** – Assessed by COSEWIC in 2015 as a species of Special Concern, occurs in the Region. Active placer and/or quartz mining claims occur on or upstream of the plant's habitat on seven of the twelve subpopulations, representing about 70% of the Canadian population. This plant currently has no legal protection in Canada however consideration should be given to the protection of stream reaches that host this species from further development.

Ecologically important features for priority consideration are shown on **Section 3 -Map #8: Unique and Special Landscape Features**.

12.8.2 Areas of Broad Conservation Interest in the Region

Areas of broad conservation interest include intact areas, representative of natural environmental variation, that are sufficiently large enough to represent benchmarks of natural ecosystem dynamics, ecologically functional wildlife populations, and terrestrial and hydrologic connectivity (Cooke and Reid 2012). No single area would adequately

represent the whole planning region, and therefore the establishment of geographically distinct ecological benchmarks is essential for landscape-level conservation and adaptive management. During subsequent phases of work on the land use plan, an analysis of conservation values within each of the broad geographic areas described below may be used to identify candidate areas for prioritizing conservation (Government of Yukon 2012).

12.8.2.1 **Beringian Connections - Northern Area**

The Northern area is the portion of the planning region north of Dawson City and includes the Ogilvie Mountains north to the Nahoni Range. This area is rich in limestone and has a unique ecology represented by a suite of rare Beringian endemic species, both plants and insects, that is not present to the south. Opportunities for conservation focus in this region include:

- *Tatonduk River – high conservation values and trans-boundary connection to Yukon-Charley Rivers National Preserve in Alaska*

The Tatonduk River watershed is of high conservation value as it features a diversity of Beringian endemics and is currently in a natural state and ecologically intact. The area features unglaciated limestone/dolomite mountains and is known to have permanent freshwater springs. The planning process offers the opportunity to develop connectivity with existing protected areas in Alaska. Conservation-based management of the Tatonduk would link the Yukon-Charley Rivers National Preserve in Alaska through to LMUs 1 and 2 in the Peel Watershed Planning Region as per the final recommended plan (Peel Watershed Planning Commission 2011).

- *Ni'iinlii Njik (Fishing Branch) Habitat Protection Area (HPA) southern boundary*

Currently, the southern boundary of the Fishing Branch HPA is delineated by the northern boundary of the Tr'ondëk Hwëch'in TT. This area is no longer within the Dawson planning region but is included in the North Yukon Annex. **The North Yukon Annex** area which contains the Porcupine Headwaters and the Miner River watershed presents opportunity to delineate a planning unit that connects and is consistent with the HPA, which protects the Miner River watershed. This area includes a collection of overlapping conservation values, including many ecological hotspots and rare/sensitive habitats.

Through interviews conducted for the 2011 Tr'ondëk Hwëch'in Resources Assessment Report, the northern portion of the planning region was identified by Elders as highly important, and incompatible with development. This sentiment has recently been

supported by TH Chief and Council, which recently passed a resolution opposing new land use applications, land developments, Class 1 activities, and mining activities within an area north of the Yukon River and Klondike Highway until a land use plan is agreed upon by the Parties. This area is of high conservation value for the Tr'ondëk Hwëch'in for both ecological and cultural reasons (TH 2019b).

12.8.2.2 **Intact Sub-Watersheds - Southern Area**

The Southern area is the portion of the planning region south of Dawson City. It includes the Klondike Plateau and the northern edge of the Dawson Range. This area lacks the extensive limestone that characterizes the north, and therefore has a distinctly different ecology. This area also supports a unique assemblage of endemic species, particularly plants, that is not represented to the north. Conservation of intact sub-watersheds in the Southern area would serve both to represent and protect unique endemic species, as well as ecological benchmarks (Cooke and Reid 2012). There are numerous sub-watersheds in the southern portion of the region that reflect conservation values criteria including the:

- North Ladue River;
- Indian River;
- Sixty Mile River;
- Matson Creek; and
- Scottie Creek.

The extreme southwest corner of the region includes the upper reaches of the Scottie Creek wetlands in the Tanana watershed with connectivity to the nearby Tetlin National Wildlife Refuge in Alaska.

12.8.2.3 **River Corridors**

The ecology of the planning region, particularly in the central and southern portions, is largely defined by the dominant river systems, which are the Yukon and Stewart Rivers. Not only do these corridors hold high recreational and cultural value in the region, but the Yukon River features habitats and species that are not represented elsewhere in the planning region. Focal species habitats along the Yukon River include peregrine falcon, sheep and salmon. The Stewart River also supports exceptional fish and wildlife populations. Other key river corridors in the planning region should be assessed for conservation values, in addition to other tributaries identified through local knowledge workshops. These include the:

- White River;
- Klondike River;
- North Klondike River;
- Sixty Mile River;
- North Ladue River;
- Indian River
- Forty Mile River;
- Tatonduk River;
- Fifteen Mile River;
- Chandindu River;
- Hamilton Creek;
- Coal Creek;
- Blackstone River;
- Miner River (NY Annex); and
- Whitestone River (NY Annex).

12.8.2.4 **Wetlands**

Since 2011, TH has become increasingly aware of wetlands within their Traditional Territory, and how development, particularly placer mining, is altering these ecosystem types. Wetlands provide habitat for wildlife, such as moose and waterfowl, and also offer services to the surrounding environment, such as water filtration, flood protection and carbon sequestration. These services benefit wildlife, hydrological and terrestrial systems, and the people (TH 2018).

TH was asked to provide a description of the socio-economic value of wetlands in the Indian River valley as well as the socio-economic impacts of wetland destruction. The document titled *Socio-economic Value of Indian River Wetlands to Tr'ondëk Hwëch'in Citizens* (2018) outlines key points related to TH values, stewardship, effects, and traditional law related to wetlands. In summary, the document speaks to the importance of conservation from both biophysical and socio-economic perspectives.

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13 MINERALS

13.1 Highlights

- For over a century, Yukon economic development has been closely linked to its mineral deposits.
- There is a positive outlook for the long-term health of the mining industry in the Yukon.
- Hard rock (quartz) mining and placer mining are distinct and different land use activities; each has its own unique pattern of exploration, development, production and reclamation.
- As of September 2019, there are 39,466 active quartz claims in the planning region covering an area of 7,778.9 km², or 19.52% of the region.
- Hard rock mineral exploration is a significant economic activity within the planning region. In 2018, exploration expenditures in the region reached a record high of \$147 million.
- As of July 2019, there are 14 active mineral exploration projects in the planning region being undertaken by nine companies (or individuals). These projects employ over 400 workers (both full-time and temporary) of which 13% are First Nations people and 11% live in the Dawson area.
- The Coffee Gold Project is a proposed open-pit gold mine that is expected to be in operation for 8-10 years with potential for extension. The mine is expected to contribute \$251.1 million to the Yukon economy annually during production and contribute \$427.5 million to government revenues, in the form of taxes and royalties, over its lifetime.
- In 2017, placer gold production in the Yukon was an estimated value of \$120 million.
- The Dawson Placer Mining District is by far the most productive placer mining district in the territory.
- As of July 2019, there are 18,867 active and pending placer claims in the planning region covering an area of 1,434km² or 3.6% of the region. Claims are primarily located within the watersheds of the Klondike, Indian, West Yukon (Fortymile, Sixtymile and Moosehorn Range rivers) and Lower Stewart Rivers.
- Mineral claim and lease staking can impact ecological and cultural values.
- Mineral exploration is an extensive activity with potential for adverse cumulative effects on ecological and cultural resource values.
- Hard rock mine development occurs on a very small footprint, but with potentially significant and enduring environmental and socio-economic impacts.

13.2 Description of Resource

Mining and quarrying are major contributors to Yukon's economy, accounting for almost 20% of total real GDP. Mineral production in the Yukon is estimated to be \$460 million per year. Since 2000, the Dawson planning region has experienced a significant level of exploration activity and, with the discovery of the White Gold occurrence in 2007 and the Coffee Creek occurrence in 2010, the level of exploration has increased dramatically. Between 2000 and 2018, over \$495 million has been spent on quartz exploration in the region. In 2018, exploration expenditures were more than \$147 million (Government of Yukon, 2019a).

The Dawson Goldfield is cited as a significant producer of gold in the Yukon over the last century. From 1978 to 2014, the total value of extracted placer gold in the region is around \$1.3 billion and on an annual basis placer mining contributes approximately \$90 million to the Yukon economy (Government of Yukon, 2016b, 2019a). Compared to the rest of Yukon, the Dawson region (Klondike Plateau portion specifically) supports approximately 85% of the placer mining activity based on the number of claims and productions value (Government of Yukon, 2019a).

13.2.1 Historic Land Use

Prior to the arrival of European explorers to the Yukon, gold was of little interest, though First Nations people did recover native copper nuggets from areas such as the White River southwestern Yukon to use in tool implements. One of the greatest concentrations of copper arrow points in the Yukon has been found in an area around the Indian River and Sixty Mile Rivers. These objects date to around 1,000 years before present (Tr'ondëk Hwëch'in, personal communication, September 2018).

In 1874, coarse gold was discovered on a tributary of the Liard River. In 1885, significant quantities of gold were found on bars of the Stewart River. Gold was first discovered in the Fortymile area on both sides of the border in 1886. By 1893, the Sixtymile district had active mining on both Miller and Glacier Creeks.

On August 17, 1896, the chance discovery of a gold nugget on Rabbit Creek (later renamed Bonanza) set off the Klondike Gold Rush. By 1900, over a million ounces were being mined in a season, at that time completely by hand. Large-scale mining, with dredges and heavy equipment, began in later years.

Early discoveries of placer gold led to a rapid influx of prospectors in the Klondike Gold Rush during the latter part of the 1890s. By the early 1900s, the most easily accessible

placer deposits had been extensively sluiced and dredged. Royalty records, which represent the minimum amount of gold production, show that over 16.6 million crude ounces (518 tonnes) of placer gold have been produced in the Yukon since the discoveries at Fortymile.

For over a century, Yukon economic development has been closely tied to its deposits of lead/zinc, gold, silver, tungsten, molybdenum, nickel and iron. Past and present mining is a significant element of the Yukon cultural landscape; most notably those activities associated with placer operations along the creeks and valley bottoms in the “Goldfields”.

Designated national historic sites acknowledge the important role the historic events associated with the gold rush had in shaping today’s relationship between Yukon First Nations people and newcomers. Extensive background material exists on historic mining details the evolution of this cultural landscape (for example, see bibliography in Hogan 1995).

13.2.2 **Hard Rock (Quartz)**

Hard rock minerals are base or precious metals including gold, silver, copper, zinc and other elements found in veins or lodes. Minerals are found in a variety of host rock types, each with varying potential for grade and tonnage of valuable metals.

13.2.2.1 **Mineral Potential**

The unique and complex geology of the Dawson planning region contains well-documented areas of high mineral potential. As of August 2019, the Yukon government MINFILE database indicates 334 mineral occurrences in the Dawson region, out of 2,498 occurrences recorded Yukon-wide. Gold is the primary target but copper, silver, zinc and lead occurrences have also received advanced exploration activity.

See Section 3 – Map #21: Mineral Potential

Actual economic value of deposits at any market price is affected by many factors, including ease of development, rates of recovery, value of commodities and accessibility to markets.

Mineral potential assessments were last carried out in Yukon over the period 1999 to 2001. The mapping was conducted using a quantitative method for prediction of undiscovered deposits developed by the United States Geological Survey. The process involved estimating the number(s) of undiscovered mineral deposits which could potentially occur in

geological tracts. These maps are now considered dated given advances in both YGS work and industry exploration since then, and needed to be updated.

To this end, a **generalized** mineral system approach to mineral potential mapping for land use planning has been developed by YGS. The process is based on actual data and while the amount, quality and vintage of data in different parts of Yukon varies, the fundamental principles utilized in prospectivity mapping going forward will remain the same to ensure uniformity and consistency of output.

The process makes use of mineral system components that may contribute to the development of metal accumulations in an area generally, in this case the area in which land use planning activities are taking place. This is supplemented by additional information including: mineral deposit information; claim data; assessment report footprints; and stream sediment sample data. The claim and assessment report footprint data represent a significant store of intellectual capital.

The procedure makes use of block modeling techniques where each unit cell is assigned a prospectivity score and, separately, a confidence score. Scores are calculated based on the presence or absence of mineral potential elements within each cell. Buffers and factors are used to appropriately weight the input parameters. Mineral potential maps are generated based on the contrasting cell values.

See **Appendix A – *New mineral potential mapping methodology for Yukon*** for further details on the mineral potential assessment that is discussed above. (Bullen, 2020)

Map # 21: Mineral potential (Section 3) as created by YGS has been explicitly designed to accommodate land use planning and decision making in the territory. The goal of the map being to reduce overly complicated representations of mineral potential data, and to present the information in a way that is logical to non-experts. As noted in the methodology description above, each cell of the map (2kmx2km) was allocated a colour representing its ranking in terms of prospectivity and confidence based on data.

Below is the legend used in the mineral potential map (**Section 3 - Map # 21: Mineral Potential**).

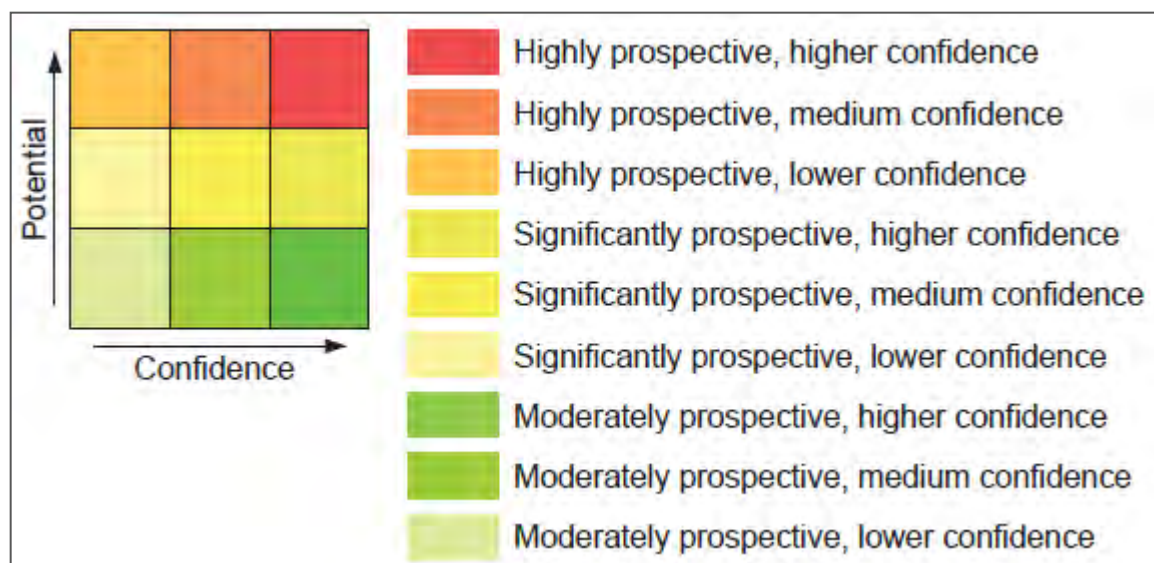


Figure 13-1 Mineral Potential Map legend Prospectivity and Confidence ranking (Bullen, 2020)

13.2.2.2 Quartz Claim Staking

The process of exploration and development of hard rock minerals begins with prospecting. The free-entry system allows anyone 18 years of age or older to enter onto land available for mining purposes to prospect, locate and mine for gold and other precious minerals or stones. Under an orderly system for allocation of mineral rights, staking and recording of a mineral claim provides the holder with an exclusive right to publicly owned mineral substances from the surface of their claim to an unlimited extension downward vertically.

- Staking may only occur on “open ground,” this excludes:
 - Land that is not already subject to mineral claims;
 - Other land uses which cannot be displaced (e.g., yard of a house, park or Special Management Area, cemetery or burial ground);
 - Category A Settlement Land – although claims on Category A Settlement lands (claims that were staked prior to the signing of the Final Agreement) are grandfathered as long as they are maintained in good standing;
 - Agricultural land; and
 - Other land withdrawn by Government of Yukon through an Order in Council.

A quartz mineral claim may be no more than 457 m by 457 m (1,500 feet by 1,500 feet), although fractional claims may be allowed where ground is bounded by existing claims.

Once the Yukon's Chief Geologist certifies that a vein or lode has been discovered within the bounds of a claim, the holder may request a more secure form of mineral tenure by way of a lease to the subsurface of the claims. Quartz leases are issued for 21 years and can be renewed for a further 21 years, provided terms and conditions of the lease are met. Quartz leases are not subject to annual work requirements.

As of September 2019, there are 39,466 active quartz claims in the planning region

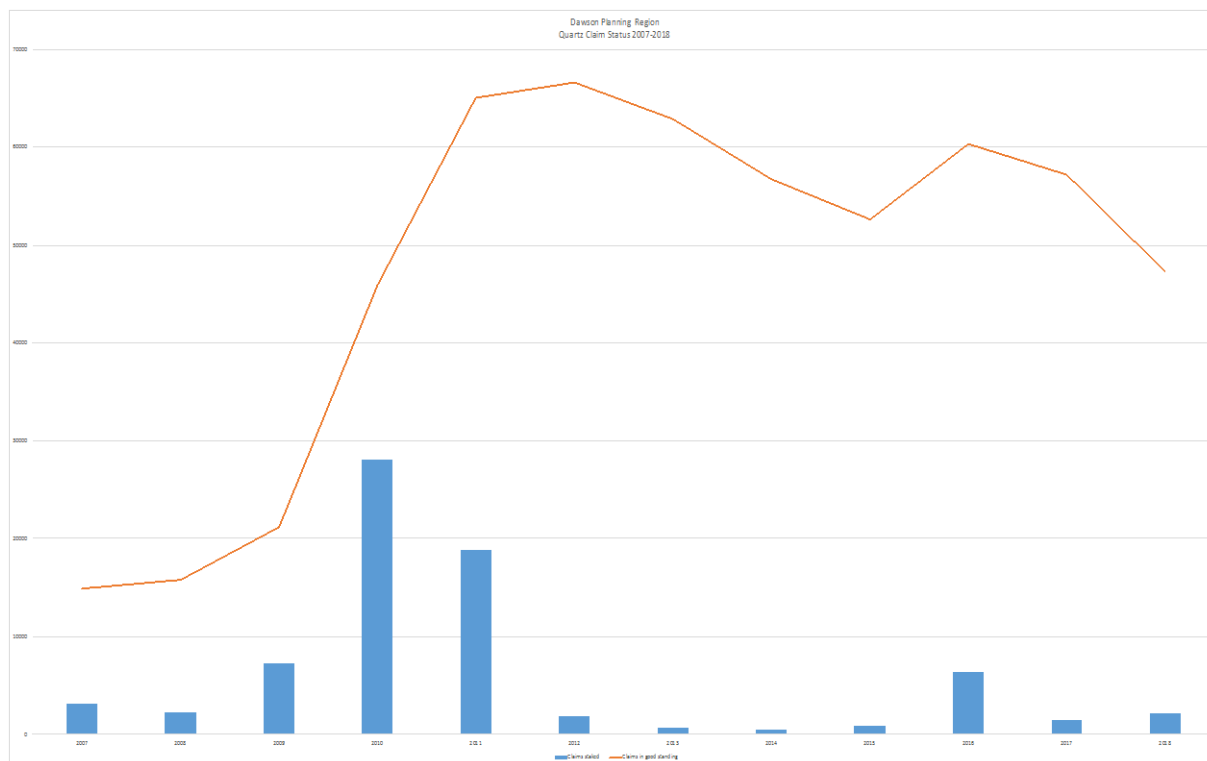


Figure 13-2 Quartz Claim status in the Region 2007-2018 (Government of Yukon, 2019a)

covering an area of 7,778.9 km², or 19.5% of the region (Government of Yukon, 2019a).

Exploration projects near Brewery Creek Mine identified new gold targets for future mine development. Hard rock gold occurrences of a similar type³ prompted the 2011 staking rush in the White Gold, Dawson Range and areas to the east of the Dempster Highway (**Figure 13-2**). Quartz Mineral Claims and Quartz Land Use Permits are shown on the map in **Section 3 – Map #22: Quartz Mining Activity**.

³ Orogenic gold ores related to plutonic intrusions of mid-Cretaceous age.

13.2.2.3 Exploration and Development

Mine permitting and development typically follows mineral exploration and the completion of environmental baseline studies that establish an understanding of the mineral potential and existing environmental conditions (Government of Yukon 2010). Within the planning region, claim holders and operators undertaking Class 1 exploration are required to submit a notice to the Yukon government and receive a response to allow the activities to go forward before starting any Class 1 level work.

Hard rock mineral exploration is a significant economic activity within the planning region. The expenditure in mineral exploration is invariably linked to mineral prices, when the price of minerals (gold specifically) is up, there is a notable increase in exploration in the Yukon (Government of Yukon, 2017). For example, high gold prices through 2011 spurred Yukon exploration expenditures over \$300 million, well above the previous year expenditure of \$160 million.

Figure 13-3 (below) shows the exploration activity for the Dawson region. Between 2000 and 2018, over \$495 million has been spent on quartz exploration in the region, with exploration expenditures reaching a record high of \$147 million in 2018. As of July 2019, there are 14 active mineral exploration projects in the planning region being undertaken by nine companies (or individuals). These projects employ over 400 workers (both full-time and temporary) of which 13% are First Nations people and 11% live in the Dawson area (YGS personal communication, July 8 2019). See **also Section 3 – Map #23 Historical Quartz (Hard Rock) Exploration Interest**.

The discovery of a deposit does not typically result in a producing mine operation. A profitable process for mineral development requires that a resource be present in adequate quantity and grade to warrant the cost of processing and transporting of a commodity, given current technology. Finding a candidate mineral resource requires extensive exploration and progressive focus on the most promising results. Citing local knowledge of historic exploration activity, the North Yukon Planning Commission reported the likely ratio of mineral discovery to establishment of a mine at 240:1 (North Yukon Planning Commission 2007).

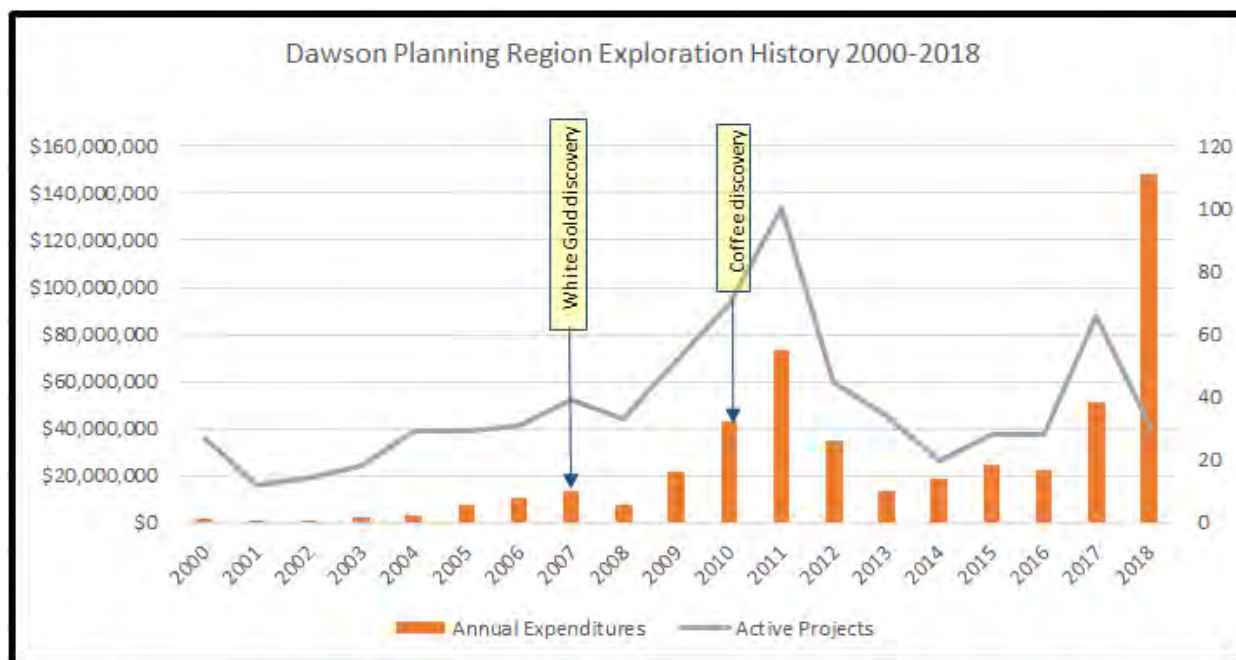


Figure 13-3 Mineral Exploration Expenditures and Active Exploration Projects in the Dawson Region (Government of Yukon 2019a)

Table 13-1 Number and Area of Quartz Land Use Permits and Quartz Prospecting Leases in the Region (from Government of Yukon data, 2019b)

Status	Count	Area (km ²)	Dawson PR Area (%)
Quartz Land Use Permits			
Valid	37	4697.0	11.79%
Pending	1	17.6	0.04%
Total	38	4714.6	11.83%
Quartz Prospecting Leases			
Active	93	14.1	0.04%
Total	93	14.1	0.04%

Quartz land use permits are required for Class 2, 3, and 4 (**Table 13-1**) activities and assessment through YESAA is required. The Government of Yukon defines the various activities and thresholds that trigger the class rating. Some activities that may be undertaken include clearing of vegetation, construction of structures, construction of corridors (trails) and lines, trenching etc. (Yukon Government, 2018b). **Section 3 - Map #12**

Recent YESAB Applications depicts YESAB applications for projects specifically associated with quartz/hardrock and placer projects in the region.

13.2.2.4 **Project Horizons**

The outlook for the Yukon mining sector is positive as development of the Eagle Gold (north east of Mayo), and Coffee Gold is on the horizon. The Coffee Gold project is located in the south east corner of the Dawson planning region. Development of these projects is expected to cost approximately \$500 million (Government of Yukon, 2017). The region may also be affected by the development of the Casino project which is located directly south of the planning region.

13.2.2.5 **Mineral Production**

13.2.2.5.1 *Coffee Gold Project*

Newmont Goldcorp is proposing the construction, operation, decommissioning and closure of an open-pit gold mine in the White Gold District of west-central Yukon. The proposed Coffee Gold Mine will extract ore at a rate of five million tonnes per year and is expected to be in operation for 8-10 years with possible extension of mine life determined by continued exploration. The mine is expected to contribute \$251.1 million to the Yukon economy annually during production and contribute \$427.5 million to government revenues, in the form of taxes and royalties, over its lifetime (Government of Yukon, 2019a).

The proposed mine site is located approximately 130 km south of the City of Dawson and 330 km northwest of Whitehorse on the proposed northern access route. The access route consists of a 214 km all-weather access road with barge crossings across the Stewart and Yukon rivers between Dawson and the mine site (refer to **Chapter 17 – Transportation and Access** for further details). The proposed Coffee Gold Project is being assessed as **Project 2017-0211** through the YESAB executive committee and is currently in the advanced exploration stage.

Proposed mining activities include four open pits, sodium cyanide heap leaching technology, a water treatment plant and waste rock storage facilities. Access to the mine site will be by air, ground and river crossings. Construction includes approximately 37 km of new road and barge landings and ice crossings at the Stewart River and Yukon River crossings (YESAB, 2017).

13.2.2.5.2 *Past Producing Mines*

Six open pit and seven underground mines previously in production in the region are listed below in **Table 13-2**, the locations of these mines are included on **Section 3 - Map #22: Quartz Mining Activity** (YGS, 2019: see reference details on map). Please note that **Table 13-3** includes all mines where production has been recorded, including small producers.

Table 13-2 Past producing mines, Dawson region

Primary Name	Type of Mine	Principal Commodity	Year First Staked	Timespan of Work
Clinton Creek	above ground	asbestos	1957	1957-2004
Caley	above ground	asbestos	1930	1956-1980
*Brewery Creek	above ground	gold	1987	1987-2009
Virgin	underground	gold	1901	1902-2001
Violet	above ground	gold	1901	1905-1994
Moosehorn	above ground	gold, silver	1970	1970-2000
Lone Star	underground	gold, silver	1897	1903-1994
Lerner	above ground	lead, silver	1965	1965-1999
Connaught	above ground	lead, silver	1965	1965-2009
Silvercity	underground	silver	1899	1905-1989
Colliery	underground	coal	1898	1899-1995
Cliff Creek	underground	coal	1895	1900-1903
Sourdough	underground	coal	1896	1903-1913

*Brewery Creek is a past producing open pit/heap leach mine, temporarily suspended in 2002. The current operator, Golden Predator, intends to advance towards production and reinstate operations in a timely manner. The site is serviced by year-round road access 55km from Dawson City.

13.2.2.6 **Mine Remediation**

Of seven previously operating Type II mines⁴ identified in the 2003 Devolution Agreement, two were in the Dawson planning region: Brewery Creek and Clinton Creek. Of those, Brewery Creek was decommissioned, twice winning the Robert E. Leckie Award for outstanding reclamation. It was subsequently purchased and further development work undertaken by another mining company. In 2019, Golden Predator Mining issued a joint press release with Tr'ondëk Hwëch'in announcing that the company intends to restart the Brewery Creek mine, which is located 55 kilometres east of Dawson City.

Clinton Creek, located 100 km northwest of Dawson, operated as an asbestos mine from 1967 to 1978. Approximately 16 million tonnes of serpentinite rock, containing 940,000 tonnes of asbestos, were removed from three open pits. Over 60 million tonnes of waste rock were deposited over the south slope of Clinton Creek, and over 10 million tonnes of tailings were deposited above the Wolverine Creek Valley. Failure of waste rock in 1974 resulted in blockage of the creek, causing a large, deep lake to form, increasing the risk of downstream flooding of Fortymile in the event of heavy rain or sudden snowmelt. Tailings continue to erode into Wolverine Creek.

Since 2002, the Clinton Creek channel has been reconstructed and erosion prevention measures put in place. Additional site remediation includes building demolition and removal of unsafe structures and equipment, monitoring of airborne asbestos levels, construction of berm and barrier ditches, installation of warning signage, and ongoing monitoring of waste rock and tailing pile movement. Government of Yukon took over site management and monitoring in 2003, although the Canadian government continues to provide funding for remediation where activities causing contamination occurred prior to devolution. In August 2006, the Government of Yukon issued an Order in Council (O.I.C. 2006/173) prohibiting entry and staking of new mineral claims over most of the former Clinton Creek Mine site. The order was issued to facilitate the cleanup and reclamation of lands damaged by previous mining activity. In 2012, an engineering report recommended that access to the abandoned mine be restricted due to the threat to human health and safety (Government of Yukon, 2016a).

⁴ Type II mines are large mine sites that have significant potential for unfunded environmental liability.

Planning for a final remediation plan at Clinton Creek is currently in progress and involves Yukon's Assessment and Abandoned Mines Branch, the Federal Government, and Tr'ondëk Hwëch'in. Additional monitoring and data collection are occurring, allowing the project team to better understand the movements of waste rock and tailings piles and the health and safety risks associated with the site. A suite of options for closure is being considered and final plans will be decided upon, after which a final remediation plan will go through the YESAA and regulatory process.

13.2.3 Placer Gold

Due to its unglaciated terrain and extensive mineralization, the Dawson Mining District is Yukon's premier placer mining district. During the 122-year recorded history of placer production in Yukon, in excess of 17 million ounces of gold were produced for shipment in Yukon. The combined value of this production is \$27.8 billion (\$CDN, nominal dollars, 2017 average annual gold price), constituting an annual average value of shipped production in excess of \$250 million (Government of Yukon, 2018c).

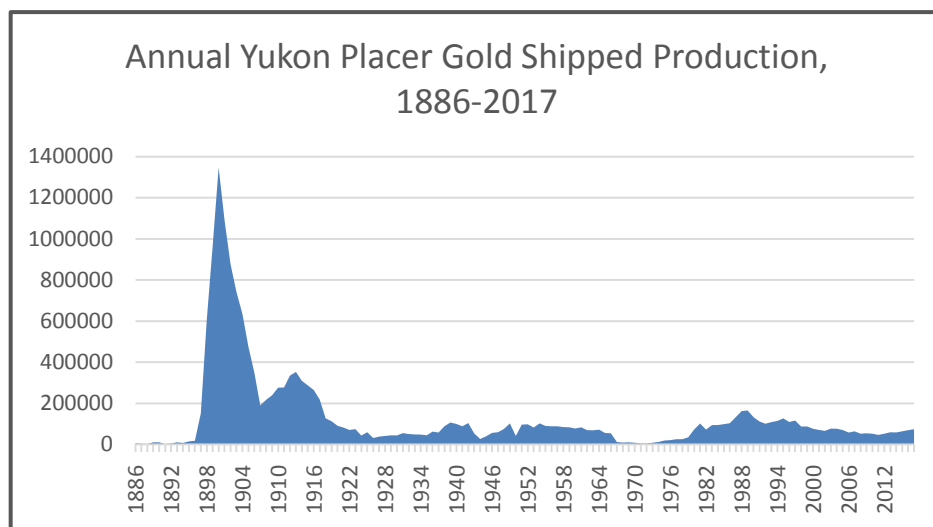


Figure 13-4 Historic Placer Gold Shipped Production in Yukon, 1886-2017 (Government of Yukon, 2018c)

In 2017, placer gold production in the Yukon was at 74,402 ounces, 57% of the annual average of production (131,210 ounces) for Yukon and with an estimated value of production of \$120 million.

Associated with this production are:

25,219 active placer claims, 343 active leases, with 2387 miles (3,843km) of creek under claim.

A modern placer mining industry has emerged in Yukon, driven by production from the Dawson Mining District. Both placer claims and leases support development and production by the industry. **Figure 13-5** below outlines the amount of gold produced in Yukon overall (crude ounces/year) in relation to the number of miles of claims and the price of gold during the 1973-2017 period (Government of Yukon, 2018c).

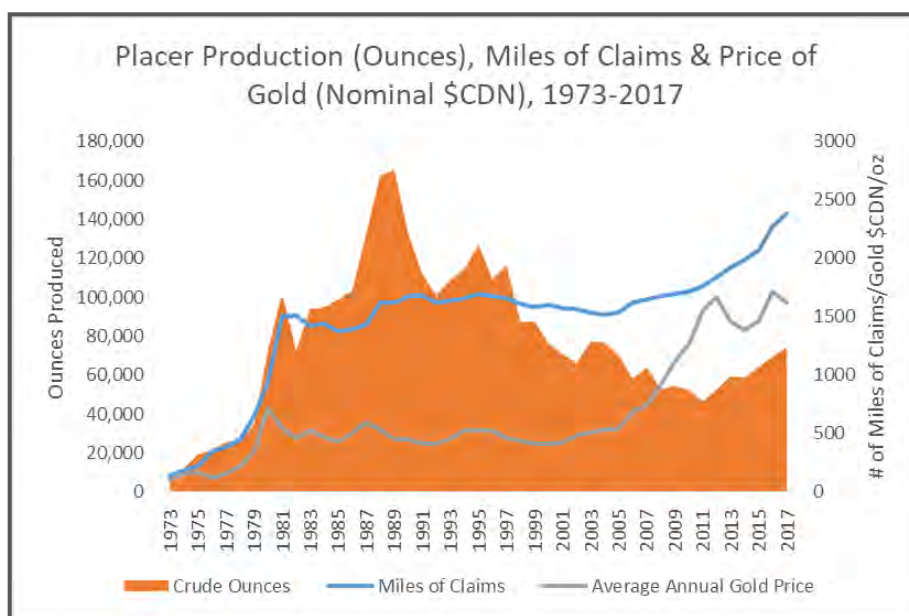


Figure 13-5 Placer Mining Production, Miles of Claims & Average Annual Gold Price (Government of Yukon, 2018c)

In the Yukon the number of miles under placer claim has grown from a low of 141 (227 km) in 1973 to 2387 (3,843km) in 2017.

During the period from 1978 to 2017, 88% of total Yukon placer gold production came from the unglaciated districts of the Dawson region, with production from the district ranging between 68% and 96% of total production in Yukon in any given year. Three drainages, Dominion Creek, Indian River and Hunker Creek accounted for 57% of the total production for the Dawson District during the 1978-2017 period, with a total of 1.7 million ounces of production. During this period, the Dominion Creek and tributaries have been the top gold producing drainage in the Yukon, yielding in excess of 716,000 ounces over the 1978-2017 period, accounting for one quarter of the total production in the Dawson Placer Mining District (Government of Yukon, 2018c).

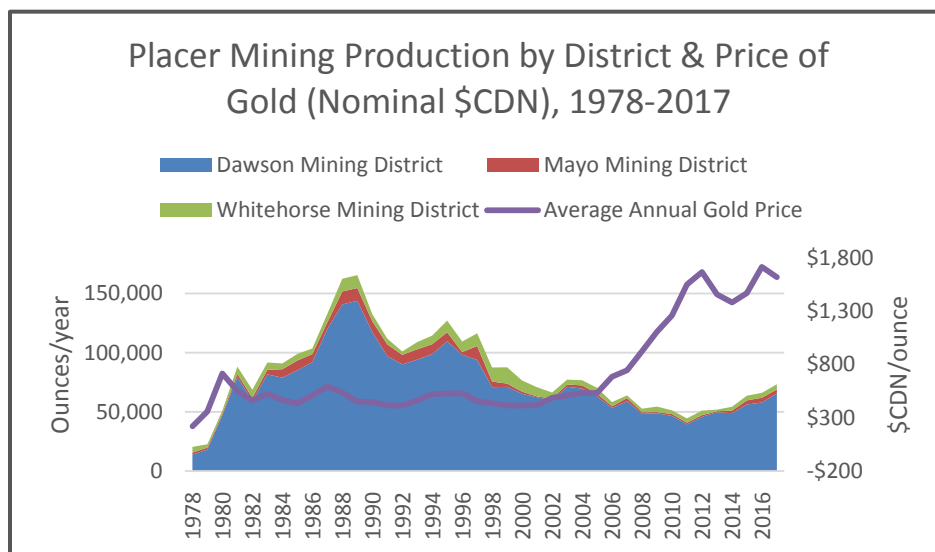


Figure 13-6 Placer Mining Production Trends by District, 1978-2017 (Government of Yukon, 2018c)

13.2.3.1 Placer Potential

Gold is one of the heaviest minerals. Flowing water washes the gold out of bedrock and further down into the gravel beds until it reaches an impermeable layer such as bedrock or clay. Often, gold is found near the bottom of gravel layers, beneath a considerable depth of sediment and just above bedrock. The gold found in these gravel deposits is known as placer gold. The erosion of orogenic gold deposits in the Yukon-Tanana terrane likely contributed to the Klondike placer deposits. The vast majority of these deposits lie in unglaciated areas. In the absence of scouring by glaciers, placer gold deposits may occur in valley bottoms, alluvial fans, in gulch gravels and as high-level terraces. Economic concentrations of gold are subject to a number of variables, and may occur in a variety of geomorphic and stratigraphic settings (LeBarge 1996).

Placer claims in the Dawson planning region are primarily located within the watersheds of the Klondike, Indian, west Yukon (Fortymile, Sixtymile and Moosehorn Range rivers) and lower Stewart rivers (**Figure 13-7** and **Figure 13-8**). More than 1,900 km of placer streams (i.e., major gold bearing streams with significant mechanized placer mining operations) are found within the planning region (Government of Yukon 2019a).

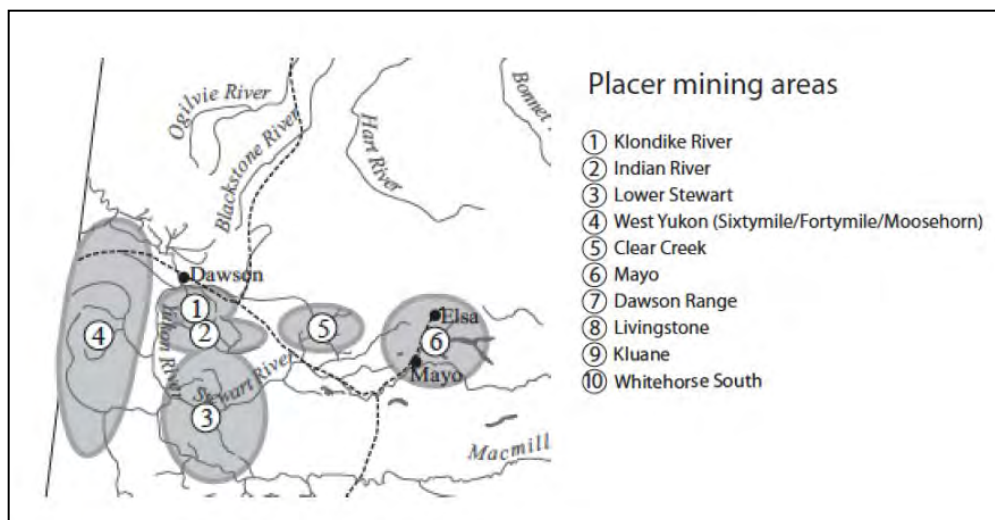


Figure 13-7 Placer mining areas (adapted from Yukon Geological Survey 2013)

Bond (2018) reviewed development status and operational activity, as well as the mineral potential assessment to produce a map of relative placer potential of regional streams. The potential distribution of placer gold within fluvial deposits in the Dawson planning region is shown in **Section 3 – Map #24: Placer Gold Potential**.

13.2.3.2 Placer Claim Staking

Placer mining operations cannot be conducted without first establishing mineral tenure under the *Placer Mining Act* and obtaining necessary regulatory approvals. Similar to quartz staking, on lands that are open to staking, an individual 18 years of age or older may stake a placer claim by placing posts in the ground in accordance with well established guidelines for claim staking.

A placer claim is a rectangular plot of ground no more than 500 feet in length along a baseline (a surveyed line generally following the direction of the center of the bottom of the creek valley) and 1,000 feet perpendicular to it. Prospecting leases may be obtained that provide exclusive right to the staking of claims for up to five miles of length along a creek. Claims must be worked individually unless grouped, and grouping must occur before work begins. Work is required to maintain a claim in good standing and such work must be performed in support of mining the claim. Other improvements, such as residential occupation of a claim, are not accepted as work for purposes of renewing a claim. A claim will lapse if adequate representation of placer mining work cannot be provided in accordance with the *Placer Mining Act* and *Placer Mining Regulations*.

In the last three years (2015-2018), the Yukon has seen the highest levels of lease staking in the past 20 years. In 2016 alone 2,476 placer claims were staked, and as of 2017, 25,219 placer claims are in good standing – this is the highest on record for the territory (Bond & Loon, 2018).

Placer Claims and Placer Land Use Permits are shown on the map in **Section 3 – Map #25 Placer Mining Activity**.

13.2.3.3 **Placer Mining Operations**

Placer mining activities include mineral exploration, construction of a mine site, mine operation and reclamation. Operations are conducted seasonally through the summer and into fall, until cold weather conditions limit the flow of water. Modern mining techniques use heavy machinery to strip soil and gravel layers, then sluice or wash the underlying gravel through large mechanical plants that separate out the gold, which enables up to 99% of the gold to be recovered. Unlike the historic gold workings, the use of more efficient technology results in areas being mined and reclaimed; these areas will not be mined again.

Placer gold is mechanically separated from gravel using only water, motion and gravity; no chemicals are necessary in the mining process to extract the gold. Used water flows into settling ponds, where it is retained until fine silt sediments have sufficiently settled to allow discharge of water back into streams. Water may be recycled through an operation many times before discharge.

Placer mines are largely owned and operated by Yukoners, with many smaller placer operations run as a family business. However, placer mining also occurs on a large industrial scale, though not as extensive as dredging operations of the past. Active placer mines require placer permits with operation plans.

There are currently 294 valid placer mining land use permits (classes 2,3 and 4) in the region with a total area of 1,045km², this accounts for 2.6% of the planning region (Table 13-3).

Table 13-3 Status, Count and Area of Placer activity in the Dawson Planning Region (from Government of Yukon data, 2019b)

Status	Count	Area (km ²)	Dawson PR Area (%)
Placer Claims			
Active	17882	1376.1	3.45%
Pending	685	57.8	0.14%
Total	18567.0	1433.9	3.60%
Placer Mining Land Use Permits			
Valid	294	1014.8	2.55%
Pending	3	30.5	0.08%
Total	297	1045.4	2.62%
Placer Leases			
Active Prospecting	80	149.7	0.38%
Pending Prospecting	25	43.9	0.11%
Active Dredging	3	3.8	0.01%
Total	80	149.7	0.38%

The Indian River area (see **Figure 13-7** for map of placer mining areas) is the top gold producing area in the Yukon followed by Klondike River, Lower Stewart River and West Yukon mining areas (**Figure 13-8**). Unglaciaded districts account for 86% of the placer gold production (Bond, J. & van Loon, S., 2018).

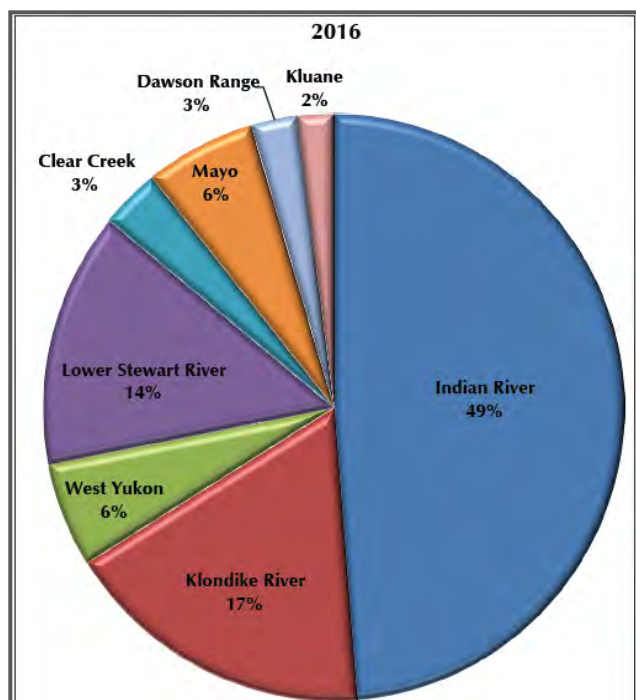


Figure 13-8 2016 production by regional placer districts in Yukon.

13.2.3.4 Infrastructure and Access

Placer mining requires access to, and the ability to modify, rivers and streams. Roads are required to transport heavy equipment to mining sites. Future exploration and development of placer resources depends on continued access to valleys and wetlands in the planning region (Government of Yukon 2019a).

Recent and planned improvements to the road network from the Stewart River area to the north will be beneficial to smaller operations and facilitate the exploration of Barker, Thistle, Ballarat, Kirkman and other nearby creeks (Government of Yukon 2011).

Development in the lower Sixtymile River drainage includes several kilometers of road, an airstrip, and a bridge installed over the Sixtymile River. This improved access is favourable for increased development and testing of nearby drainages such as Twenty Mile Creek and Thirteen Mile Creek, as well as the upstream reaches of the Sixtymile River (Government of Yukon 2011).

The **Yukon Resource Gateway Project** has proposed upgrades to existing roads and new road sections in the Goldfield area and down to the site of the proposed Coffee Gold Mine directly south of the planning region (YESAB, 2017). The upgrades will provide increased access for the Yukon Placer industry and increased safety for users of the road network

(Government of Yukon, 2016b). For more information refer to **Chapter 17 -Transportation and Access**.

13.3 Resource Values

13.3.1 Natural Values

Development of non-renewable resources is dependent on proper functioning of ecosystem services – for example, the regulation and supply of water, timber and aggregate; flood protection; and natural waste assimilation. Although natural value is depleted by extraction of non-renewable resources, mitigation of impacts from mining activity may minimize loss of natural ecosystem function.

Potential impacts from non-renewable resource development include displacement of wildlife, diminished habitat quality and pollution of natural systems. Of particular concern are the potential cumulative impacts to natural systems over the entire period of exploration, development and production of non-renewable resources.

Quartz claim staking activities, while relatively low impact in and of themselves, when conducted en masse over large areas may lead to wildlife disturbance from helicopter traffic, increased use of airstrips and seasonal campsites, and higher incidence of overlap with other resource users.

Hard rock mineral exploration occurs over large geographic areas, progressively refining the search until possible mine development happens on a relatively small footprint. Early on, staking and soil sampling can be undertaken with air support and minimal footprint. Subsequent exploration requires transport of drilling and trenching equipment, camps and support personnel over access roads. Actual mine footprints, though relatively small, are enduring features.

Placer mining directly impacts creek drainage, peat wetlands and fish habitat. Mitigation of adverse impacts is required during active operations and restoration following mining activity. Streams may be diverted or dammed during operation periods. Water used for sluicing becomes silt laden, and is released to discharge ponds to allow for settling. Reclaimed ponds generally re-vegetate quickly, often providing browse for moose. Operational and reclamation standards in and around waterways are outlined by the Fish Habitat Management System to mitigate adverse impacts on fish bearing streams under the authority of Fisheries and Oceans Canada.

Access features created to facilitate exploration and mining also contribute to the fragmentation of habitat and may affect interactions between predator and prey species, leading to declines in populations of valued wildlife such as moose, caribou and sheep. Additional loss of natural value may occur where access facilitates other activities unrelated to mineral exploration, such as forestry, hunting, recreational use, or other mineral exploration and development. See **Chapter 17 – Transportation and Access** for further discussion of the consequences of access development on natural value.

Mining and other land use activities that strip the vegetative layer can cause degradation of permafrost and the release of methane, and/or accelerate processes already occurring as a result of climate change.

13.3.2 Traditional Value

- *Intensive mining might affect my salmon fishing.*
- *Mining will always be here so we need to get proper compensation.*
- *We need to respect the land and not strip it all up.*
- *Family placer mines are good.*
- *Hard rock mining is not acceptable.*
- *Mining is ruining the land so that people can get rich.*
- *Miners don't realize that they're polluting so how can you get them to understand?*
- *Viceroy and Clinton Creek are examples of mining gone wrong and the impacts that mining can have.*
- *Gold leaves the Yukon and we are left with the aftermath.*
- *Reclamation is good but won't replace what is lost.*

Tr'ondëk Hwëch'in citizen comments (Tr'ondëk Hwëch'in 2012)

The rapid influx of miners to the region had a significant impact on the traditional values and economic practices of Tr'ondëk Hwëch'in people. Early mining development activities and hunting pressures greatly reduced animal populations, most notably the Fortymile caribou herd. Chief Isaac relocated the traditional community of Tr'ochëk downriver to Moosehide to distance his people from the effects of the gold rush. Gradually, time spent on traditional harvest activities diminished as wage labour, then residential schools, drew people away from the traditional community lifestyle. The loss of connection with traditional values continues to have consequences to personal and community health,

including destruction of family units, poor school performance, substance abuse, addictions and other social problems (Tr'ondëk Hwëch'in 2012).

Mining activity affects the land and streams and has the potential to negatively affect Tr'ondëk Hwëch'in treaty rights. Pursuant to the Tr'ondëk Hwëch'in Final Agreement, Canada and Yukon legislation, and the common law, negative effects upon the land and treaty rights must be minimized, mitigated and compensated. Conflict occurs with traditional value where mining land use or access routes interfere with areas which support cultural activities such as hunting, trapline trails, plant harvest etc., including the forest, trails and harvest areas; where fish and fish habitat (surface or groundwater resources) are impacted by mining; or where habitat value for moose, caribou, sheep and other wildlife species is diminished. Access and other surface disturbances related to mineral exploration may directly impact historic or cultural resources, which are widely scattered and poorly documented.

Stripping and trenching results in removal of vegetation and surface layers, placing above ground and buried archaeological and palaeontological heritage assets at risk. New and/or easier access to areas previously inaccessible or isolated increases the potential for damage to heritage resources, as well as potential for looting.

At one time the Indian River was a salmon spawning river before mining activity came into the area. My grandfather used to tell me this and he learned from his grandfather. This was before the Gold Rush.

TH Elder (Tr'ondëk Hwëch'in personal communication, September 2018)

Mining has the potential to change a landscape so drastically that people no longer feel a connection to parts of their traditional territory as it is left unrecognizable. The potential for cultural loss due to mining is significant. However, mineral resource development may contribute to a traditional economy by providing seasonal employment (e.g. environmental monitoring and stewardship roles) and improving access to harvest areas. Tr'ondëk Hwëch'in may enter into direct negotiations with mining companies in an effort to ensure equitable benefit to its citizens from resource development within its Traditional Territory.

13.3.3 Socio-Cultural Value

Stories of gold mining activity in the Klondike are a significant part of Yukon folklore and are often celebrated in art, music and storytelling. The history of the Klondike Gold Rush

draws visitors from all parts of the globe. Preservation, conservation and re-creation of Klondike Gold Rush history are central to the retelling of this period of Yukon's historic past. In a description of potential locations on a tentative list of sites for nomination as World Heritage Sites, Parks Canada (2012) observes:

The Klondike represents the most comprehensive and intact of all the cultural landscapes that illustrate life before, during and after the world's great 19th century gold rushes.

Linking the region's stories through history can provide opportunities for enhanced and new tourism experiences, products and partnerships. For example, the relationship between gold mining and the Yukon's ice age history and science is intriguing. Klondike miners unearthed evidence of Yukon's ancient past at the turn of the century and modern Klondike area placer mining produces hundreds of fossils each year. The Klondike is well known around the world for research on ice age paleontology, geology and environmental science and this story is of interest to visitors. Linking the current gold rush with the Klondike Gold Rush is a theme worth exploring. In addition to those with an interest in mining history, modern day mining activities (and high gold prices) draw tourists, tour companies and film crews to the region.

Gold mining is recognized as quintessentially "Yukon," aptly demonstrated by adoption of the "gold panner" as a cultural icon on Yukon vehicle license plates for the past 60 years (**Figure 13-9**). The discovery of gold in the Klondike is commemorated annually in the Yukon by a civic holiday held August 17, called "Discovery Day."



Figure 13-9 Yukon gold panner license plate

13.3.4 Economic Value

Historic cycles of economic development have occurred in response to global market forces, including fluctuating prices for base and precious metals, fuel costs and the availability of investment capital. Mineral exploration expenditures may vary considerably from year to year, historically ranging from less than \$7 million in 2002 to over \$300 million in 2011 in the territory (Yukon Geological Survey 2013). In the late 1990s to 2001, significant

declines in the mining sector resulted in reduced exploration spending, lost jobs and population decline. In contrast, high gold prices in 2011 drove mineral staking to record setting levels, resulting in labour and housing shortages. Between 2000 and 2018, over \$495 million has been spent on quartz exploration in the planning region, with exploration expenditures reaching a record high of \$147 million in 2018 (Government of Yukon 2019a).

The Yukon placer industry showed signs of stability and growth in 2016. It is estimated that 170 placer mine sites directly employed approximately 700 people in the territory. The mineral extraction sector is an important component of the Yukon's GDP (Government of Yukon, 2017). The figure below shows a 10-year trend in placer gold production. Production has been rising steadily since 2011 and its value in Canadian dollars is at a 27-year high.

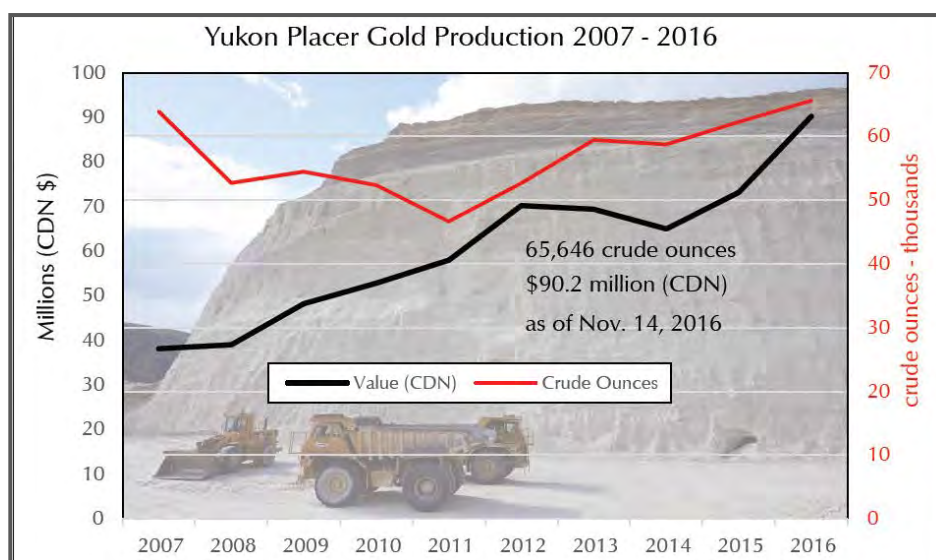


Figure 13-10 A chart illustrating placer gold production and its value over the last 10 years. (Bond, J. van Loon, S. 2017)

Like many other activities within the planning region, the pace of activity is largely seasonal, with minimal activity and considerably less expenditure during the winter period. Recent claim staking has resulted in a significant increase in the number of exploration and placer mining projects under review by the Yukon Environmental and Socio-Economic Assessment Board (YESAB). Project activity for the period from 2005 to 2018 is shown on the map at **Section 3 – Map #12: Recent YESAB Applications.**

Some people working in the placer mining sector work most of the year in another industry. Seasonal mining activity generates secondary employment through demand for accommodation and food services. Other economic benefits from mineral development take the form of royalty and tax payments.

The creation of access roads for exploration and mining may also improve the economic viability of other development activity, such as forest resource harvesting. Public expenditures to improve access to the Yukon's mineral resources include the Yukon Mineral Exploration Program, the Resource Access Roads Framework, Yukon Resource Gateway Project and Regional Mineral Resource Assessments.

Increased industrial activity in remote areas results in an increased requirement for safety and environmental monitoring inspections.

Within the planning region many Tr'ondëk Hwëch'in citizens and Tr'ondëk Hwëch'in owned businesses economically benefit by owning, operating and working in placer mines and quartz exploration sites, as well as benefiting by providing services to the industry.

13.4 Resource Management

13.4.1 Regulatory Framework

Mining activity is regulated to respect other land interests and to accommodate other users of the land. After claims are staked under the free entry system, most exploration and all mining work can only be done when regulatory permits (or Notification for Class 1 and 2) have been obtained from the Government of Yukon, or from Tr'ondëk Hwëch'in when claims are on Settlement Lands. The rights conveyed to quartz claim holders under Yukon mining legislation only apply to subsurface mineral interests, and these rights can only be exercised under a system of regulatory approval (Government of Yukon 2007).

13.4.1.1 Fisheries Act (Canada)

Sections 34 to 42 of the *Fisheries Act* – entitled *Fish and Fish Habitat Protection and Pollution Prevention* – are the primary legislation for the protection of fish and fish habitat. Section 35(1) prohibits a person from carrying on any work, undertaking or activity that results in harmful alteration, disruption or destruction of fish habitat, unless permission has been given under 35(2).

The Fish Habitat Management System for Yukon Placer (2008) is the basis for *Fisheries Act* watershed-based authorizations pertaining to placer mining.

Additional information from placer operators must be submitted with an application to YESAB, indicating how the design, operation and reclamation associated with placer mining activity will address fish habitat requirements, given a specific fish habitat suitability classification for that portion of the stream.

13.4.1.2 **Lands Act and Territorial Lands (Yukon) Act**

All Commissioner's lands are open for staking and mineral exploration unless they are expressly excluded or withdrawn by an Order in Council under the *Lands Act*. Excluded lands include buildings, dwelling houses, cemeteries, agricultural lands, and Settlement Lands. Within the planning region, the Tombstone Territorial Park area is withdrawn from staking under Order-In-Council 2004/202.

Some activities in support of mining occur off claim areas (e.g., a road or an airstrip). Permits for such land use activities are required under the *Territorial Lands (Yukon) Act*.

13.4.1.3 **Environment Act**

Many mine sites, exploration camps, outfitting operations and other land use activities located in remote areas use incineration for waste disposal. The *Solid Waste Regulations* do not prohibit incineration of solid waste. Open burning, however, is not recommended and the Government of Yukon recommends it be considered only as a last resort. Facilities that burn garbage must obtain an Air Emissions Permit under the *Environment Act*. Anyone burning garbage generated by commercial or public activities is required to obtain a Solid Waste Permit, and more than 5 kg of solid waste per day also requires an Air Emissions Permit.

13.4.1.4 **Quartz Mining Act and Placer Mining Act**

Four classes of work are established under both the *Quartz Mining Act* and *Placer Mining Act*, distinguished according to the nature, type, and extent of activity proposed. A limited range of work is considered as Class 1 activity, which requires notification and approval by the Chief, Mining Land Use after consultation with the affected First Nation. Class 1 activities include the use of hand tools for line clearing and trenching and limited use of explosives, but road construction or building of permanent structures are not permitted. Class 2-4 programs require an assessment under YESAA (details on process below), the end result being a recommendation issued by YESAB to the Decision Body for the Project. Following review of the YESAB recommendation, a Decision Body must produce a Decision Document signed by the Chief of Mining, Land Use. Terms and conditions of the Decision Document make up the terms and conditions of either a notification (Class 2), Operating Plan (Class 3) or Mining Land Use Approval (Class 4). In addition to a placer mining land use approval, Class 4 placer activity also requires a Water License issued by the Yukon Water Board

(Government of Yukon, 2018b). See **Table 13-4** for recent count and area of placer and quartz permits in the planning region.

Table 13-4 Quartz and Placer Land Use Permits by Class (from Government of Yukon data, 2019b)

Status	Class	Count	Area (km ²)
Quartz Land Use Permits (by Class)			
Pending	3	1	17.6
Valid	3	34	4134.3
	4	2	547.6
	5	1	15.1
Grand Total		38	4714.6
Placer Land Use Permits (by Class)			
Pending	4	3	30.5
Valid	3	8	7.4
	4	286	1007.5
Grand Total		297	1045.4

13.4.1.4.1 *Class 1 Exploration Programs and Placer Land Use Operations*

In recent years, increased levels of mineral exploration have highlighted concerns about the lack of information around Class 1 exploration programs and Class 1 placer land use operations. As well, the December 27, 2012 Yukon Court of Appeal decision in *Ross River Dena Council vs. Yukon Government* declared that the Government of Yukon has a duty to notify and, where appropriate, consult with and accommodate Ross River Dena Council before allowing any mining exploration activities to take place, to the extent that those activities may prejudicially affect asserted Aboriginal rights.

In December 2013, the *Quartz Mining Act*, *Placer Mining Act* and their regulations were amended to establish a process of notice and consultation with First Nations on Class 1 activities in the Ross River area to comply with the court decision.

The Traditional Territory of Tr'ondëk Hwëch'in was designated a Class 1 notification area effective April 1, 2018 with the current thresholds under the *Yukon*

Environmental and Socio-economic Assessment Act (YESSA) (see below (Government of Yukon, 2019c).

13.4.1.5 Proponents operating in a designated Class 1 notification area must provide notice to the Department of Energy, Mines and Resources of their planned activities before starting work. Once notice is provided, there is a 25-day review and First Nation consultation period.

In 2018, there were approximately 186 Class 1 notifications within the planning region (Government of Yukon 2019a).

13.4.1.5 **Yukon Environmental and Socio-economic Assessment Act (YESAA)**

Class 2, 3 and 4 quartz and placer mining activities are subject to review under YESAA, by assessors independent of decision authorities. YESAB may recommend that a project proceed with or without terms and conditions in order to mitigate significant adverse effects. Alternatively, if YESAB determines that the Project will have significant adverse effects that cannot be mitigated, they can recommend that the project does not proceed. This recommendation is then reviewed by Decision Bodies, who can accept, reject, or vary the recommendation prior to the issuance of a license. Approximately 95% of assessments conducted by YESAB are at the Designated Office level. Large and/or complex projects may require Executive Committee screening. Coffee Gold Mine (2017-0211) is the only executive level screening being considered in the region at this time.

13.5 Policy Direction

Yukon Mineral Exploration Program (YMEP)

The YMEP is a funding program designed to support individuals and companies in their search of mineral deposits by shouldering a portion of the risk capital required to explore for mineral occurrences.

Fuel Tax Exemption

This exemption is provided for authorized off-road commercial purposes. Authorized activities are mining, logging, outfitting, agriculture, trapping, fishing, hunting, tourism, and generation of electricity.

Mining and Petroleum Environmental Research Group (MPERG)

MPERG promotes research aimed at a better understanding of issues surrounding mine operations and closure, including mining technology, evaluation of techniques and impacts of mining and public communications about modern mining practices.

Yukon Mine Site and Closure Policy (2006)

This policy provides guidance in implementing the *Quartz Mining Act* and *Waters Act*, to allow consistency respecting aspects of mine reclamation and closure requirements governed by different legislation and delivered by different Yukon government agencies. The policy applies to development, operation and closure of hard rock mines that are on mineral claims, leases and crown grants. The goal is to ensure the health of the environment and public and financial viability of a mine closure plan.

13.5.1 **Current Best Management Practices and Guidelines**

Best management practices (BMPs) have been developed for the Yukon's mineral resource industry to mitigate potential impacts on wildlife, wilderness tourism and heritage resources. Current BMPs include:

- *Staking Guide* (2003)
- *Prospecting Lease Guidelines* (2003)
- *Schedule of Representation Work and Placer Grouping Guidelines* (2003)
- *Mineral Exploration Best Management Practices for Heritage Resources* (2010)
- *Placer Mining Best Management Practices for Heritage Resources* (2010)
- *Tr'ondëk Hwëch'in Best Management Practices for Heritage Resources* (2011)
- *Flying in Sheep Country* (2018)

13.6 Risks and Uncertainty

13.6.1 **Pace of Development**

Economic viability of mineral resource development is driven by many factors external to the planning region and Yukon. Global supply and security issues well beyond the Yukon's border drive fluctuations in the pricing of base metals such as gold, as well as the cost of inputs like gasoline and diesel fuel. Exploration projects require considerable private investment and compete with other investment opportunities in a volatile stock market. While staking of claims may occur over a short burst of activity, the pace of follow-on exploration activity will largely be determined by short to mid-term market conditions. The ebb and flow of staking and exploration activity creates difficult financial and social circumstances for further economic development.

13.6.2 Climate Change

Most exploration and placer mining activities are limited by way of need for overland access or flowing water to short summer operating seasons. Changes in timing and duration of snow cover, wet ground conditions, flooding, and disruption of permafrost are all potential changes arising from climate change that could have an impact on long-term operations and reclamation programs.

Effects of climate change could have both positive and negative consequences on the mining industry. Reduction in permafrost cover would make placer mining easier and cheaper, but reduced ice-road seasons could increase access constraints. Maintaining water balance is a critical element at all stages of mine operations, and changes in precipitation could make it more difficult to manage water quality. Lack of water could halt placer mining altogether (Government of Yukon 2013b).

Increasing disturbance of land cover can promote permafrost degradation and exacerbate or accelerate shifts occurring as a result of climate change.

13.6.3 Technology

Continuous improvement of techniques and tools for exploration, sample analysis and metal recovery can have a significant impact on the economic viability of mining operations. Areas considered too environmentally sensitive or not economically viable may become more accessible with improved technology. Low-impact access technology could encourage development in more remote areas, placing heritage and sensitive ecological resources at risk.

Improved technology for monitoring may identify new vulnerabilities requiring mitigation.

13.6.4 Access to Resources

Mineral resources are neither evenly nor predictably distributed in the planning region. Finding resources in sufficient quantity and quality to allow economic recovery requires extensive exploration over large areas to find and demarcate mineral deposits with potential for development. Withdrawal of areas from resource exploration, before resource values can become known and quantified, limits the extent of exploration and risks placing high value mineral deposits outside of economic reach.

Limits to access, either through land withdrawal or imposition of restrictions on surface or air access, may constrain economic potential for mining by increasing costs or placing resources out of reach.

13.6.5 Cumulative Effects

In reviewing project proposals, YESAB assessors are required to consider cumulative effects from activities that have occurred, are occurring, or are likely to occur, when determining the significance of project level effects. No thresholds have been established for surface or linear disturbance to guide decision-making in the planning region. Assessors may assess the potential for cumulative effects on valued components, such as key wildlife species, by considering consequences of project activities on annual allowable harvest of moose and loss of key habitat areas (e.g., lambing areas for sheep and winter habitat for caribou).

During the exploration seasons in 2010 and 2011, a high number of projects were proposed for quartz exploration in the White Gold area of the planning region. Potential for cumulative environmental and socio-economic effects arise from exploration related activities, including land clearing, aircraft over-flights, drilling, line cutting, road/trail improvements, camps, and/or development. In a study of the potential for cumulative effects of 44 proposed mining exploration or development projects in the White Gold district, a relatively strong correlation was found between trail/road density and river access, and moose harvest (EDI Environmental Dynamics Inc. 2011). If access features are a cause of increased harvest pressure, the proposed exploration activity will further increase moose harvest in game management areas already experiencing unsustainable harvest levels.

Roads associated with mining may open up previously inaccessible areas to other land users, including hunters. This can increase the hunting pressure on some species and ultimately disturb and displace animals (Tr'ondëk Hwëch'in, personal communication, September 2018). In addition, new roads provide increase predation opportunity thus increased mortality rates on some species. Quantifiable thresholds for surface disturbance at a landscape level could provide more certainty that projects meet environmental requirements and decrease assessment timelines (Pelchat 2012).

Under section 112 of YESAA, the executive committee may undertake studies of environmental or socio-economic effects that are cumulative geographically or over time at the request of the federal minister, territorial minister, or first nation. In 2016 Tr'ondëk Hwëch'in requested a cumulative effects study through section 112 of the YESAA, regarding cumulative effects to wetlands in Indian River watershed (Tr'ondëk Hwëch'in, personal communication, September 2018).

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14ENERGY

14.1 Highlights

- Transportation, commercial, residential, and industrial are the major sectors for energy consumption in the Yukon.
- There are no dispositions for coal in the planning region or surrounding areas, it is unlikely that coal will be pursued for exploration or development anywhere in the planning region.
- The northern section of the planning region includes portions of two sedimentary basins with identified potential for oil and natural gas resources; the Eagle Plain and Kandik basins.
- The Government of Yukon is not proceeding with development or regulation of unconventional hydrocarbons (i.e. extracted by means of hydraulic fracturing) at this time.
- Hydrocarbons continue to be a major source of energy.
- Demand on existing hydroelectric infrastructure continues to rise with new construction and major mining projects.
- Exploration of a hydro generation facility is underway for the North Fork area.
- Biomass energy (fuel wood) is an important resource for heating in the region. There will likely be increased demand for wood energy over the short and long term. The Dawson Forests Management Plan provides strategic direction for the local fuel wood market.
- Solar energy for heating and electricity is a viable seasonal option.
- There has been limited assessment of sources and options for wind and geothermal energy in the region.
- Renewable energy systems are vital for those people who choose to live 'off the grid' and for those wishing to offset the high costs of petroleum fuel and electricity.
- There are potential negative impacts to the natural value of the region associated with renewable and non-renewable energy resources.
- Future energy requirements in the planning region will depend on population trends, energy efficiency of municipal and territorial infrastructure, and the level and type of economic development activities.

14.2 Description of Resource

Transportation, electricity and heating of residential, commercial, and institutional buildings are the major sectors for energy consumption in the Yukon (Kishchuk, 2018). Demand on the existing energy infrastructure continues to rise. Imported petroleum products remain the fuel of choice for transportation and heating of buildings however, new construction tends to utilize electricity for heating. With a growing population and new mines set to open in the near future, governments and industries are actively seeking new sources of energy, including potential new sites for hydroelectric projects and the possibility of using liquefied natural gas (LNG).

In 2015, 95% of Yukon's energy was derived from two main sources

- Electricity (37%)
- Refined petroleum and propane products (63%)

Needs were met using a mix of renewable and non-renewable resources (Kishchuk, 2018)

- Renewable resources 35% (87% hydroelectric, 12% biomass burning for space heating)
- Non-renewable resources 65% (97% refined petroleum products and 3% electricity from diesel or gas).

Figure 14-1 shows the variety of energy sources that the Yukon has in their portfolio to meet the energy needs of the territory. This chapter will explore the different sources in detail and indicate how they are applicable to the Dawson planning region.

Non-Renewable Energy Sources	Renewable Energy Sources
Coal	▲ Biomass (e.g., wood)
▲ Hydrocarbon gas liquids (e.g., propane)	▲ Geothermal (heat from inside the earth)
Nuclear	▲ Hydropower (flowing water)
▲ Petroleum products (e.g., gasoline, diesel)	▲ Solar (light and heat)
▲ Natural gas	▲ Wind

Figure 14-1 Sources of energy in common use in Canada with a symbol next to sources that are currently used in Yukon (Kishchuk, 2018)

Economic and population growth in the Yukon is increasing the demands for energy. In particular, continued development of the mining sector is placing additional pressure to identify adequate and cost-effective local sources of energy production.

The geographic setting and relative isolation of the planning region have a major effect on energy supply and consumption. Energy costs in the region are high, with heating fuel and transportation costs substantially higher than Whitehorse. Older homes and buildings are

often poorly insulated and inefficient to heat in winter temperatures, which can reach below -50 C.

Retail residential heating fuel prices are substantially higher in the Dawson area. **Table 14-1** shows the average price of fuel as of August 29, 2018 (based on a 500 Gallon tank) (Government of Yukon personal communication 2018).

Table 14-1 Average fuel price August 2018 Dawson/Whitehorse

Fuel	Dawson	Whitehorse
Furnace oil	\$1.328/L	\$1.223/L
Arctic stove oil	\$1.406/L	\$1.270/L
Propane	\$1.121/L	\$0.974

Dawson is served by the Yukon Energy Corporation (YEC) Mayo hydro facility by means of the Mayo/Dawson (MD) transmission line (see Figure 14-2).

Despite the availability of hydroelectric power, energy from hydrocarbons continues to be a major source of energy for heating and electricity. Diesel powered generators are still used as a supplement to existing hydro capacity, both as a backup in case of failure and as a supplementary source, along with Liquid Natural Gas (LNG), when demand on the grid is excessive (e.g., during winter). Many households and businesses in the Dawson region utilize fuel oil for heating and some also use propane, especially those living off the grid.

These factors, as well as a desire to reduce dependence on fossil fuels and take action on climate change by reducing greenhouse gas emissions, have highlighted the importance of investing in local renewable energy sources. Improving efficiency of existing energy infrastructure, designing new construction to more energy efficient standards, and retrofitting existing buildings are also important initiatives to reduce consumption.

14.2.1 Non-Renewable Energy Resources (Hydrocarbons)

Hydrocarbons are a class of organic compounds consisting of only hydrogen and carbon (fossil fuels) and are the basis of coal, crude oil and natural gas.

This section summarizes hydrocarbon reserves and resource potential in the planning region as well as past activity, existing dispositions, future anticipated activity and

management considerations. Units of measure used are Mt (million tonnes) for coal; Bcf (billion cubic feet) and Tcf (trillion cubic feet) for natural gas volume; and MMbbls (million barrels) for oil volume.

14.2.1.1 **Coal**

Coal is a combustible sedimentary rock, and is extracted from the ground through mining, either with shafts underground or at ground level with open pits.

Coal is found in areas which underlie as much as 37,000 km² of the Yukon. The largest deposits and those with the greatest potential are located approximately 130 km east of the Dempster Highway in the Bonnet Plume basin, outside the planning region boundary (Government of Yukon 2008a).

The Tintina Trench and Indian River areas are known locations of coal deposits within the planning region. Coal has been mined in the Dawson and Carmacks areas since the turn of the century and was used until the North Fork hydro plant was opened in 1911 (Government of Yukon 2008a).

There are no dispositions for coal in the planning region or surrounding areas, and it is unlikely that coal will be pursued for exploration or development anywhere in the planning region. Although the Bonnet Plume basin to the east of the region has significant coal reserves, its remote location and subsequently high costs for development work and transportation to markets is a significant deterrent.

14.2.1.2 **Oil and Natural Gas**

Crude oil is a naturally occurring flammable liquid that is found in geologic formations beneath the Earth's surface. After extraction, usually by drilling, it is refined and separated into fuels like gasoline and kerosene, as well as into chemical reagents used in manufacturing a wide variety of materials such as plastics and pharmaceuticals.

Natural gas is a naturally occurring hydrocarbon gas mixture consisting primarily of methane; it is found in deep underground natural rock formations or associated with other hydrocarbon reservoirs (e.g., in coal beds). Natural gas is a leading source of heat and

electricity throughout Canada, and is typically regarded as a “cleaner” and cheaper energy option than coal or diesel.

The northern section of the planning region includes portions of two sedimentary basins with identified potential for oil and natural gas resources: the Eagle Plain and Kandik basins (see **Section 3 – Map #26: Energy Resources**).

Oil and gas resource assessments for various exploration areas have been completed by the National Energy Board and the Geological Survey of Canada and are periodically updated to incorporate new geological field information. Most areas have little or no well information (Government of Yukon 2008b).

14.2.1.2.1 *Eagle Plain Basin*

The Eagle Plain basin consists of two sub-basins, Bell in the north and Eagle in the south, separated by the east-west trending Eagle Arch.

Mean petroleum resource estimates for the entire Eagle Plain Basin are 436 MMbbls oil and 6,054 Bcf gas (Government of Yukon 2012b). The extreme southwest portion of the basin (six per cent or 1,315 km²) occurs in the planning area on TH settlement land and the NY Annex. Estimates for that portion are 28 MMbbls oil and 385 Bcf gas.

Activities in the 1960s and 1970s resulted in the development of seismic lines, winter roads and trails, airstrips and abandoned well sites. Many of these linear disturbance features are still readily visible on the landscape today.

Chance Oil and Gas (formerly Northern Cross) currently maintains disposition in this area and are operating under a geoscience exploration license. It is anticipated that Chance Oil and Gas will seek Executive Committee review for operation of wells on its property in the foreseeable future.

14.2.1.2.2 *Kandik Basin*

The Kandik basin straddles the Yukon-Alaska border, with approximately 60 per cent located in Alaska.

In 2000, a resource assessment was conducted for the basin based on very limited subsurface geological data. In order to adequately assess the petroleum resource potential of the basin more data needs to be obtained. (Government of Yukon 2011b).

There are no discovered reserves in the Kandik basin. From 1970 to 1972, three exploration wells were drilled in the Yukon portion of the Kandik basin but none encountered gas or oil. A reflection seismic survey of approximately 180 km was also conducted in the area in 1971 (Government of Yukon 2011*b*).

Mean petroleum resource estimates for the Yukon portion of the basin are 99.3 MMbbls oil and 649 Bcf gas (Government of Yukon 2011*b*). These values are based on conceptual plays in an area where no defined pools or discoveries have been made. The southeast portion of the basin (44 per cent or 2,538 km²) occurs in the planning region, and estimates for that portion are 44 MMbbls oil and 288 Bcf gas.

14.2.1.2.3 *Liquefied Natural Gas (LNG)*

LNG is natural gas in its liquid state. At -160 °C natural gas turns into a clear, colourless and odourless liquid. As its volume is significantly decreased LNG is ideal for transport over long distances.

YEC has stated that LNG is the only near-term supply option that can meet all of the forecasted energy demand, in the event that Eagle Plains became operational, without the need for significant diesel generation. LNG provides an opportunity to utilize natural gas reserves in the absence of a pipeline. If a micro-LNG plant (i.e., 11 to 61 kilotonnes per day) was constructed at Eagle Plain, between two and seven trucks per day would be required to transport the LNG to demand centers (Fekete Associates Inc. 2011).

14.2.1.2.4 *Unconventional Hydrocarbons*

Unconventional hydrocarbons are hydrocarbon resources such as shale gas, natural gas in coal, and “tight” gas that are chemically identical to conventional gas, but are considered “unconventional” because of the methods used in their extraction (e.g., hydraulic fracturing) to release the gas and achieve economic production (Government of Yukon 2013*a*). Shale gas is currently not authorized in the Yukon (Government of Yukon, 2018*a*). Tr’ondëk Hwëch’in has also passed a resolution that it does not support fracking within its traditional territory, until such time as fracking is proven environmentally sustainable.

The Government of Yukon is not proceeding with unconventional hydrocarbons (i.e. extracted by means of hydraulic fracturing), developing coal policy or permitting at this time.

14.2.2 Renewable Energy Resources

14.2.2.1 Hydroelectricity

Hydroelectric power generation converts the energy of moving water into electrical power. Facilities must have adequate river flow and/or a sufficient height for the water to fall. The best locations are typically waterfalls, rapids, canyons, deep valleys or river bends. Rivers with large volumes of slow moving water may also have enough inertia to generate power. In general, there are two types of hydroelectric facilities:

- dam and reservoir projects that store water for use during periods of low flow; and
- run-of-river projects that use minimal or no storage.

These developments can vary in scale from micro-hydro facilities of less than 0.5 megawatts (MW) to large scale (i.e., greater than 100 MW). The Yukon's mountainous terrain and wealth of rivers and lakes is ideal for hydroelectric generation; however, few sites exist with a significant drop in elevation (head) and with significant flow, especially during winter months for large scale projects (North Yukon Planning Commission 2007).

Construction of large hydro facilities in the Yukon has almost always been driven by new mining developments. For example, the first hydropower plant in the Yukon was built in the Dawson area at Twelve Mile River to power the dredges during the Klondike Gold Rush; the North Fork Klondike River hydro plant operated from 1911 to 1966.

Yukon's electrical system connects all but five Yukon communities to each other by an electrical transmission network called the Yukon Integrated System, but known as the Yukon grid. The map below (**Figure 14-2**) shows Yukon's transmission and generation facilities. The Yukon grid is not connected to the rest of North America (Government of Yukon, 2017).

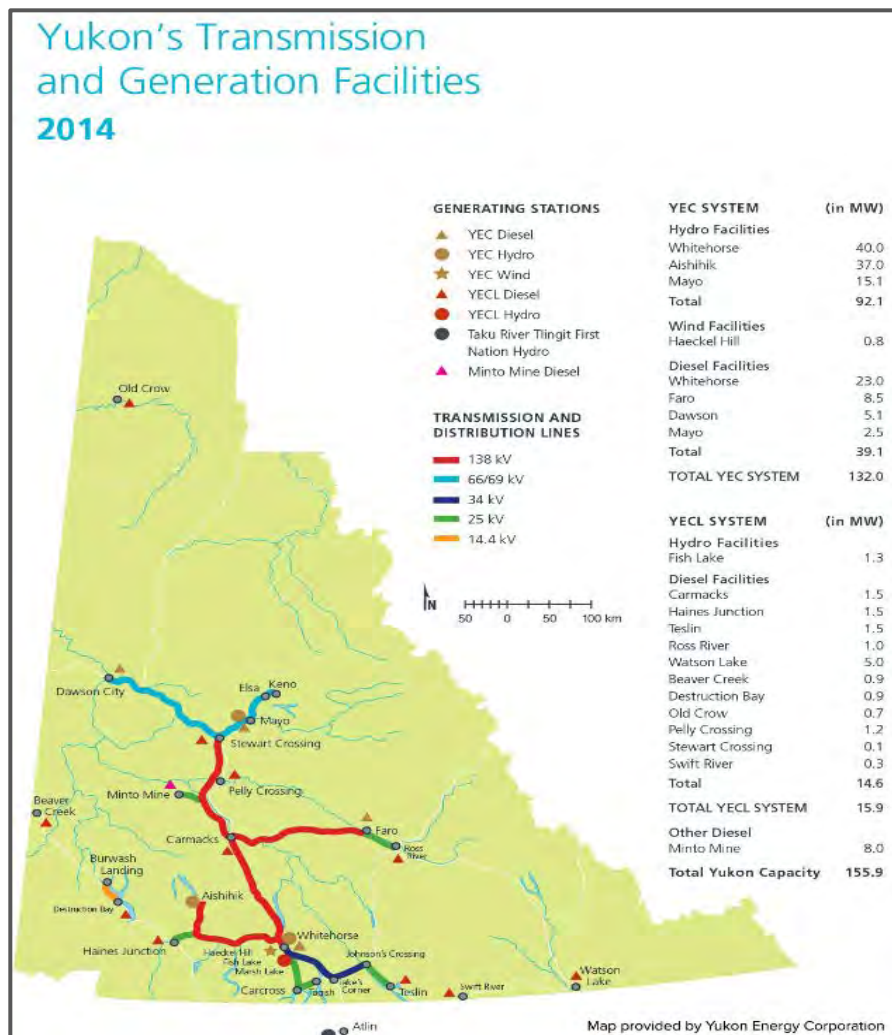


Figure 14-2 Map of Yukon showing communities, roads, electrical generation facilities and transmission lines (Courtesy of Yukon Energy Corporation)

Close to 93% of Yukon's electricity is generated by four hydro plants and with one wind turbine site. The remaining 6% is generated by diesel and liquefied natural gas (LNG) to provide seasonal peaking capacity and backup.

A new Mayo B powerhouse was constructed in 2011 with a capacity of an additional 10 MW (YEC 2013) and the north and south grids were also connected in 2011 to form the Yukon Integrated System. Future growth capacity will likely come from smaller developments such as hydro sites near communities and energy transmission corridors in various parts of the territory. There is also potential for micro-hydro projects where water is drawn from a higher location and piped to a lower hydro turbine, and the resulting head (i.e., the power of the falling water) is used to generate power (Government of Yukon 2011c).

14.2.2.1.1 *North Fork Hydro Project*

The North Fork Hydro Project is identified as a specific provision in Chapter 7, Section 7.8 of the TH Final Agreement and the terms for a land exchange between the Government of Yukon and TH relating to this project are set out in Schedule B of Chapter 9.

In 2018 a project proposal for geotechnical investigations and mapping in the North Fork area was submitted to YESAB and approved. The proposal was submitted with a letter by TH whereby they expressed their support for the feasibility testing of redeveloping the historic North Fork Hydroelectric Project (YESAB, 2018).

See Section 3 – Map #26: Energy Resources

14.2.2.1.2 *Other Potential Sites of Hydroelectric Interest*

North Fork (and four other sites within the Dawson region) were considered among 49 sites across Yukon in a small hydroelectric screening assessment prepared for YEC (Knight Piésold Consulting, 2016) and reported in the Yukon Energy Resource Plan 2016.

Sites in the Dawson region under consideration were (see **Figure 14-3**):

- North Fork (Klondike River)
- Chandindu River
- Indian River
- Rock Creek
- Sixty Mile Diversion

However, none of the above sites made it to the top 5 recommended for further study (Knight Piésold Consulting, 2016).

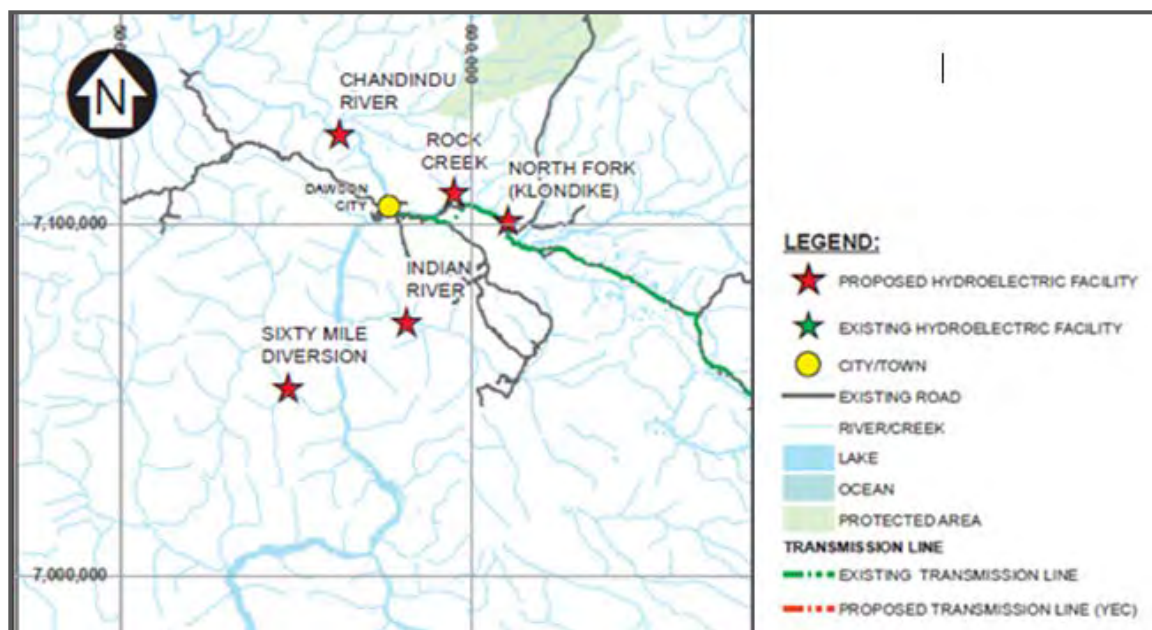


Figure 14-3 Potential hydro sites in the Dawson area (Knight Piésold Consulting, 2016)

14.2.2.2 Bioenergy (Biomass and Biofuels)

Bioenergy is the production of energy by releasing stored chemical energy in biomass (i.e., vegetation, primarily trees).

In the past, timber was harvested as fuel wood for the steamboat industry. (Dawson Forest Management Planning Team 2013). Today, 25 per cent of Yukoners, compared to about 5.4 per cent of the population nationwide, rely solely on wood to heat their homes (Government of Yukon 2011d). Many more Yukoners use wood heat as a back-up or supplementary heating fuel. The Dawson City water treatment facility, uses a biomass system fueled with locally produced wood chips.

The major sources of fuel wood are dry wood from recent forest fires or white birch stands surrounding Dawson.

Strategic directions for the local fuel wood market include developing fuel wood harvesting opportunities within Flat Creek, Dempster Highway and North Fork Road accessible burns. Key areas for potential white birch harvesting are Hunker Creek, Bonanza Creek and the Top of the World Highway (Dawson Forest Management Planning Team 2013).

14.2.2.3 **Solar**

Solar energy can be used directly for heating or cooling or, through the use of solar electric panels and photovoltaic cells can be converted to electricity. On a monthly or annual basis, the amount of solar energy available also depends upon geographic location, with latitude and aspect both being important (North Yukon Planning Commission 2007).

There are a number of people using small-scale solar energy in the Yukon, and the planning region. Households utilize solar thermal energy for hot water heating and photovoltaic arrays to generate electricity. The swimming pool in Dawson City is heated by solar panels during its summer operating season. Telecommunications businesses, highway maintenance camps, park interpretive centres, camps, and research facilities are other examples of places where solar energy is being used.

In 2018 one of the largest off grid solar arrays in the Yukon was installed at Moosehide Village. 12 kilowatts of solar modules and energy storage was installed in Moosehide, drastically reducing the Tr'ondëk Hwëch'in's reliance on diesel at this important community site.

As a part of the 2016 Energy Resource Plan, an inventory was undertaken of potential solar sites. The study identified four potential viable sites, none of which are in the Dawson planning region (Kishchuk, 2017).

However, the Dawson region receives on average approximately 2.66 kWh/m² of solar radiation in any given day, making solar energy a viable technology for producing both heat and electricity (Government of Yukon 2011b). A report has been completed documenting the potential for solar domestic hot water heating systems in Whitehorse and Dawson (Thevenard 2008). Interactive maps of photovoltaic potential in Canada have been developed by the Canadian Forest Service (Great Lakes Forestry Centre) in collaboration with the CANMET Energy Technology Centre (Government of Yukon 2011e). The region may see an increase of solar projects associated with residential and commercial development, although given the long periods of reduced winter daylight, backup alternative systems are still required.

14.2.2.4 **Wind**

Wind energy is a pollution-free, infinitely sustainable form of energy that is utilized successfully in many parts of Canada and the world. Wind energy is typically harnessed by a windmill or wind turbine. The most cost-effective turbines are located in the windiest areas and, since wind speed is affected by local terrain and increases with height above ground, wind turbines are usually mounted on tall towers to maximize wind velocities (North Yukon Planning Commission 2007).

One major operational issue in extreme northern climate conditions is the formation of rime ice which can make it very difficult for wind turbines to operate (Government of Yukon 2012e).

As a part of the 2016 Energy Resource Plan, an inventory of potential wind sites was undertaken. Seven potential viable sites were identified, none of which are in the Dawson planning region. As options are generally limited to particularly high and mostly isolated mountaintops and ridges. (Appendix 5.9 of Kishchuk, P, 2017).

The Yukon Energy Corporation, Energy Solutions Centre (a branch of the Government of Yukon's Department of Energy, Mines and Resources), industry and private individuals continue to evaluate Yukon sites for their wind generation potential. There has been limited assessment of wind energy sources and options in the planning region. The Government of Yukon has noted that wind speed has been measured at approximately six sites in the planning region and all sites have shown a poor wind regime, with wind speeds under five meters per second (Government of Yukon 2012b). This does not mean however that there are no suitable sites in the region.

14.2.2.5 **Geothermal**

Earth's crust contains a large amount of energy, in the form of heat. Geothermal energy uses steam or hot water in Earth's crust to power turbines and to heat or cool air or water. Geothermal energy requires a source temperature of more than 100 C to drive a generating turbine, but substantially less to provide efficient heating (North Yukon Planning Commission 2007).

A number of geothermal projects are in operation elsewhere in the Yukon. However, Dawson City is considered to have low to moderate potential for geothermal projects (Gartner Lee Limited 2003).

The necessary drilling costs and the fact that Dawson City is part of the hydroelectric grid, make economic geothermal power generation rather unlikely. Dawson City's population and the fact that it attracts many summer tourists may lead to tourist targeted low temperature direct-use applications being viable. Tourist attractions like geothermally heated swimming pools can be a huge economical success. In Dawson's case the limiting factor to any development are the drilling costs (CanGEA, 2016).

14.3 Resource Values

14.3.1 Natural Value

Sustainable development of non-renewable resources is dependent on proper functioning of ecosystem services such as the regulation and supply of water, timber and aggregate; flood protection; and natural waste assimilation. Potential impacts from non-renewable resource development include displacement of wildlife, diminished habitat quality and pollution of natural systems. Of particular concern are the potential cumulative impacts to natural systems over the entire period of exploration, development and production of hydrocarbons.

14.3.1.1 Potential Impacts from Non-renewable Resource Development

Aggregates are a critical resource for the development of transportation and industrial infrastructure in northern permafrost landscapes. Large amounts of gravel would be required for the construction and maintenance of infrastructure associated with oil and gas development (e.g., access roads, well pads, compressor stations and work camps). Future requirements would be in addition to existing requirements for the community of Dawson, regular highway maintenance or any future highway upgrades. Even if the projects occur outside of the planning region, aggregate sources within the region would likely be developed, with all associated impacts, due to potentially limited resources in Eagle Plain (see **Chapter 17 – Transportation and Access** for more detail on potential impacts of gravel extraction and quarrying activities).

Water is also an essential resource for oil and gas exploration and development activities (e.g., exploration wells, drilling mud, work camps and ice road construction). Key considerations include:

- Conventional oil production typically requires about five barrels of water to produce one barrel of oil.

- Ongoing all-season gravel road maintenance may require water for dust control or surface treatments.
- Most oil and gas exploration activities would occur in winter, when maintenance of fish over-wintering populations is considered to be a critical issue for fish populations, and depends on adequate water flow, depth and quality.
- Depending upon the amount of withdrawal, the discharge and ecology of the river, water withdrawal operations can affect in-stream biota by reducing usable habitat, blocking access to usable habitat and causing direct and indirect mortality (TH personal communication, September 2018).
- Water withdrawal operations can also impact the visual quality of river courses, lakes and wetlands.

Potential direct impacts from industrial oil and gas activity include decreased slope and soil stability, especially in the case of surface disturbance in permafrost areas; greenhouse gas emissions from compressor stations; noise and human activity disturbance to wildlife; habitat loss and alteration from construction of camps, roads, pipelines, seismic lines and other linear features; pollution and toxicity from spills of oil and contaminants such as process chemicals; impacts of sedimentation on fish habitat and water quality at river and stream crossings; noise and vibration disturbance from rigs, wells and compressor stations; and impacts of explosives used during seismic exploration (Yukon Fish and Wildlife Management Board 2002). Also, depending on the road density and volume of traffic, research has demonstrated numerous and diverse effects of road and traffic on plants and animals. These effects include loss and fragmentation of habitat, increased wildlife mortality and light, noise and dust pollution from Traffic (van der Ree et. al, 2011).

14.3.1.2 **Potential Impacts from Renewable Energy Resources**

Hydroelectric

While hydroelectric power is a renewable energy source, large and mid-size dam and reservoir projects can have significant ecological impacts. Flooding of reservoir areas, constrained fish migration, altered stream flow, impacts on wetlands and low-lying areas, and changed river ice conditions may all result.

Biomass

Although biomass energy is considered carbon neutral (no net contribution to greenhouse gas emissions), inefficient burning in wood stoves can contribute to local air quality issues.

Wind

In some areas of the world, concerns have been raised about birds striking wind turbines. These are mostly in areas where turbines are located directly within flight paths or migration routes

14.3.1 Traditional Value

The northern part of the territory should be left alone.

Tr'ondëk Hwëch'in citizen comments (Tr'ondëk Hwëch'in 2012)

Surface disturbance may result in damage or loss of integrity to heritage resources. Impacts to natural values may also have indirect effects on traditional economic activities that rely on them. Roads for development into areas not previously accessible may place heritage resources and sensitive wildlife populations at risk. Any negative impacts on the Porcupine caribou herd from hydrocarbon resource development projects would be felt within the planning region.

In a few cases, community travel and subsistence use/harvesting have benefited from oil and gas development (e.g., where historical seismic lines and winter roads are used as travel routes).

Vuntut Gwitchin and Tr'ondëk Hwëch'in governments have both declared through Council Resolution that their Traditional Territories should be kept “frack-free” until such time as the practice of hydraulic fracturing can be proven not to adversely affect groundwater and drinking supplies.

Small-scale renewable energy systems are generally compatible with traditional economic activities. As noted above, large-scale hydroelectric systems involving dams and reservoirs can have significant ecological impacts.

14.3.2 Socio-Cultural Value

Oil and gas development could negatively impact visual quality and experiences for wilderness tourists, but increasing road access could have positive impacts on mineral exploration, forestry and other tourism and recreation markets. The greatest potential land use conflicts are likely to occur between future oil and gas activities and wilderness/cultural tourism and subsistence harvesting activities in the vicinity of Eagle Plains, the Dempster Highway and major river corridors.

Secondary impacts from oil and gas development may include increased demand for housing, community and commercial services.

Renewable energy systems are vital for those people who choose to live 'off the grid' and for those wishing to offset the high costs of petroleum fuels and electricity. They can contribute to self-sufficiency for the region and the Yukon, with less reliance on imported fossil fuels and less susceptibility to fluctuating global market prices.

14.3.3 Economic Value

YEC's 2016 Resource Plan outlines a proposed action plan for the Yukon to address the territory's energy needs into the year 2035. The plan outlines three scenarios that utilize the most effective combination of energy resources to meet future low, medium and high industrial needs (YEC, 2017).

14.3.3.1 Oil and Gas

Between 2007 and 2010, 16 permits for oil and gas exploration were issued in north Yukon totaling \$29.4 million in work commitments (Adilman 2011). Although these oil and gas dispositions are located outside of the planning region, it is likely that any future developments would utilize existing transportation networks through the region (e.g., Dempster Highway) and that any potential socioeconomic benefits and/or impacts would affect the region and its residents. As well, portions of both the Eagle Plain and Kandik basins extend into the planning region, as described in **Section 14.2.1.2**.

Development of potential oil and gas pipelines and infrastructure would depend on access to potential industrial customers (e.g., Casino mine), additional infrastructure and navigating the complex regulatory system, which would cross both federal and territorial jurisdictions. Potential economic benefits from oil and gas development and pipeline construction include employment opportunities (from construction, operations, and ongoing exploration and production) and revenues from resource royalties. Based on the natural gas scenario described by Fekete (2006), resource royalties could represent contributions of several million dollars annually to First Nation governments, and much higher levels to the Government of Yukon (as cited in North Yukon Planning Commission 2007).

14.3.3.2 **Natural Gas Power Plants**

Natural gas power plants can be relatively easily integrated into the Yukon system as conversion or replacement of current diesel generation plants. They require relatively low capital costs compared with hydro development and have options for “scalable” generation over a wide range of sizes. Natural gas power utilizes proven technology that is readily available and can be reliably operated over an economic life of 20 to 25 years. Power units can also be located at load centres to minimize transmission requirements (YEC 2012*b*).

14.3.3.3 **Biofuel**

The Dawson Forest Resources Management Plan states that there are several personal fuel wood suppliers in Dawson, with an estimated combined annual harvest of approximately 600 to 700 m³, and that from 1999 to 2008 there were an average of 10 commercial fuel wood permits issued each year (Dawson Forest Management Planning Team 2013). Each winter, around 3,500 m³ or 1,600 cords of fuel wood are used in the Dawson area. The supply of fuel wood in the Yukon has been valued at approximately \$4 million a year in direct employment and import substitution (Government of Yukon 2011*d*).

14.3.3.4 **Hydroelectric**

Hydroelectric development is costly. Hydro plants can have capital costs from 3-10 times greater than diesel plants, and larger scale projects may require 20-50 year periods of return on capital investments. Long-term (10 year) feasibility studies and detailed water monitoring are typically required to determine cost effectiveness and stream flow characteristics. Distance to areas of major electrical demand and environmental and social impacts are important considerations. However, operation and maintenance costs are relatively low, there are no ongoing fuel requirements (or risk of fuel cost escalation and variability), and most facilities have a very long service life, greater than 60 years (AECOM 2011).

There is potential for the development of micro or small hydro sites (i.e., less than 20 MW) or run-of-river facilities that do not regulate river flow and cause few alterations to the natural river system. However, because they do not utilize water storage, they would be useful primarily for seasonal operations (summer only). Estimated capital costs (2009) for construction of various small hydro sites in the planning region range from approximately 25-30 million dollars for Rock Creek and North Fork Klondike River to closer to 100 million dollars for Chandindu River (AECOM 2011).

14.3.3.5 Solar

The costs of solar technologies are becoming more competitive with conventional electrical generation, and after the initial capital cost has been recovered, solar energy is virtually free and requires very little maintenance (largely because there are no moving parts). There are numerous opportunities for expanded use of solar technology in seasonal operations and camps, where the operating season coincides with the highest amount of annual availability of solar energy.

Larger scale renewable energy projects require capital investments, and the ability to produce power at costs equivalent to competing technology such as diesel generators. As the federal carbon price in Yukon rises to \$50/tonne in 2022⁵, renewable energy resources with low emissions of greenhouse gases will become increasingly competitive.

Development of Yukon's domestic energy resources could yield significant economic benefits by generating local employment, encouraging local business development, and substituting energy imports into the territory. To the extent that domestic energy sources are less costly than imports, local energy development would also reduce costs for local households and businesses, enabling them to reinvest more of their income into the local economy.

14.4 Resource Management

The following sections note legislation, regulations and policy that specifically address energy sector development. Other acts and regulations dealing with land disposition, resource extraction, water use, access, and other industrial activities may also include measures to manage land use. Additional protocols and requirements may also apply if work is being conducted on Settlement Land.

14.4.1 Regulatory Framework

14.4.1.1 First Nation Final Agreements

Several definitions are provided in **Chapter 1** of Final Agreements with respect to mineral rights for non-renewable resources:

"Minerals" means precious and base metals and other non-living, naturally occurring substances, whether solid, liquid or gaseous, and includes coal, Petroleum and

⁵ https://www.canada.ca/en/environment-climate-change/news/2017/05/pricing_carbon_pollutionincanadahowitwillwork.html

Specified Substances;
" <i>Petroleum</i> " means Oil or Gas;
" <i>Oil</i> " means crude oil, regardless of gravity, produced at a well head in liquid form, and any other hydrocarbons except coal and Gas and, without limiting the generality of the foregoing, includes hydrocarbons that may be extracted or recovered from deposits of oil sand, bituminous sand, oil shale or from any other type of deposits on the surface or subsurface;
" <i>Gas</i> " means natural gas and includes all substances other than Oil that are produced in association with natural gas.

Chapter 18 – Non-Renewable Resources sets out required considerations for the exercise of mineral rights for Petroleum, including provisions regarding the need for consent for access to mineral rights, and standards of performance where reasonable access is permitted without a requirement for consent of the affected First Nations.

14.4.1.2 **Tr'ondëk Hwëch'in Oil and Gas Act (Draft)**

This act (in draft form as of August 2013) will, when enacted, trigger reciprocal Consultation duties under Section 14 of the Yukon *Oil and Gas Act*. 'Consultation' will have the same meaning as in the TH Final Agreement.

14.4.1.3 **Oil and Gas Act**

The *Oil and Gas Act* (RSY 2002, c162) establishes the management regime for exploration, drilling, pipelines, facilities and production activities associated with oil and gas. Regulations established under the act include:

- *Oil and Gas Disposition Regulations*
- *Oil and Gas Drilling and Production Regulations*
- *Oil and Gas Geoscience and Exploration Regulation*

If there is a conflict between a provision of the *Territorial Lands (Yukon) Act Land Use Regulation* and the *Oil and Gas Act* or a regulation under it, the provision of the *Oil and Gas Act* prevails.

14.4.1.4 **Yukon Development Corporation Act**

The act and its regulations direct Yukon Development Corporation (YDC) and its wholly-owned subsidiary, Yukon Energy Corporation (YEC), to “participate in the economic development of Yukon by ensuring there is a continuing and adequate supply of energy in the territory in a manner consistent with sustainable development” (YEC 2012a). YEC owns and operates the electrical energy generation, transmission and distribution assets and the electrical rate structure is subject to the authority of the Yukon Utilities Board. YEC and YDC negotiate an annual protocol with the Government of Yukon, which outlines what is expected each year from the corporations.

14.4.2 **Policy Direction**

14.4.2.1 **Yukon Oil and Gas Rights Disposition Process**

Pursuant to the *Oil and Gas Act* and *Oil and Gas Disposition Regulations*, the rights to Yukon oil and gas are obtained through a competitive disposition process. The process involves the following stages (Adilman 2011):

- “Requests for Postings” (RFPs) are issued for locations in which industry is interested in exploring for oil and gas;
- RFP review during which the public, First Nations and government agencies may submit presentations with respect to environmental, socio-economic and access concerns related to the requested locations;
- “Call for Bids” where industry is invited to submit bids on posted locations; and
- Issuance of oil and gas permits to successful bidders.

The initial term of a permit is six years, and may be extended for a further four years if a qualifying well is drilled during the initial term. Companies are required to obtain all regulatory approvals and undergo environmental screening through YESAB prior to any activity, and companies are also expected to adhere to best management practices as outlined by Government of Yukon Oil and Gas Resources (OGR) (Adilman 2011).

14.4.2.2 **Micro-generation Program (Yukon)**

Under the micro-generation program, Yukoners can offset their electrical consumption by connecting renewable energy technologies to their homes or businesses while remaining connected to Yukon’s electrical grid. Utility customers in residential, general service and industrial classes can participate (Government of Yukon, 2013c).

14.4.2.3 Government of Yukon Energy Strategy

The development of the Yukon's natural gas resources is a priority action in the Government of Yukon's *Energy Strategy for Yukon* (Government of Yukon 2009). The strategy promotes sustainability, energy security, self-sufficiency, optimizing benefits, climate change coordination, leadership and partnerships (YEC 2012a).

Government of Yukon considers that developing Yukon gas resources would provide clean and reliable energy as well as create numerous economic development opportunities, as relying on expensive diesel fuel for energy is a major disincentive for the development and operation of mining projects in Yukon (Adilman 2011).

However, the *Energy Strategy for Yukon* also identifies increasing use of renewable energy sources as a priority to reduce fossil fuel use and greenhouse gas emissions. This includes replacing fossil fuels with cleaner energy sources where possible, investing in research and development for new technology, encouraging small scale renewable energy production, and developing a bioenergy industry by building a local market for wood energy technologies and wood fuel products. It also promotes energy conservation and efficiency (Government of Yukon 2009).

14.4.3 Current Best Management Practices

Best management practices (BMPs) have been developed for the Yukon's oil and gas industry to mitigate potential impacts on wildlife, wilderness tourism and heritage resources (Yukon Government, Date unknown).

The goals of the oil and gas BMPs are to conserve wildlife and fish habitat, vegetation and surface soil, and to avoid sensitive landscape and habitats. Specific considerations are preventing and minimizing permafrost degradation; restricting activities in wetlands to winter operating seasons; ensuring a healthy and vibrant Yukon trapping industry; protection of historic resources throughout the territory; use of "Low Impact Seismic" practices; and reduction in conflict with wilderness tourism operations (Government of Yukon 2011h).

14.5 Risks and Uncertainty

14.5.1 Energy Resources and Climate Change

Climate change could have major impacts for hydroelectric energy planning and infrastructure in the region. Known potential effects include: changes to water flow,

quantity and quality; increases in mean air temperature; changes in snow depth; and changes in weather patterns. These changes could result in melting of permafrost, changes to winter flow in streams, reduced stability of structures, engineering challenges and increases in construction costs, shifts in operational costs, and changes in accessibility on land and rivers.

There are excellent opportunities to integrate hydro with other intermittent renewable energies such as wind and solar, thereby responding to variability in generation and improving overall reliability. “The Yukon is fortunate to have significant hydro assets as this can accommodate and complement wind power without requiring natural gas electrical generation” (AECOM 2011).

Bioenergy is considered a carbon neutral fuel and not a net contributor to greenhouse gas emissions, since no more carbon dioxide is produced than was consumed by the tree during its growth. As long as new trees are allowed to grow in place of those harvested, a carbon balance is maintained. However, there are concerns about the contribution of wood smoke to air quality issues. This issue is being monitored by the Yukon Government (Government of Yukon personal communication, September 2018). In addition, there are concerns about availability of fuel wood for use by Dawson residents and bioenergy may be competing for the same resource base.

The global transition toward a greener and lower carbon economy, indicated by the Paris Agreement of 2015 and the green economic development strategies of many countries and sub-national governments, is likely to expand global markets for low-carbon energy resources and technologies and contract global markets for fossil fuels compared to historical trends. This creates an economic opportunity for Yukon to export clean energy technologies and expertise. It is also relevant when considering the development and export of local fossil fuel resources.

14.5.2 Other Risks and Uncertainties

The demand on the Yukon’s electrical grid is expected to outstrip the supply of renewable energy from existing Yukon Energy hydro facilities within the next few years, and potential new mines will require 200 megawatts of reliable and competitively priced electricity by 2021 to enhance their economic viability (Adilman 2011).

Although the use of liquefied natural gas as a source of electricity is promoted as a “cleaner” option than diesel (i.e., generates less greenhouse gas emissions), there are major public concerns with the potential for contamination of groundwater if hydraulic fracturing, or fracking, techniques are utilized for extraction. As well, some transportation options for

LNG (e.g. trucking) would generate additional greenhouse gas emissions which may offset any potential benefits.

Exploration and future development of hydrocarbon resources is dependent on access, both short-term (e.g., for exploration) and long-term (e.g., for infrastructure corridors). Any access restrictions to an area with petroleum potential will affect the ability to identify and achieve an economic and sustainable land base for resource development.

Development of oil and gas resources in, and north of, the planning region is dependent on access to potential industrial customers in the south, such as the mining belt in the southern portion of the planning region. Consideration of an access and energy corridor traversing the region is required.

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15 AGRICULTURE

15.1 Highlights

- The Dawson planning region contains some of the best agricultural land in the Yukon.
- In this region, high quality soils are associated with the floodplains and terraces of the major rivers. The areas of West Dawson, Sunnyside, Henderson's Corner, and the Klondike Valley contain large areas of suitable agricultural land.
- As of 2018, there are approximately 40 titled lots derived from agriculture land programs (i.e. Spot Land Program). However, spot land applications for agriculture have caused land use conflicts with YFN and individuals who apply in the region.
- TH has noted several Settlement Land parcels that are suitable for agriculture in the region.
- Some degree of self-sufficiency in food production is valued as a key factor for sustainable communities.
- Current agricultural production in the Dawson region is geared towards the local market with an emphasis on direct sales, either at the farm gate or at the weekly farmers' market in the summer. The majority of sales are for fresh vegetables and eggs, although bedding plants, dairy, and meats are making inroads.
- Agricultural development may impact traditional activities and disturb heritage resources.
- Improper management practices can result in adverse impact to wetlands and wildlife habitat.
- Yukon's agriculture policy states that no significant loss of key wildlife habitat will occur as a result of new agricultural land development.
- Some activities on agricultural land are assessed by the Yukon Environmental and Socio-Economic Assessment Board (YESAB). The resulting terms and conditions mitigate any significant adverse effects that would have otherwise impacted traditional activities, heritage resources and/or loss of key wildlife habitat in the project area.
- The Tr'ondëk Hwëch'in Teaching and Working Farm is a valued cultural and economic resource.

15.2 Description of the Resource

This section summarizes agricultural potential in the region including soil capability; climate; water considerations; existing and future potential production; and strategic planning considerations.

Agriculture is generally used in this section to refer to crop and food production. Agriculture activities generally refer to a wide variety of uses including but not limited to production, storage and sale of: crops, grains, eggs, dairy, honey, bedding plants, landscape trees, sod, beef, pork, meats, greenhouses and vegetables (Government of Yukon personal communication, September 19, 2018).

The Dawson Planning Region contains some of the most productive agricultural land in the Yukon. High quality agriculture soils are associated with the flood plains and lower terraces of major river valleys all across the Yukon. In this region, there are extensive suitable agriculture areas along the Yukon (both upstream and downstream of Dawson), the lower Stewart River as well as along the Indian River and, to a lesser extent, the Klondike River (Government of Yukon 2019).

Agricultural soils of Class 3 to 5 with provision for reasonable access are primarily located along existing transportation corridors (road and navigable river) within the planning region. Approximately 61,100 hectares of Class 3-5 soils are located on Crown Land and an additional 31,300 hectares located within First Nation Settlement lands (Government of Yukon 2019).

15.2.1 Agriculture Capability

Climate is one of the major determinants of northern growing conditions. The Dawson region has short summers and long winters, and temperature ranges are wide throughout the year (i.e., over 30°C in the summer to as low as -50°C in the winter). Long hours of daylight in the summer somewhat compensate for the shorter overall growing season (McCracken and Revel 1982). The Dawson region is considerably warmer in the summer months than elsewhere in the Yukon. Climatic data indicates a frost-free period of more than 80 days per year, a vegetative period in excess of 110 days (Hennessey et al. 2009).

Within the Dawson planning region lies some of the best arable agricultural soil in the Yukon. High quality soils are associated with the floodplains and terraces of the major rivers. There are extensive areas suitable for agriculture on islands in and along the banks of the Yukon River (both upstream and downstream of Dawson City), the lower Stewart River, the Indian River, and the Klondike River. Most of these areas are accessible only by

boat. More easily accessible subdivisions near the Dawson townsite (i.e., West Dawson, Sunnydale, Henderson Corner, and the Klondike Valley) also contain large areas of suitable agricultural land.

Government of Yukon's Agriculture Branch uses a standardized classification system when determining lands suitable for agriculture purposes. Class 1 being ideal with no significant limitations to agriculture to Class 7 lands which have no capability for agriculture (**Table 15-1** Soil suitability for agriculture classification, Yukon (Government of Yukon and Agriculture and Agri-Food Canada, 2008). The classes in-between provide a range of suitable types of agriculture that can occur on that land. There is an estimated 25,000 ha of class 3 or 4 lands in the Dawson/Mayo region. (Rostad et al., 1977).

Table 15-1 Soil suitability for agriculture classification, Yukon (Government of Yukon and Agriculture and Agri-Food Canada, 2008)

Class 1	1400-1600 EGDD	These lands have no significant limitations that restrict the production of the full range of common Canadian agricultural crops.
Class 2	1200-1400 EGDD	These lands have slight limitations that restrict the range of some crops but still allow the production of grain and warm season vegetables.
Class 3	1050-1200 EGDD	These lands have moderate limitations that restrict the range of crops to small grain cereals and vegetables.
Class 4	900-1050 EGDD	These lands have severe limitations that restrict the range of crops to forage production, marginal grain production and cold-hardy vegetables.
Class 5	700-900 EGDD	These lands have very severe limitations that restrict the range of crops to forages, improved pastures and cold-hardy vegetables.
Class 6	<700 EGDD	These lands have such severe limitations for cultivated agriculture that cropping is not feasible. These lands may be suitable for native grazing.
Class 7		These lands have no capability for cultivated agriculture or range for domestic animals.

Many Tr'ondëk Hwëch'in (TH) Settlement Land parcels are also suitable for agriculture. TH has noted several parcels south of Dawson City near the Yukon River that are suitable for grain crops (Class 3) and seeded forages (Class 5), as well as one site near the Stewart River. Parcels in the Klondike River valley (including C-7B, currently the Tr'ondëk Hwëch'in Teaching & Working Farm), land in the Henderson's Corner area, and some parcels along the Yukon River near the Canada/USA border were also deemed suitable.

15.2.2 Agricultural Production

15.2.2.1 Agricultural land disposition

The area has had a long history of agriculture in various forms since the Klondike Gold Rush. A small number of farms continued to supply central Yukon in the 1950s and 1960s, but the southern Yukon became dependent on imported produce, and farmers there focused more on forage crops and other sources of income.

In 1982, the first Yukon Agriculture Policy was released which allowed crown lands to be disposed of for agriculture use through a Spot Land Program. As well, a more recent planned land program was developed in the early 2000s to allow for the disposition of lands within higher demand areas. As of 2018, statistics show within the land planning area, approximately 40 titled lots were derived from agriculture land programs. As of May 2018, there are three active agriculture agreements for sale (Government of Yukon personal communication, September 19, 2018).

There are however concerns that the spot agricultural applications are in contravention with the objectives of Chapter 11 and agricultural activities should take place within planned areas be it regional or sub-regional (TH personal communication, September 2018).

Only one agricultural reservation is currently registered in the Dawson planning region, totaling 974.3 ha. This reservation is to restrict spot land applications near Flat Creek, in part due to Tr'ondëk Hwëch'in trapping interests in the area. The draft West Dawson/Sunnydale Local Area Plan also designates 130 hectares for agriculture (Government of Yukon 2012).

15.2.2.2 Current Agricultural Activity

Current agricultural production in the Dawson region is geared towards the local market with sales occurring:

- Directly with customers;
- At the Dawson Farmers Market;
- Through restaurants, grocery stores, bizzarres, and at the newly established butchery; and
- At the Dänojà Zho Cultural Centre and Tr'ondek Hwech'in events.

Yukon Farm Products and Services guide lists 12 farms in the Dawson area. Dawson farmers are supplying vegetables, herbs, berries, chicken, eggs, pork, preserves, syrups, ornamentals, bedding plants, field crops, hay and dairy products. Other recent Dawson local food highlights include:

- The Bonanza Market carries local vegetables;
- BonTon Butcherie & Charcuterie is cutting, curing and preserving farm raised meats;
- In 2017 and 2018, the Yukon Mobile Abattoir operated in Dawson to slaughter animals through the inspection process; and
- Klondike Valley Creamery operating out of Dawson was permitted in 2018 to process milk into cheese and yogurt for the retail market (Government of Yukon personal communication, September 2018).

Hay production is the single largest agriculture product grown in the Yukon, although the Dawson area has few livestock and horses so there is a very small market for these types of crops. Straw is used as bedding for sled dogs and poultry, and some big-game hunting outfitters produce their own hay for the horses used in their operations.

In recent years, TH has continued the development of the Teaching & Working Farm (Nän kāk nishi tr'ēnòshe gha hētr'ohoh'ay; On the land we learn to grow our food), at the old Strachan Farm property located on settlement land parcel C-7B between the Klondike River and the Klondike Highway near the Dawson airport. In 2014, TH partnered with Yukon College/Yukon Research Centre for the creation of the Teaching and Working Farm (TH Farm) on TH settlement land. The TH Farm has graduated two groups of students during 2016 and 2017, and has played an important role in improving their local self-sufficiency, food security and local skills development (Government of Yukon personal communication September 19, 2018). The five-year projection from 2014 was to establish organic crop production to provide fresh produce to 100 TH families and to provide produce to the local market – this projection has been largely attained (TH personal communication, September 2018). The farm has become an important education tool, employer, and revenue generator for Tr'ondëk Hwëch'in, and is an important program within the community. The farms supply local vegetables, eggs, poultry and pork for TH events and market sale.

The Government of Yukon also has a *Grazing Program*. Currently there are 33 grazing agreements in the Yukon. This program grants livestock owners grazing rights (through the grazing agreement process) on designated areas of public land.

15.2.2.3 Potential for Agricultural Production

In the 2011 *Dawson Community Food Survey*, local produce was found by consumers to be desirable and reasonably priced. However, respondents indicated that supply is inconsistent and not available in sufficient quantities to meet demand. There are other potential markets such as mining companies and camps, many of which source their orders through the local grocery stores (Conservation Klondike Society, 2011).

Additional opportunities exist in value-added production, where primary agriculture products are further processed or developed into products like jams, pickles and preserves, bread, cheese, wool clothing and crafts, and jerky. This practice diversifies operations to increase profitability, captures new markets and enables more year-round income. In 2018 the Dawson area saw new commercial operations coming online, including a creamery (cheese & yogurt production) and likely a commercial egg grading station (Government of Yukon, personal communication, September 19, 2018).

15.3 Resource Values

15.3.1 Natural Value

Agricultural activities are dependent on many ecosystem services, including pollination, biological pest control, maintenance of soil fertility and structure, nutrient cycling and hydrological services. In turn, agriculture provides services such as the regulation of soil and water quality, carbon sequestration and biodiversity (Alison 2010).

However, some agricultural practices have the potential to impact natural value. Clearing and burning of forests to create agricultural land can reduce available habitat for wildlife including large mammals, birds and furbearers. Other services provided by the boreal forest, such as carbon sequestration and biodiversity, may suffer when forest is turned to agriculture. Fencing and cross-fencing of agricultural land dispositions can disrupt movement corridors for wildlife. Agricultural crops can be an attractant for some wildlife species and result in human-wildlife conflict. Wildlife mixing with livestock can also increase the risk of disease transmission. Clearing of land can increase erosion and sedimentation, potentially impacting aquatic systems and waterfowl habitat if near wetlands. Imported seed stock and livestock feed have the potential to introduce invasive plant species.

Farming is good because we will need to produce food locally in the future.

Tr'ondëk Hwëch'in citizen comments (Tr'ondëk Hwëch'in 2012)

15.3.2 Traditional Value

At Moosehide small scale gardening goes back to the early 1900's as gardens were encouraged to promote self-sufficiency. Today several Moosehide residents actively maintain gardens on an annual basis. Residents and other citizens positively reminisced about the proliferation of gardens at Moosehide during early years and agreed that gardens were common, even up to the 1980s. Residents planted flower gardens and grew produce and traditional plants to supplement supplies. The practice has fallen away more recently. Ever-increasing food prices, and demand for fresh, organic local produce have highlighted the benefits of local food production (Tr'ondëk Hwëch'in, 2018b).

Many of the Tr'ondëk Hwëch'in Settlement Land parcels with agriculture potential were also selected for traditional economic resource pursuits and include heritage resources. For example, R-12A near Stewart River is suitable for Class 3 and Class 5 agriculture but was primarily selected for being a traditional river encampment. There are also a number of parcels identified as having good agricultural potential, and were selected for this purpose.

Conflicts may occur between agricultural development and harvesting activities. *Wildlife Act* regulations prohibit hunting within one kilometer of a residence without permission of the occupants.

Clearing of land, use of heavy equipment and other ground disturbance may damage heritage resources, traplines or other harvest infrastructure and impact on traditional economic activities.

15.3.3 Socio-Cultural Value

Self-sufficiency in food production is valued as a key factor for sustainable communities. Food security is a major area of vulnerability since only a small percentage (about 8%) of the food needs of the community are produced locally (Conservation Klondike Society 2011).

Many area residents invest in home gardens for personal and family use and, like most Yukoners, share their gardens.

Agriculture can provide educational, recreational and tourism opportunities. Farmers markets are regularly held during the summer, and many items quickly sell out.

The TH Farm is an excellent example of the socio-cultural benefits of agricultural practice in the community. The farm provides a teaching and learning environment, while providing a source of fresh local produce, preserves, meat and foodstuffs to citizens and community events.

15.3.4 Economic Value

The agriculture industry contributes to the Yukon economy as a whole through the purchase and sale of farm products, machinery and land as well as other transactions such as wages and processing fees. The state of the industry report for 2013-17 (Government of Yukon, 2018b) states:

- In 2016 Yukon farms reported \$4.3 million in total gross receipts
- Sector is growing slowly and farms are becoming more profitable
- The industry's potential growth is bolstered by development funds and incentives

Major limitations for large-scale operations include high start-up and operating costs including investment in machinery, equipment and facilities as well as costs of seed, fertilizer and labour. Most producers are unable to generate sufficient income to farm full-time and have to take on other jobs (Government of Yukon and Agriculture and Agri-Food Canada 2010).

15.4 Resource Management

The following sections note legislation and regulations that specifically address agriculture. Other acts and regulations dealing with land development, water use, or other industrial activities may also include measures to manage agricultural land use. Additional protocols and requirements may also apply if work is being conducted on Settlement Land.

15.4.1 Regulatory Framework

Lands Act and Territorial Lands (Yukon) Act

The Government of Yukon's Department of Energy, Mines and Resources, Agriculture Branch has the mandate to dispose of Crown Lands (under the *Lands Act* Section 3.1 and

the *Territorial Lands (Yukon) Act* Section 6). The Agriculture Branch accepts applications for Yukon Land providing that the land is unencumbered by any other use. The use must be soil-based agriculture (e.g., hay crop or market garden), which requires arable soil at the application site for the application to be successful. The minimum parcel size for an agriculture land application is six hectares and the maximum is 65 hectares.

Yukon Environmental and Socio-economic Assessment Act

Some activities on agricultural land are subject to review under the *Yukon Environmental and Socio-economic Assessment Act* (e.g. construction of buildings or structures).

Tr'ondëk Hwëch'in Lands and Resources Act and Tenure and Land Use Regulations

Provides for land and resource management of Settlement Lands to provide for the sustainable use of the land, promote healthy lifestyle of TH citizens, and to preserve the peaceful enjoyment of the land by TH Citizens.

Other Acts

- *Pounds Act and Highways Act* – livestock control
- *Animal Health Act and Animal Protection Act* – animal health and protection

15.4.2 Policy Direction

15.4.2.1 Government of Yukon

The current policy in place is the 2006 *Yukon Agriculture Policy* (Government of Yukon 2006) and its overall objectives are:

To encourage the growth of a Yukon agricultural industry that produces high quality products for local consumption in a manner which is environmentally sustainable, economically viable, and contributes to community well-being.

The policy states that the government will give priority to planning for new development in agricultural subdivisions where there is sufficient demand, and a policy target is in place to make 25 per cent of new farmland available through planned development areas by 2016.

Approximately 130 ha of land was identified west of Dawson with potential for an agricultural subdivision (Government of Yukon 2006).

The policy framework also has a target stating that there will be no significant loss of key wildlife habitat as a result of new agricultural land development. It advocates best management practices for maintaining wildlife habitat along farm edges, leaving wildlife

corridors, maintaining riparian buffers, and preventing disease transmission between domestic animals and wildlife. A key issue is the ability of biologists to quantify carrying capacity, or indicator-species density estimates, of wildlife habitats that are of interest for agriculture so that population-level impacts of trade-offs in land disposition can be estimated and brought forward to environmental assessment (YESAA) reviews.

The 2006 Yukon Agriculture Policy is currently under review. Yukon Government has completed its public consultation phase and in 2018 published a 'What We Heard' document. They are currently working towards an updated Yukon Agriculture Policy (Government of Yukon 2018c).

15.4.2.2 **Local Food Strategy 2016**

The intent of the strategy is to contribute to food sovereignty for Yukon, encourage Yukoners to make healthy and local food choices, and to support production, processing, distribution, access, waste recovery and consumption of local food (Government of Yukon, 2016)

15.4.2.3 **Other Stakeholders**

Non-government organizations with expressed objectives for research and development in Yukon agriculture and local food security include the *Yukon Agricultural Association*, *Yukon Game Growers' Association* and *Conservation Klondike Society*.

15.4.3 **Current Best Management Practices**

Best management practices for riparian management should be followed to ensure conservation of riparian and associated floodplain and valley- bottom dependent wildlife (notably beaver, river otter, waterfowl, and songbirds), in addition to the following:

- Fencing to Contain Horses on Yukon Government Grazing Agreements

15.4.4 **Monitoring Activity**

15.4.4.1 **Monitoring Agencies**

Agreements for sale and grazing agreements are monitored by the Government of Yukon's Agriculture Branch personnel to ensure compliance with Farm Development Agreements and grazing management plans. However, once title is obtained, there is no further

monitoring or requirement to continue agricultural production. Agricultural titled parcels remain zoned as agriculture permanently. In this case agriculture activities are the primary use under the *Development Area Regulation* and this use must be demonstrated prior to a review for approval of further development permits and subdivision options for that lot.

15.4.4.2 **Research Networks**

Research, science and innovation are also key initiatives for future agriculture. Crop production research has been undertaken at the Gunner Nilsson and Mickey Lammers Research Forest outside Whitehorse since 1988. A variety of crops, soil conservation techniques, soil enrichment practices, irrigation and new technologies are tested for suitability in the Yukon.

15.5 Risks and Uncertainty

15.5.1 **Agriculture and Climate Change**

Changing temperatures, precipitation, and evaporation conditions will affect agriculture most strongly through the amount of irrigation water required to produce a crop. Increased water demand from a progression towards higher-value crops and changing streamflow regimes could become an issue for smaller creeks.

Future climate change could bring longer, warmer, wetter springs and an increased number of frost-free days. This could create greater opportunities for agriculture with a longer growing season and potential for increased crop yields and new crop varieties. However, this could also bring new challenges such as more erratic and unpredictable weather (e.g., more lightning and fires, high winds, and extreme events) and new insect pests and diseases.

The thaw of discontinuous permafrost also creates uncertainties related to developmental timelines. Removal of vegetation precipitates melting of ground ice and, depending on depth of frost and soil texture, it is difficult to predict when cleared land will be dry enough to farm.

Warming climate conditions that allow for expansion of agricultural areas may increase the potential for conflict between agriculture and other land users (e.g., industries such as placer mining and tourism and recreation that would also have extended seasons).

15.5.2 Other Risks and Uncertainties

There is the potential for spills and contamination of soil and water from the storage and handling of fuels and pesticides (if used).

Some areas in the planning region with high agricultural potential are already being utilized by other land users. For example, one large polygon on the Indian River was identified in the 1977 soil survey as having high potential, but the entire valley bottom has since been staked and placer mined. At the same time, placer mining presents a unique opportunity for agriculture development. At the closure and restoration end of the placer cycle, provided that fine texture materials and organics are preserved for redistribution over the gravels, revegetation may provide a transition to agriculture uses (Government of Yukon 2011a).

Future industrial demand for water is expected to increase, which may impact both water quality and quantity. Water management decisions (e.g., issuance of water licences) need to take into account discrepancies between the needs of water users and the current and future supply.

Water quality concerns associated with agriculture arise mostly from non-point-source pollution resulting from various agricultural practices and from precipitation runoff. Yukon's semi-arid climate, limited summer precipitation, and riparian setbacks have, to date, prevented intensively used agricultural areas from impacting waterways (Government of Yukon 2011b).

The risk of land being acquired and cleared for agricultural purposes and then being utilized for other purposes is an uncertainty that will need to be managed accordingly (TH personal communication, September 2018). Areas around Henderson corner as well as some small areas within Sunnysdale were once developed farmland but have since moved to Rural Residential and/or other uses (Government of Yukon personal communication, September 19, 2018).

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16 TOURISM and RECREATION

16.1 Highlights

- The Dawson region has a long history as a tourism destination and is an important contributor to regional and territorial economies.
- Scenery, wildlife viewing, Klondike gold rush history, and historical attractions are identified as key tourism attributes of the region.
- Historic resources and attractions tied to gold rush history are concentrated in and around Dawson City.
- Linear heritage features, particularly the Ridge Road Trail and Yukon Ditch are popular for motorized and non-motorized recreational use.
- Tourism provides seasonal and year-round jobs for local residents, as well as seasonal jobs for transient summer workers.
- Dawson residents are primary users of the recreation resources in the region.
- Opportunities for growth include winter activities, lodge-based tourism, First Nation cultural interpretation tours, and ecotourism.
- Areas with high potential for new and expanded recreation activities include the Yukon River Corridor and Forty Mile area; Ogilvie Mountains and Dempster Highway Corridor; the Yukon Ditch trail network; and the Top of the World Highway.
- The Regional Economic Development Plan for the Tr'ondëk Hwëch'in Traditional Territory identifies opportunities for growth including FN cultural heritage sites (e.g. Tr'ochëk) and Tombstone Territorial Park (including the Dempster Highway).
- Another major tourism opportunity for the region is the potential Tr'ondëk-Klondike UNESCO World Heritage Site. The bid for this designation is currently on hold but may be resubmitted in the future by the project partners.
- Visitation data shows significant increases in visitor numbers and tourist spending. New attractions such as the Inuvik to Tuktoyaktuk highway may continue to contribute to this rise in the region.
- Tourism operators note that land use and access are potential barriers to business growth. There is limited access to land for infrastructure and uncertainty about land tenure.
- Increased resident and visitor use of popular routes and destinations may impact environmental and cultural values and resources in the region
- Best management practices and cross-industry cooperation are key to maintaining a quality wilderness and/or cultural tourism experience

16.2 Description of Resource

The Dawson region is an important destination for visitors to the Yukon. Well-known historical and cultural attractions, along with wilderness destinations such as the Yukon River and Tombstone Territorial Park and road-accessible tundra landscapes, continue to attract visitors looking to explore Yukon history, cruise and paddle historic and wild rivers, hike through sub-arctic landscapes, and learn about the cultural heritage of the Tr'ondëk Hwëch'in.

Dawson City is a critical component of the region's tourism sector. With well-established tourism attractions, accommodation, infrastructure and tourism services, facilities and businesses, Dawson is a destination for nearly all highway and backcountry visitors and is an important factor in tourism growth in the region. While most tourists visit in the summer, Dawson has a growing winter tourism season anchored by outdoor and cultural events and activities that attract both visitors and media.

The region has a long history as a tourism destination and as an important contributor to regional and territorial economies. Today, tourism is an integral part of a diversified economy for the region, and maintaining economic diversity will be important for continued economic growth and stability.

Tourism is a resource-based industry typically grouped into eight sectors (Government of Yukon 2013a):

- Accommodations
- Transportation
- Events and conferences
- Attractions
- Food and beverage
- Adventure tourism and recreation
- Travel trade
- Tourism services

Tourism activities, businesses, viability and growth potential depend on recognition and consideration of tourism interests in land and natural and historical resources. Many tourism activities are seasonal in nature:

- *Summer:* hiking and backpacking, canoeing, rafting, fishing/angling, power boating, motorboat touring, mountain biking, hunting, wildlife viewing, biking, berry picking, photography, paragliding, and 4WD/ATV touring.
- *Winter:* snowmobiling, cross-country skiing, dog-sledding, skijoring, snowshoeing, downhill and backcountry skiing and snowboarding.

In summary, canoeing, hiking, motorized boat tours and summer and winter events are the most popular visitor activities in the Yukon (Government of Yukon 2019):

- Annually, 14-18 tourism operators, the majority of which are Yukon-based, guide over 300 multi-day canoeing clients on the Yukon River; and 1,500 tourists rent canoes for self-guided trips on the Yukon River.
- About 15,000 tourists take motorized boat trips on the Yukon River each year, mostly between Dawson and the Yukon-Alaska border and return.
- From 1995 to 2007, annual visitation to the Dempster Highway Interpretive Centre grew from about 3,000 to over 12,000. Approximately 20 tour companies include the Dempster Highway and Tombstone Park as part of a Yukon tour, and six companies, the majority of which are Yukon-based, guide multi-day trips into the Park.
- Three outfitters guide hunts in the planning region.

16.2.1 Areas of High Recreation and Tourism Value

Areas of high recreation significance correspond to areas of high tourism value or potential. The report *Klondike Regional Plan: Outdoor Recreation Data Review* (EDI Environmental Dynamics Inc. 2010) notes several areas of high potential for new and expanded recreation activities, including the Yukon River Corridor and Forty Mile area; Ogilvie Mountains and Dempster Highway Corridor; the Yukon Ditch trail network; and the Top of the World Highway (**Section 3 –Map #27: Tourism and Recreation**).

Recently, reality television shows such as *Gold Rush*, which focuses on the life and business of placer miners, are being filmed in the region. They are seen as a huge driver for tourism and revenue for the region (CBC North, 2017).

In the region there are currently two main areas that attract tourists outside of Dawson City these are, Tombstone Park and The Dempster Highway.

16.2.1.1 Dempster Highway

The Dempster Highway is a unique and well-known touring route with an international reputation as one of the last wilderness highways in North America. It is Canada's only highway to the Arctic and it enables viewing and study of tundra landscapes, arctic ecology, birds and wildlife that are not accessible by road anywhere else in Canada. The summer of 2018 marked the opening of the all-season highway between Inuvik to Tuktoyaktuk, NWT, this highway is expected to attract thousands of new visitors each year, all of whom will be travelling through the Dawson Region and up the Dempster Highway (CBC 2018). The highway also provides access to canoeing and rafting on the Blackstone and Klondike rivers and to Tombstone Territorial Park.

Touring by vehicle is the main activity along the Dempster, complemented by wilderness-based activities like hiking, mountain biking, camping, photography and nature study.

16.2.1.2 **Tombstone Territorial Park**

Tombstone Territorial Park is within the Dawson planning region but a separate management plan is in place for the park. It is an important tourism destination for day and multi-day wilderness trips and for highway travelers. Nearly all visitors access the park by the Dempster Highway, and most park visitors also travel to other destinations in the planning region. Over 80 per cent of non-water based wilderness tourism activity in the “Klondike region” (as defined by Government of Yukon 2008) takes place in the park. Hikers and photographers are attracted by tundra walking with dramatic views, unusual landforms and craggy peaks. Wildlife watchers are rewarded by a diversity of species including large mammals and an array of arctic and subarctic birds. Exploring Tombstone Territorial Park can involve everything from short hikes off the highway to multi-day backpacking and mountaineering trips in the backcountry (Government of Yukon 2008).

Increased use of remote helicopter access sites, new enquiries from operators regarding air-access hiking trips, and increased use of backcountry campsites indicate good potential for managed growth in the park (Government of Yukon 2008). 2017 visitor statistics, taken at the Tombstone Interpretive Centre were 22,895, this is up from 15,670 in 2016, an increase of 46% (Government of Yukon, personal communication, September 19, 2018).

16.2.2 **Visitation Data**

The Tourism Yukon 2017 Year-end Report (Government of Yukon, 2017a) cited that 2017 was a record-breaking year for visitation numbers and retail sales in the Yukon, with an estimated 334,000 overnight visitors and an estimated \$418 million in visitor spending. 2017 was also a record-breaking year for international border crossings, which is another metric used to assess the health of the tourism sector (**Figure 16-1** 5-year trend in border crossings into Yukon).

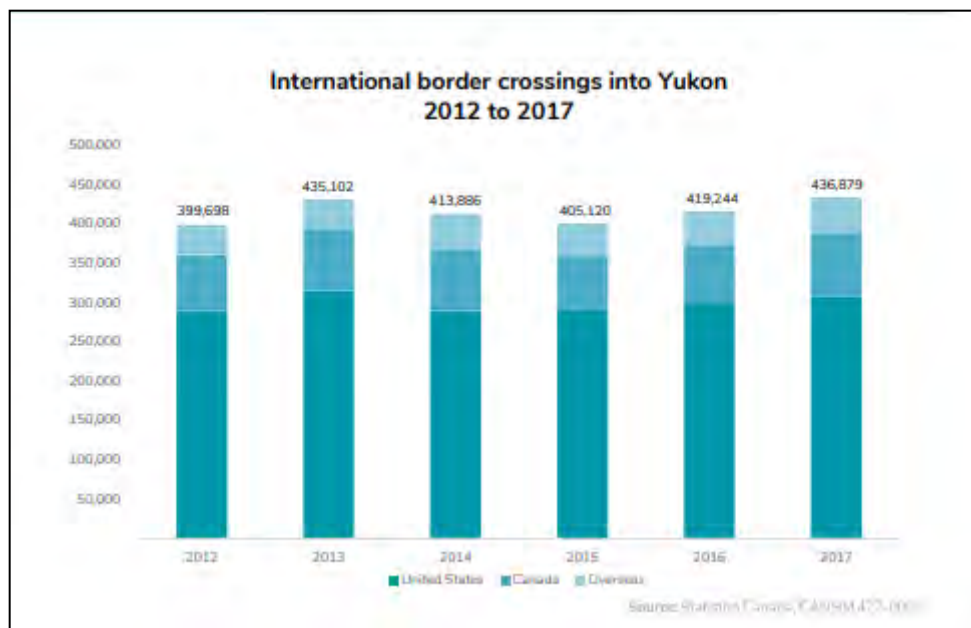


Figure 16-1 5-year trend in border crossings into Yukon

The Dawson / Little Gold crossing on the Top of the World Highway saw 22,473 people cross into Yukon in 2017 (Government of Yukon, 2017a). However, many Americans are travelling through the Yukon on their way to Alaska, and as a result spend considerably less time and money in the Yukon per party than other groups of visitors.

The US accounts for the majority of visitors to the Yukon, Canada is the second largest tourism market, and Germany, Australia, and the UK currently form the Yukon's largest overseas market and the third largest market overall (Government of Yukon, 2017a). Condor Airlines provides direct weekly flights in the summer between Frankfurt and Whitehorse. Visitors from Japan continue to grow as more companies offer activities such as aurora viewing. (Government of Yukon 2011b).

The last comprehensive regional visitor survey was conducted in the summer of 2012-2013. 29% of respondents to the survey cited Dawson as their primary destination in Yukon and 23% cited Dawson as their favorite Yukon community (Government of Yukon, 2013). **An updated Yukon Visitor Exit Survey is currently underway and results will be available in 2019.**

In the summer of 2016, a Community Visitor Survey was conducted in the Dawson region representing over 3,400 visitors to the region (Government of Yukon, 2016). Some of the highlights of this report are:

- The visitors surveyed were from: 45% Canada, 33% US, 16% Europe, 6% Asia;
- 88% planned to visit Dawson; and
- 95% of people participated in at least 1 outdoor activity and 27% of them participated in 5-7 outdoor activities (Table 16-1) (Government of Yukon, 2016).

Table 16-1 Ranked outdoor activities in the Dawson Region

Outdoor activities participated in	Overall
Wildlife viewing or bird watching	58%
Hiking	48%
Camping	41%
Visiting Tombstone	38%
Driving the Dempster	36%
Go on a river cruise	31%
Gold panning	29%
Visiting the Dome	18%
Fishing	17%
Canoeing/kayaking	11%

Some wilderness-based events in the Dawson area draw major media attention that raises awareness of, and interest in, Yukon and the region as a tourism destination. The Yukon Quest, Arctic Ultra, Fulda Challenge and Trek Over the Top help to raise the profile of Dawson as a winter tourism destination. The Yukon River Quest – the longest annual canoe and kayak race in the world – attracts several hundred paddlers each June.

Historic routes like the Yukon River, the Dawson Overland Trail, the Ridge Road Trail and Yukon Ditch support tourism activities and events, and historic sites and features enrich visitor experience by adding a cultural and interpretive component to outdoor activities and tours.

16.2.3 Tourism Opportunities and Challenges

There is a growing awareness of the Yukon as a travel destination, assisted by a strong *Yukon Now* marketing campaign which started in 2014. Growing overseas markets include Oceania, the Netherlands and Japan. Emerging markets include China and Mexico.

In 2009, Mammoth Mapping (in association with Across the River Consulting) prepared a *Final Report: Land Asset Identification and Analysis* for the Tourism Industry Association of the Yukon. The study identified 10 major criteria used for decision-making in the overall development of tourism locations (Mammoth Mapping 2009):

- | | |
|---|---|
| 1. Scenery | 6. Near environment |
| 2. Wildlife | 7. Infrastructure, services and amenities |
| 3. Accessibility | 8. Access to existing market |
| 4. Activity-based | 9. Wilderness |
| 5. Cultural heritage and interpretation | 10. Conflict with industry |

“Scenery” is repeatedly identified as one of the Yukon’s key tourism attributes both from visitor feedback and industry surveys. Highly diverse topography, mountainous terrain, vast views or vantage points, and visibility of large waterbodies are considered most positive. Roads (especially highways and high-traffic roads but also limited-use roads and trails), forest harvesting areas, damaged forest areas (i.e. fire), and views of other infrastructure (e.g., power lines, built-up areas, pipelines, cutlines, towers and runways) are considered negative.

Tourism operations are more likely to be developed in areas with high wildlife viewing opportunities, especially for the “charismatic megafauna” (i.e., caribou, bears, moose, wolves and sheep) as well as raptors and waterfowl. Ideal locations are in close proximity to navigable waterbodies, trail networks or backcountry routes, and places of historic and cultural importance, as well as interpretive signage or tours. Proximity to existing market locations is also important (e.g., highway networks or well-branded places like national parks).

The Yukon is marketed primarily as a wilderness destination, so areas with high levels of industrial activity are not considered desirable. In the Mammoth Mapping (2009) study, both potential and actual conflict with industry was identified as an issue.

Some of the mineral development activities that were identified as having a negative impact on tourism include air traffic, landscape damage and advanced stage/multi-year projects (Mammoth Mapping 2009).

Potential for growth in regional tourism opportunities exists due to strong interest in outdoor destinations, adventure/leisure-oriented products, touring, culinary experiences, cultural pursuits and experiencing natural phenomena.

In addition, the 2018-2028 Yukon Tourism Development Strategy (YTDS) has identified a number of goals, core values, and action plans that can inform land use planning as follows (Government of Yukon 2019):

- One main goal is sustainable tourism development, to ensure tourism growth supports healthy communities and preserves our natural environment for generations to come.
- A key value is to preserve and enjoy the natural environment. The natural environment must be effectively managed so that visitors and residents can explore wild and dynamic landscapes without detracting from them or impacting wildlife habitat. Wilderness a fundamental part of who we are.
- Another key value is to honour heritage, which includes Indigenous knowledge and traditions, the natural environment, heritage sites and experiences, and significant historical events such as the Klondike Gold Rush.

16.2.3.1 **UNESCO World Heritage Site Submission**

The proposed Tr'ondëk—Klondike World Heritage Site is one of thirteen sites identified in Canada's current Tentative List for World Heritage Sites as having strong potential to meet the high standards required for nomination under UNESCO (Parks Canada, 2018).

The regional tourism industry report identified the designation as the primary opportunity for growth in the sector going forward and the economic benefits may be significant. In May 2018, the project partners jointly decided to withdraw the nomination from consideration by the World Heritage Committee (Tr'ondëk Hwëch'in, personal communication, 2018). The bid (Tr'ondëk-Klondike proposal) was unique in that it considered a "cultural landscape" that included areas of natural interest and past and active mining sites. Pending reassessment of the proposed site's values and boundaries, Canada (in collaboration with Yukon-based partners) may resubmit the Tr'ondëk-Klondike nomination to UNESCO in future (Government of Yukon, personal communication, September 19, 2018).

Project partners including Tr'ondëk Hwëch'in, City of Dawson, Government of Yukon, Parks Canada, Klondike Visitors Association, Klondike Placer Miners Association, Dawson City Museum, Dawson City Chamber of Commerce and Yukon Chamber of Mines worked together with local residents from 2013 to 2018 to pursue a successful inscription of Tr'ondëk-Klondike on the World Heritage List.

16.2.3.2 **Top of the World Highway Interpretive Plan**

The intent of the Top of the World Interpretive Plan is to create an interpretive experience for the increasing number of travellers on the highway by presenting

stories and information through the use of signage and brochures. It will convey key storylines and messages about local and regional cultural heritage and natural resources. The proposal includes: three Interpretive Rest Areas, two Special place pull-outs, ten Points of Interest, and three Highway Information signs (Government of Yukon, 2019b)

16.2.4 Tourism Infrastructure

Typical infrastructure that support tourism operations include accommodations, restaurants, logistics, supplies, shopping, fuel, power, potable water, communications, activities and attractions, and medical services. Depending on the location and time of year, these may be available only seasonally or be limited in quality and/or quantity, and may or may not be required depending on the type of tourism activities.

A capacity study undertaken by Burke (2003) utilizing information from Yukon wilderness tourism operators identified the winter season as an area with potential for more growth. It was noted that existing activities such as dog sledding and northern lights viewing could be expanded, as well as new activities such as skijoring, ice fishing, and ski trips with overnight stays in cabins. Some operators felt that the lack of infrastructure and services were a barrier for winter season expansion, particularly the minimal restaurants and hotels open year-round and less options for air travel scheduling. Other opportunities for industry growth (non-season specific) included lodge-based tourism, First Nation cultural interpretation tours, ecotourism with a focus on environmental education, and finding ways to encourage visitors to stay longer.

The Burke (2003) study also asked operators what they considered as barriers to business growth or reaching full capacity; **almost all operators noted land use and access as a major factor**. Access to wilderness lands was a priority for their business, including the ability to build cabins, lodges and other infrastructure to attract more clients, but initial land costs are too high for remote locations and there is uncertainty about land tenure.

16.3 Resource Values

16.3.1 Natural Value

In the context of wilderness tourism, “wilderness” is any area in the Yukon in a largely natural condition in which ecosystem processes are generally unaltered by human activity. It may include areas of visible human activity that don’t detract from wilderness tourism (Government of Yukon, 2008).

Thanks to several major assets – the Yukon River, Tombstone Territorial Park, the Dempster Highway and Klondike National Historic Site – along with an established trail network in and near Dawson City, the region is one of the Yukon’s most active wilderness tourism areas. Some of the valued natural tourism assets of the region include:

- The Tintina Trench is a dramatic bird migration corridor in May and September. It is also home to many terrestrial wildlife year-round
- The riverside cliffs, wetlands, marshes and muskegs provide suitable nesting sites and plenty of food.
- The flight of the sandhill cranes is the most obvious and spectacular of the migrations as over 200,000 birds pass through the valleys on their way to and from their tundra nesting grounds.
- Porcupine caribou herd migration can be observed from Dempster Highway locations.
- The numerous river tributaries that drain into the trench provide migration routes and spawning grounds for salmon.
- Heritage routes, such as the Ridge Road Heritage Trail, and historic sites are often featured and interpreted in wilderness activities (Government of Yukon 2011c).
- The Yukon River’s easy access and paddling makes it the most popular canoe route in Yukon and in Canada’s North, showcasing First Nations and Klondike Gold Rush history.
- There are approximately 15 mostly Yukon-based operators that lead trips down the Yukon River each year.
- Visitors also take advantage of rental canoes, motorized tours (in 2004 there were over 17,000 clients serviced by 11 licensed operators (Government of Yukon, 2008))

16.3.2 Traditional Value

- *It is good to show people the land and to tell our stories.*
- *Tourism is ok if people are just viewing the land.*
- *People who come from the outside don't know how to take care of the land. Accidents can happen when people do not know what they're doing. Accidents to themselves and to the land, like forest fires. - Tr'ondëk Hwëch'in citizen comments (Tr'ondëk Hwëch'in 2012)*

For Tr'ondëk Hwëch'in cultural tourism can be an opportunity to share and teach about their homeland and worldview. It can provide meaningful opportunities for TH citizens who can take pride in sharing their stories and knowledge of their traditional territory. Elders

have voiced concern that too many people can have an adverse impact on the land. In addition, Elders worry that tourists are not educated properly about the land and living outdoors. This may cause damage to the land or create accidents where people are hurt. Solutions may include increased education about how to care for the land as well as guided activities. Some tourism activities can create meaningful economic opportunities, especially given the desire for cultural experiences that tourism demands. Elders feel that any new developments must be small-scale and leave a small footprint (Tr'ondëk Hwëch'in 2012).

First Nations values related to recreation are described in the *Klondike Regional Plan: Outdoor Recreational Data Review* (EDI Environmental Dynamics Inc. 2010) as follows:

Like other residents of the Klondike Planning Region, the Tr'ondëk Hwëch'in are very involved with outdoor activities throughout the year. The Tr'ondëk Hwëch'in participate in a wide variety of outdoor activities, including boating, fishing, hunting, snowmobiling, and dog-sledding. However, some differences do exist between First Nations and other local residents in perceptions of recreation. These differences in perception by local First Nations lie in the unique link between cultural and subsistence activities with recreation activities.

Consumptive activities such as fishing, hunting and berry-picking are more than a form of recreation to the Tr'ondëk Hwëch'in; they are an important means of subsistence and a traditional part of their culture. The subsistence value of these consumptive activities can lead to challenges when discussing recreational values with First Nations. Many activities (camping, boating, and nature-viewing) typically identified as recreational activities coincide with these subsistence activities, and are often seen as inseparable.

The Tr'ondëk Hwëch'in also had a unique perspective when identifying areas of particular recreational value. These interests often focused around areas of cultural and heritage value within their community (Government of Canada, 1998). Areas that were identified of particular importance were Tr'ochëk (also known as Lousetown), Moosehide Village, R-22 (healing camp), and Forty Mile.

There is a strong relationship between history and tourism in the planning region. The region's history and its visible and interpreted historic resources remain key visitor attractions, and there are opportunities to enhance and build on that relationship in the future. Visitors are interested in learning about Yukon's history and culture through experiences, stories and interpretation of the features and landscapes around them. There is a positive relationship between conserving historic and cultural resources and enhancing visitors' experience – conservation enables the experience; experience generates appreciation, support and economic benefits from visitors, which in turn reinforces the value of conservation and interpretation of those resources.

Linking the region's stories through history can provide opportunities for enhanced and new tourism experiences, products and partnerships.

The relationship between gold mining and the Yukon's ice age history and science is intriguing. Klondike miners unearthed evidence of Yukon's ancient past at the turn of the century and modern Klondike area placer mining produces hundreds of fossils each year. The Klondike region is well known around the world for research on ice age paleontology, geology and environmental science.

16.3.3 Socio-Cultural Value

16.3.3.1 Perceptions of Tourism

In a study conducted by YG (Government of Yukon, 2019c), at least 80% of Yukoners who answered responded positively about the overall benefit of tourism to the territory and their community. "Overall, Yukoners felt positive about the social and cultural impacts of tourism in Yukon. At least two-thirds of Yukoners feel tourism positively contributes to quality of life and helps preserve and celebrate culture" (Yukon Government, 2019)

16.3.3.2 Recreation

Recreational use, including hiking, skiing and both motorized and non-motorized vehicle use has important physical, social, creative, intellectual, and spiritual benefits to residents of the planning region. Access to and protection of existing trails and maintaining the wilderness character of recreational use areas is important for residents.

The Klondike Active Transport and Trails Society (KATTS), based in Dawson City, seeks to develop and promote non-motorized recreation trails in the Klondike region "in order to promote healthy, safe and spiritually rewarding outdoor activities and showcase our regions rich cultural and natural resources" (KATTS 2013) [*sic*]. Current KATTS projects include construction and maintenance of the 9th Avenue Trail skirting Dawson City, developing a GIS-based trails inventory, and further developing the trails network in Tombstone Territorial Park (KATTS 2013).

The Dempster Highway passes through three land use planning regions, but from a traveler's perspective, the highway is viewed as a whole. Cooperative efforts are needed to protect and manage highway viewsapes to ensure that the values that attract visitors are maintained.

The Government of Yukon and Yukon First Nations are developing regulations to guide back-country ATV use in the Yukon. The regulations process is currently in the consultation stage (refer to **Section 17.5** for more information).

16.3.4 **Economic Value**

16.3.4.1 **Yukon GDP**

In 2016, Yukon businesses attributed \$262.9 million of their gross revenue to tourism, which is up from \$226.9 million in 2014. In 2016, the total GDP attributable to tourism was \$117.2 million, which represents 4.4% of the total GDP in Yukon. These figures have increased since 2014, when the total GDP attributable to tourism was \$95.9 million representing 3.9 per cent of total GDP (Government of Yukon, 2017b).

16.3.4.2 **Employment**

According to the Yukon Economic Outlook 2017, the outlook for visitation to Yukon remains positive. Tourism related activities add to the diversity of the local economy, help promote the territory, and support employment across a wide variety of local goods and service providers (Government of Yukon, 2017c). Retailers, grocery stores, restaurants, accommodations providers, providers of sport and recreational activities and providers of arts and culture all benefit annually from the activities of visitors to Yukon. Tourism accounted for nearly 3,500 jobs in Yukon in 2015, up 4.7% from 2014 (Yukon Bureau of Statistics, 2015). The tourism sector accounted for 13.5% of all jobs in the Yukon labour market in 2015, the highest of all the provinces and territories and above the national figure of 9.7% (Government of Yukon, personal communication, September 19, 2018).

16.3.4.3 **Special Events and Activities**

Recreational events also contribute to the Yukon's economy. For example, the Government of Yukon states that the 2006 Yukon Quest race resulted in an estimated increase in spending of \$214,000 in the Yukon; an estimated \$107,000 increase in the Yukon GDP; and 10 full-time equivalent jobs (Government of Yukon News Release #07-247).

The film industry also contributes to the Dawson and Yukon economy. The TV show Gold Rush, which airs on the Discovery Channel, contributed \$1.2 million in GDP to Dawson's economy in 2014 and employed 51 Dawson residents. Awareness of the Gold Rush TV show is also having a measurable impact on the decision of tourists to visit the territory

and to extend their length of stay in the territory (Malcolm Taggart Research Northwest, 2015).

16.3.4.4 **Tr'ondëk Hwëch'in**

As outlined in *Regional Economic Development Plan Traditional Territory of the Tr'ondëk Hwëch'in: Community based projects implementation 2013-14* (Klondike Development Organization 2013), planned community-based projects include promotion and expansion of Tr'ondëk Hwëch'in heritage tourism. Tr'ochëk National Historic Site of Canada, Forty Mile Heritage Site, Tombstone Territorial Park, and Dänojà Zho Cultural Centre combined have the critical mass to act as the foundation of a unique First Nation heritage tourism feature that will appeal to new and existing visitor markets, including the important cultural traveller segment. However, the correctly positioned visitor products are not in place. The project aims to support heritage tourism business opportunities that can deliver the key accommodation, transportation, interpretive guide and other experiential services that meet the demonstrated demand.

16.4 Resource Management

16.4.1 **Regulatory Framework**

16.4.1.1 **First Nation Final Agreements**

FN Final Agreements require tourism values and resources to be identified and considered in project assessments, land use plans, and fish and wildlife management plans. Tourism activities and tourism potential based on heritage resources and natural areas are important to economic development.

16.4.1.2 **Parks and Land Certainty Act**

The protection and management of representative areas of territorial significance provides recreational opportunities for Yukoners and visitors, and encourages public appreciation of Yukon's natural environment as a legacy for future generations. Protecting these resources supports tourism activities and opportunities and manages visitor activities, including the development and maintenance of campgrounds, recreation areas and other facilities.

16.4.1.3 **Wilderness Tourism Licensing Act**

Maintenance of the quality of Yukon lands and waters is central to the wilderness tourism sector. The act requires operators to obtain a licence to conduct wilderness tourism activities, adhere to minimum impact camping standards, and report statistics about commercial trips and rentals.

The act and regulations allow for activity-specific regulations and may limit commercial activity to achieve conservation objectives or ensure sustainability of the wilderness resource.

16.4.1.4 **Various Transport Canada Legislation**

Various laws and regulations under Transport Canada apply to a variety of tourism activities. These include the *Marine Liability Act* and *Canada Shipping Act* (river rafting and other small vessel regulations), as well as various regulations pertaining to aviation.

16.4.1.5 **Historic Resources Act**

This act promotes appreciation of Yukon's historic resources and provides for their protection and preservation as well as study and interpretation. It allows for appropriate visitor opportunities and historic sites.

16.4.1.6 **Environment Act**

Part 5 of this act refers to Integrated Resource Planning and Management, and recognizes the inherent value of wilderness as a resource. The act also allows for the designation of a 'wilderness management area'.

16.4.1.7 **Tr'ondëk Hwëch'in Heritage Act**

Provides direction for the management of Yukon First Nations heritage and culture.

16.4.2 Other Planning Partners

Tourism Industry Association of the Yukon (TIA Yukon)

TIA Yukon aims to “influence, promote and assist the development of tourism in the Yukon” by acting as the territory’s common voice for the visitor industry association (TIA Yukon 2013).

Wilderness Tourism Association of the Yukon (WTAY)

WTAY is the collective voice of the wilderness and adventure tourism industry in the Yukon. Member based, nonprofit organization providing marketing, advocacy, research, consultation, referrals and education.

Klondike Visitors Association (KVA)

The Klondike Visitors Association focuses on visitation to Dawson City with a marketing emphasis on the area’s unique past, present and future. (Klondike Development Organization 2013)

Inter-Jurisdictional Initiatives

In partnership with the private sector, non-government organizations and other governments, the mandate of the Government of Yukon’s Department of Tourism and Culture is to (Government of Yukon 2011c):

- Generate long-term economic growth and revenues for the benefit of Yukon people through the development and marketing of Yukon’s tourism industry.
- Generate long-term economic growth and maximize socio-cultural benefits for Yukon residents and visitors through the preservation, development and interpretation of historic resources, visual, literary and performing arts and cultural industries in the Yukon.

16.4.3 Current Best Management Practices

The Wilderness Tourism Association of the Yukon (WTAY) has developed a set of guidelines explained in the brochure *Code of Conduct for Operating Wilderness Tours* (WTAY 2002). These guidelines were prepared by WTAY in consultation with tourism operators, First Nations, non-government organizations, and several Government of Yukon departments. WTAY promotes the definition of ecotourism as “responsible travel that conserves natural environments and sustains the well-being of local people.”

- *Best Environmental Practices on Yukon Rivers* (WTAY 2013) To minimize river travellers' impacts on the environment and on other travellers (including tourists, residents, First Nations people, hunters, trappers and fishers)

Wilderness tourism operators and big game outfitters often operate in remote regions where aircraft is required to transport clients, equipment and supplies. Best management practices for reducing disturbance from aircraft to wildlife have been developed and are utilized by the tourism industry including:

- *Flying in Sheep Country: How to minimize disturbance from aircraft* (Government of Yukon 2006b)
- *Flying in Caribou Country: How to minimize disturbance from aircraft* (Government of Yukon 2010)

A **Memorandum of Understanding** (MOU) was signed in 2008 between the Yukon Chamber of Mines (YCM), Klondike Placer Miners Association (KPMA), and TIA Yukon. (YCM, KPMA and TIA Yukon 2008).

The purpose of this MOU is to provide a foundation of mutual recognition, respect, education, open dialogue and cooperation between businesses in order to foster healthy development and minimize conflict. Where conflict does occur, the MOU provides a forum in which to defuse tensions and resolve differences cooperatively (Government of Yukon 2011c).

Best management practices for protection of heritage resources educate clients about legislation (e.g., no removal of artifacts), reporting any discoveries, practicing no-trace camping, using existing trails and avoiding new trail development on landscape features with high potential for heritage sites (e.g., edges of terraces or ridges and riparian zones) or utilizing a buffer of 60 to 100 m from these features.

16.5 Risks and Uncertainty

16.5.1 Tourism and Climate Change

Climate change could create uncertainty around snow and weather conditions, potentially impacting plans for tourism expansion in the winter season.

Heritage and cultural sites that occur in permafrost areas may deteriorate as a result of ground shifting. Sites adjacent to river shorelines are particularly susceptible to slumping and erosion from increased melting of permafrost.

Climate change impacts on road transportation in particular is leading to substantial increases in maintenance costs, and may lead to declining levels of service on some roads frequently trafficked by tourists.

16.5.2 Land Use Compatibility

Freeman (1983) states that the carrying capacity of an area's resources for tourist use can be defined as "the maximum use level for developments when both environmental quality and user satisfaction are maintained." Freeman goes on to note that carrying capacity is determined by three factors:

1. The biophysical characteristics of the resource that affect the resource's sensitivity to use;
2. The user's expectations of the resource's condition, which affect the amount of resource degradation tolerated by users; and
3. Management actions that upgrade the resilience of an area to overuse (e.g., paving trails), change user expectations (e.g., promote an overused tent campground as an RV campground), or balance biophysical characteristics with user demand (e.g., regulating fishing season and catch limit).

New access to remote areas could open up possible tourism opportunities. In a written submission to the Dawson Regional Planning Commission (2012), Government of Yukon notes that while historic ground access is important for tourism in the planning region, new ground access may or may not be useful or beneficial to tourism and should be part of a comprehensive assessment of potential conflicts. Key factors include:

- Desirable and undesirable tourism features or destination accessed by a route;
- Impact of increased use on wilderness resources and other resource uses;
- Environmental and economic sustainability of new tourism opportunities; and
- Practical and safety considerations associated with public use of new backcountry industrial roads (e.g., potential industry responsibility for capital and operational costs of road infrastructure).

Depending on the tourism product and intended market, new opportunities could also arise utilizing trail, river or air access.

Tourism is a resource-based industry, and continued success and growth depends on maintaining those resources (e.g., opportunities for fishing, both recreational and commercial, are dependent on healthy fish stocks). Areas which could potentially be impacted by other land use and development activities include aesthetics, water quality and safety considerations along the Yukon River corridor; Tombstone Territorial Park

values; guided hunting activity values of wilderness and wildlife; scenic views and access to recreational activities (particularly along the Dempster Highway and Yukon River corridors); and impacts of new ground access on the Yukon Quest route (e.g., Dawson Trail may have potential for all-season access to the White Gold mining region).

Increased resident and visitor use of popular routes and destinations may impact environmental and cultural values and resources.

- Level of use in some recreational areas can become so high that the quality of the recreational experience is diminished (i.e., “loving it to death”).
- Use of motorized vehicles may disrupt wildlife and damage sensitive ecosystems (e.g., alpine plateaus).
- Competition on popular established trails and increasing traffic on the Yukon River has created congestion and some conflict between operators.

Compatibility with traditional uses of the land:

- The majority of Tr’ondëk Hwëch’in trapping concessions are located between Km 1 and Km 266 of the Dempster Highway; the highway corridor is also a major wildlife movement corridor and is used for traditional harvesting activities of moose, caribou and sheep.
- Wilderness tourism activities such as backcountry hiking, campsites, trail development, and infrastructure development can potentially impact heritage resources.
- Also, there may be a conflict between tourism activities and traditional harvesting activities occurring in the same areas or utilizing the same resources; for example, large numbers of hunters (guided and independent) from outside the region could impact wildlife populations also used by local First Nations and resident hunters. The Yukon River valley is also a vital area for traditional salmon fishing and wildlife harvesting.

Compatibility with the resource development sector:

- Resource development activities may affect the aesthetic, or visual, quality of recreational use (e.g., the sight of mining activities or pipelines on the ground or helicopters flying overhead would disturb a wilderness experience).

On the other hand, resource development activities can also provide increased opportunities for recreation, particularly through the development of new roads by providing access to areas previously accessible only by air.

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17 TRANSPORTATION and ACCESS

17.1 Highlights

- Major transportation assets of the region that allow for economic, traditional and recreational activities include: three highways, a community airport and airstrips, an international border crossing, the Yukon River Corridor, a traditional trail system, and numerous secondary roads and trails typically associated with economic activities.
- The Yukon River is the major navigable waterway in the region and one of the most valuable resources to TH and many others. It is a key transportation corridor and essential to traditional economic activities.
- Shared corridors provide economic and ecological advantages. However, route selection for new all-season corridors is difficult without full cost accounting and consideration of potential environmental, social and cultural impacts.
- Increased access in the region can have positive and negative effects on traditional, socio-cultural and economic values. However, the impact of increased access on the natural values of the region is generally negative.
- The impact of access on ecological integrity and wildlife varies with the;
 - size and extent of access features,
 - level of activity associated with those features, and
 - success of mitigation measures designed to minimize these impacts.
- Limits to access affect the ability of resource users to pursue economic, recreational or cultural activities.
- Aggregate resources are limited in the Dawson Region and their availability must be taken into consideration when planning large infrastructure projects and access routes.
- Yukon Government is currently developing a Resource Road Regulation and an Off-Road Vehicle Regulation which will guide access decisions in the territory.
- The proposed Northern Access Route (NAR) involves the creation of new roads, upgrading existing roads and stream crossings starting from the Klondike Highway near Dawson City and extending south to the proposed Coffee Mine project.
- The proposed Northern Access Route (NAR) is approximately 214km long starting from the Klondike Highway near Dawson City and extending south to the proposed Coffee Mine Project. The NAR follows existing public roads for over 80% of the route and will require a total of approximately 37km of new road construction to connect

existing portions, along with various upgrades to existing road and stream crossings along portions of the remainder of the route (Personal Communication, Mining Industry Submission, January 2020).

- Climate change presents risk to the stability of transportation infrastructure and uncertainty in route planning to avoid permafrost areas.

17.2 Description of Resource

Regional access and transportation networks are vital for the movement of people, food, freight, construction materials, fuel, and other goods and supplies. Transportation networks and infrastructure also have a major influence on land use patterns and economic development within the planning region. In the following section, various types of land, water and air-based access are identified. Aggregates are also included in this chapter because their primary purpose in the planning region is as a key resource vital for construction and maintenance of the modern road transportation network.

Movement was a way of being for the Tr'ondëk Hwëch'in and other Athabaskan peoples. Constant movement was both a way of life and a means of ensuring life. Rather than heading out on an occasional trip, the Tr'ondëk Hwëch'in were constantly watching for signs from weather, land and animals, and preparing to move with the seasons. Travel was one of the few constants in life (Winton, 2013).

17.2.1 Traditional and Modern Trail Networks

For the purposes of this report, trails are distinguished from other types of land-based access and are defined as “ground access that is constructed with very little movement of earth and rock” (Tr'ondëk Hwëch'in 2013a).

17.2.1.1 Trails

Traditional trails have been developed over long periods of time, with many used more intensively during certain times of the year to access seasonal harvesting opportunities as well as for other travel and trade purposes. They are worn smooth and kept open mainly through this ongoing use, and they remain a key infrastructure asset that requires little maintenance effort. Trails and travel routes, similar to landmarks, helped to define a traditional territory, as well as create links between people, resources and different territories. Haynes and Simeone suggest that “aboriginal travel routes often took the path of least resistance, following naturally cleared corridors, such as rivers, exposed ridges, and low mountain passes...” (Haynes and Simeone p19).

The modern trail network is often associated with recreation, tourism and hunting. The Dawson region has many trails and other access routes (on land and water) which have multiple users – snowmobilers, dog mushers, skiers, ATV riders, hikers, bikers, horseback riders, walkers, runners, trappers, hunters, fishers, berry pickers, boaters, canoeists, kayakers and more formal trails that are used extensively by residents and tourists. Often times these trails will encompass all or part of a traditional trail system. Their importance to the region is discussed in further detail in **Chapter 16: Tourism and Recreation**.

17.2.1.2 Traditional Travel Routes

Traditional ‘routes’ may not have any physical remnants. Traditional routes may include historic access where there is no longer physical indication of a route, but the traditional knowledge surrounding this route is still present, and the knowledge and connection to the route is still culturally important.

Major traditional travel routes are indicated in **Section 3 – Map #14: Paleontological, Archaeological and Historic Localities**. When creating the Dawson regional plan it is important that these traditional routes are identified within each Land Management Unit. Traditional travel routes are identified in the THFA (see below) and detailed maps are included as Appendix A of the *Tr’ondëk Hwëch’in Navigation Project 2013-2014* (Winton, 2013).

The Tr’ondëk Hwëch’in (TH) Final Agreement identifies a number of traditional travel routes with particular cultural and heritage significance, including:

(TH – DIAND 1998, Chapter 13, Schedule C)

- Eagle to Old Crow
- Hän migration
- Dawson to Moosehide
- Dawson to Fort McPherson
- Dawson to Tetlin

17.2.2 Roads and Access Corridors

Roads and access corridors are the most predominant type of access in the planning region and includes highways, secondary roads, cutlines, power transmission lines, seismic lines, pipelines, airstrips, railway lines and bridges. For the purposes of this report, we categorize all of these as “linear features” or “linear infrastructure” on the landscape.

Roads and linear infrastructure are considered in **Section 6.4** of this report as **surface disturbance**. Refer to these sections for more information on current levels of surface disturbance, linear features density and disturbance

17.2.2.1 Highways

The major highways in the region are:

- **The Klondike Highway:** All season, multi-use transportation corridor connecting the region to south Yukon and to the north via the Dempster highway.
- **The Dempster Highway:** All season multi-use transportation corridor connecting the region to the south via the Klondike Highway and to Inuvik in the north, connecting with the Tuktoyaktuk Highway further north to the Arctic Ocean.
- **The Top of the World Highway** accessible only during summer months via ferry from Dawson. It is an important scenic route linking Yukon and Alaska.

The Yukon Department of Highways and Public Works (YG-HPW) is responsible for annual maintenance of major highways and roads, and also has land tenures for road building and maintenance facilities, gravel pits and quarries.

There are also numerous other roads and trails in the planning region (some maintained year-round, others only seasonally, and others not at all) that provide access to residential, commercial, and industrial properties as well as recreational and cultural use areas. YG-HPW has jurisdiction over both maintained and unmaintained highways (Government of Yukon 2013a).

17.2.2.2 Private resource roads

These are less common in the Yukon than in other jurisdictions like British Columbia. Responsibilities for construction and maintenance are with the owner during the time of operations, but once decommissioned to the standards outlined in the permitting process, the area reverts back to Crown land.

17.2.2.3 Special designation under the Area Development Act

See **section 17.4.1** for further information on:

- The Dempster Highway Development Area
- The Tombstone Corridor

17.2.2.4 Yukon Resource Gateway Project

In 2017, the Federal Government committed to contributing funds to the proposed Yukon Resource Gateway Project for road creation and improvements to “realize the potential national economic and social benefits that will arise from mineral development in Yukon”(Government of Yukon, 2017).

The Dawson Range of the Yukon Resource Gateway Project will involve upgrades to a series of roads starting from the Klondike Highway near Dawson City and extending south to the proposed Coffee Gold Mine property and the proposed Casino mining area. Upgrades to existing Goldfields roads will also provide increased access for the Yukon Placer industry and increased safety for users of this road network. Improvements and further road access will also positively impact the viability of the Coffee Project, an open-pit gold mining proposal in the northern portions of the Dawson Range (Government of Yukon, 2016).

The Coffee Gold Mine Project submission to YESAB by Goldcorp Inc. includes further details about the proposed road into the Coffee Gold area, referred to as the Northern Access Route (NAR) (**see Figure 17-1**). Within the Dawson Planning Region the proposed road will entail predominantly minor and major construction on existing access corridors and some construction of new roads. The NAR follows the same route as the Dawson Range of the Yukon Resource Gateway Project but culminates at the Coffee Gold area. The NAR will require construction of approximately 37km of new road, to create a 214km continuous route that will begin on the Hunker Creek Road just outside Dawson City and end at the mine site's airstrip. There are proposed barges and ice bridges to cross the Yukon and Stewart Rivers (Goldcorp Inc., 2017a, Goldcorp Inc., 2017b).

More detail of the Northern Access route is provided **Section 3 – Map #22: Quartz Mining Activity**.

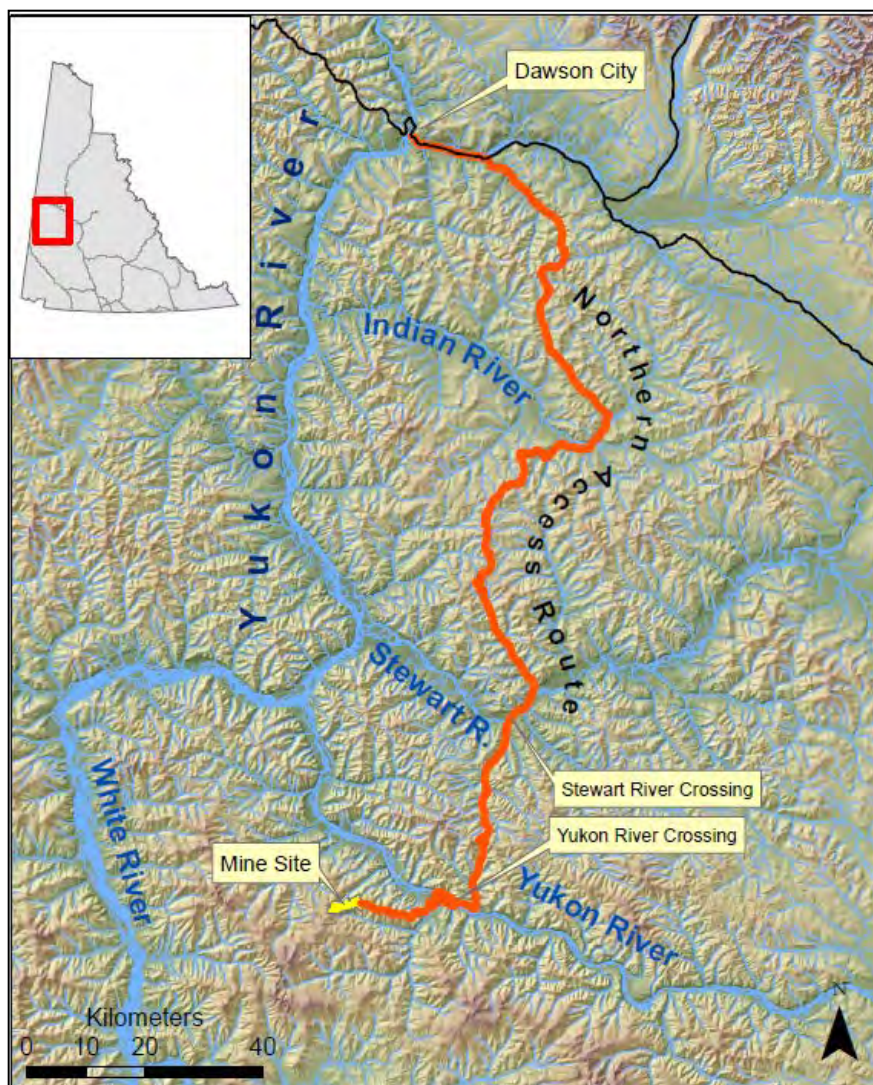


Figure 17-1 Regional Overview of the Northern Access Route: Coffee Mine Project (Goldcorp Inc., 2017a, Goldcorp Inc., 2017b).

17.2.2.5 Access corridors conceptual study

Shared access corridors to areas of economic opportunity or demand (e.g. energy transmission, mineral exploration, mining, forestry or tourism) have advantages in terms of economic savings, efficiency and reduced linear disturbance on the landscape. Identifying potential resource access corridors can inform investment decisions by natural resource developers and can help avoid public/private land use conflicts.

Access Consulting Group prepared a *Conceptual Study to Identify Potential Natural Resource Infrastructure Access Corridors* for the Government of Yukon, Department of Energy Mines and Resources in 2003. This was a desktop-level study aimed not at proposing access

routes, but rather at identifying the most probable locations where access corridors may need to be developed, based on natural resource potential and developments that would require infrastructure access corridors in order to be economically viable over the intermediate to long-term. The report recognizes that detailed engineering studies would be required prior to final selection of routing and construction of any corridor (Access Consulting Group 2003).

The spatial data for these potential access corridors is available and can be mapped for the region, and additional details on the corridors can be found in the last iteration of this report (Government of Yukon, 2013c).

The criteria used to evaluate potential access corridors included (Access Consulting Group 2003):

1. Maximize resource potential
2. Minimize construction cost
3. Minimize potential maintenance cost
4. Maximize utilization of existing infrastructure network
5. Minimize environmental impact

The study identified 32 potential resource infrastructure access corridors, including the following nine within the planning region (Access Consulting Group 2003). For more detailed information on the potential corridors refer to the 2014 Resource Assessment Report and/or Access Consulting Group's report (2003).

17.2.1 Rail access

Rail access has been discussed in the past, specifically in regards to the transportation of liquid natural gas (see **Chapter 14 – Energy**). U.S. political support for the construction of this resulted in the passage of the *Rails to Resources Act* (2001) by the U.S. Congress, and some discussions between Canada and the U.S. about conducting further feasibility studies (Access Consulting Group 2003). The Alaska to Alberta Railway (A2A), a privately owned company, has proposed a 2,400km rail route connecting Alaska to Northern Alberta. The proposed route will potentially run near or through the Planning Region (A2A Rail, 2019).

17.2.2 Water Access

Waterways have historically been significant in the Yukon, particularly prior to the development of a ground transportation system. Travel routes provided by navigable rivers and lakes increased people's ability to carry heavy loads and move more quickly and

effortlessly. They were linked with trails on land to create an interconnected transportation system. (Tr'ondëk Hwëch'in 2012).

The Yukon River is the major navigable waterway in the planning region and an important access corridor. Barge transportation of fuel and supplies provides an economical option for seasonal resource industry activity. The George Black Ferry on the Yukon River, operated by the Government of Yukon, links Dawson to the Top of the World Highway and on to Alaska. It operates roughly from mid-May until mid-October. The potential for replacement of ferry service at Dawson City with a permanent bridge has been discussed in the past, but no definitive information has been provided to the Commission.

The Yukon River corridor is one of the most valuable resources of the planning region to the Tr'ondëk Hwëch'in and to many others in the region. It is not only a key transportation corridor, but also used for many other activities including hunting, fishing and berry picking (Tr'ondëk Hwëch'in 2013a). Various landing sites and docks are also associated with water access.

Ice roads along rivers in the winter have also been important factors in transportation to and from resource developments and communities.

Today several placer mines upriver of Dawson City depend on Yukon River barging for the economical transportation of bulk fuel and heavy machinery to their operations. Both the Coffee Gold and Casino quartz projects utilize barges to supply the advanced explorations projects. Barges in the region generally load from Dawson City or Minto Landing. The potential for future development of an industrial waterway system is limited to the short open-water season and to the major deeper rivers with less navigational hazards (Access Consulting Group 2003).

17.2.3 Air Access

The Dawson community airport has scheduled Air North daily passenger service to and from Whitehorse, Inuvik and Old Crow. The runway was paved in May, 2019. It is anticipated the newly paved Dawson Airport runway will enhance tourism, increase economic opportunities and improve community security in the region. YG-HPW manages this airport as well as the airstrips at Chapman Lake and McQuesten Field (which are not maintained regularly, and are slightly outside of the Region boundary). (See **Section 3 - Map #2: Infrastructure, Access and Land Status**).

New airstrips are constructed on an as-needed basis to service individual projects for the purposes of exploration, development and associated activities (Access Consulting Group 2003).

17.2.4 **Aggregates**

Aggregate reserves and deposits (i.e., sand, gravel, crushed rock and topsoil) are a critical resource needed to support the development of transportation, municipal and industrial infrastructure. Government gravel reserves are set aside to ensure that gravel resources are available for long-term maintenance and construction projects. Reserves are proposed based on a 50-year projected need.

Aggregate potential is not well documented in the planning region outside of existing sources, which tend to be located where there is current demand (i.e. along major highway corridors). Aggregate resource assessments have been completed for the Dempster Highway corridor, and the high terraces along the major rivers in the corridor (primarily the Eagle, Bell, Whiststone, and Porcupine rivers) are a source of potential aggregate resources (North Yukon Planning Commission 2007).

In the planning region, aggregate resources are used primarily for road construction and maintenance. As shown in **Table 6-4**, the planning region currently has 40 gravel pit reservations with a total area of 1,174.55 ha, the most numerous and extensive third-party interest in the planning region. Three quarry leases are also registered, covering an area of 15.2 ha. These land dispositions are all located along the three major highways (Klondike, Dempster and Top of the World) and are shown in **Section 3 – Map #2: Infrastructure, Access and Land Status**. Other related infrastructure includes storage areas for granular stockpiles and equipment.

Quarrying generally refers to the extraction and removal of aggregate materials from a pit or site. However, YG has accepted YESAB's recommendation to allow for YG-HPW to recover aggregate from mine tailing for road maintenance over a five-year period. Most of this aggregate will be used on the Goldfields loop roads (TH personal communication, September 2018).

17.2.4.1 **Gravel Pit Development**

Gravel pits are developed as needed. Establishing a gravel reserve does not grant approval to develop a pit (this is done through the quarry permit application and review process), nor does it assume the reserve will be developed as a pit immediately or at all. Reserves

can also be modified to accommodate environmentally sensitive areas and other land use interests, may be developed in only a portion of the total area, and may not be used continuously throughout their development (Government of Yukon 2011*b*). Pits are also used as camp locations, maintenance and fuel storage, granular stockpiles and equipment storage areas. (See **Map #2 Infrastructure, Access and Land Status**).

Development of a new pit typically consists of clearing an area for the pile site (usually a pad with a drainage ditch around the perimeter), construction of an access road, geotechnical testing, and maintenance and fuel storage. Annual use of existing gravel pits typically involves stripping of overburden (usually stockpiled for reclamation purposes), extraction of gravel, transportation of extracted material to pits or crushing sites (generally in close proximity to the project, i.e., 3-6 km), maintenance and fuel storage, contractor camps, and burning of brush and trees. These tend to be short-term projects of a few days to a few weeks, conducted in summer during low water season when streambeds and floodplains are dry (YESAB 2013).

17.3 Resource Values

Many of the impacts that result from industrial land uses, particularly to ecological integrity and fish and wildlife populations (and by extension traditional economic activities), are a result of the direct and indirect effects of roads and other forms of access and people's use of them. Access is a common theme to all resource and land uses described in this report. This section describes potential impacts of access on various other values in the planning region, both positive and negative. It is recognized that these impacts are potential only (i.e., may not occur at all) and may also be project-specific, species-specific, and/or time-specific (e.g., some impacts may be only temporary, such as during the construction phase of a project). It is also recognized that not all access is the same (e.g., a trail versus a major highway), and numerous options exist to mitigate many of these impacts. Some mitigation measures are discussed in the Resource Management section below, in terms of regulatory regimes and best management practices. Specific access management strategies for the planning region will be detailed in the Final Recommended Plan.

17.3.1 Natural Value

- *We need to protect our land so that we can enjoy it. How can you enjoy the land when it is being torn apart?*
- *We need to limit what we do on the land in order to protect the water.*
- *Roads can be beneficial for berries.*
- *Roads can be good for moose because willow grows.*
- *We need to respect the land and not strip it all up.*
- *Reclamation is good but won't replace what is lost.*
- *Roads and vehicles chase the animals away and spoil the land.*

Tr'ondëk Hwëch'in citizen comments (Tr'ondëk Hwëch'in 2012)

17.3.1.1 Potential Impacts of Access on Ecological Integrity

Access can have a number of potential impacts on the ecological integrity of the region. Sources for section: (Carmanah Research Ltd. 1995, Hamilton and Wilson 2001, Craighead 2002, Forest Practices Board 2005, Eos Research & Consulting Ltd. 2009, Daigle 2010, Union of BC Municipalities and Government of British Columbia 2010, and others specifically noted in the text)

17.3.1.1.1 *Pollution*

- Increased levels of contaminants and air emissions from vehicles
- Displaced and compacted soils and increased dust levels from vehicle traffic can cause changes to soil temperature and pH, water retention and light levels. This leads to changes in biomass and plant growth, loss of productivity, and impacts on larger ecosystem processes.

17.3.1.1.2 *Hydrology*

- Reconfigured landforms can cause changes to the water table, timing of runoff, wetlands and streambed materials. Other changes to the hydrologic system include interruption or diversion of groundwater flow and alteration of streamflow (timing and intensity of high and low flows).

- Hydrology changes (slopes, surface disturbance leading to permafrost degradation, disruptions to stream flows and drainage patterns) can result in higher levels of erosion and an increased number and extent of landslides or other debris flows.

17.3.1.1.3 *Species composition*

- Dispersal of invasive plant species along the road and trail system

17.3.1.1.4 *Ecosystem alteration*

- Some ecosystems are particularly fragile and sensitive to damage (e.g., alpine plateaus or areas containing rare plants).
- Infrastructure related to access fragments landscapes inhibiting the ecosystems' ability to adapt to change, including climate change.
- Compaction of snow from snowmobiles lowers the temperature beneath the snow and reduces over-winter survival of plants, soil microbes and small mammals (YFWMB 2003).
- Increased risk of forest fire due to human activity or increased need for fire suppression around areas of human activity can alter natural fire cycles.

17.3.1.2 **Potential Impacts of Access on Wildlife**

Access can have a number of potential impacts on wildlife species and habitat, including the following:

Sources for section: (Carmanah Research Ltd. 1995, Hamilton and Wilson 2001, Craighead 2002, Forest Practices Board 2005, Eos Research & Consulting Ltd. 2009, Daigle 2010, Union of BC Municipalities and Government of British Columbia 2010, and others specifically noted in the text)

17.3.1.2.1 *Habitat damage, loss and modification*

The easiest and cheapest places to build roads (e.g., valley floors, floodplains and south-facing slopes) are also typically high-value seasonal habitat for mammals and birds. Clearing of vegetation and forest cover removes both active and potential wildlife habitat and creates opportunities for changes in species composition (e.g., invasive plants).

17.3.1.2.2 *Habitat fragmentation and barriers to movement*

Access roads and trails across habitat prevents wildlife from fully using preferred areas or migration routes, especially where they are required to cross long, wide stretches. Roads, fences, buildings and other infrastructure create physical barriers to movement. Several forest-dwelling bird species exhibit reluctance to cross gaps in forest cover, and while other species do not appear to perceive roads as barriers to movement, their willingness to fly over puts them at risk for collisions (Kociolek et al. 2011).

17.3.1.2.3 *Direct and indirect mortalities and injuries*

Each year many animals are killed or injured by vehicles on roads. Moose are killed most frequently in winter when deep snow limits their movements outside of plowed rights-of-way (YFWMB 2003). Birds are more likely to collide with vehicles if they forage, roost or nest near roads, or are attracted to road salt. Collisions with linear features such as power lines account for a major source of bird mortality. Road mortality is an issue especially for populations or species that are already small, isolated, declining, threatened or endangered.

Roads and trails increase hunting pressure on animal populations and increase the likelihood of negative human-wildlife encounters, particularly bears and other “problem wildlife” which often need to be relocated or destroyed. A study in British Columbia’s Rocky Mountains found that from 1971 to 1998 all the grizzly bears killed by humans (96 bears) were killed within 500 m of a road or trail (YFWMB 2003).

Animals may be poisoned by ingesting contaminants such as de-icing agents, petroleum-based compounds, chemicals and other substances that spill or accumulate on paved roads during construction, maintenance and use. Dust on unpaved roads can change the composition of vegetation, and gravel roads are sometimes treated with dust suppressants, the environmental and toxicological effects of which are not well understood (Kociolek et al. 2011).

Many sectors of the economy rely on helicopters and fixed wing aircraft for operations. Mineral exploration often occurs in mountainous areas that can only be accessed by aircraft; outfitting and ecotourism businesses operate in many remote areas; and aircraft-based tourism such as flightseeing, heli-hiking and heli-skiing has also increased steadily over the years. Many of these places are also home to caribou, sheep, and other alpine species like marmots and pikas. Caribou and sheep are susceptible to aircraft disturbance,

especially at periods in their annual cycle that are most important for long term survival of the herd. (EDI Environmental Dynamics Inc. 2008, Laberge Environmental Services 2006).

17.3.1.2.4 *Modified behavior patterns and predator-prey relationships*

Many wildlife species will avoid roads and other infrastructure because of heavy traffic, noise, lights, smells and other signs of human activity, over the long term causing a shift in home range and migration routes.

Some wildlife species are more adaptable than others to human activity associated with roads (e.g., grizzly bears and wolverines tend to be more sensitive to disturbance), and some individual animals may have more or less experience with similar disturbances. Public access to the backcountry in off-road vehicles is now common with powerful new technology and increasing numbers of ATV and snowmobile owners.

Examples of behavior change:

Caribou: In a study conducted near Revelstoke, British Columbia the aspects of snowmobiling most disturbing to caribou were human scent and large groups of machines moving rapidly around an area. Caribou were able to tolerate low levels of snowmobile use and, if not harassed, their tolerance would increase.

Bears: Bears are more likely to be impacted by disturbance in the spring when they emerge from their dens and are physically stressed.

Moose: Studies in the Talkeetna Mountains near Denali, Alaska show increasing recreational snowmobile use is beginning to change moose use of preferred treeline willow habitats. Moose are especially dependent on these habitats in the winter (YFWMB 2003).

Hoary marmot: A study conducted in the Tombstone area found that following a disturbance by a hiker, hoary marmots became more vigilant and spent less time foraging. (Cadsend and Jung, manuscript in preparation, as cited in Government of Yukon 2011c).

Some animals are attracted to roads for ease of travel (especially in winter), available forage or road salt. Birds often rest on road surfaces because they retain heat, and associated road infrastructure like poles and bridges can create nesting sites. However, frequenting areas close to roads makes them more vulnerable to vehicle collisions and hunting pressure. Predators like wolves are also known to use roads for easier hunting, and scavengers like foxes and ravens will look to roads as a food source (roadkill).

17.3.1.2.5 *Impacts on health, survival and reproductive success*

Access and disturbance from human activities may cause wildlife to have higher stress levels, increased exertion and use of energy reserves by running away or moving more than usual. This is especially detrimental at critical times of the year (for caribou and moose these are the fly season, very cold weather in winter, late pregnancy and calving time). Animals displaced from their preferred or ideal habitat to avoid disturbance lose nutritional value and/or safety from predators.

An interesting example of this can be seen with some species of birds, traffic noise appears to have the most widespread and greatest indirect effect on birds since they rely extensively on acoustic communication. Reproductive success rates of ground-nesting birds are also often lower where roads or linear infrastructure are present because of increased “edge effect” and nest predation by mammals such as foxes (Kociolek and Clevenger 2011).

17.3.1.3 **Potential Impacts of Access on Fish and Aquatic Systems**

Access can have a number of potential impacts on fish species and habitat, as well as on other aquatic species such as waterfowl, including the following:

Sources for section: (Carmanah Research Ltd. 1995, Hamilton and Wilson 2001, Craighead 2002, YFWMB 2003, Forest Practices Board 2005, Eos Research & Consulting Ltd. 2009, Daigle 2010, Union of BC Municipalities and Government of British Columbia 2010, and others specifically noted in the text):

17.3.1.3.1 *Habitat damage, loss and modification*

If roads are not carefully built and maintained, they can be damaging to fish habitat. The removal of vegetation near streams during construction can cause an increase in stream sediment and temperature, as well as removing several key features of riparian vegetation (shades streams and keeps them cool, provides a food source for fish, and provides debris for shelter). Human activity and the use of vehicles and machinery in proximity to streams can cause sedimentation and there is the potential for spills and contamination to affect water quality.

17.3.1.3.2 *Habitat fragmentation and movement barriers*

The construction and use of roads and trails built near streams and wetlands can cause issues surrounding erosion, pollution, sedimentation, changes in water temperature, alteration of stream flow, barriers to migration, and general destruction of fish and bird habitat.

17.3.1.3.3 *Direct mortalities and injuries*

Where roads bisect wetlands, ducks can collide with vehicles while crossing the road. Fish can become caught in machinery or equipment, and fish fry can be smothered by sediments.

17.3.1.3.4 *Impacts on health, survival and reproductive success*

Increased sedimentation in streams can affect the development of fish eggs and fry and be harmful to invertebrates that fish feed on. Increased water temperature can cause migratory disruption, a decrease in reproductive success, and an increased vulnerability to disease. Removal of vegetation can increase vulnerability to predators and disease, and barriers to migration can affect population levels. Chemicals and contaminants such as road salt, oil and chemicals can pollute water. All of these impacts can cause reduced body mass, reproductive success, and survival of individuals and local populations.

17.3.2 **Traditional Value**

Trail networks were historically a key component of the traditional economy. Trails combined with water routes provided by the navigable rivers and lakes to link together much of the traditional territory and provide access to key harvest locations. This transportation system also provided social and cultural connections, shaping people's perspective on the world and bringing people together. First Nations people viewed their traditional territories and landscapes within the context of trail networks and marine routes, as shown by place names and stories. Animals also frequently moved along trails, and certain trails served as trade corridors by providing passage to adjacent traditional territories. Many trails and routes continue to be used today for the same purposes (Tr'ondëk Hwëch'in 2012).

Trails, routes and waterways remain important today for contemporary activities on the landscape, the traditional economy and heritage resource values. Activities such as subsistence harvesting, trapping, wood cutting, camping and other ways of connecting with the land for spiritual, cultural or personal well-being continue to be practiced on the land.

Access can have a number of potential positive and negative impacts on traditional values, including heritage resources and traditional economic activities:

17.3.2.1 **Heritage features and archaeological sites**

New and/or easier access to areas may

- increase the potential for more discoveries of heritage resources and archaeological sites
- result in damage and looting,
- subject sensitive sites to damage due to the use of heavy equipment and machinery.

17.3.2.2 **Tr'ondëk Hwëch'in traditional economy**

The Tr'ondëk Hwëch'in definition of heritage resources also includes traditional economic activities such as hunting, fishing, trapping, berry picking and harvesting medicinal plants. Therefore, any impacts to the land, water, fish and wildlife will by extension impact the traditional economy (subsistence harvesting activities, movement on the landscape and social and cultural connections). Increased levels of access could impact these culturally significant areas;

- positively by making it easier to get to areas of importance or
- negatively as it also opens these areas to other land uses and users.

17.3.2.3 **Hunting, trapping and fishing**

Increased access and disturbance may

- create more opportunities and easier travel for subsistence hunting and trapping.
- make it more difficult to locate wildlife due to wildlife avoidance of disturbance caused by increased access.
- impact water quality, fish health and populations, and migration timing.

17.3.3 Socio-Cultural Value

Historically, traditional trail networks and access routes facilitated the movement of people across the landscape, enabling them to share resources and knowledge. Continued use of these access networks today enables people to be out on the land and water, teaching cultural traditions and maintaining important social connections. Trading networks (facilitated by trails and water access routes) also functioned as a means to provide environmental information about distant locations, situations, events and changes. Trade and exchange of resources provided people with goods not readily available in their area, helped ensure peace among groups, facilitated transfer of new knowledge and technologies, and enriched Aboriginal culture through customs such as ceremonial rituals, dance and trading protocol (Tr'ondëk Hwëch'in 2012).

Today, in addition to continuing the long standing traditional economy uses, trails are being utilized for many purposes, with recreation being a major factor. For example, old mining trails in the Dawson area that were becoming overgrown are being actively cleared for other activities. A member of the local snowmobile association, the Dawson Sled Dawgs, noted that “the trails are there so you might as well use them” and “opening up new trails will give locals more recreational options because they could also be used in the summer by hikers, horseback riders and ATVers” (Yukon News 2007).

Access can have a number of potential impacts on socio-cultural values such as:

- Potential impacts of access and industrial development on land, water, fish or wildlife also affects **traditional economic activities**, which in turn impacts self-identity, fundamental cultural values obtained through connections to the land, and social and community well-being.
- Increased roads and trails can facilitate increased use of otherwise remote areas, resulting in more opportunities for **hunting, fishing and recreational activities**.
- Increased activity levels (e.g., large-scale random camping) and use of popular routes and destinations can result in areas being “loved to death” (impacting environmental values), or becoming non-desirable (too crowded) for those seeking more **wilderness experiences**.

17.3.3.1 Conflicts

Land use and resource conflicts may arise where access constructed for the purposes of mineral exploration attracts unintended users (i.e. recreational). Increased resident and visitor use of popular routes and destinations may impact cultural values and conflict with

traditional economic activities. Roads or trails currently used on a seasonal or temporary basis may have multiple users, but if the road became all-season or permanent these uses could overlap and conflict. For example, the Dawson Trail may have potential for all-season access to the White Gold region, which could result in conflicts between other users of the trail such as tourism, dog-mushing, mining, hunting and recreation (Government of Yukon 2011d). However, various industries are finding ways to work together to resolve some of these issues (e.g., the Memorandum of Understanding between Yukon Chamber of Mines, Klondike Placer Miners Association, and Tourism Industry Association of Yukon – discussed in section 17.4 Resource Management).

17.3.1 Economic Value

According to Government of Yukon (2019), maximizing the available land base in the planning region is necessary for ongoing economic development. Access fragmentation and access restriction to areas of mineral potential affects the ability to identify and achieve an economic and sustainable land base for further mineral resource exploration and development.

The Government of Yukon provides financial and material support to industry to develop resource access roads in Yukon through the *Resource Access Roads Program* (described in detail in the **Section 17.4**, along with the guiding *Resource Access Roads Framework*).

The following are examples of the type and extent of access that various industries need to be economically viable in the region.

17.3.1.1 Placer mining

Placer Mining requires access to, and the ability to modify, rivers and streams, and future exploration and development of placer resources depends on continued access to valley bottom and riparian zone land in the planning region. The placer industry also requires roads for transporting heavy equipment and an industrial land base for mining operations adjacent to the resource.

17.3.1.2 **Development of oil and gas**

Oil and gas resources in and north of the planning region are dependent on access to potential industrial customers in the south, such as the mining belt in the southern portion of the planning region.

17.3.1.3 **Forest harvesting**

Forest harvesting in the planning region generally requires access with limited road building requirements (three to five kilometers off existing all-season roads and within 1.5 hours drive from Dawson City).

17.3.1.4 **Future renewable energy**

Renewable energy producers in the planning region need to be able to connect to Yukon's electrical energy grid.

17.3.1.5 **Surficial materials**

Surficial materials (i.e., aggregates like sand and gravel) are key resources required to build roads and pipeline corridors. Adequate gravel resources are also required to maintain and upgrade any new roads or existing roads with increased traffic. (Government of Yukon 2011*b*). The location of accessible aggregate deposits could influence the location of future transportation infrastructure and industrial development.

17.3.1.6 **Tourism**

Tourism businesses benefit from access to trails and remote areas by plane and water, however, increased access for other industries may negatively affect the regions tourism assets by affecting the 'wilderness' experience.

New all-season access roads and infrastructure will likely be a response to demand from industry. Most new discoveries are located far from current roads, and almost all materials are transported in and out by air and/or barge during the exploration phase.

Secondary gravel roads maintained by government, as well as unmaintained bush roads, trails and winter access routes are also important infrastructure assets that allow access for economic activities. These types of access features are of only limited use to large-scale

industries such as hard rock mining because they cannot handle intensive use and heavy loads. However, they are considered extremely valuable to the mineral exploration, placer mining, forestry and tourism industries, as well as to the traditional economy. These non-government maintained access features are also used by tourists and others looking for outdoor recreation opportunities, as well as by First Nations for hunting, fishing, trapping and other subsistence harvesting activities (Archer, Cathro & Associates (1981) Limited 2012).

Many economic development opportunities in the planning region are limited because of inaccessibility and lack of infrastructure, and new roads constructed for one resource sector could make other sectors economically viable (e.g., a new mining road could provide access for a forestry operation or tourism destination). There is the potential to utilize traditional trail networks or marine routes instead of roads to create options for development in locations that would otherwise be inaccessible, without extensive infrastructure investments or high maintenance costs and with fewer environmental liabilities (Tr'ondëk Hwëch'in 2012).

17.4 Resource Management

17.4.1 Regulatory Framework

17.4.1.1 First Nation Final Agreements

Chapter 6 of Yukon First Nation Final Agreements specifically deals with access to Crown land within that particular Traditional Territory as well as conditions of access on Settlement Land, and there are various other provisions related to access and transportation in other chapters. Access provisions in the Tr'ondëk Hwëch'in Final Agreement (TH – DIAND 1998) include but are not limited to the following:

- A Waterfront Right-of-Way exists from the high water mark to a distance of 30 meters inland, for all navigable waters which border on or are within Settlement Land (5.15.1). Any Person has a right of access, without the consent of the First Nation, to use that Right-of-Way for travel and non-commercial recreation including camping and sport fishing (5.15.3). Consent or an order of the Surface Rights Board is required for access for commercial recreation purposes and if a permanent camp or structure is built (5.15.5, 5.15.6).
- A Person has a right of access, without the consent of the First Nation, to enter, cross and make necessary stops on Undeveloped Settlement Land to reach adjacent non-Settlement Land for commercial and non-commercial purposes (6.3.1). This is

conditional on the access being of a casual and insignificant nature; the route used is generally recognized or was used in the past on a regular basis; and no significant alterations are made of the route.

- Regarding (18.4.1)
 - 18.4.1.1 - Access being casual and insignificant. TH's definition of casual and insignificant: "means access that is occasional and leaves no enduring footprint or trace of human use lasting longer than a period of one year."
 - 18.4.1.2 - this condition requires the route to be "generally recognized" and having been used on a "regular basis" prior to the route becoming part of the SL parcel.
- A Person has a right of access, without the consent of the First Nation, to enter, cross and stay on Undeveloped Settlement Land for a reasonable period of time for all non-commercial recreational purposes (6.3.2).
- The rights of access provided by all these clauses are subject to the conditions that there shall be no significant damage to Settlement Land or improvements on Settlement Land, no mischief committed, and no significant interference with the use and peaceful enjoyment of Settlement Land by First Nations (6.1.6).
- A Yukon Indian Person has a right of access, without the consent of Government, to enter, cross and stay on Crown Land and to use Crown Land incidental to such access for a reasonable period of time for non-commercial purposes (6.2.0), if it is of a casual and insignificant nature or if it is for the purpose of harvesting fish and wildlife.
- Other access to Settlement Land may be granted with the consent of the First Nation or, failing consent, with an order of the Surface Rights Board setting out the terms and conditions of the access. Such an order would normally not be granted unless the Person seeking access satisfies the Board that such access is reasonably required, and is not also practicable and reasonable across Crown Land (5.15.6 and elsewhere in Chapter 6).
- Terms and conditions of this other access may include seasons, times, locations, method or manner of access (6.6.2). This would only be done to protect the environment; protect Fish and Wildlife or their habitat; reduce conflicts with traditional and cultural uses of Settlement Land by the First Nation; or protect the use and peaceful enjoyment of land used for communities and residences (6.6.3).
- Government will endeavor to locate any new quarries on non-Settlement Land and eliminate the use of existing quarry sites on Settlement Land by finding alternative sites. Some Settlement Land parcels are subject to further identification of quarries (18.2.5.2).
- Access to Settlement Land for an existing mineral right (18.3.0) is subject to similar clauses as in 6.3.1.

- Access to Settlement Land for a new mineral right (18.4.0) is subject to similar clauses as in 6.3.1 for Category B and Fee Simple lands. However, there is a right of access without the consent of the First Nation if “the exercise of the right of access does not require the use of heavy equipment or methods more disruptive or damaging to the land than hand labour methods” (18.4.2).

17.4.1.2 Tr’ondëk Hwëch’in Land and Resources Act

The *Tr’ondëk Hwëch’in Land and Resources Act* (2004) provides greater detail on the rights of access granted in the Final Agreement and states minimum terms and conditions for exercising that access. In particular:

<i>Unless otherwise authorized by a Tr’ondëk Hwëch’in law no person shall (Section 9):</i>
(a) cause significant damage to the land or to improvements on the land;
(b) cause or commit mischief on the land;
(c) cause significant interference with the use and peaceful enjoyment of the land by others;
(d) disturb a burial site, a site of paleontological or archaeological interest, a historic site or a heritage site which may be found within the land;
(e) allow any petroleum product, chemical or any other substance hazardous to the environment, people or wildlife to be stored or transferred in such a manner as to allow spillage into a body of water or the land; or
(f) abandon or discard on the land rubbish, refuse, garbage, packaging, containers, glass, paper, metal, soil, manure, sewage, the whole or part of a vehicle or machinery, or any material used in construction or resulting from demolition.

Section 7 defines “traditional activities” as those undertaken by a Tr’ondëk Hwëch’in citizen on a non-commercial basis for the purpose of obtaining food or providing for subsistence, or for a ceremonial, spiritual or cultural purpose, and any activity incidental thereto, and includes trapping.

A beneficiary of the Final Agreement has the right to use and occupy the land for the purpose of carrying on a traditional activity, including but not limited to:
(a) exercising rights under Chapters 16 and 17 of the Final Agreement [Fish and Wildlife and Forest Resources];
(b) gathering flora and fungi for food or medicine;
(c) harvesting dead timber for personal use as firewood; or
(d) spiritual or ceremonial activities.

The act also provides authority for Tr’ondëk Hwëch’in Government to: designate areas for specific land or resource management purposes; issue permits with terms and conditions for the exercise of access or the use of land and resources (e.g., leases, quarry concessions,

easements, access permits or grazing permits); charge fees, rents, or royalties and/or require financial security; designate stewards with monitoring, inspection and enforcement capacities.

Various regulations (2004) have been established under Section 120 of the act, including:

- Permit Regulations
- Lease Regulations
- Disposition Regulations
- Central Tr'ondëk Land Management Area Regulations (2018)
- Quarry Regulations
- Tenure and Land Use Regulation (2013)

These regulations, as well as terms and conditions in permits or leases, may have additional requirements regarding access, including controls on use where significant traffic or significant impact on wildlife or harvesting is a concern.

17.4.1.3 **Lands Act and Territorial Lands (Yukon) Act**

The Government of Yukon's Department of Energy, Mines and Resources, Lands Management Branch manages the majority of public land in the territory under the *Lands Act* (RSY 2002, c 132) and the *Territorial Lands (Yukon) Act* (SY 2003, c 17). Pursuant to this legislation, the branch regulates the disposition of land including sales, leases and grants of rights-of-way or easements, as well as temporary use or work on public lands. A land use permit is required for activities such as: site clearing or earth work; constructing a new road, trail or access; clearing or installing a utility right-of-way; establishing quarries; and conducting geotechnical or hydrological studies. The legislation also applies to land-based activities that occur directly adjacent to water (Government of Yukon 2011e).

17.4.1.4 **Highways Act**

The *Highways Act* (RSY 2002, c 108) regulates public roads. Under the act, a highway includes land used as a highway, land surveyed for use as a highway, and land designated by the Commissioner in Executive Council as a road allowance. Bridges or other public improvements to a highway and ice roads are also included within the definition (Government of Yukon 2011f).

The *Highways Regulation* (OIC 2002/174), Schedule 1 provides a list of all maintained highways in Yukon, and other sections discuss required permits (i.e., Highway Access

Permit) and terms and conditions of access from any of these listed highways. Regulations have been established for closures of roads or portions of roads.

17.4.1.5 **Area Development Act**

The *Area Development Act* (RSY 2002, c 10) permits the Commissioner in Executive Council to designate as a development area any area in Yukon where it is considered necessary in the public interest to regulate its orderly development.

17.4.1.5.1 **Dempster Highway Development Area Regulations**

A portion of the Dempster Highway was designated as such under the *Dempster Highway Development Area Regulations* (CO 1979/064), specifically the area from Km 68 to the Yukon-Northwest Territories border, for eight kilometres each side of the centre line. Section 7(1), 7(5) and 9(6) of the regulations outlines permissible uses, users, and areas where access is permitted within the development area, including during the event of the highway closure.

17.4.1.5.2 **Tombstone Territorial Park Management Plan**

Section 3.0, identifies the Tombstone Corridor as excluded from the Park to “provide for continued highway maintenance activities, a possible future pipeline, transmission line or other public visitor infrastructure that may be required along the Dempster Highway.” The Tombstone Corridor is to be managed under the *Area Development Act* and is not subject to the provisions of Chapter 10, Schedule A of the Tr’ondëk Hwëch’in Final Agreement [matters related to the establishment of the park]. The Government of Yukon has committed to manage the Tombstone Corridor in a manner that respects park values and, subject to the Tombstone Corridor objectives, is consistent with this management plan.

17.4.1.6 Placer Mining Act and Placer Mining Land Use Regulation

Section 1 of the *Placer Mining Land Use Regulation* (OIC 2003/59) under the *Placer Mining Act* (SY 2003, c 13) provides the following definitions related to access features and use:

"access road"	means a road that provides access to a public highway or to a private road
"corridor"	means a path from which trees and brush have been cut to accommodate a trail, water line, fuel line or power line
"isolated road"	means a road that does not provide access to a public highway directly or through a private road
"road"	means a pathway for vehicular traffic the construction of which requires the movement of rock or earth
"trail"	means an access to a site within a claim or lease that is constructed with little or no movement of rock or earth
"upgrading"	in relation to a road, means re-establishing a road that has not been useable for more than five years by vehicles of a type the road was originally designed to serve; modifying a road to provide usability for vehicles that are of a different type than those for which the road was originally designed to serve; and any other upgrading or modifying of a road, other than for maintenance or erosion control

Schedule 1, Part L of the regulation provides further details on the use of roads and trails.

A number of criteria are also used in Section 3 of the regulation to determine whether activities may proceed as Class 1 activities without further notification or approval (**Table 17-1**). For information on the placer mining Class system see **Chapter 13 Minerals**.

Table 17-1 Class 1 access criteria – placer mining operations

Activity	Class 1 Criteria
Construction of lines	Not exceeding 1.5 m in width and cut by hand or with hand held tools
Corridors-width	Not exceeding 5 m in width
Corridors-length	Total length not exceeding 0.5 km
New roads	Not authorized
Upgrading of roads	Not authorized
Use of roads or trails	Within the design limits or tolerances of the road or, if unknown, vehicles with a gross vehicle weight of less than 40 t for roads and less than 20 t for trails
Off-road use in summer	Low ground pressure vehicles only (35 kPa pressure or less)
Off-road use in winter	Low ground pressure vehicles or vehicles with gross vehicle weight not exceeding 40t used over a distance of not more than 15km

Activities exceeding Class 1 criteria require review and assessment under YESAA.

Operations that exceed any of the Class 2 criteria or that involve construction of a structure with a foundation are considered Class 3, and any operation that requires a water licence under the *Waters Act* is considered Class 4.

17.4.1.7 Quartz Mining Act and Quartz Mining Land Use Regulation

Section 1 of the *Quartz Mining Land Use Regulation* (OIC 2003/64) under the *Quartz Mining Act* (SY 2003, c 14) utilizes the same definitions for access features as the *Placer Mining Land Use Regulation* above. Schedule 1, Part L, Items 33 to 37 also uses the same wording for activities related to the use of roads and trails as above, but also adds one additional (38):

In addition to any remedial action required in relation to Item 2 of this Schedule [re-establishment of vegetative mat], temporary trails must be blocked to prevent further vehicular access.

A number of criteria are also used in Section 3 of the regulation to determine whether activities are considered Class 1 or Class 2, including the following related to access and linear features **Table 17-2**.

Table 17-2 Class 1 access criteria – quartz mining operations

Activity	Class 1 Criteria
Construction of lines	Not exceeding 1.5 m in width and cut by hand or with hand held tools
Corridors-width	Not exceeding 5 m in width
Corridors-length	Total length not exceeding 0.5 km
New roads	Not authorized
Upgrading of roads	Not authorized
Establishment of trails,	Not authorized
Establishing or using temporary trails	Not authorized on Settlement Land; otherwise only if width max. 7 m (or 1 m more than width of equipment to be moved), total length max. 3 km, and trail used only for moving sampling equipment between test sites
Use of existing roads or trails	Within the design limits or tolerances of the road or, if unknown, vehicles with a gross vehicle weight of less than 40 t for roads and less than 20 t for trails
Off-road use in summer	Low ground pressure vehicles only (35 kPa pressure or less)
Off-road use in winter	Low ground pressure vehicles or vehicles with a gross vehicle weight not exceeding 40 t used over a distance of not more than 15 km

The criteria also refer to helicopter pads as a type of surface clearing, with restrictions on the number and area of clearings permitted per claim. Operations that exceed any of the Class 3 criteria are considered Class 4. Mining Land Use Authorizations and Quartz Mining Licenses are issued pursuant to these regulations. Land Use Permits may also be required. Planning and approval of major mine developments, including road construction and decommissioning, would be guided by the Mine Site Reclamation and Closure Policy and Security regulations.

17.4.1.8 Forest Resources Act and Forest Resources Regulation

Part 4, Section 32 of the *Forest Resources Act* (SY 2008, c 15) contains provisions regarding establishment and parameters of roads for the purposes of forest resource harvesting:

In addition to new roads constructed for the purpose of harvesting forest resources, existing roads may also be designated as a forest resources road if the road:

- Requires modification or maintenance;
- Is not a highway under the *Highways Act*; and

- Will provide access for harvesting or forest management activities.

All forest resources roads are to be posted with appropriate signage indicating road name, restrictions on use, and phone number of the local Client Service & Inspections office (Government of Yukon 2013b).

The *Forest Resources Regulation* (OIC 2010/171), Part 7 states that no person may construct, modify, maintain or decommission a forest resources road or use a motor vehicle on a forest resources road without authorization (obtained through a harvesting licence, forest resources permit, cutting permit, or forest resources road permit). Upon completion of forest resource activities, the road is to be decommissioned according to terms within planning documents and the current standards. A security deposit may also be required from the holder of a forest resources road permit. Section 62(2) notes that in fixing the amount of security, the Director must consider the cost to restore the area that may be affected by the use of the road and to remedy or reduce any environmental impacts associated with the use of the road.

Section 64 permits the Director to suspend or cancel a forest resource road permit if the permit holder is not in compliance with the terms and conditions, or if use would create a safety hazard or unjustifiable damage to the environment.

Other sections permit the Director to close the road to use by any persons other than the permit or licence holder; to establish guidelines or standards for the construction, maintenance, modification and decommissioning of the road; and to limit the type of motor vehicles using the road.

Regardless of who constructs, modifies or maintains a forest resources road, ownership of the road remains with government (Section 68).

17.4.1.9 **Navigation Protection Act**

The federal *Navigation Protection Act* (1985) regulates and protects the public's right to marine navigation on navigable waterways in Canada.

In the Yukon, only the Yukon River and the Arctic Ocean are covered under the act, with Transport Canada as the decision body for projects. Developments on waterways (e.g., bridges or roads) are rare and not proposed in isolation. They are usually included in larger development proposals such as a mine, oil and gas development, or transmission line and are assessed accordingly.

17.4.1.10 **Waters Act**

The *Waters Act* (2003) regulates the use, diversion and discharge of water (both surface and ground water) from waterbodies in the Yukon, as well as the deposit of waste into waterbodies.

17.4.1.11 **Wilderness Tourism Licensing Act**

The *Wilderness Tourism Licensing Act* (RSY 2002, c 228), Section 14(1) permits the Commissioner in Executive Council to make regulations including the following, which could pertain to access management:

(c) limiting the type, use, volume, location, and duration of wilderness tourism activities for conservation purposes or sustainability of the wilderness resource; and

(p) establishing standards for vehicles and equipment to be used in a wilderness tourism activity.

The current *Wilderness Tourism Licensing Regulation* (OIC 1999/69) does not contain any regulations related to these specific matters.

17.5 Policy Direction

17.5.1 **Transportation infrastructure maintenance**

In terms of the *Highways Act*, roads built by developers for their own purposes typically remain private. Otherwise, they are designated as public roads unless access is specifically limited by the Minister under the act. Private resource roads where access may be restricted are generally of a limited life span, and the Government of Yukon's Department of Highways and Public Works (YG-HPW) generally requires that the road be gated or signed indicating it is not a public road. The general meaning of "access" to YG-HPW is the point where the new road intersects the main highway or secondary road within the highway right of way. It would be highly unlikely YG-HPW would ever deny a resource-type access. However, they do insist that the point of access to the main highway meets all safety standards, and request that the Department of Energy, Mines and Resources include road reclamation requirements in the land use permit (Government of Yukon 2012b).

YG-HPW, Transportation Engineering Branch manages planning and budgeting, monitors condition of infrastructure, and maintains information on land and granular resources associated with highway infrastructure.

17.5.1.1 Quarrying

Quarrying activities administered by the Government of Yukon include (Government of Yukon 2011a):

- Quarry leases – sites in planned quarry projects on Yukon land are leased to individual contractors or operators, or individuals may apply to lease stand-alone parcels.
- Designated public/community pits – provide small quantities of granular material for the general public and small contractors.
- Highway pits – With the consent of YG-HPW Transportation Maintenance Branch, users may remove raw gravel (pit run) from government pits. However, all stockpiles of crushed gravel are for government use only.

A quarry permit is required for all of these activities and is issued by the Department of Energy, Mines and Resources, Land Management Branch. Quarry permits specify how much and what type of material to be taken, start and finish date, and other conditions that may deal with pit reclamation. Some quarry activities, such as new pit development, may be subject to review under YESAA.

Closure and reclamation of gravel pits is undertaken on both a temporary and permanent basis. Operations will cease at a gravel pit when all the material needed has been extracted, or if the supply has been exhausted. When closed temporarily, YG-HPW ensures that clean up addresses erosion, drainage or contaminated soils within the pit. Some pits may appear abandoned as they are only used every five to 10 years (Government of Yukon 2011b). When a pit is closed permanently, the developer must follow a reclamation plan that includes removal of all garbage and debris from the site, erosion control and treatment of any contaminated soil. Seeding, planting and fertilizing may then occur as well as reclamation of the access road and removal of access from the highway.

17.5.2 Resource Access Roads

17.5.2.1 Resource Access Roads Framework (2013)

The Resource Access Roads Framework (RARF) outlines the goals and principles that guide decisions around the development and management of resource access roads and is supported by operational procedures and guidelines.

For the purposes of the framework, resource access roads are defined as “all routes needed by industry to access their properties and move their product to market”

(Government of Yukon 2013c). They include routes maintained by YG-HPW, routes not maintained by YG-HPW but still used by the public, and resource roads used by industry. The RARF applies only to quartz or hard rock mining and oil and gas sectors, as well as any placer mining operations that are large enough in scale.

Principles of the RARF include: managing resource access road development to minimize the potential for unsustainable maintenance costs or ongoing liability for government; consideration of potential socio-economic benefits as well as potential negative environmental and socio-economic impacts of proposed road projects; and maximizing the public good while minimizing risk.

The RARF states that it will “minimize impacts by ensuring shared access routes whenever possible,” but does not discuss planning of regional corridors or otherwise designating access routes. Instead industry is “encouraged” to work together to bring forward shared-use arrangements to government, who may then facilitate cost-sharing arrangements between the users. Agreements would also include any restrictions to use, access controls (whether physical or signage), and cost recovery mechanisms.

The RARF notes that development of new public access roads will be discouraged, and that all new roads for resource development will be decommissioned to an appropriate level upon completion of the project, unless otherwise determined by Government of Yukon. It also notes that access management will be key to controlling public use. When deciding on the closure of roads, Government of Yukon will consider social and economic benefits as well as potential environmental risk. In some cases, the potential for future industry use may warrant minimal decommissioning, such as taking out a bridge rather than reclaiming a whole road. Other situations may warrant minimal reclamation by virtue of their remoteness, and simply use signage indicating they are private roads to mitigate liability concerns.

17.5.2.2 **Resource Access Road Regulation (in progress 2019)**

The Government of Yukon is currently in the consultation phase of developing this regulation which builds on the 2013 RARF. This will regulate the construction, use, closure, and decommissioning of resource roads in the territory. Some of the implications of this regulation for regional planning will include the following: (Government of Yukon, 2018a)

- Creating regulations for the entire lifecycle of the road, including decommissioning, and will guide the restoration process and decrease environmental footprint.
- Multi-user agreements – to reduce the number and extent of roads.

- Clarity – regarding roles and responsibilities, and the purpose of the roads to ensure proper use.

17.5.2.3 **Resource Access Road Program (RARP)**

Provides financial and material support to industry to develop resource access roads in Yukon. Primary focus of this program is to assist resource-based companies with upgrading existing roads (Government of Yukon 2009).

17.5.3 **Other Policy**

17.5.3.1 **Off-Road Vehicle Regulations (In progress)**

The Government of Yukon's Department of Energy, Mines and Resources is currently working on Backcountry Off-road Vehicle (ORV) regulations for the territory. It is currently in the consultation and development phase. The ORV regulation has been proposed to mitigate some of the negative environmental impacts of ORV use while recognizing the utility and necessity of ORVs. When it is completed this regulation will have implications for planning access corridors in the region (Government of Yukon, 2018b).

17.5.3.2 **Forest resource roads and forest management**

Under the Forest Resources Act (FRA) standards for the construction, maintenance, modification and decommissioning of forest resource roads have been developed. These standards are found within the *Forest Resources Act Standards and Guidelines: Forest resources roads* (Government of Yukon, 2015a). This document contains the territory's standards on a number of elements including; site plans, riparian areas, and road classification to name a few. Additionally, the Yukon Forestry Handbook (Government of Yukon, 2015b) dedicates a chapter to Forest Resource Roads and offers guidance to planning, permitting and maintenance of these roads.

17.5.4 **Boards and Councils**

17.5.4.1 **Yukon Surface Rights Board**

The Yukon Surface Rights Board was established under the federal *Surface Rights Board Act* (SC 1994, c 43) with the primary role being to resolve access disputes between those owning or having an interest in the surface of the land and others with access rights to the

land. These disputes are primarily related to accessing or using Yukon First Nation Settlement Land and, in certain circumstances, disputes involving access to or use of non-Settlement Land. For example, the board's responsibilities under the *Quartz Mining Act* and *Placer Mining Act* are to hear and determine disputes about compensation to be paid under those acts for loss or damages, or about the adequacy of security required by the mining recorder (Yukon Surface Rights Board 2013).

17.5.4.2 Yukon Fish and Wildlife Management Board

The YFWMB has researched and participated in a number of initiatives related to access management as it pertains to fish and wildlife species. For example, in 2003 the board established a working group to explore the issues surrounding the use of off-road vehicles in the Yukon and produced a report entitled *Down the Road: The Effects of Roads and Trails on Wildlife* (YFWMB 2003). The board has also produced a number of documents related to the potential impacts of oil and gas development, and participated in development of the *Northern Mountain Caribou Management Plan* and the *Forty Mile Caribou Herd Working Group Habitat Protection Recommendations* (YFWMB 2013).

17.5.4.3 Dawson District Renewable Resources Council (RRC)

The Dawson District RRC participates in a number of management planning initiatives related to fish and wildlife habitat, including access management issues and recommendations (e.g., *Tombstone Territorial Park Management Plan*, *Porcupine Caribou Management Plan*, and *Dawson Forest Resources Management Plan*).

17.5.5 Best Management Practices

A large number of industry-specific best management practices have been developed by the Government of Yukon in consultation with industry representatives and other stakeholders, all of which address some mitigation measures for access construction and use, including aircraft disturbance. These are listed in **Section 3.4** of this report.

The report entitled *Down the Road: The Effects of Roads and Trails on Wildlife* produced by the Yukon Fish and Wildlife Management Board (2003) contains extensive recommendations on ways to reduce potential impacts of access on wildlife and wildlife habitat, including road design and construction, seasonal timing of access, decommissioning and reclamation, and access management strategies specifically for controlling or reducing the human use of development corridors.

The *Memorandum of Understanding* between the Yukon Chamber of Mines, Klondike Placer Miners' Association, and the Tourism Industry Association of the Yukon (2008) is an example of industries in the planning region acknowledging shared use of the land and resources, agreeing to share information on areas of importance, and making an effort to enhance communication and avoid conflict. A mechanism for conflict resolution is laid out in the MOU.

17.6 Risks and Uncertainty

17.6.1 Access and Climate Change

Achieving and maintaining stable roads over permafrost soil is a major challenge in the Yukon. Anything that causes the permafrost to melt (including soil disturbance during construction, soil contact with ground water, or warming climate) will cause the ice-rich soil to liquefy. Liquid soil has little strength and will settle or subside. When it freezes, it will expand or heave. This process causes large amounts of damage on road surfaces, such as undulations and cracking (Government of Yukon 2012a).

17.6.2 Other Risks and Uncertainties

17.6.2.1 Nonrenewable resources

Aggregate resources can be considered a non-renewable resource which is in limited supply. New sources of granular materials will need to be identified as existing sites are exhausted, particularly in the Dawson City area as well as along the major highways in the planning region. Long-term planning must consider current and future highway reconstruction and maintenance operations, community infrastructure needs, and current and potential future resource development projects. Aggregate requirements for new projects, in particular a full-scale operating mine, would be substantial. Therefore, the location of accessible aggregate deposits could influence the location of future transportation infrastructure and industrial development.

17.6.2.2 New Technology

New technological developments such as the use of dirigibles, hybrid air vehicles, and drones may help to reduce the amount of surface access features required for some industries. As well, new road and trail building techniques and/or the increased use of water transportation corridors could also lessen cumulative impacts on the ground.

17.6.2.3 Cumulative Effects

It is difficult to monitor and manage cumulative effects on the environment when many land use activities utilizing access routes are not reported or recorded. The Government of Yukon has recently implemented a voluntary Class 1 mining activity notification system.

For example, staking activities (while relatively low impact in and of themselves) when conducted en masse over large areas may lead to wildlife disturbance from helicopter traffic, increased use of airstrips and seasonal camp sites, and higher incidence of overlap with other resource users.

Disturbance of wildlife from many sources can have a cumulative effect (e.g., aircraft overhead flights, ATVs, snowmachines, predators, hikers, insects and hunters). Direct and indirect effects may act synergistically to cause decreases in population density and species richness. Increasing habitat loss and fragmentation, altered physical health due to disturbances and displacement from ideal habitat, increased hunting pressure, and projected impacts of climate change could combine to compound the overall effects of increasing access (EDI Environmental Dynamics Inc. 2008, Laberge Environmental Services 2006).

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Section 3



Resource Summary Maps

For online access of Section 3: Resource Maps, please visit
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